



NJD-iScience

№136

The Norwegian Journal of Development of  
the International Science





№136/2024

**Norwegian Journal of development of the International Science**

ISSN 3453-9875

It was established in November 2016 with support from the Norwegian Academy of Science.

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# AGRICULTURAL SCIENCES

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## RULES AND IMPORTANCE OF CORRECT USE OF MILK AND MILK SUBSTITUTE IN CALF RAISING

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### Abstract

Entrepreneurs always think about creating a more productive feed in breeding farms. Proper care of piglets, the fact that the piglets are healthier is considered to be the factor that will make the farm work economically and profitably in the future.

**Keywords:** cows, colostrum, newborn, breeding farms, milk substitute, calf feeding study, feeding calves

### Introduction:

Sixty days before the birth of calf, the body's demand for macro and micro elements and vitamins increases. During this period, the calf in the mother's womb begins to grow intensively (300-400 g per day). Therefore, special care is required for the cow during this period. The cow must be properly fed, and the conditions of care must comply with zoogenic rules.

A newborn calf should not be separated from its mother immediately. It is important that the cow licks the calf, which is necessary to stimulate blood circulation and skin respiration of the calf. Scientific studies have proven that up to 8% of the air exchange in newborn calves occurs through the skin, so the licking by

the mother cow directly affects their movement. The gastrointestinal system of newborn calves is sterile, and their immunity is weak. Therefore, no later than one hour after birth, the calf should be fed with colostrum from the mother. Compared to regular milk, colostrum contains 2 times more dry matter and energy, 100 times more vitamin A, 6 times more protein, and 3 times more minerals. Colostrum cleanses the calf's digestive tract and prevents the spread and movement of *E. coli* into the upper gastrointestinal tract and stomach.

### Quality indicators of colostrum

There are 3 types of immunoglobulins in colostrum (table 1).

Table 1

| Type of immunoglobulins | The importance                                     |
|-------------------------|----------------------------------------------------|
| ig G and ig M           | Destroys microorganisms entering the blood         |
| ig A                    | It prevents microorganisms from entering the blood |

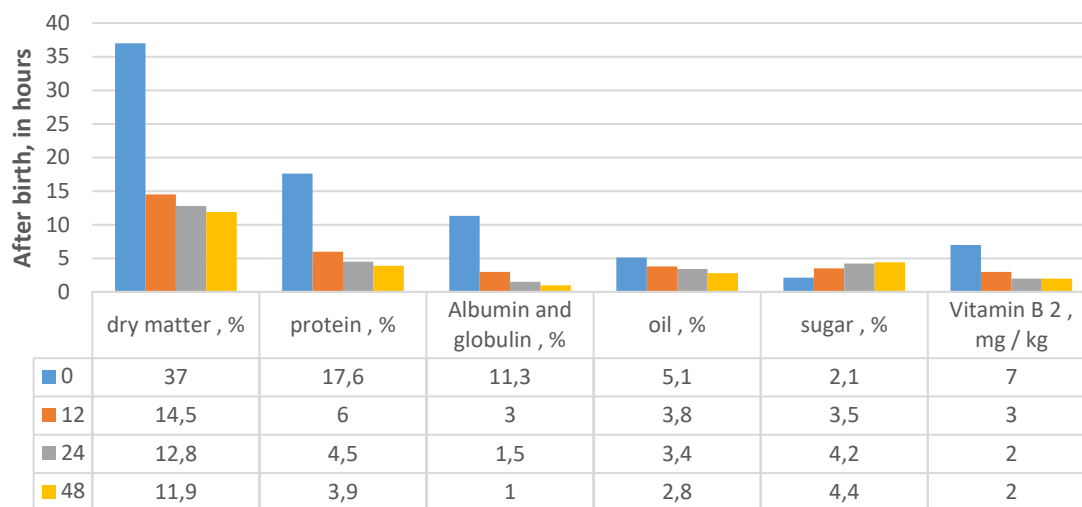
The concentration of IgG immunoglobulin in high-quality colostrum should be at least 50 g per liter. On the first day when calves receive colostrum, 90% of immunoglobulins are absorbed in the intestines. This absorption then decreases to 59% on the second day and 48% on the third day. Therefore, timely feeding of colostrum is considered very important for the healthy growth and development of newborn calves. The composition of colostrum changes after birth (Table 2).

Table 2

Changes in the composition of oral milk after birth

| Substances                       | After birth, in hours |      |      |      |
|----------------------------------|-----------------------|------|------|------|
|                                  | 0                     | 12   | 24   | 48   |
| Dry matter , %                   | 37.0                  | 14.5 | 12.8 | 11.9 |
| Protein , %                      | 17.6                  | 6.0  | 4.5  | 3.9  |
| Albumin and globulin , %         | 11.3                  | 3.0  | 1.5  | 1.0  |
| Oil , %                          | 5.1                   | 3.8  | 3,4  | 2.8  |
| Sugar , %                        | 2.1                   | 3.5  | 4.2  | 4.4  |
| Vitamin A, BV / kg               | 11000                 | 7000 | 4000 | 2000 |
| Vitamin B <sub>2</sub> , mg / kg | 7.0                   | 3.0  | 2.0  | 2.0  |

## Changes in the composition of oral milk after birth



### Rules for using oral milk and milk substitute.

Calves should be introduced to fresh green grass after receiving colostrum for at least 7-10 days to forage and other feeds after 15 days. Calves should receive 1.5-2 liters of colostrum 3-4 times a day, up to 10% of their live weight on the first day. In the following days, up to 2 liters of colostrum can be given to calves every

10-12 hours, 3 times a day. After 10 days, you can use 80% skim milk, 15% vegetable oil, 5% phosphatide concentrate, and 30 BV of vitamin A per 1 kg of dry matter as a milk substitute. The temperature of the milk replacer should be 38-40°C when fed to calves (Table 3).

Table 3  
Rules for using oral milk and milk substitute

| Age of calves, days, weeks | Rules of use                                          |
|----------------------------|-------------------------------------------------------|
| 1-2 days                   | 1.5-2 liters of colostrum 3-4 times a day             |
| 3-4 days                   | 1.5-2 liters of oral milk 3 times a day               |
| 6-8 days                   | 1.5-2 liters of colostrum 3-4 times a day             |
| 9-15 days                  | 2.5-3 milk 2 times a day                              |
| 16-20 days                 | 3 liters of milk 2 times a day (75% milk and 25% CFA) |
| 3-4 weeks                  | 3 liters of milk 2 times a day (50% milk and 50% CFA) |
| 5-8 weeks                  | 3 liters of milk 2 times a day (25% milk and 75% CFA) |
| 9 weeks                    | 3 liters of milk twice a day                          |

As a result, with the correct use of colostrum and milk additives, it is possible to raise healthier calves in breeding and private farms. This can lead to the re-establishment of the existing herd.

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# BIOLOGICAL SCIENCES

## PLANTS, HUMAN HEALTH AND CIVILIZATION

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## РАСТЕНИЯ, ЗДОРОВЬЕ ЧЕЛОВЕКА И ЦИВИЛИЗАЦИЯ

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### Abstract

People's ideas about plants underlie a wide range of their activities and cover, or rather affect, all areas of human life. Because since the birth of human civilisation and its development, business has depended on the management of plants, and due to the lack of the necessary knowledge, this business has failed in some cases. Nevertheless, throughout history, plants have been collected, traded, selectively adapted to new habitats and propagated to produce individuals with new characteristics. The logical consequence of this was the manipulation of plants for various (food, fodder, medicinal, technical, etc.) purposes, including aesthetic (ornamental properties), and this situation continues today. Moreover, modern civilisation is based on the proper use of biological and physical resources of plants, more efficiently and according to the principles of sustainable development. Because even today our understanding of the environment is still incomplete and there are many questions to be clarified, which cannot be solved without a comprehensive study of plants. The importance of this situation is now more obvious in the context of global problems in the world, as well as at the level of modern development of science and technology.

### Аннотация

Представления людей о растениях лежат в основе широкого круга их деятельности и охватывают, а точнее, затрагивают все области человеческой жизни. Потому что с момента зарождения человеческой цивилизации и ее развития дело зависело от управления растениями, и из-за отсутствия необходимых знаний это дело в ряде случаев терпело неудачу. Тем не менее, на протяжении всей истории растения собирали, продавали, выборочно адаптировали к новым местам обитания и размножали для получения особей с новыми характеристиками. Логическим следствием этого стало манипулирование растениями для различных (пищевых, кормовых, медицинских, технических и т. д.) целей, в том числе эстетических (декоративные свойства), и такая ситуация продолжается и сегодня. Более того, современная цивилизация основана на правильном использовании биологических и физических ресурсов растений, более эффективно и согласно принципам устойчивого развития. Потому что и сегодня наши представления об окружающей среде еще неполны и существует множество вопросов, требующих выяснения, которые невозможно решить без всестороннего изучения растений. Важность этой ситуации сейчас более очевидна в условиях глобальных проблем в мире, а также на уровне современного развития науки и техники.

**Keywords:** fodder plants, aerobic, microorganisms, technical plants, oil plants.

**Ключевые слова:** кормовые растения, аэробы, микроорганизмы, технические растения, масличные растения.

Известно, что большинство организмов, живущих на Земле, не могут жить без атмосферного воздуха, т. е. кислорода, то есть являются аэробами. Роль растений, как и некоторых микроорганизмов, неоценима в удовлетворении потребностей живых существ. Таким образом, только растения и некоторые микроорганизмы реализуют удовлетворение потребностей живых существ в кислороде и органических веществах путем преобразования солнечной энергии в химическую. На этом их роль не заканчивается, и упомянутая группа организмов играет важную роль в регулировании химического и биологического состояния климата, почвы и воды, источника полезных ископаемых (например, угля), которые мы сегодня истощаем, т.е. , возобновляемый источник энергии, который легко получить в будущем. Кроме того, растения и фотосинтезирующие бактерии действуют в биосфере, прежде всего, в регулировании круговорота углерода, в симбиотических отношениях с микроорганизмами, в обеспечении использования инертного атмосферного азота всем живым существом, в эрозии почв и в экологических аспектах жизни. открытая и закрытая среда, в которой действуют люди. Сегодня никто не сомневается в том, что она играет незаменимую роль в решении таких проблем. Неслучайно в наше время принято считать растения одним из неотъемлемых компонентов стратегии «Единого здоровья». Тем не менее, негативные последствия промышленной деятельности человека, то есть возрастающая антропогенная нагрузка на окружающую среду, увеличение численности населения Земли и другие последствия природопользования, могут изменить буферную систему природных процессов, регулирующих глобальный климат. Это может быть примером глобального изменения климата, которое человечество уже переживает сегодня. Будущее развитие Земли также зависит от результатов, которых люди добьются при более разумном и эффективном использовании растительной жизни.

Следует отметить, что растения отличаются от других живых существ рядом качеств, и это отличие лежит в основе научного и практического интереса к ним. Логично было бы прояснить этот момент, коснувшись некоторых из этих различий.

Во-первых, для превращения недифференцированных, т. е. соматических, клеток растений во взрослые особи требуется всего несколько фитогормонов, а из клеток вегетативных (лиственных и корневых) органов можно регенерировать целый организм. Подобная особенность не обнаружена у животных.

Во-вторых, как уже говорилось, растения являются практически основным и единственным источником органического вещества на Земле, прежде всего кислорода. Причиной этого является наличие у растений хлоропластов, способных собирать солнечную энергию, синтез 20 незаменимых аминокислот, необходимых для образования белков, в том числе 9, не вырабатываемых человеком (валин, триптофан и фенилаланин, лейцин, изолейцин). , лизин, метионин и треонин) вместе с микро-

организмами живые существа в атмосферном воздухе, а также сами растения обладают такими свойствами, как фиксация азота, которые они не могут использовать.

В-третьих, хотя у растений нет основной системы органов, присущей животным, т. е. нервной системы, их физиологические особенности реагируют на то, что происходит в окружающей среде. Помимо иммунной системы, растения обладают индукционным механизмом, обеспечивающим устойчивость к заболеваниям, вызываемым возбудителями и синтезируемыми ими токсинами.

В-четвертых, примитивные и высшие растения составляют первое звено пищевой цепи в наземных и водных системах. По этой причине растения занимают центральное место в сельском хозяйстве, вместе с микроорганизмами и домашними животными они могут служить источником сырья для питания человека, различного назначения, например, для изготовления одежды, строительных материалов и т. д. Кроме того, можно с уверенностью сказать, что применение основных сведений о растениях, например изучение потребности растений в питательных веществах, позволяет управлять плодородием почв, в связи с чем их изучение в различных аспектах актуально и сегодня.

В-пятых, хотя экологическая наука значительно продвинулась в понимании процессов, регулирующих динамику и трофическую структуру экосистем, систематические различия между экосистемами все еще сохраняются, что приводит к сохранению противоречий. Устранить их можно только путем всестороннего изучения растений в экосистеме.

Если к сказанному добавить, в результате исследований растений, ряд вопросов, играющих важную роль в развитии современной биологии и базирующихся на ней сегодня, например, законы Менделя, положившие начало генетике (эксперименты на горохе), явление фитохрома, транспозиция генетических элементов (кукуруза), ферментов, выяснено, что оно имеет белковую природу и т. д., т. е. в качестве модельных организмов используются и растения. В то же время это позволяет еще раз с уверенностью констатировать, что растения входят в число интересных и актуальных объектов исследования в любом аспекте и что необходимо проводить исследования в этих направлениях.

Кроме того, изучение растений связано и с другим моментом, связанным с возникновением инвазионного события. Таким образом, в результате ряда исследований становится ясно, что тысячи местных видов исчезли из-за инвазионных видов [12]. Предотвращение этого важно как для Конвенции Рио-де-Жанейро о биоразнообразии, так и для решения проблем, возникающих в результате глобализации.

Этот вопрос, то есть изучение растений в условиях Азербайджана, важен еще и с другой стороны, так как определенная часть территории уже 30 лет находится под оккупацией, экологическим террором, осуществляемым оккупантами, а также Тот факт, что большая часть воды, используемой для

орошения сельскохозяйственных растений, осуществляется за счет трансграничных рек, позволяет с уверенностью утверждать это.

Известно, что хотя основу питания человека традиционно составляют различные продукты, полученные из растений и животных, среди пищевых продуктов, употребляемых человеком, всегда имеются продукты, полученные при прямом и косвенном участии микроорганизмов, прежде всего бактерий и грибов, и многое другое. обнаруживается также больше продуктов из указанных источников, соотношение меняется в пользу микроорганизмов. Несмотря на это, растения и животные по-прежнему остаются основным источником питания человека, и по этой причине их исследования в удовлетворении потребности человека в продуктах питания считаются одной из актуальных проблем современности в силу вышеперечисленных причин.

Сегодня растения играют более важную роль в удовлетворении потребностей человека в продуктах питания, что обусловлено их следующими характеристиками:

1. Растения биологически более ценны в качестве пищи [15, 16], так как их биохимический состав, а именно содержащиеся в них белки, богаты как заменимыми, так и незаменимыми аминокислотами, а также способностью синтезировать витамины. Кроме того, растения богаты минеральными элементами, витаминами и другими важными для человека биологическими, в том числе фармакологически активными веществами;

2. Растения непосредственно являются одним из источников питания для людей и в то же время косвенно влияют на питание людей, составляя основу кормов животных, используемых людьми для приобретения продуктов питания, поэтому кормовые растения также играют важную роль. Большую роль в формировании количественных и качественных показателей животноводческой продукции они играют [17].

3. У растений есть более важная функция, жизненно необходимая для всего живого в природе, связанная с удовлетворением потребности в кислороде самих растений и других живых существ, являющихся источником питания для людей, ведущих аэробный образ жизни на Земле. Таким образом, необходимый для процесса дыхания кислород образуется в результате процесса фотосинтеза, происходящего в растениях [18].

Все это ясно подтверждает, какую важную роль играют растения в природе и жизни человека. По этой причине охрана растений и их эффективное использование являются одной из важных задач, требующих более точного решения, вытекающих из реалий современного глобализованного мира.

Следует отметить, что данные о количестве видов живого на Земле на данный момент резко отличаются друг от друга, и это число фиксируется от 2 миллионов [19] до 3 триллионов. Подходя к этим цифрам с точки зрения того, что известно науке и что актуально в природе, строятся различные системы [20], и по этим системам число известных

науче видов на Земле составляет  $8,7(\pm 1,3)$  млн видов, из них  $2,2 (\pm 0,18)$  млн обитают в морях, а остальные — на суше. В настоящее время каталогизировано в общей сложности 1,2 миллиона видов этих существ. 86% живого на земле и 91% в море ждут своего описания [21]. Тем не менее, количество известных науке видов цветковых растений по состоянию на 2023 год составит 369 000 видов. Если добавить сюда примитивные растения, то общее число видов, входящих в растительный мир, составит около 550 тысяч [22]. Из них количество видов, зарегистрированных в Азербайджане, равно 5000 [23], что составляет 9% мировой флоры. Тем не менее флора Азербайджана имеет самую богатую флору на Кавказе, так как 66% растений, встречающихся на Кавказе, встречаются в Азербайджане [24].

Тот факт, что большинство видов растительности можно встретить на небольшой территории, позволяет отметить богатство флоры Азербайджана [13], а для эффективного их использования эти растения систематизируются по-другому, как в мире, так то есть они также используют искусственную систематизацию растений. Из таких систем происходят лекарственные растения, технические растения, масличные растения, декоративные растения, кормовые растения.

Кормовые растения, как культурные, так и дикорастущие, представляют собой основную группу растений, необходимых для развития животноводства. Хотя невозможно назвать конкретные цифры о количестве видов кормовых растений в Азербайджане, нет сомнения, что их количество исчисляется сотнями. Так, семенной фонд однолетних злаковых трав на территории СНГ насчитывает до 1000 видов [8].

Следует отметить, что почти все кормовые растения по жизненным формам относятся к злакам и бывают однолетними, двулетними или многолетними [5]. В целом кормовые растения делятся на 4 группы, включающие злаковые травы, бобовые травы, осоки и разнотравье [16].

К травам, которые в настоящее время культивируются в Азербайджане культурным способом: *Agrostis alba* L., *Beta vulgaris* L., *Dactylis glomerata* L., *Festuca pratensis* Huds, *Helianthus annuus* L., *Hordeum vulgare* L., *Lathyrus sativus* L., *Medicago sativa* L., *Melilotus officinalis* Desr, *Onobrychis viciaefolia* Scop., *Panicum miliaceum* L., *Pisum arvense* L., *Sorghum sudanense* Pers, *Triticum aestivum* L., *T. durum* Desf, *Vicia sativa* L., *V. villosa* Roth, *Zea mays* L. и т. д. и др. растения можно отнести [5-7].

Большинство этих растений возделываются практически во всех регионах Азербайджана, но их посевные площади, продуктивность и кормовая ценность различны. Например, в 2023 году посевная площадь зерновых и зернобобовых составит 985 687 га, кормовых культур – 372 745 га, яровой и озимой пшеницы – 547 185 га. В 2023 г. урожайность пшеницы кормовых культур составила 31,9 ц/га, кукурузы на зерно - 58,6 ц/га, бобовых - 15,8 ц/га [18].

В целом следует отметить, что такие культуры, как люцерна, кукуруза, твердая и мягкая пшеница, а также ячмень, сейчас высеваются по всей стране, и большая часть используемых в стране кормов поставляется за счет этих культур. По этой причине их ресурсы как ресурса больше по сравнению с другими растениями. Например, в 2023 году урожайность подсолнечника на зерно составила 23 центнера, а посевная площадь - 11 539 га, что означает 26 539,7 тонн урожая в год. По кукурузе и пшенице объем продукции, произведенной за этот год, составляет 178829,6 т и 1745520 т соответственно [18].

Следует отметить, что ряд кормовых растений дикорастет и культурным способом еще не культивируется. Примерами могут служить такие растения, как *Agrostis alba* L., *Cynodon dactylon* (L.) Pers., *Malva ignorea* Wailler, *Phleum pratense* L., *Trifolium pratense* L. и др. [15-17]. Невозможно также дать конкретную цифру о ресурсах этих заводов, хотя бы по той причине, что такой статистический показатель не встречается ни в одном источнике. Именно их широкое распространение можно воспринимать как синоним наличия большого количества ресурсов. В связи с этим среди дикорастущих растений в качестве заповедников можно отметить *A.alba*, *Artemisia vulgaris* L., *C.dactylon*, *M.neglecta*, *T.pratense* и другие растения. Так, их можно встретить практически во всех районах региона.

Как культурные, так и дикорастущие кормовые растения имеют не только важное кормовое значение, но и активно участвуют в ряде процессов, типичных для растений в целом. Например, бобовые кормовые растения принимают активное участие в превращении инертной формы азота в почве в удобоваримую, т. е. в фиксации атмосферного воздуха. Кроме того, кормовые растения улучшают физико-химические свойства обрабатываемых почв, предотвращают такие процессы, как эрозия и засоление, а также используют их в различных целях (озеленение, пчеловодство, обогащение пастбищ и т.д.) [22] позволяет добиться эффективных результатов.

Наконец, уместно коснуться одного вопроса, что из-за искусственной систематизации растений одно и то же растение попадает в разные системы. Как известно, некоторые виды, упомянутые выше как кормовые растения, обладают и другими качествами. Например, кукуруза, подсолнечник, полынь, клевер трехлистный и др. растения также являются важными лекарственными растениями [21] и широко используются в народной медицине как средства, обладающие мочегонными, обезболивающими и др. свойствами [22, 24]. В то же время, благодаря этим свойствам, эти растения стали предметом различных аспектов (ботанических, фармакологических, микологических и др.) исследований, и эта ситуация продолжается до сих пор.

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# CHEMICAL SCIENCES

## INVESTIGATION OF INTERACTION AND GLASS FORMATION IN THE $\text{Ti}_3\text{As}_2\text{Se}_6$ - $\text{TiAs}_2\text{Se}_3\text{S}$ SYSTEM

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### Abstract

Using physicochemical methods of analysis (DTA, X-ray diffraction, microstructural analysis, as well as determination of density and microhardness), the chemical interaction and glass formation in the  $\text{Ti}_3\text{As}_2\text{Se}_6$ - $\text{TiAs}_2\text{Se}_3\text{S}$  system were studied, and its phase diagram was constructed. It was found that the  $\text{Ti}_3\text{As}_2\text{Se}_6$ - $\text{TiAs}_2\text{Se}_3\text{S}$  system is a non-quasi-binary section of the quaternary Ti-As-S-Se system. In the  $\text{Ti}_3\text{As}_2\text{Se}_6$ -based system, the solid solution region at room temperature is 5 mol %, and on the basis of  $\text{TiAs}_2\text{Se}_3\text{S}$ , the solid solutions are 3 mol %. Since the initial components of the  $\text{Ti}_3\text{As}_2\text{Se}_6$ - $\text{TiAs}_2\text{Se}_3\text{S}$  system are glassy, all alloys of the system are glassy.

**Keywords:** glass, phase, system, solid solution, liquidus.

### Introduction

The components of the  $\text{Ti}_3\text{As}_2\text{Se}_6$ - $\text{TiAs}_2\text{Se}_3\text{S}$  system are obtained from the compounds  $\text{As}_2\text{Se}_3$ ,  $\text{TiS}_2$  and  $\text{TiSe}$ . These compounds are materials with functional properties. It is known that arsenic chalcogenides and glassy alloys based on them are photosensitive semiconductor materials of the visible wavelength range and are used in various fields of photoelectronics [1-8].

Thallium chalcogenides and new phases based on them are photosensitive materials and are widely used as energy converters [9-11]. From this point of view, the study of chemical interaction and phase equilibrium between  $\text{Ti}_3\text{As}_2\text{Se}_6$  and  $\text{TiAs}_2\text{Se}_3\text{S}$ , which form the  $\text{Ti}_3\text{As}_2\text{Se}_6$ - $\text{TiAs}_2\text{Se}_3\text{S}$  system, has scientific and practical significance. Systems consisting of internal sections of the As, Ti/S, Se quaternary system have been previously studied by us [12-15].

The aim of this work is to construct its phase diagram by studying the physicochemical interaction and glass formation in the  $\text{Ti}_3\text{As}_2\text{Se}_6$ - $\text{TiAs}_2\text{Se}_3\text{S}$  system.

The  $\text{Ti}_3\text{As}_2\text{Se}_6$  compound melts incongruently at 245°C, the microhardness in the crystalline state is 1250 MPa, in the glass 1080 MPa [16]. The  $\text{TiAs}_2\text{Se}_3\text{S}$  compound is a glassy material with congruent melting at 305°C, with microhardness and density, respectively:  $H\mu = 840$  MPa and  $\rho = 6.82$  g/cm<sup>3</sup> [17].

### Experimental part

The alloys of the system were obtained by joint melting of  $\text{Ti}_3\text{As}_2\text{Se}_6$  and  $\text{TiAs}_2\text{Se}_3\text{S}$  compounds in a sealed quartz ampoule with air suction to a pressure of 0.133 MPa. During the synthesis, the temperature was first smoothly increased to 600°C and maintained by vibration for 5 hours, then the furnace temperature was

reduced to 400°C and maintained for 24 hours. The next day, the temperature was brought to 200°C by cooling at a rate of 100°C per hour, and then cooled by switching off. The alloys of the  $\text{Ti}_3\text{As}_2\text{Se}_6$  and  $\text{TiAs}_2\text{Se}_3\text{S}$  system were studied by DTA, X-ray diffraction, MSA analysis, as well as by determining the density and microhardness.

Differential-thermal analysis was performed on a low-frequency pyrometer THERMOSCAN-2. Chromel-alumel was used as a thermocouple, the heating rate was 5°C/min. X-ray phase analysis of the alloys was performed on a D2 PHASER X-ray diffractometer.  $\text{CuK}\alpha$  radiation and a Ni filter were used as an anode. Microstructure analysis was performed on a MIM-8 microscope. A solution of 10 ml of 0.1 HCl + 5 ml of  $\text{H}_2\text{O}_2$  was used as an etchant to detect the phase boundary in the samples. Microhardness was measured on a PMT-3 metallographic microscope. Density was determined by the pycnometric method, toluene was used as a filler.

### Results and discussion

The synthesized alloys are dense, black shiny substances. The alloys of the system are resistant to water and air. Samples rich in the  $\text{Ti}_3\text{As}_2\text{Se}_6$  compound are relatively poorly soluble in mineral acids, while the  $\text{TiAs}_2\text{Se}_3\text{S}$  compound is practically insoluble. They dissolve well only in heated  $\text{HNO}_3$  acid and gradually in alkaline solutions (NaOH, KOH).

The synthesized samples were kept at 170 °C for 850 hours for crystallization. Crystallization was monitored using physicochemical analysis methods. Some physicochemical properties of the  $\text{Ti}_3\text{As}_2\text{Se}_6$ - $\text{TiAs}_2\text{Se}_3\text{S}$  system alloys in glass and crystalline form are given in Tables 1 and 2.

Table 1.

Composition of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system alloys, DTA results, microhardness and density measurements (in glass form)

| Composition, mol %                              |                                     | Thermal effects, °C | Density, q/cm <sup>3</sup> | Mikrohardness, MPa |                                   |                                                                |     |
|-------------------------------------------------|-------------------------------------|---------------------|----------------------------|--------------------|-----------------------------------|----------------------------------------------------------------|-----|
| Tl <sub>3</sub> As <sub>2</sub> Se <sub>6</sub> | TlAs <sub>2</sub> Se <sub>3</sub> S |                     |                            | α                  | TlAs <sub>2</sub> Se <sub>4</sub> | Tl <sub>3</sub> As <sub>2</sub> S <sub>3</sub> Se <sub>3</sub> | β   |
|                                                 |                                     |                     |                            | P=0,15 N           |                                   |                                                                |     |
| 100                                             | 0.0                                 | 145. 245            | 7.40                       | 1250               | —                                 | —                                                              | —   |
| 95                                              | 5.0                                 | 140. 230. 245       | 7.40                       | 1280               | —                                 | —                                                              | —   |
| 90                                              | 10                                  | 140. 225. 240       | 7.25                       | 1280               | —                                 | —                                                              | —   |
| 80                                              | 20                                  | 135. 190. 225. 235  | 7.15                       | 1270               | 1150                              | 1050                                                           | —   |
| 70                                              | 30                                  | 135. 190. 225. 230  | 6.97                       | 1250               | 1130                              | 1060                                                           | —   |
| 60                                              | 40                                  | 140. 190. 215. 245  | 6.90                       | 1250               | 1100                              | 1050                                                           | —   |
| 50                                              | 50                                  | 130. 190. 265       | 6.80                       | —                  | 1100                              | 1050                                                           | —   |
| 45                                              | 55                                  | 130. 190. 225. 275  | 6.72                       | —                  | —                                 | —                                                              | —   |
| 40                                              | 60                                  | 130. 190. 240. 280  | 6.67                       | —                  | —                                 | 1050                                                           | —   |
| 35                                              | 65                                  | 135. 250. 285       | 6.60                       | —                  | 1100                              | 1050                                                           | —   |
| 30                                              | 70                                  | 140. 205. 270       | 6.56                       | —                  | —                                 | —                                                              | —   |
| 20                                              | 80                                  | 150. 205. 250. 270  | 6.49                       | —                  | —                                 | —                                                              | 880 |
| 10                                              | 90                                  | 155. 230. 250. 290  | 6.42                       | —                  | —                                 | —                                                              | 880 |
| 5,0                                             | 95                                  | 160. 270. 300       | 6.30                       | —                  | —                                 | —                                                              | 870 |
| 0,0                                             | 100                                 | 165. 305            | 6.25                       | —                  | —                                 | —                                                              | 840 |

Table 1.

Composition of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system alloys, DTA results, microhardness and density measurements (in crystalline form)

| Composition, mol %                              |                                     | Thermal effects, °C | Density, q/cm <sup>3</sup> | Mikrohardness, MPa |                                   |                                                                |        |
|-------------------------------------------------|-------------------------------------|---------------------|----------------------------|--------------------|-----------------------------------|----------------------------------------------------------------|--------|
| Tl <sub>3</sub> As <sub>2</sub> Se <sub>6</sub> | TlAs <sub>2</sub> Se <sub>3</sub> S |                     |                            | α                  | TlAs <sub>2</sub> Se <sub>4</sub> | Tl <sub>3</sub> As <sub>2</sub> S <sub>3</sub> Se <sub>3</sub> | β      |
|                                                 |                                     |                     |                            | P=0,10 N           |                                   |                                                                |        |
| 100                                             | 0.0                                 | 245                 | 7.80                       | 1080               | —                                 | —                                                              | —      |
| 95                                              | 5.0                                 | 230. 245            | 7.78                       | 1100               | —                                 | —                                                              | —      |
| 90                                              | 10                                  | 225. 240            | 7.70                       | 1100               | —                                 | —                                                              | —      |
| 80                                              | 20                                  | 190. 225. 235       | 7.52                       | 1120               | 920                               | 890                                                            | —      |
| 70                                              | 30                                  | 190. 225. 230       | 7.40                       | 1100               | 900                               | 970                                                            | —      |
| 60                                              | 40                                  | 190. 215. 245       | 7.25                       | 1090               | 910                               | 870                                                            | —      |
| 50                                              | 50                                  | 190. 265            | 7.15                       | 1080               | 910                               | —                                                              | —      |
| 45                                              | 55                                  | 190. 225. 275       | 7.05                       | Eutek.             | Eutek.                            | Evuek.                                                         | —      |
| 40                                              | 60                                  | 190. 240. 280       | 6.95                       | —                  | 900                               | —                                                              | —      |
| 35                                              | 65                                  | 250. 285            | 6.82                       | —                  | 900                               | —                                                              | —      |
| 30                                              | 70                                  | 205. 270            | 6.79                       | —                  | Eutek.                            | Eutek.                                                         | Eutek. |
| 20                                              | 80                                  | 205. 250. 270       | 6.62                       | —                  | —                                 | 870                                                            | 820    |
| 10                                              | 90                                  | 230. 250. 290       | 6.54                       | —                  | —                                 | —                                                              | 820    |
| 5.0                                             | 95                                  | 270. 300            | 6.45                       | —                  | —                                 | —                                                              | 800    |
| 0,0                                             | 100                                 | 305                 | 6.40                       | —                  | —                                 | —                                                              | 780    |

Differential-thermal analysis of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system shows that softening temperatures are observed on the thermograms of alloys before heat treatment. Thermal effects are almost always very small and mixed. The fact that the temperature  $T_g$  (140-165°C) does not increase monotonically and takes different values indicates the complexity of the composition. In order to distinguish phases, microstructural analysis of glassy and crystalline samples was carried out. One of the ways to better detect phases is etching with a chemical solution. Annealing allows us to iden-

tify the size, shape and distribution of phases in the alloy. The main condition is the formation of different phase relief. In this case, it is not important which phase has the highest dissolution rate inside the alloy. To determine the composition of the obtained samples, they were crystallized and their microstructure was studied. It was found that in areas close to the main components, single-phase and two-phase alloys are found. It was found that three-phase alloys exist in the concentration range of 15-80 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$  (Fig. 1). The alloy with a concentration of 5 mol % shown in the figure is a solid solution alloy based on the compound

$\text{Tl}_3\text{As}_2\text{Se}_6$ . Samples of 10 and 40 mol % are two-phase and three-phase alloys.

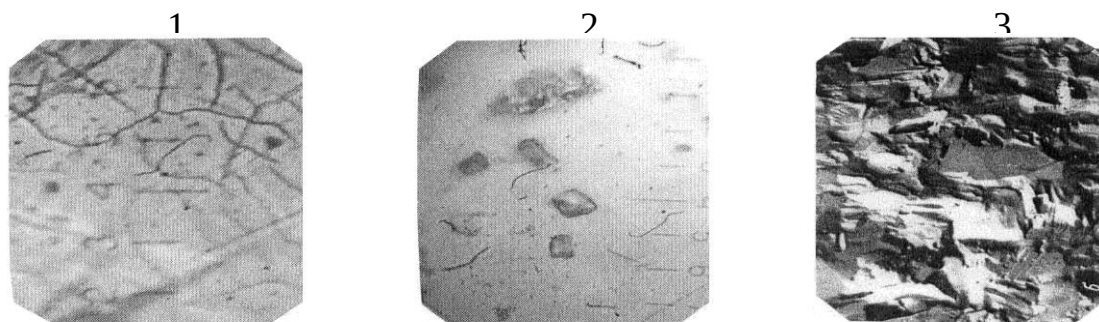


Fig. 1. Microstructures of alloys of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system. ( $\times 340$ ): 1-5, 2-10, 3-40 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$ .

An X-ray structural analysis of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  alloys was performed. It was found that no diffraction maxima were obtained on the diffraction patterns of the samples before heat treatment. Figure 2 shows the X-ray patterns of  $\text{TlAs}_2\text{Se}_3\text{S}$  samples with a

content of 20, 50 and 80 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$  in the glassy state. This indicates that all the obtained alloys are glassy.

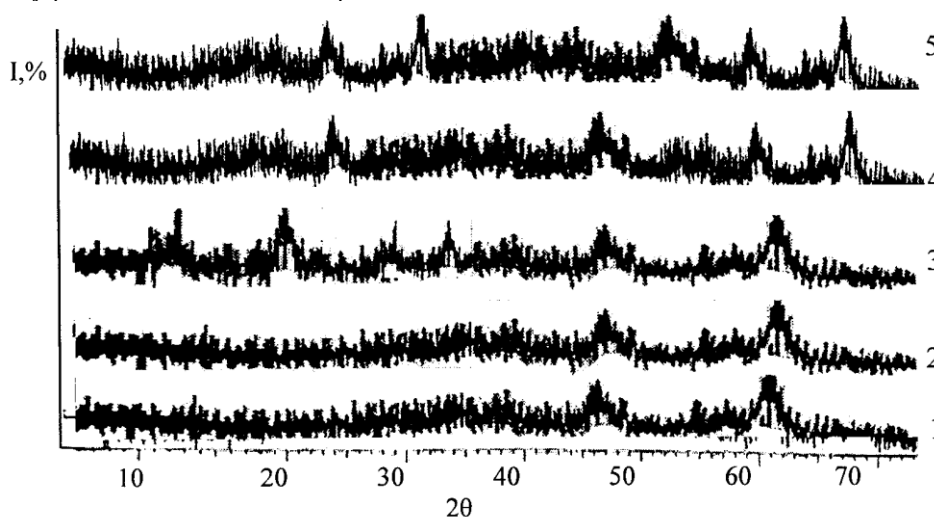


Fig. 2. Diffraction patterns of glassy alloys of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system.  
1-  $\text{Tl}_3\text{As}_2\text{Se}_6$ , 2-20, 3-50, 4-80, 5- 100 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$

X-ray analysis after heat treatment shows that diffraction lines of sufficiently high intensity appear on the X-ray images of the samples. Thus, X-ray analysis, like the above-mentioned methods of analysis, shows that a complex interaction occurs in the system. When measuring the microhardness of the alloys of the system, four different, relatively close values were obtained. The following values of microhardness and density of glass were obtained. The values of microhardness  $H\mu = (1250-1280)$  MPa and density  $\rho = (7.15-7.40)$  g/cm<sup>3</sup> of the  $\alpha$ -solid solution obtained on the basis

of the combination  $\text{Tl}_3\text{As}_2\text{Se}_6$ ,  $H\mu = (1100-1150)$  MPa,  $\rho = (6.90-7.15)$  g/cm<sup>3</sup> of the  $\text{TlAs}_2\text{Se}_4$  compound,  $H\mu = (1050-1060)$  MPa,  $\rho = (6.56-6.80)$  g/cm<sup>3</sup> of the  $\text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$  compound and  $H\mu = (840-880)$  MPa,  $\rho = (6.25-6.56)$  g/cm<sup>3</sup> correspond to the values of microhardness and density of the  $\beta$ -solid solution obtained on the basis of the  $\text{TlAs}_2\text{Se}_3\text{S}$  compound.

Based on the results of physicochemical analysis methods, a phase diagram of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system was constructed (Fig. 3).

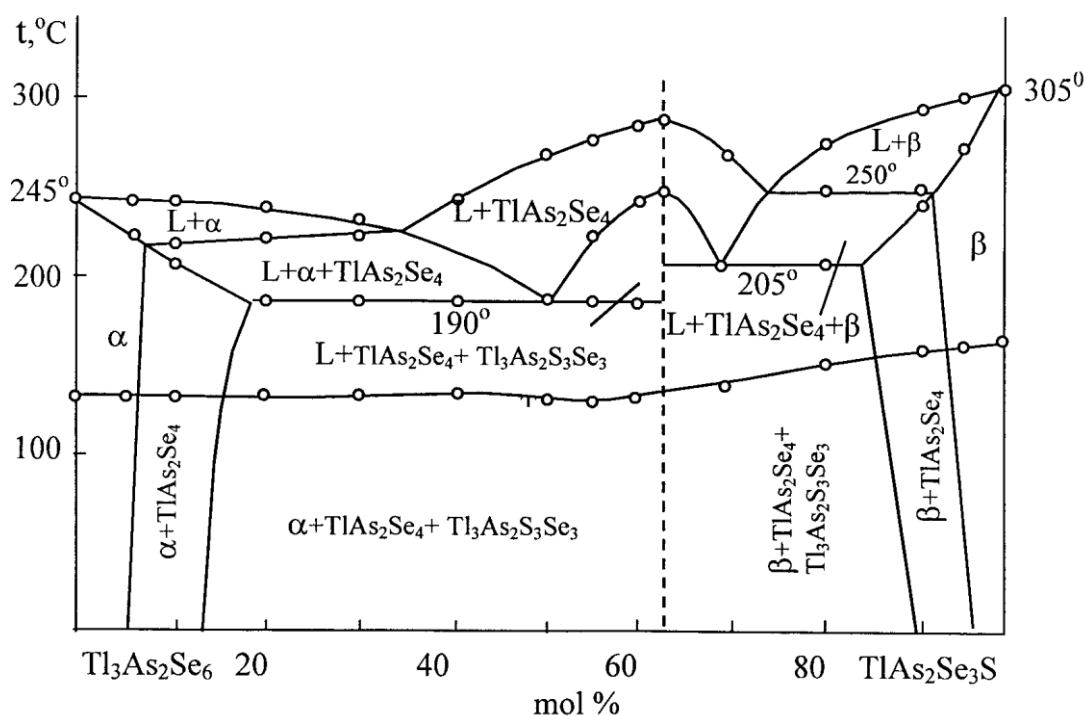


Fig. 3. Phase diagram of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system.

During the study of the quasi-ternary system  $\text{As}_2\text{S}_3$ - $\text{As}_2\text{Se}_3$ - $\text{TlS}(\text{Se})$ , it was found that the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system is non-quasi-binary, passing through the regions of two subordinate triangles  $\text{As}_2\text{Se}_3$ - $\text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$ - $\text{TlAs}_2\text{Se}_4$  and  $\text{TlAs}_2\text{Se}_4$ - $\text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$ - $\text{Tl}_3\text{As}_2\text{Se}_6$ .  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  crosses the three-phase field, crossing the triangle  $\text{TlAs}_2\text{Se}_4$ - $\text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$ - $\text{Tl}_3\text{As}_2\text{Se}_6$ . At this time, in the range of 0–63 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$ , the liquid of this part of the system is limited by the initial crystallization curves of the  $\text{TlAs}_2\text{Se}_4$  compound with an  $\alpha$ -solid solution. The combined crystallization of both phases ends with a double eutectic. At this point, a three-phase equilibrium  $\text{L} \leftrightarrow \alpha + \text{TlAs}_2\text{Se}_4$  occurs. In the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system based on the compound  $\text{Tl}_3\text{As}_2\text{Se}_6$ , the solid solution region at room temperature is 5 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$ , and based on the compound  $\text{Tl}_3\text{As}_2\text{Se}_6$  up to 3 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$ .

The composition of the eutectic is ~35 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$ , the melting point is 225°C. In this region, the phases ( $\text{L} + \alpha$ ) and ( $\text{L} + \text{TlAs}_2\text{Se}_4$ ) are located below the liquids lines. Below the liquidus line, there are two-phase and three-phase regions, ( $\text{L} + \text{TlAs}_2\text{Se}_4$ ) and ( $\text{L} + \text{TlAs}_2\text{Se}_4 + \text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$ ). Below the solidus line, as a result of double precipitation, alloys consisting of three-phase ( $\alpha + \text{TlAs}_2\text{Se}_4 + \text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$ ) alloys crystallize. In the ternary eutectic, a four-phase equilibrium is formed:  $\text{L} \leftrightarrow \alpha + \text{TlAs}_2\text{Se}_4 + \text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$ .

The rest of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system passes through the region of the  $\text{As}_2\text{Se}_3$ - $\text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$ - $\text{TlAs}_2\text{Se}_4$  hardness triangle. At the intersection point, the  $\text{Tl}_3\text{As}_2\text{S}_3\text{Se}_3$  and  $\text{TlAs}_2\text{Se}_4$  phases are formed. In the concentration range of the system of 53–100 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$ , the liquidus region is surrounded by the curves of primary crystallization of  $\text{TlAs}_2\text{Se}_4$  and the  $\beta$ -solid solution. Their cocrystallization is completed by a binary eutectic of the composition ~73 mol %

$\text{TlAs}_2\text{Se}_3\text{S}$  with a melting point of 250°C. At this point, invariant equilibrium occurs:  $\text{L} \leftrightarrow \beta + \text{TlAs}_2\text{Se}_4$ . Below the liquids line, in the range of 73–90 mol %  $\text{TlAs}_2\text{Se}_3\text{S}$ , phases consisting of a mixture of  $\text{L} + \beta + \text{TlAs}_2\text{Se}_4$  are formed. As a result of reprecipitation, the liquid phase completely dissolves, passes into the solid phase, and three-phase alloys consisting of ( $\beta + \text{TlAs}_2\text{Se}_4 + \text{TlAs}_2\text{Se}_3\text{S}$ ) crystallize below the solidus line.

### Conclusion

Thus, the phase diagram of the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system was constructed using physicochemical analysis methods. This system is a non-quasi-binary part of the quasi-ternary  $\text{As}_2\text{S}_3$ - $\text{As}_2\text{Se}_3$ - $\text{TlSe}$  system. Based on the initial components, a limited area of solid solutions is obtained in the system. Upon normal cooling, all alloys of the system were obtained in the form of glass. In the  $\text{Tl}_3\text{As}_2\text{Se}_6$ - $\text{TlAs}_2\text{Se}_3\text{S}$  system, the area of the solid solution at room temperature is 5 mol % based on the  $\text{Tl}_3\text{As}_2\text{Se}_6$  compound and 3 mol % based on  $\text{TlAs}_2\text{Se}_3\text{S}$ . The softening and crystallization temperatures of the obtained chalcogenide glasses were determined.

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## CYCLIZATION REACTIONS WITH REAGENTS CONTAINING A CAGE SUBSTITUTE

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National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"***Klimko Yu.***PhD in Chemistry, Senior Lecturer**Department of Organic Chemistry and Technology of Organic Substances  
National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute"***Levandovskii S.***student**National Technical University of Ukraine "Kyiv Polytechnic Institute"**Kyiv, Ukraine*<https://doi.org/10.5281/zenodo.12746001>**Abstract**

By a cyclocondensation reaction known as the Biginelli reaction, tetrahydropyrimidines and thiotetrahydropyrimidines containing an adamantyl substituent at positions 1 and 4 of the heterocycle were synthesized. The yields of target products ranged from 46 to 76% depending on the type of substituents ( $X=O$  or  $X=S$ ,  $R=Ad$ - or  $AdCH_2$ -). Intramolecular condensation of N-adamantoylglycine yielded 2-(1-adamantyl)-5(4H)-oxazolone in 61% yield.

**Keywords:** Biginelli reaction, 6-Methyl-4-phenyl-5-ethoxycarbonyl-1,2,3,4-tetrahydropyrimidin-2-one, adamantyl-containing ureas, thioureas, aldehydes, N-(1-adamantylcarbonyl)glycine, 2-(1-adamantyl)-4-benzylidene-5-oxazolone, 2-(1-adamantyl)-5(4H)-oxazolone, dicyclohexylcarbodiimide.

**Materials and methods**

Chromatograms and LC/MS spectra were obtained on an "Agilent 1100 Series" instrument equipped with an "Agilent LC/MSD SL" detector.

$^1H$  NMR spectra (400 MHz and 500 MHz) were recorded on Varian Mercury-400 and Bruker Avance DRX 500 NMR spectrometers with TMS as an internal standard.

The IR spectra of samples in KBr pellets containing 0.25% of the substance were recorded on a Specord 75IR instrument.

All reagents were obtained from commercially available sources (Aldrich, Fluka) and were used without further purification.

**Results and discussion.***Biginelli reaction with reagents containing a cage substitute*

In the interaction of benzaldehyde, urea and acetoacetic ester in a molar ratio of 1:2:1 in the presence of a catalytic amount of hydrochloric acid, as shown by Biginelli, 6-methyl-4-phenyl-5-ethoxycarbonyl-1,2,3,4-tetrahydropyrimidine-2-one [1]. Later it turned out that not only aromatic, but also aliphatic aldehydes enter into this condensation [1–4]. At the same time, in addition to urea and thiourea, it was possible to use their N-substituted derivatives [5]. Thus, the Biginelli reaction turned out to be one of the important methods for

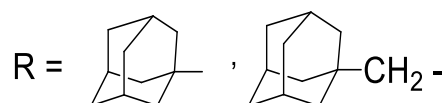
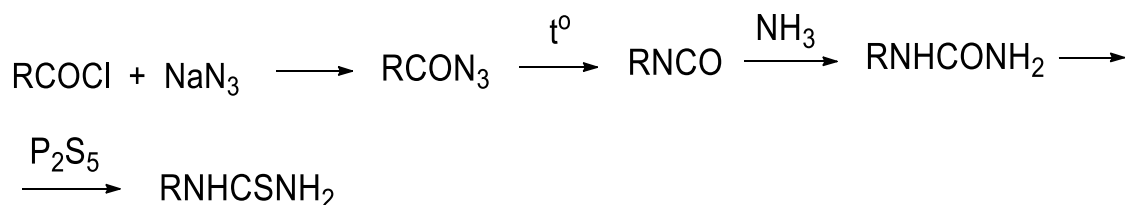
the synthesis of various tetrahydropyrimidine derivatives. An important role in the formation of the latter is played by intermediate amidoalkylating agents of the or type, which can be obtained as a result of the condensation of urea with aldehydes or acetoacetic ester [6]. Instead of aldehydes and acetoacetic ester, it was possible to use the products of their condensation obtained previously [3].

In recent years, interest in the Biginelli reaction has increased significantly, due to the search for drugs that affect the cardiovascular system among tetrahydropyrimidine derivatives. In a number of these compounds, pharmaceutical agents have indeed been found, having a pronounced hypotensive effect and a negative inotropic effect [7, 8].

On the other hand, the presence of an adamantyl substituent in compounds containing pharmacophore groups is known to enhance or impart new properties to potential physiologically active substrates.

The aim of this part is to obtain tetrahydropyrimidines containing adamantyl radical in different positions of the ring.

The starting adamantyl-containing ureas, thioureas, and aldehydes were obtained by standard procedures.



A few drops of concentrated hydrochloric acid were added to a mixture of reagents in acetic acid (X = O) or ethanol (X = S) in the ratio indicated above and boiled for 8 (X = O) or 12 hours (X = S). The solvent

was removed in vacuo. The residue was crystallized from methanol.

Yields of tetrahydropyrimidines are shown in Table 1.

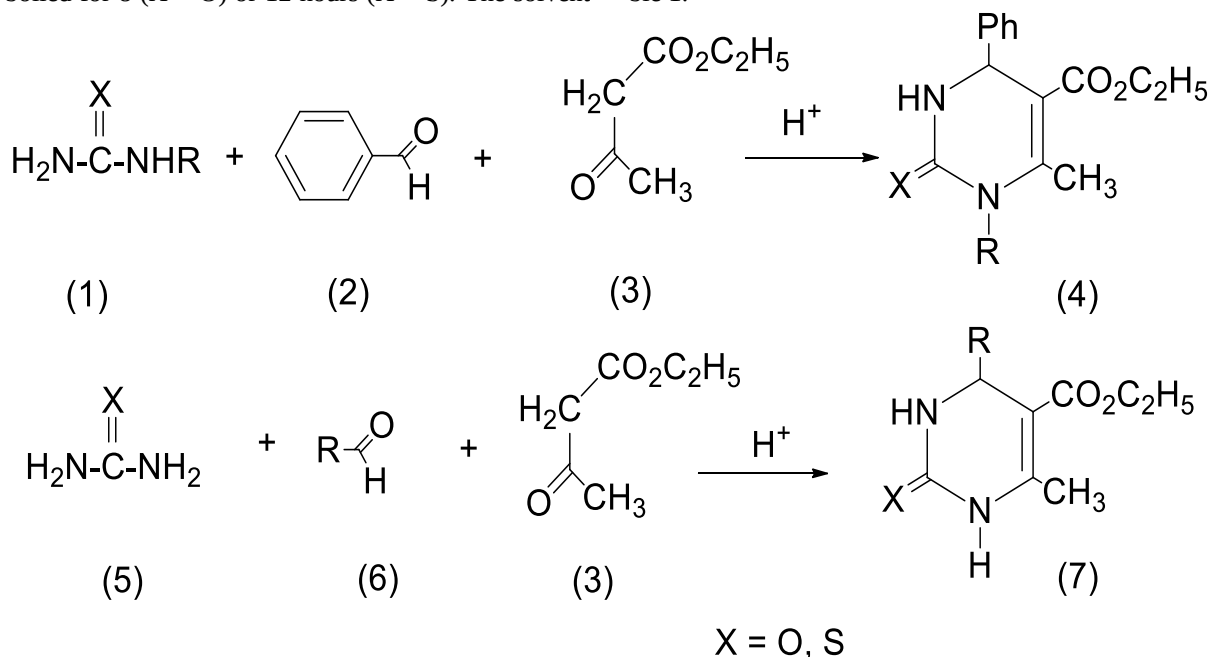


Table 1.

Yields of synthesized tetrahydropyrimidines (4), (7).

| Compound | Yield, % |                     |       |                     |
|----------|----------|---------------------|-------|---------------------|
|          | X = O    |                     | X = S |                     |
|          | Ad-      | AdCH <sub>2</sub> - | Ad-   | AdCH <sub>2</sub> - |
| 4        | 51       | 73                  | 46    | 68                  |
| 7        | 47       | 72                  | 52    | 76                  |

As can be seen from the table, the yields of compounds containing adamantyl radical are lower than those of compounds with adamantylmethyl radical. This can be explained by spatial difficulties arising in the first case.

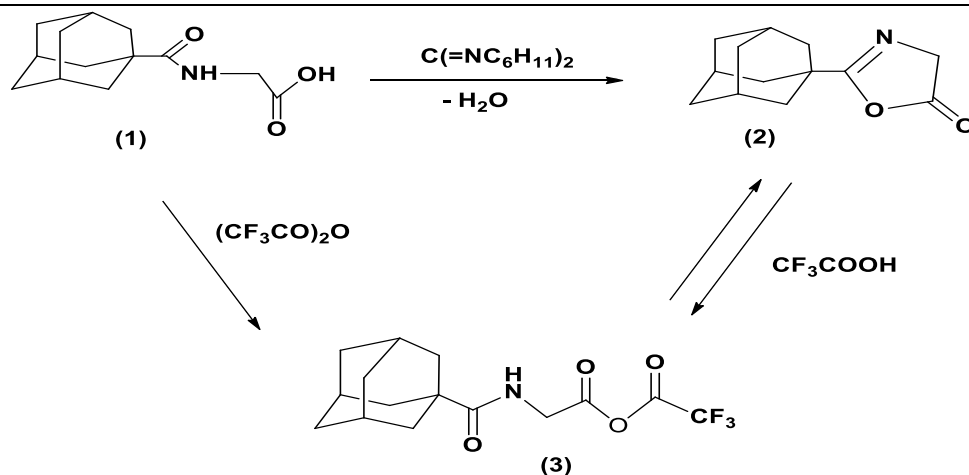
#### Cyclization of *n*-(1-adamantylcarbonyl)glycine

The only known example of an oxazolone containing an adamantyl radical in position 2 is 2-(1-adamantyl)-4-benzylidene-5-oxazolone, obtained by the condensation of *N*-(1-adamantylcarbonyl)glycine (1) with benzaldehyde under Erlenmeyer reaction conditions [9].

Continuing research in the field of chemistry of  $\alpha$ -amino acids of the adamantane series [10–13], we synthesized for the first time stable 2-(1-adamantyl)-

5(4H)-oxazolone (2) from acylated glycine (1), an adamantyl analogue of hippuric acid. Compound (2) is formed by refluxing *N*-(1-adamantylcarbonyl)glycine (1) in anhydrous chloroform for 4 hours in the presence of dicyclohexylcarbodiimide in a yield of 61%.

The presence of a characteristic band at 1830 cm<sup>-1</sup> in the IR spectrum of compound (2) unambiguously indicates its cyclic structure [14]. In the <sup>1</sup>H NMR spectrum of a solution of this compound in deuterioacetone in the region of 4.25 ppm. there is a singlet of protons of the methylene group at position 4 of oxazolone (2). The addition of trifluoroacetic acid to the analyzed solution leads to the opening of the azlactone ring and the formation of mixed anhydride (3), as evidenced by the appearance of a doublet with a spin-spin coupling constant of 6 Hz at  $\delta$  3.9 ppm.



An attempt to carry out the cyclization of acylamino acid (1) by the action of trifluoroacetic anhydride led to the formation of mixed anhydride (3) of N-(1-adamantylcarbonyl)glycine and trifluoroacetic acid. The isolated compound (3) spontaneously slowly cyclizes with elimination of a trifluoroacetic acid molecule, which is confirmed by the presence in the  $^1H$  NMR spectrum of the corresponding signals of oxazolone (2) and anhydride (3) protons.

**2-(1-Adamantyl)-5(4H)-oxazolone (2).** To a solution of 0.92 g (4.4 mmol) of dicyclohexylcarbodiimide in 30 ml of anhydrous chloroform was added 1 g (4 mmol) of N-(1-adamantylcarbonyl)glycine (1) and the mixture was boiled for 4 hours. After cooling, the precipitate of dicyclohexylurea was filtered off. The solvent was removed in vacuo. 20 ml of anhydrous pentane was added to the residue, and the mixture was boiled for 5 minutes. 0.38 g of compound (1) was isolated by filtration of the hot solution, m.p. 195 °C. The filtrate was cooled to 0 °C. The precipitate of oxazolone (2) was filtered off and recrystallized from pentane. Yield 0.56 g (61%), mp 59–60 °C. IR spectrum,  $\nu$ ,  $cm^{-1}$ : 1660 (C=N), 1830 (C=O).  $^1H$  NMR spectrum,  $\delta$ , ppm,  $(CD_3)_2CO$ : 1.3–2.15 m (15H), 4.25 s ( $CH_2$ ).

**Interaction of N-(1-adamantylcarbonyl)glycine (1) with trifluoroacetic anhydride.** To 0.2 g (0.85 mmol) N-(1-adamantylcarbonyl)glycine (1) with ice cooling and stirring 0.4 ml (2.55 mmol) of trifluoroacetic anhydride was added. The precipitate that formed was immediately filtered off under argon and washed with a small amount of cold anhydrous pentane. Yield of mixed anhydride (3) 0.26 g (92%), m.p. 77–78 °C.  $^1H$  NMR spectrum,  $\delta$ , ppm: 1.3–2.15 m (15H), 3.9 d [ $CH_2$ , compound (3), J 6 Hz], 4.25 s [ $CH_2$ , compound (2)], 7.37 m [NH, compound (3)].

### Conclusions

1) A method for the synthesis of adamantyl-containing tetrahydropyrimidines was developed for the first time. Testing them for physiological activity is recommended.

2) The possibility and method of cyclization of N-adamantylglycine into 2-(1-Adamantyl)-5(4H)-oxazolone is shown. The possibility of converting its fluorine-containing amino acid derivative is shown.

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# JURISPRUDENCE

## BIPATRISM AND ITS PROBLEMS

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<https://doi.org/10.5281/zenodo.12746035>

### Abstract

Bipatrism or dual citizenship refers to the legal status of a person being a citizen of two countries at the same time. While this offers advantages such as greater employment opportunities, ease of travel and access to social services in both countries, it also creates a number of challenges. First, bipatrism can lead to legal conflicts. Dual citizens are subject to the laws of both countries, which can sometimes conflict. For example, issues with military service obligations, tax obligations and legal responsibilities may arise, potentially leading to legal disputes and difficulties. Second, dual loyalties can cause significant anxiety. Individuals with dual citizenship may face situations where the interests of two countries collide, leading to a dilemma as to which country to prioritize. This can be especially problematic during times of diplomatic tension or conflict between two nations. In addition, bipatrism can complicate diplomatic relations. Countries can have different views on citizenship, which can lead to tensions with one nation refusing to recognize dual citizenship status. It can affect diplomatic negotiations and international relations. Finally, the administrative burden is considerable. Managing dual citizenship requires careful attention to the legal and bureaucratic requirements of both countries, which can be time-consuming and expensive.

**Keywords:** dual citizenship, problems, legal conflicts, national loyalty, tax issues

**Research methods:** analysis, synthesis, historical and comparative methods were used in the research work. To achieve the scientific results of the work, systematic, process, resource and effective approaches were used.

### Introduction

#### **Bipatrism**

Bipatrism, also known as dual citizenship, refers to the status of a person who is a legal citizen of two countries at the same time. This situation can arise in several ways, such as birth, naturalization, marriage or descent [3]. The legal recognition and consequences of dual citizenship vary widely between countries, with some states allowing it fully and others imposing restrictions or outright prohibitions.

Paths to dual citizenship:

- **Birth:** A child born to parents of different nationalities or in a country that practices *jus soli* (law of land) can acquire dual citizenship at birth.
- **Naturalization:** An individual can acquire a second citizenship by completing residency and other requirements in another country.
- **Marriage:** Some countries offer fast-track citizenship processes for foreign spouses, potentially leading to dual citizenship.
- **Descent:** Individuals can claim citizenship through ancestral lines if the laws of their country of origin allow it.

Advantages:

- **Freedom of movement:** Dual nationals can travel, live and work freely between the two countries without a visa or residence permit.
- **Access to services:** They can access public services, education and healthcare in both countries.
- **Employment opportunities:** Dual citizenship can provide more job opportunities in both countries.

- **Political Participation:** Dual citizens can vote and run for office in either country, provided both countries allow it.

### **Problems of bipatrism**

Bipatrism, or dual citizenship, presents several legal and political challenges that individuals must address. One important issue is conflicting obligations. Dual citizens may be subject to conflicting legal requirements in both countries. For example, they may be required to serve in the military in both countries, which causes legal and logistical problems. Moreover, differences in laws and enforcement systems between the two countries can create complex situations for dual citizens [1]. Another major problem is double taxation. Dual citizens may face the risk of being taxed on their global income by both countries. This can lead to complex tax situations and potential financial burdens. Despite tax treaties designed to reduce double taxation, navigating these treaties requires comprehensive knowledge and often professional advice, which can be costly. Legal conflicts are also a serious problem. Different legal systems can create conflicts over matters such as inheritance, divorce, and child custody. For example, a divorce finalized in one country may not be recognized in another, leading to lengthy litigation and uncertainty. Inheritance laws can vary widely, which can lead to disputes over the distribution of assets. Child custody issues can be particularly problematic because each country has its standards and regulations, making them difficult to enforce and resolve. Overall, while dual citizenship offers advantages, it also requires careful consideration and navigating a complex web of legal and political issues that often require expert guidance. Questions may arise about the loyalty of a dual citizen, especially if the two countries have strained diplomatic relations or conflicting interests.

Dual nationals may face restrictions on accessing sensitive information or working in certain government jobs due to security concerns. Dual nationals may face difficulties with visa requirements as some countries may not recognize one of the passports. When a legal problem arises abroad, dual nationals may find it difficult to get help from embassies, especially if the incident involves another country of citizenship [5]. Navigating between two cultural identities can be difficult, potentially leading to feelings of divided loyalty or identity confusion. Dual nationals may have access to social benefits in both countries but may be expected to contribute (e.g., through taxes or social service obligations) in both countries. Tracking and maintaining valid passports, visas, and other legal documents for both countries can be difficult. Compliance with the laws and regulations of both countries requires constant vigilance and knowledge of each country's legal changes. Dual citizenship can complicate inheritance and property laws, especially if the two countries have different rules. Issues such as divorce and child custody can become more complicated when the laws of two different countries are involved. In addition to double taxation, there may be complex financial reporting requirements for both countries, which may require specialized and expensive legal and accounting services. Some countries impose restrictions on ownership, investment, or business operations by dual nationals, potentially limiting economic opportunities. Overall, while dual citizenship can offer numerous advantages, it also presents a variety of challenges that individuals must carefully consider and manage. Each country has its own laws and regulations regarding dual citizenship, which can add another layer of complexity to the situation.

### Conclusion

Consequently, while dual citizenship, or bipatriism, offers individuals enhanced mobility across borders, cultural enrichment, and economic opportunities, it is not without challenges. The main concerns about dual citizenship revolve around legal complexities, potential conflicts of loyalty, and national security issues.

Legally, navigating between the two rights, duties, and obligations can be complex, often requiring careful consideration of different legal frameworks and diplomatic agreements between countries. In addition, dual citizens may face loyalty dilemmas in times of conflict or political tension between their two countries of citizenship, raising questions about where their true loyalties lie. From a national security perspective, dual citizenship can present vulnerabilities, as individuals may have access to sensitive information or positions of influence in multiple countries. This aspect requires robust regulatory frameworks to effectively manage risks and prevent abuses. In addition, dual citizenship can lead to administrative burdens, particularly about consular services, tax obligations, and military service requirements. These practical challenges require clear policies and efficient administrative procedures to ensure fair treatment and accountability for dual nationals. While dual citizenship offers significant advantages, including promoting global interaction and personal autonomy, addressing its associated complexities and potential drawbacks is critical to ensuring fair and secure international relations in an increasingly interconnected world.

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# MEDICAL SCIENCES

## EVALUATION OF THE EFFECTIVENESS OF DISTALIZATION OF UPPER MOLARS

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<https://doi.org/10.5281/zenodo.12746094>

### Abstract

Distalization of the upper permanent molars is an important and often decisive component in many orthodontic treatment cases. The key role of the correct position of the first upper permanent molars in the formation of physiological occlusion, the complexity of the biomechanical requirements for their orthodontic movement create an independent branch of orthodontics from the distalization of molars. The most common indication for distalization of upper molars is their mesial position.

**Keywords:** Mesial position of the upper permanent first molar, distalization.

The main cause of this pathology is premature removal of primary molars (detected in more than 17% of children already at the age of 3–5 years) [1]. During the period of mixed dentition, the number of dentition defects increases, and due to the active growth of children, in addition to the mesial displacement of the molars, other structural and functional disorders of the dental system quickly develop: inclination of the first permanent molars towards the dentition defect, shortening of the dental arch, lack of space for erupting permanent premolars and canines, violation of the timing of their eruption, axial rotation and supraocclusion, decreased bite height. These disorders cannot be self-regulated; their elimination is possible only with the help of active orthodontic treatment [2,4]. Indications for distalization of molars are also dentoalveolar disorders (disproportion between the sizes of teeth and dental arch, mesial position of the upper dental arch) and skeletal disorders (protrusion of the upper jaw, protrusion of the upper jaw in combination with retrusion of the lower jaw) [3,5]. Molar distalization is often the first step in the treatment of malocclusions without extraction of premolars or in treatment with extraction of second molars. Appliances for distalization of upper molars are divided into extraoral (face arch with various traction options - occipital, cervical or combined) and intraoral (plate with distalizing elements, nitinol springs, Wilson distalizing arch, Distal Jet, Jones Jig, etc.). Intraoral devices developed recently are becoming increasingly popular, as they provide greater comfort to the patient, do not even require periodic connection of extraoral or intermaxillary traction, and allow for rapid and effective significant corpus distalization of molars with minimal loss of support in the frontal area and without side effects such as extrusion, intrusion or rotation of the teeth being moved. One of such devices is the First Class distalizer (a set of distalizer components is produced by Leone, Italy). The supplied kit includes: • two

extension screws, • two 0.045 inch wire blanks, • two 0.045 inch ID tubing, • two extension screw support rings, • two nitinol springs, • two screw retaining rings.

Device manufacturing technology.

1. Fit rings or make and fit crowns on repositioned molars and supporting premolars. Obtain an alginate impression, insert the indicated elements into it, and cast the model from supergypsum.

2. Solder a 0.045-inch diameter tube on the palatal side of the first molar and a screw support ring on the labial side of the premolar, oriented parallel to each other.

3. Bend a 0.045 inch wire to the shape of the palate, insert it into the molar tube and solder it to the palatal surface of the premolar.

4. Place the nitinol spring on the wire between the premolar and the molar tube. Insert the screw into the guide ring of the premolar, install the locking ring into the screw. Solder the screw body to the vestibular surface of the molar, ensuring that the wire guide on the palate and the screw body are mutually parallel. Polish the device parts.

5. Bend the distal part of the wire according to the shape of the palate and in accordance with the expected length of movement of the molar.

Form an expanded Nance stop from plastic, polymerize it, and polish the plastic stop. Thus, the manufactured apparatus in its vestibular part is represented by extension screws soldered to the rings of the molars, bushings and locking rings that fix the screws on the premolars. Palatal part: a guide sleeve on the molar, a frame of 0.045 inch wire that serves to secure the extended Nance stop and as a guide for moving the molar (the wire is loose in the molar sleeve and soldered to the premolar) and a nitinol spring between the premolar and molar to move the molar. The joint work of the extension screw on the vestibular surface, the nitinol spring on the palatal surface and the Nance stop ensures

body movement of molars up to 10 mm without rotation, extrusion, intrusion and loss of support in the anterior region. The design of the device allows for its autonomous operation on the right and left or only on one side of the jaw, and also allows it to be easily converted into a support device for retraction of anterior teeth. The device can be used in both mixed and permanent dentition. The anterior support can be either a permanent premolar or a primary molar. The device is activated by a quarter turn of the screw once a day. A full turn of the screw gives 0.4 mm of movement. Before installing the screw, it is necessary to eliminate rotation of the molars. Clinical example of using the First Class device. Patient N., 20 years old, complained of an aesthetic defect associated with a pronounced uneven position of the teeth. Previously, orthodontic treatment was carried out with plate-type devices, and leveling extractions of teeth 14, 24 and 34 were also performed. Treatment was interrupted due to lack of positive results. Upon external examination, a flattening of the facial profile is noted. When analyzing the bite, the ratio of the molars according to class II was 6 mm on the right and 3 mm on the left, the ratio of the canines according to class II was 6 mm on the right and 4 mm on the left, narrowing and shortening of the upper dentition, a complete lack of space for 13, shortening of the lower dentition. The midline of the upper jaw dentition is shifted 4 mm to the right. Vestibular position and supraocclusion 13, axis rotation 15, 16, 25, 26, 43.

Treatment was carried out.

1. Leveling extraction 44 was performed.

2. The width of the upper dentition in the area of the chewing teeth was normalized, rotations 16, 15, 26, 25 were eliminated - Quadhelix arch

3. The molars of the upper jaw were distalized on the right by 6 mm and on the left by 3 mm using a First

Class apparatus with the purpose of creating space for installation in the dentition 13 and normalizing the position of the midline of the upper jaw dentition.

4. 13 was installed in the dentition and the position of the teeth was normalized in relation to the sagittal plane using a multibonding system and the use of fragments of the First Class apparatus for retention of displaced molars.

5. The position of the teeth was detailed and retention of treatment results was carried out. Treatment steps are presented in Figures 4–20.

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# PHILOLOGICAL SCIENCES

## SPECIFICS OF USING AUTHENTIC MATERIALS AS A METHOD FOR DEVELOPING FOREIGN LANGUAGE SPEECH MONOLOGUE SKILLS

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<https://doi.org/10.5281/zenodo.12746116>

### Abstract

The development of monologue speech skills should always be based on the development of the ability to build a coherent statement that clearly states a position or idea. Often it is the difficulties in constructing a logical statement that are the main problem for students in preparing a monologue. For the proper development of monologue skills, an effective technique is to use authentic texts as a basis and example. Fabulous texts can serve as both an example for a full-fledged monologue statement and a thematic example, the retelling of which will serve as an excellent training for monologue skills. The use of authentic story texts in foreign language classes is an effective method for developing students' monologue skills.

**Keywords:** monologue skills, authentic texts, fabulous text, plot text, home reading, retelling.

### Introduction

Reading authentic literature is one of the ways to get acquainted with the peculiarities of constructing texts and presenting a certain idea in the text. In the process of learning a foreign language, reading authentic texts allows students to immerse themselves in the natural linguistic environment, experience the cultural and linguistic mentality, study interesting phraseology, and learn many new words and expressions. Reading fable texts both in class and in the process of reading at home is one of the aspects of language training of students, provides a more robust formation of various skills of communicative competence (linguistic, sociolinguistic, discursive, sociocultural), and therefore is an important aspect of the process of teaching foreign languages.

Reading is one of the core competencies that students must master as part of the school curriculum.

Home reading is one of the forms of independent work for students to study a foreign language. Home reading is mandatory for all students, additional to the textbook, constant reading in order to extract meaningful information [1, p. 253]. In the context of developing monologue skills, reading authentic fable texts is a type of exercise that allows you to develop several skills in parallel. At the same time, for the effective development of all skills, the teacher checks the fact that students are completing home reading. For these purposes, reflection exercises and consolidation of the material read by students at home should be performed in lessons. In the context of reflection, a teacher can effectively use different types of tasks (retelling, answering questions, writing a short story by students) to develop monologue speech skills based on a plot text.

### Materials and type of research

Objectives of the study: first, to determine the relationship between the development of reading skills

and the development of monologue speech; second, determine the specifics of using plot texts to develop listening skills; third, develop a set of exercises for developing monologue speech skills based on the plot text for home reading "Jacob Faithful" by Frederick Marryat.

The study involved 9th grade secondary school students.

Research stages:

1. Preparation of exercises for individual chapters of the plot text "Jacob Faithful" by Frederick Marryat;
2. Developing lesson plans and conducting classes in 9th grade using exercises to test the results of home reading and to develop monologue speech skills;
3. Conducting classes using prepared tasks for the plot text;
4. Systematization and analysis of results.

### Research questions

Here are three research questions:

- Is it effective to use materials from plot texts to develop monologue speech skills?
- How to correctly use plot texts for home reading in the process of developing reading and monologue speech skills?
- How should home reading materials (fabular texts) be integrated to develop monologue skills in foreign language lessons?

Tools: Text for home reading "Jacob Faithful" by Frederick Marryat. This study presents a proper approach to using home reading story texts to develop monologue speaking skills in foreign language lessons.

### Discussion

Turning to the problem of teaching monologue speech, you should know that its formation occurs in close relationship with other skills of communicative competence. A monologue is a form of speech that is built in by one person, who himself determines the

structure, composition and linguistic means. Monologue speech is characterized by systematicity, therefore it requires internal logic, argumentation, and smooth presentation of thoughts to achieve the goals of communication. A monologue, like other forms of speech, is motivated by a stimulus emanating from a situation. The situation is the starting point for the monologue, then it seems to break away from it, forming its own environment-context [2].

G. K. Zhunussova on the example of developing listening skills, clarified that the correct choice and use of information sources largely determine the effectiveness of the process of teaching a foreign language [3]. The researcher emphasizes that training should be carried out on appropriate materials that cover communicative goals for the development of perceptual and receptive types of speech activity.

A.S. Seidikenov and G.K. Zhantileuova argue that the relevance of using authentic materials in teaching a foreign language lies in their functionality [4, p.65]. By functionality, the researcher understands the orientation of such materials towards real use, since they create the illusion of familiarization with the natural language environment, which is the main factor in successful language acquisition.

Reading authentic texts is a means of obtaining information, developing lexical skills and a way of mastering the rules of logical text construction. An authentic text can support the development of speaking skills. By reading a variety of texts, students begin to understand the specifics of constructing statements of different lengths (a couple of sentences, a full text), different forms (story, argument, monologue/dialogue), i.e. master the logic of constructing statements. According to G.V. Rogova, the role of the text as a template for the development of speaking skills is of great importance for the formulation of statements at the reproductive and productive level, where elements of creativity and independence are mandatory [5, p.76].

G.O. Rakhimbekova points out the following arguments in favor of the use of authentic materials: 1) illustrate the functioning of the language in the form accepted by its speakers and in a natural social context; 2) stimulate the interest of students due to their thematic and stylistic diversity; 3) are the optimal means of teaching the culture of the country of the language being studied; 4) are excellent material for familiarizing yourself with the phraseology of the language being studied [6].

A.T. Iskalieva, A.A. Isalieva, B.Kh. Kurmanov distinguishes the following types of authentic materials:

- 1) Printed materials (newspapers, magazines, posters, maps, books, etc.);
- 2) Video materials (television programs, documentaries and feature films, interviews, amateur videos from social networks).
- 3) Audio materials (musical songs, radio programs, radio advertising, audio books, etc.).
- 4) Multimedia materials [7].

To develop monologue skills, all types of authentic materials can be used in different communicative

situations and with subsequent exercises to consolidate the material.

G.T. Urazumbetova points out that there are two main ways to develop monologue skills [8]. "The path from above": maximum "appropriation" of the content plan of the text, its linguistic material and composition, i.e. everything that can then be applied in the texts that the students themselves will create, building their monologues: introducing students to the text (exercises: read the text, answer questions; plan, order of sentences; brief retelling); conveying the content of the text (on behalf of one of the characters); change of situation. It is on this principle that monologue speech is taught on the basis of authentic texts. In this case, the text serves as a model for constructing a monologue. The "path from below" consists in developing a statement from an elementary unit-sentence to a complete monologue: statements by schoolchildren on a specific topic (statements are constructed in a logical order, students, with the help of the teacher, develop their statements); the stage of forming textual and logical connections between statements; students produce their monologue on a specific topic, including opinions and assessments.

E.A. Zimina and O.S. Khosainova argue about the need to use authentic fable texts as the basis for the development of monologue skills. At the same time, the researchers list the basic requirements for choosing plot texts for students. It has to be noted that E.A. Zimina and O.S. Khosainova consider the retelling of plot texts as one of the exercises for developing monologue speech skills. Therefore, they determined the following requirements for such authentic texts: 1) retelling texts should be feasible for the average student; 2) when selecting texts, it is necessary to be guided by the criteria of compliance with the age interests of students; the subject matter of the texts must correspond to the cognitive, communicative and aesthetic needs of students; 3) the selected materials must meet the goals, objectives and content of teaching a foreign language at the appropriate level according to the Common European Framework of Reference for Languages [9, p.176]. In addition, plot authentic text containing certain linguocultural information must be understandable to students, since they usually work with such texts on their own (as part of home reading). The linguistic accessibility of the text allows you to focus on its content, structure, and unfamiliar vocabulary. Therefore, it is important that the text offered for reading is based on familiar language material, and that unfamiliar lexical units are either understandable from the context or that they do not interfere with the general understanding of the text.

Home reading is an effective method for developing students' competency skills as part of learning a foreign language. Home reading is an active activity of students working with the texts of fable works and modern journalism, aimed at learning new vocabulary, consolidating knowledge of grammatical forms, expanding students' horizons and regional knowledge. The use of story texts for home reading develops in students such important skills as the ability to work with text, analyze, draw conclusions and generalizations. The development of additional exercises for texts

makes it possible to work on other speech skills based on the text. Reading fable texts performs important functions: developmental, educational and forms information competence in students. Retelling plot texts, writing an essay based on the read text and answering questions about the text are the main types of exercises for developing monologue skills based on the read plot text. However, the teacher can also offer other exercises - writing your own story based on the example of the text you read, creating a presentation based on the text or its characters, etc. Thus, taking into account the variety of possibilities for developing additional exercises for plot texts for the development of monologue skills, we can conclude that their use is an effective method of teaching a foreign language.

### Research results

During the educational experiment, based on the technological map of the lesson and the plot text, 6 lessons and 2 writing tests were conducted to construct a full-fledged independent monologue-retelling of the text for each student separately.

Classes with students were structured as follows:

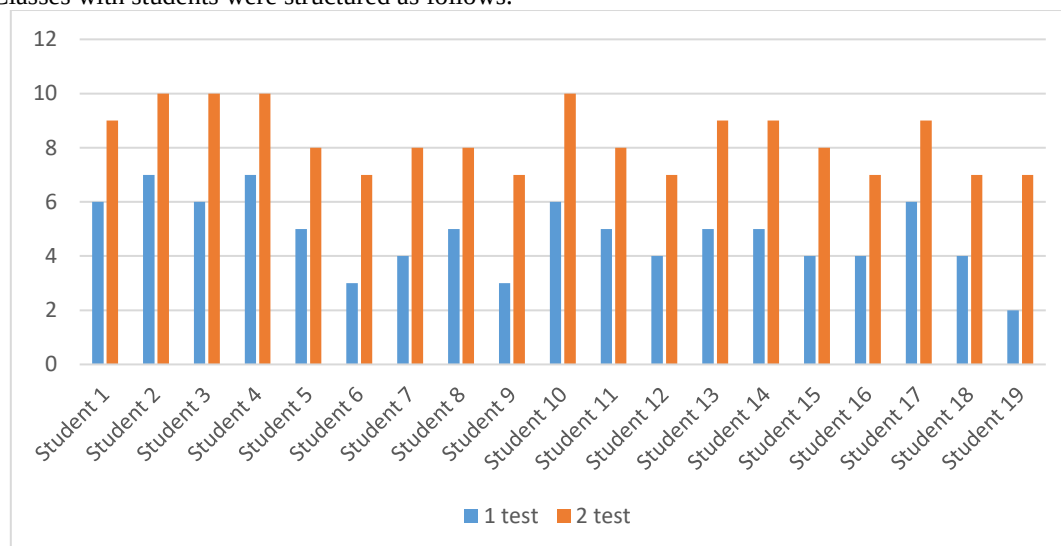


Figure 1. Experiment results

As can be seen from the results presented in Figure 1, the number of student errors in constructing a monologue statement based on the text decreased by an average of 1.5 times for each individual student. This is largely due to the development of the skill of correctly sequencing statements, which influenced its integrity and logic, as well as the coherence of the text. Of great importance was the fact that mandatory check of home reading by performing exercises for it in class encouraged students to actually read the text and write down unknown words and expressions that were worked on in class with the teacher.

Judging by Figure 1, the proposed method of using texts for home reading to develop monologue speech skills is effective, since students learned to better compose a monologue statement after reading each individual chapter. Also, tasks for the plot text helped students remember new vocabulary from the text and colloquial expressions that can be used in speech.

Based on the results of the experiment, in the last lesson a discussion was held with students about the

- 1) checking new vocabulary from the chapter of the story for home reading;
- 2) retelling the chapter read by several students;
- 3) performing exercises for home reading texts to reflect on the material and develop monologue speech skills.

During the experiment and preparation of additional training exercises, emphasis was placed on:

- explanation of new vocabulary from each chapter of the home reading text;
- highlighting the most important information in each chapter of the home reading text;
- teaching the practice of dividing a chapter into main information blocks that students must tell (retell);
- strengthening lexical knowledge and skills to consistently construct a statement (retelling / detailed answer to a question) to compose a monologue expression.

During the initial attempts to retell a chapter of a plot text, many students made mistakes in the factual content and sequence of composing a written monologue.

need to study texts for home reading in class to reinforce the material and develop communication skills. During the discussion, students confirmed the following didactic aspects of using plot texts:

- 1) The text chosen for home reading was interesting, contained a lot of new vocabulary and colloquial expressions, so they were easy to understand from the context and remember;
- 2) Students were able to practice reading skills, monologue speech (oral and written);
- 3) Students were able to learn new vocabulary by reflecting on the chapter in class and while doing exercises for the text;
- 4) Students' horizons, cultural and communicative knowledge have expanded, and their motivation to learn a foreign language has increased.

### Conclusion

The development of monologue speech skills is possible not only in class, but also in the process of doing homework. To develop monologue speech skills, it is rational to use plot texts as an example and source of

lexical and grammatical information. Fabulous texts are multifaceted authentic texts that consist of a sequence of events ordered into a logically presented text that ends with a specific ending and conclusion.

The development of monologue skills based on plot texts involves systematic work on students' assimilation of new vocabulary and the practice of constructing coherent statements. Relying on a plot text is an effective way to teach students to logically build the logic of a statement. The use of story texts in foreign language lessons develops such important skills in students as the ability to read and work with text, analyze, evaluate, criticize, draw conclusions and generalizations. In addition, reading authentic fable texts allows students to independently develop creative thinking using a foreign language and the skills of constructing fable stories in accordance with the norms of text structure.

As a result of the study, it was established that the use of plot texts is an effective method for developing monologue speech skills.

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## CONCEPTS RELATED TO CULTURAL-HISTORICAL TYPES AND "TURKIC CIVILIZATIONS" IN LITERATURE

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<https://doi.org/10.5281/zenodo.12746138>**Abstract**

The article analyzes the cultural-historical types presented in the book "Russia and Europe" by the Russian philosopher N. Danilevsky, published in 1869, and the concept of civilizations put forward by him. The concepts of O. Spengler and A. Toynbee, discussed in the later periods, as a whole, discussions on this level, ideas related to the concepts of "culture", "civilization", "historical-cultural type", as well as literary addresses and texts, and F.M. Dostoyevsky are referred to. As the main reason why the Turkish historical-cultural type cannot take a proper place in these concepts, the rise of the Slavic historical-cultural type against the background of the Russo-Turkish wars are emphasized.

It is obvious that the Turkish cultural-historical type is not included in the first and subsequent classifications based on the laws and regularities of movement defined by the Russian scientist who had the first role in defining cultural-historical types. Historical facts and various types of evidence are listed to prove this. Although the indicated error was eliminated by the authors of the Eurasian concept of Russian history in the 20s and 30s of the 20th century, it is noted that there is a need for scientific-theoretical confirmation of the existence of the Turkish cultural-historical type and Turkish civilization as an ideological landmark in the historical conditions of the formation of the Union of Turkic States.

**Keywords:** N. Danilevsky, "Russia and Europe", cultural-historical type, crusades, Slavs.

**INTRODUCTION**

The term "cultural-historical type" belongs to Nikolai Danilevsky, a Russian philosopher, and natural scientist who lived in the nineteenth century. In the book "Russia and Europe" (1869), he proposed the theory of cultural-historical types [8]. As a philosopher of history, N. Danilevsky was the founder of the theory of civilizations (synonym: the theory of "local civilizations") and the author of its first version – the theory of cultural-historical types" [8, 6]. Based on this characteristic, S. I. Bazhov, the author of the preface to the latest edition of the previously mentioned book, calls history a "biography" of original and independent cultural-historical types (civilizations), and also lists the ten "full-fledged" cultural-historical types indicated in Danilevsky's book: 1) Egyptian; 2) Chinese; 3) Assyrian-Babylonian-Phoenician, Chaldean or Ancient Semitic; 4) Indian; 5) Iranian; 6) Jewish; 7) Greek; 8) Roman; 9) New Semitic or Arabian; 10) German-Roman or European, and two American types: Mexican and Peruvian, who went extinct by "violent death" before the end of the development cycle. N. Danilevsky also thinks about the future of the Russian-Slavic cultural-historical type [8, 8].

This book by N. Danilevsky attracts our attention from the point of view of: 1) recent changes in ideas about cultural and historical types; 2) the need for a new reading of the theory of civilizations; 3) to identify the significance of the book "Russia and Europe" for a rational understanding and completion of discussions about the nature of today's world order, and its prospects; 4) the probable vulnerability of this theory, which undoubtedly influenced the subsequent concepts of the development of civilizations.

**PROBLEM ANALYSIS**

To substantiate and motivate the answers to these questions, let us first turn to chapter V of the book [8,125-150], where five laws of movement and development of cultural-historical types are presented and commented on. According to N. Danilevsky's *first law*, "every tribe or family of peoples characterized by a separate language or group of languages possesses an original cultural-historical type." According to his *second law*, any original cultural-historical type can originate and develop with political independence. Depending on N. Danilevsky's *third law*, each cultural and historical type is original, unique, but it "develops" its own civilization "with greater or lesser influence of external, preceding, or modern civilizations. *The fourth law* of cultural-historical types, according to the Russian scientist, assumes that the ethnographic elements inherent in each type "achieve completeness, diversity, and richness" with the existence of a federation or a political system of state. The author builds his *fifth law* on the fact that after indefinitely prolonged growth, cultural-historical types achieve rapid development and prosperity, but in a short time their depletion and extinction occur.

Commenting on the first two laws, N. Danilevsky does not doubt their correctness. At the same time, the statement of the Russian scientist that by the time he put forward the theory of cultural-historical types, in other words, by the second half of the nineteenth century, "all other significant tribes had not formed original civilizations" is questionable. Such civilizations include Turkic tribes, who, according to the scientist, "live in countries that are not suitable for culture, have not emerged from a state of savagery or nomadism."

Seemingly, "these tribes remained at the level of ethnographic material, this means they did not participate in historical life at all or rose only to the degree of destructive historical elements" [8, 127]. This statement was put forward in that historical period when the whole of Europe and the Christian world were united by the struggle against the centuries-old presence of the Turkic Ottoman Empire in three parts of the world, and there was also opposition not only to the political, but also to the cultural and religious influence of the Turkic state. At the same time, Russia continued the process of ousting the Ottoman Empire from the Slavic lands, and the Russian-Turkish wars were in progress. Russia fought for the right to leadership in these territories. Simultaneously, Europe feared a significant strengthening of the Russian Empire in the Balkans and the Middle East. It was a time when Russia actively joined the struggle for the implementation of the political theory of "Moscow—III Rome", and the transformation of the country into an Eurasian state. Russia intervened in the confrontation between the Romano-German and Turkic-Islamic civilizations in Europe, and wanted to create a Slavic Union and an All-Slavic Federation in the lands cleared from the Turkish presence. Therefore, it was important for N. Danilevsky not only to show that Russia did not belong to Europe, the Romano-German world, but also to substantiate the process of maturation and prosperity of the Slavic civilization on the basis of the Byzantine, the emergence of a new cultural-historical type-Slavic. At the same time, Russia intended to bring the matter to an end: by supporting the liberation wars of the Eastern and Western Slavs. By all means, it wanted to win their hearts, and prevent any of the Slavs from entering into an alliance with the countries of the Romano-Germanic world. But the intervention of European states in the Crimean campaign (1853-1856) prevented the implementation of Russian plans. It was the "course of the Eastern question about the Crimean War" that gave N. Danilevsky an excuse to "disclose the hostility of Europe to Russia and the Slavs." According to the scientist, "this hostility lies in the deep enmity that exists between the Slavic and Germanic-Roman worlds, a discord that penetrates to the very foundations of the general plan of development of world history." [8, 565]. N. Danilevsky considered the cure of Russian society from the "disease" of Westernism, as well as the complete political liberation of all Slavic peoples, the formation of the All-Slavic Union under the patronage of Russia to be an important factor for the establishment of the Slavic cultural and historical type and the identification of the main differences with the Germanic-Roman type [8, 566]. In the XV and XVII chapters of his book, under the titles "All-Slavic Union" and "Slavic cultural-historical type (instead of conclusion)," the author establishes categories indicating various discoveries of the historical life of the Slavic peoples, about their inherent culture [8]. The general sections of cultural life are designated and commented on under the following definitions: *religious, cultural, political, and socio-economic activities*. Slavs are presented as a four-basic cultural-historical type [8, 568-569].

The question of the essence of world civilizations and the role of European cultures and countries in the representation and transformation of accumulated experience and values has long been discussed in the philosophy and literature of Western Europe, while the term "cultural-historical types" was established in the late 1960s of the XIX century. The epoch of classicism assimilated, revised, and remade samples of ancient and medieval cultures. And all this happened at the same time as the European bourgeois revolutions. The era of classicism mixed with the age of Enlightenment, the rapid development of philosophical and didactic ideas. There was a dilemma about educating a new human being—a person of the era of awakenings and shocks, a person who is thinking and free internally. Almost simultaneously, the era of sentimentalism and romanticism began. Europe was engulfed by philosophical ideas, on the one hand, and the romantic spirit of the poetry of Byron, Goethe, and Schiller, on the other. The Great French Revolution, which shattered established orders and ideas, was followed by the creation of the empire of Napoleon Bonaparte. The era of Napoleonic victories was replaced by a period of awakening Russian minds in the aftermath of the liberation of Europe from Napoleonic violence. But Russia was not able to take advantage of the historical opportunity that appeared after the creation of the Holy Alliance in Europe. For Russia, the era of the gendarmerie of Europe began with years of internal confrontation. Instead of liberating the common people from serfdom, implementing serious reforms, and supporting the spirit, ideological and creative aspirations, and inspiration of the young Russian nobility, after the Decembrist uprising, persecution of liberals began. As a result, they found themselves in Siberia and the Caucasus. For the second time in its history, Russia failed to take advantage of the opportunity presented to it for socio-economic and cultural elevation. Let us recall the first years of Catherine II's coming to power, her decree on the drafting and establishment of a new code in Russia with the involvement of all layers of Russian society, the Empress's decision to publish liberal magazines, the introduction of a European-style educational system in the country, and other achievements of the era of European classicism. However, soon, under the pretext of the outbreak of war with Turkey, everything came to an end.

Having gotten rid of the apprenticeship of Western European literature and philosophers, Russian philosophical and literary thought tried to interpret the course of civilizational processes in its own way. Along with Westerners, who perfectly understood and affirmed the role of Europe in the formation of philosophical and cultural thought in Russia at that time, Slavophile views appeared, who saw the path of development and the mission of their motherland in the Slavic world. The concept of N. Danilevsky became the cornerstone of the ideological platform of the Slavophiles. The ideas of Westernism and Slavophilism penetrated into the Russian literature of the XIX century; which was strongly ideologized. In the context of the debate about the Russian idea, in the sources of many outstanding texts of Russian literature like the novel "The Brothers Karamazov", in their philosophical backgrounds, as

well as in the widespread overlap of these works with the ideas of Rousseau, Kant, Nietzsche, Schopenhauer, and other European thinkers, there is a deep search for Russian identity, religiosity, conciliarity, and other qualities.

According to our observations, subsequent concepts and views about cultural-historical types came from the original theory about them; their authors were strongly influenced by the Russian philosopher. Oswald Spengler's concept of the collapse of Western civilization [21] appeared immediately after the First World War. Arnold Toynbee put forward the theory of the emergence and development of civilizations before the outbreak of World War II as a *response* to the global challenges of the time [17]. Each new version of this concept had its own socio-political, economic, and ideological basis and was created by scientists with completely different professional and ideological platforms. Each of them presented the history of the development of civilizations and cultures in different ways.

But it would be logical to refer to the origins of the question, to the historical moment when it became necessary to define the concepts of "culture" and "civilization", and N. Danilevsky's theory of cultural-historical types has not yet been established. This will help us understand the essence of the definition of these types. In our opinion, one of those who seriously studied the history of European civilization and stood at the origins of the problem is the French historian, philosopher, theorist of language and literature, statesman, and diplomat Francois Guizot. He had an unequivocally firm belief about the development of civilization in Europe: "Civilization cannot be searched in any one European state, and its history cannot be studied from the history of only one country. It endlessly changes nuances; has never fully developed in any one single state. The elements of its history should be searched in France, at the same time in England, or in Germany, then in Italy and Spain" [6].

Conceptually, it would be necessary to take as a basis precisely this position of the theorist of civilizational development, which made it possible to come to a completely acceptable conclusion: "One can ask oneself the question: Is there a worldwide civilization of the human race? Does humanity strive for a certain goal? Do people pass on to each other from century to century something that does not disappear, something that grows, is stored as a precious treasure, and is thus something imperishable and eternal? As for me, I am deeply convinced that humanity really has a common purpose; that there is a transmission of the treasures of civilization from generation to generation and, consequently, there is a universal history of civilization." [6].

O. Spengler and A. Toynbee, in turn, became the authors of the subsequent most systematic and well-known classifications of cultural-historical types. The first of them rejected the idea of a universal world history, claimed the existence of many stories of individual original cultures functioning as an integral, autonomous organism. The German scientist identified eight great cultures: *Egyptian, Babylonian, Indian, Chinese, Greco-Roman (ancient), Arab-Byzantine (magical), Maya (Mexican), and Western European (Faustian)*. In

addition, he suggested the possibility of the emergence of a new *Russian-Siberian* culture.

In his opinion, the time of existence of each culture from the moment of its origin to its death is about a thousand years. Culture, having fallen into decline, is transformed into civilization [19, p. 39].

A. Toynbee's classification of civilizations was based on religious and territorial criteria, i.e., the presence or absence of religious ties between societies, as well as the degree of remoteness from the place where a particular society originated. Initially, he identified 21 civilizations: *Western, fundamental Orthodox Christian (Byzantine-Balkan), Orthodox Christian in Russia, Iranian, Arab, Indian, Hindu, Far Eastern fundamental, Far Eastern in Korea and Japan, Hellenic (Greco-Roman), Syrian, Chinese, Minoan, Sumerian, Hittite, Babylonian, Andean, Mexican, Yucatan, Mayan, and Egyptian*. Later, A. Toynbee reduced the number of independent civilizations to ten.

Perceiving history as a cyclical process, a cycle of local societies, and calling it civilization, the English historian rejected the definition of the general terms of the existence of civilizations. For example, the historical process of the origin, development, flourishing, decline, and death of the Egyptian civilization, according to the scientist, took about two thousand years [17, 77-79].

The Turks, according to the authors of these concepts, belong to the "destroyers" of civilizations or represent "frozen" civilizations. The civilizations created by the Turkic peoples are briefly indicated as not quite certain types ("Nomadic" and "Ottoman"). It is surprising that none of the authors above identified turkic as a cultural-historical type in the list of the main civilizations.

N. Danilevsky, as an ardent Russian Slavophile whose views reflected the ideas and moods of the Russian intelligentsia of the second half of the 19th century, was a supporter of the Greek-Slavic path of development in Europe. He was not satisfied with the existing division of the territory of Eurasia between the Romano-Germanic and Greek-Slavic worlds due to the backwardness of the regions inherited by Russia, among which was Central Asia, the Turkestan cultural-historical area. A contemporary of N. Danilevsky, K. Leontiev, a Russian diplomat in Greece, was more skeptical and sober about the Slavophile illusions of the scientist. The sincerity and credulity of the Slavs of Eastern Europe and the Balkans, despite the efforts of Russia, stirred doubts in him. He called Slavism a "sphinx-riddle": "Imagining All-Slavism in our mind, we get only some kind of amorphous, spontaneous, unorganized representation..." [13, 1-7]. Byzantism, in his opinion, "in the state means autocracy. In religion, it means Christianity with certain features that distinguish it from Western churches, from heresies and schisms..." [13, 1-7]. N. Danilevsky and K. Leontiev divided humanity into cultural and historical types that overcame certain stages of development: youth, maturity, and old age.

In parallel, other views on the development and existence of cultural-historical types have been estab-

lished. When O. Spengler came to the idea of the decline of European (Western) civilization, the Azerbaijani ideologist of Turkism, Ahmed Aghaoglu, argued about the dominant role of Romano-German culture in the world: "European culture, flowing in a powerful stream and not encountering any obstacle, removes everything in its path. The only way out of this state is to accept this culture" [1, 30]. A. Aghaoglu comes to these conclusions in a book published in 1927. By this time, a school of Turkism had already developed in Russia and Turkey, pan-Turkic ideas were vigorously discussed in the works of Ismail Gaspirinsky, Yusuf Akchura, Ali Bey Huseynzade, etc. In 1923, Zia Gekal-p's book "The Basic Principles of Turkism" was published. In Turkey, the government of Mustafa Kemal Atatürk was oriented towards European values. Being an associate of Atatürk, A. Aghaoglu recognized the backwardness of the culture of the Turkic world compared to the Western one and emphasized the impossibility of bypassing the victorious culture [1, 35].

Based on the theses of Francois Guizot, we can understand A. Aghaoglu, who was looking for a path of cultural development through the unconditional acceptance and assimilation of the achievements of European civilization.

And now let's turn to the works of one of the main representatives of existentialism, the German philosopher, cultural historian, psychologist, and psychiatrist Karl Jaspers, who, summing up the experience of his predecessors, gave a clear definition of the concepts of "culture" and "civilization". The scientist, who went through two world wars, was worried about "philosophical, historical, and ideological problems: how can we overcome the cataclysms that befell European civilization in the 20th century? What spiritual guidelines do European people have and how do you find them in a modern industrial society?" [22, 8]: "Over the past five centuries, Europeans have drawn the whole world into their orbit. They spread their civilization everywhere and took from other civilizations what they themselves did not have... The Europeans were the first to make the unity of the world conscious, communication systematic, long-lasting, and reliable..."

There is a unity of cultures as a unity of a virtually common world of life forms, institutions, ideas, and beliefs – the unity of peoples by origin, language, and fate; the unity of religions as "world religions" ... [22, 260-261]

Most of the works that appeared after the publication of the books by Russian scientists N. Danilevsky and K. Leontiev continued to present the history of world civilizations one-sidedly, especially cultural-historical types. Therefore, it is no coincidence that Rustam Rahmanaliyev used it as an epigraph to his book "The Empire of the Turks. The History of a Great Civilization" uses Goethe's words: "Nowadays, there is no doubt that world history will have to be rewritten from time to time. Such a need arises not because more and more new events come to light over time, but because new views appear that encourage the advanced man of the new time to take a point of view from which he could see and evaluate the past in a completely new way." [16, 5]

Our searches have shown that although the history of studying the issue begins with N. Danilevsky, philosophers and writers in Western Europe have long been thinking about the essence of human civilizations, about their origin, development, decline, and death. They were looking for answers to questions: how to explain the disappearance of the great Egyptian civilization, the Library of Alexandria, the Khazar Khaganate, etc. What was the reason for their extinction? Natural phenomena, great migrations of peoples, world wars, confrontations of civilizations, or the natural course of their origin, development, prosperity, and decline?

Each new stage of the outbreak of disputes and discussions about the development of world civilizations and cultures and about their types began in relation to the peculiarities of the current historical situation: during confrontations, world wars, or after their completion.

At the root of all these discussions around the concepts of N. Danilevsky, O. Spengler, and A. Toynbee, there were so many disagreements that modern historiography and philosophy became disappointed with them and put forward alternative options, completely different interpretations of the course of history. But no one has been able to overcome the basic contradictions of these concepts. The history of fierce confrontation between world religions-West and East, Russia and Europe-continues to this day, even tougher and more severe. How is that possible? Atilla was recognized as a man of the first millennium, and Genghis Khan was recognized as a man of the second millennium. The leaders of the first and second great migrations were the Turks. Only listing the names of the greatest Turkic states and empires could take up more than one page of our article. The idea of collecting all the lands and states of the world belongs to Genghis Khan and Amir Teymur. The Orkhon-Yenisei writings, the great epics of the early Middle Ages (Kitabi-Dede Gorgud, Manas, etc.), belong to the Turks. Outstanding representatives of the Renaissance of the same era are Jalaleddin Rumi, al-Farabi, Ibn Sina, Nizami, Nasimi, Navoi, Fuzuli, etc., but there is not a word in any of the concepts of world civilizations about the wealth, depth, and prevalence of Turkic civilizations, the Turks are not mentioned by anyone in a positive way. After all, the Turkic civilization, as well as the other civilizations listed by N. Danilevsky, O. Spengler, and A. Toynbee, were characterized by stages of emergence, development, prosperity and decline. The Turkic cultural-historical type that we assume has undoubtedly passed through all the stages of existence, according to the five laws of movement and development of cultural-historical types mentioned by N. Danilevsky. The Turkic cultural-historical type, as well as the Slavic one, can be described as four-basic, having religious, cultural, political, and socio-economic activities.

And why are the definitions applied to the Turks not attributed to other civilizations, to the same Romano-Germanic, to the participants of the crusades who massacred hundreds of thousands of Orthodox Christians and Muslims, who destroyed Constantinople long before its conquest by the Turks in 1453? If the Turkic cultural-historical type, in our opinion, has the right to

be named among the main ones for the simple reason that it meets all five laws of movement and development of cultural and historical types, approved by the pioneer of these theories N. Danilevsky, then why didn't his followers, K. Leontiev, O. Spengler, A. Toynbee, B. Russell, and others, refute it? Javad Hayyat's article "The Influence of Islamic Culture on the Development of Western Culture" became a kind of response to the general methodological miscalculations of these theorists. It puts forward a scientifically based idea that the origins of modern flourishing Western culture were not Roman and Byzantine cultures, but eastern Islamic and Turkic. [12] The recognition of this just statement is very timely for the realization of the idea of the unification of the Turkic states. On the other hand, the article by J. Haight can be evaluated as a reaction to the views of modern American philosophers Francis Fukuyama [19] and Samuel Harrington [20] about the confrontation of Islamic culture with Western ones and the future clash of these civilizations.

After all, the days have long passed when everyone was engaged in refuting the opinion, "Scratch a Russian, and there will be a Tatar." On the other hand, today in Europe, in the Slavic world, and in Eurasia, a completely different world order has been established. F. Dostoevsky's statement has lost its relevance. : "Russia cannot step aside from the great idea left to it by a number of centuries and which it has followed steadily up to now. The idea is the unity of the Slavs, but this unity is not to occupy or use violence, but for the sake of serving humanity...". The great writer is right that Russia's forces were "quite mistakenly directed in this direction." [9, 258] This also follows from K. Leontiev's statement that the rivalry for a dominant role in the Romano-German world between France and Germany continues, while Russia vainly claims a leading position in the Greco-Slavic world. At the same time, F. Dostoevsky, an ardent supporter of the theory of N. Danilevsky, assumed the unity of all peoples without any exceptions: "We will announce to the world for the first time that we do not want to achieve our own prosperity through the suppression of personalities of foreign nationalities, but on the contrary, we see it only in the freest and most independent development of all other nations and in fraternal unity with them, replenishing one another, grafting their organic characteristics to ourselves and giving them branches from ourselves for grafting communicating with them with soul and spirit, learning from them and teaching them, and so on until humanity, replenished by the world communication of peoples to universal unity, like a great and magnificent tree, overshadows the happy earth." [11, 100]. In our opinion, in the above statements, F. Dostoevsky sees a certain contradiction. On one hand, he is a Slavophile, a supporter of N. Danilevsky, one of the active ideologists of the so-called Eastern question, and on the other, the author of the "Russian idea", which became the basis of Russian philosophy. This is universal responsiveness, i.e., the absence of national egoism, willingness to help other people. It seems that today the writer's speech about Pushkin, addressed to the Russian people, the Slavic world, and Europeans, is very relevant. According to Arseny Gulyga, "... Dostoevsky sees

the true "feat of Pushkin" in the fact that universal ideas shine in his poetry. Since "what is the strength of the Russian nation, if not its striving for universality and universal humanity in its ultimate goals? Oh, the peoples of Europe do not even know how important they are to us Russians! And subsequently, I believe in this: we-that is, of course, not we-but in the future, every single Russian will already understand that becoming a real Russian will mean striving to bring reconciliation about European contradictions" [6, 86]. Yes, "Dostoevsky spoke about the future. He drew attention to the fact that in Russia "there will be a higher cultural type that does not exist in the whole world – a type of worldwide support for everyone." This "world enthusiast" will arise from the "earth patriot": the stronger the attachment to the native land, the sooner it develops into an understanding that the fate of the motherland is inseparable from the fate of the whole world. Hence the desire to arrange European and world affairs as a characteristic Russian feature" [6, 86]. As a result of technological progress, globalization, wars, and cataclysms, the world has become so small, fragile, and defenseless that each of us today is confused by the questions "How to preserve and protect it, not to lose the achievements and results of civilization, multicultural and ethnic identity of the planet? What should we do to know, see, appreciate the cultural diversity of the world and skillfully use, enjoy and cherish everything that we have on Earth? Are not the teachings of F. Dostoevsky's answer to these questions the tragic consequences of the confrontation in Eastern Europe between Russia and Ukraine? Was this the all-Slavic unity dreamed of by the Slavophiles? Did such a confrontation between Russia and Europe worry the authors of the Russian idea? Were these supposed to be the results of the Romano-Germanic and Greco-Slavic development of the European way?

This is what our thoughts lead to around N. Danilevsky's "suspicious" concept of cultural-historical types, where even prehistoric civilizations, civilizations that do not touch Russian borders, found a place. It is fair that, based on the realities of European development, the present and future plans of the main players in European politics, he distinguished the Romano-Germanic and Greek-Slavic cultural-historical types. It was only unclear how he kept silent and missed the history of the great Turkic civilization, which for centuries was closely intertwined and coexisted with the ancient Russian and ancient Slavic cultures. Although F. Dostoevsky waited with great interest for the appearance of the chapters of the book "Russia and Europe" by N. Danilevsky in the era of incessant disputes between Westerners and Slavophiles, in our opinion, it is impossible to understand and adequately perceive him in terms of the "flaw" of interest to us without notes by the same F. Dostoevsky. In his comments under the titles "My Paradox", "Conclusion from the paradox" and "The Eastern Question" [10], the writer explained all the reasons for not including the Turkic cultural-historical type in the list under discussion. It turns out that Russia, ashamed of its Hunnic, Avar, Khazar, Pecheneg, and Tatar pasts, abandons the history of its

revival in the XIV-XVII centuries, largely made possible by relations with the Golden Horde, and then with the Ottoman Porte, which contributed to its elevation to the rank of a great Eurasian power. And this is only to be heard and accepted in the West, in Europe. It turns out that by cutting a window to Europe, Russia had to abandon not only its Orthodox, but also its Turkic past. All that remained was to "drag a sick man out of bed (Dostoevsky meant Ottoman Turkey, *our remark*) completely off." But for the sake of Slavic unity, the Russian theorist N. Danilevsky and the writer F. Dostoevsky did not want Europe to call a consilium "to treat him again." It is clear that the intervention of European countries in the so-called "eternally insoluble Eastern question" would then have prevented Russia's plans, according to the political theory of Philotheus and the testament of Peter I, to liberate Constantinople from the Turks and turn it into the center of the All-Slavic Union.

From the point of view of a Western observer, this special path is due to two interrelated factors: on the one hand, Peter's reforms, which brought Russia as close as possible to the West, and on the other, the "resistance of the material", some features of a historical, religious, and cultural nature that do not allow Russia to dissolve into Western civilization" [2, 336]. It seems to us that the problem is not in the "resistance of the material", i.e., religious content, ethnic diversity, or the history of the formation of Russian statehood. From the point of view of politicians, publicists, and thinkers in the West, a number of events led to the formation of the myth of the Russian threat, ideas about a semi-Asian country, the purpose of which is to "drown in blood the European civilization weakened by its age-old foundations" [2, 339].

### CONCLUSION

Today, in the Turkic countries, along with large-scale international and interregional socio-economic development projects, cultural, informational, scientific, and technical measures are being implemented that contribute to strengthening integration processes within the framework of the Unification of the Turkic States. This is important for every Turkic state in terms of defining its historical, cultural, and national identity. We need to consider our history and culture in the context of identifying the contribution of the Turkic peoples to world culture and civilization. Today, Azerbaijan is experiencing a peculiar national-patriotic upsurge. Historical justice is being restored: the native Azerbaijani lands occupied by the Armenians as a result of mass migrations are being returned. Thanks to socio-economic, cultural, and scientific projects, the Karabakh and East Zangezur regions of the republic are being revived, and historical memory is being restored... We are looking forward to the imminent opening of the Zangezur Corridor, which is economically beneficial for all countries in the region...

We are particularly impressed by the Turkological studies of Kazakhstanis. In this regard, Sagadi Bulakbayev's article "The Turkic world in the context of the history of philosophy", which recently appeared in one of the scientific journals of Kazakhstan, is noteworthy.

[3]. Firstly, in this publication, the author makes an attempt to "combine individual "stories" into a single world history", second, he frees us from the task of providing irrefutable facts about Turkic history and culture in favor of its assertion as one of the main cultural-historical types. Let's pay attention to Bulakbayev's arguments: 1) starting from the end of the VI century, the borders of the Turkic Khaganate closed in the west with Byzantium, in the south with Persia and India, and in the east with China; 2) contrary to the claims of historians, the Turks had their own self-sufficient culture and civilization in the center of Eurasia, created several centers of world culture and civilization, which had a significant impact on other cultures and civilizations, primarily European; 3) referring to L. Gumilyova the author gives numerous facts of technological progress (*the invention of metal stirrups and pack harnesses, metal smelting, production of cast iron and steel, the invention of the curved saber, the appearance of printing technology eight centuries before the discovery of Gutenberg, "equestrian culture", irrigation art, the conquest of peoples and countries, the ability to keep them under their power, the stretching of conquered territories from The Pacific Ocean to the Atlantic, in particular, the possessions of the Turkic Khaganate, the empire of Genghis Khan, the empires of the Timurids, Ghaznavids, Mughals, Zhalairs in Iran, the Ottoman Empire, possession of the best military art, the use of Turkic troops as allies or mercenaries, perfect forms of social existence and social institutions, nomadic democracy, tax system, money circulation, safe trade, ideal communication network, diplomacy, tolerant attitude to the language, culture and traditions of all peoples, etc.* – italic added).

Based on the "Persian Letters" of the French philosopher Charles Montesquieu, the Kazakh scientist expresses the following interesting idea: "The conquests of Genghis Khan significantly surpass the conquests of seven major European generals recognized by the whole world: Alexander the Great, Hannibal, Caesar, Swedish King Charles XII, Frederick the Great, A.V. Suvorov, and Napoleon Bonaparte ..." [3].

We agree with the opinion that "... in the context of modern cultural methodology, the concepts of Danilevsky, Spengler, and Toynbee are quite working and in demand" [15]. We take these concepts as the basis for our views and future research on the Turkic cultural-historical type. At the same time, we support the restoration of historical justice and offer a scientific and theoretical platform necessary for the unification of the Turkic states. In contrast to N. Danilevsky's theory, we consider the Eurasian concept of Russian history, proposed by Eurasian scientists G. Vernadsky [3], N. Trubetskoy [17], L. Gumilev [6] and others, to be quite objective, corresponding to the nature and logic of the development of centuries-old Slavic-Turkic ties and relations between Russia and Europe. The works of Eurasians of the Soviet and post-Soviet times, the neo-Eurasian movement in Russia, the Eurasia platform in Turkey, the concept of Turanian Eurasianism by O. Suleimenov, N. Nazarbayev, as well as Turkological studies of recent decades in Turkic countries, indicate that the existence of the Turkic cultural-historical type

is beyond doubt. The problem is how to present it, how to broadly and deeply cover and describe the entire process of its emergence, development, and flourishing, and how to determine the current state of civilizational trends.

It is necessary to adhere to L. Gumilev's well-known thesis that "if Russia were saved, it would be only as an Eurasian power and only through Eurasianism." [6]. In this sense, the opinion of one of the well-known representatives of the Turkish platform of Eurasianism, Omer Geksel Ishyar, is also important.: "In the Eurasian region, Turkey and Russia should not oppose each other but act together, achieve political flexibility among themselves, and not get carried away by superiority and competition in their relations..." [12, 89]. This request is relevant and viable for the stability of relations between the Union of Turkic States and the Russian Federation in all spheres of life. Today, new scientific fields have emerged that integrate with culture: cultural studies, ethnoculturology, linguoculturology, multiculturalism, ethnopscychology, and other meta-disciplines of practical importance in the study of the language, culture, and history of the peoples of the world. In our opinion, ignoring or distorting the history and culture of any nation limits the possibilities of cultural and scientific exchange, rapprochement, dialogue, and comprehensive cooperation between peoples.

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# INNOVATIVE APPROACHES IN THE ACTIVITIES OF "INFORMATION AND DOCUMENT MANAGEMENT"

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## Abstract

It is noteworthy that over the past ten years, significant development has taken place in the field of "Library and Information Activities" in Azerbaijan. Great importance is also attached to the training of professional specialists in the field of information and document management. The number of textbooks, monographs and scientific articles published in this area has increased significantly. The work of Azerbaijani scientists and researchers in this area has significantly expanded in the direction of applying and approving new concepts. This article is devoted to the problem of creating an effective information environment and scientific and theoretical analysis of the topic through the use of new technologies in the process of distributing specialists and continuous education. In the article, we also try to assess the analysis of scientific articles published in recent years on the problem.

**Keywords:** Information engineering, information space, scientific school, libraries of Azerbaijan, information technology, continuous education.

## Introduction.

Over the past ten years, Azerbaijani researchers have attracted attention with new perspectives and new concepts, as well as the application of new methods and innovative projects in information and document management activities.

In 2011, Associate Professor P. Kazimi published a monograph, "Information Engineering in Library and Information Activities,"<sup>1</sup> followed by a series of articles in this area. The articles reflected such important issues as the dissemination of scientific information<sup>2</sup>, issues of information accessibility,<sup>3</sup> the problem of forming a new information environment using new technologies,<sup>4</sup> and methods of assessing information. It was as a result of these studies that the scientist was invited to become a member of the American Society of Engineers (IEEE).

The work "Information Engineering in Library and Information Activities" put forward by the scientist attracted the attention of specialists.<sup>5</sup> This concept proposed ten subsystems of information engineering. Among these subsystems, a new approach to information theory attracted attention. In this direction, the researcher took as a basis the theory of "Informasiology" of the Russian scientist Yuzvishin<sup>6</sup>. He also defines an algorithm for creating an information environment in a modern information environment and interprets the information

environment as follows: "The information environment is an ecosystem that determines and influences the ways in which people acquire, exchange and use information. This environment consists of various forms of technology, media channels, social networks, digital platforms, information sources and mutually beneficial relationships between users of these sources. The information environment is an important tool that shapes people's way of thinking, decision-making processes and the general culture of society.<sup>7</sup> Trust in information channels and information products is in the spotlight.

As methods of creating an information environment, several main areas are systematically identified: - Creation of technologies and infrastructure, creation and exchange of content, creation of opportunities for communication and cooperation, application of the function of education and information.<sup>8</sup>

In the field of formation of the information environment, the ways in which people acquire, exchange and use information change and affect the development and culture of society. Therefore, in order for this process to be successful, it is important to consider various areas, such as technology, content, communication and education.

The importance of creating an information environment in the process of continuous education and

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<sup>6</sup> Kazymi, P. F. (2011). About democracy of library work. *Kursk. Journal of scientific publications*, 102-105.

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<sup>8</sup> Kazimi, P., & Aliyeva, A. (2019). Evaluation criteria of censorship and limitation in library and information activity. *Historical sciences*, 17, 65-72.

lifelong learning is widely studied. Lifelong learning means creating opportunities for people to engage in continuous learning to develop knowledge and skills throughout their lives. Creating an information environment makes this process more effective and efficient.<sup>9</sup> For this purpose, such areas as easy access to information, creation of individual opportunities for information services for education, opportunities for interactive education and feedback, accessibility and inclusiveness, introduction of innovations in the process of updating education, collaboration and networking, analysis of collected information and assessment are used and activities are indicated.

The creation of an information environment in the process of continuous education and lifelong learning creates a "connected" opportunity to develop people's knowledge and skills. This environment serves the development of society and the success of an individual in his or her personal and professional life, ensuring continuity and education at any age and everywhere.

The forms and methods of creating an information environment in education and continuous education are diverse and multifaceted. These forms and methods use various technologies and methods that make the educational process more effective and accessible. The studies show some of the main forms and methods of creating an information environment in the process of continuous education.

In the directions arising from the basic structure of the concept,<sup>10</sup> the author begins to conduct new research and conducts research on "time spent by young people on social networks"<sup>11</sup>, conflicts of interest in social networks,<sup>12</sup> reliability of information,<sup>13</sup> and problems of reader and consumer satisfaction.<sup>14</sup>

In 2020-2023, Associate Professor P. Kazimi's research develops new directions. The researcher touches upon such important topics as democracy in library and information activities, censorship and restrictions in information services, satisfaction of

readers-consumers, dynamic development of library and information activities, reliability of information, conflict of interests in information services. Associate Professor P. Kazimi, who is invited to prestigious international scientific conferences annually held by the Institute of Electrical and Electronics Engineers (IEEE) of the "American Association of Engineers", together with renowned scientists organized "Project and Innovation Activities". libraries"<sup>15</sup> in 2020 and "Bio-bibliographic documentary database of cultural heritage" in the same year. "<sup>16</sup> in 2021" Data and terminological concepts of project activities in higher education "<sup>17</sup> "Global information network and conflict of interests (stakeholders), Interests and conflicts) "<sup>18</sup>, in 2022" Intelligent system of a family doctor: a project approach "<sup>19</sup> 2023. - In 2016, he gives presentations at conferences "Time spent by young people in the global information space (Problems of reading or providing information needs) "<sup>20</sup>, and his scientific articles are published in journals indexed in the Scopus database.

The formation of the "information environment" should be considered as a factor influencing the development and culture of society by changing how people acquire, exchange and use information. For this process to be successful, it is important that various areas work together, such as technology, content and content, communication and education.<sup>21</sup> The creation of an information environment in the process of lifelong learning creates greater opportunities for the development of people's knowledge and skills. This environment supports the development of society and the success of people in their personal and professional lives, ensuring sustainable education at any age and in all places. Also, in the course of lifelong learning, it is necessary to study the forms and methods of creating an information environment.<sup>22</sup> These forms and methods depend on various technologies and methods that make the educational process more effective and accessible. Below are some of the main forms and

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<sup>21</sup> Rashad, G., & Parviz, K. (2023). University libraries as centers for scientific communications (according to the experience of higher educational institutions of the Republic of Azerbaijan).

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methods of creating an information environment in the process of lifelong learning:

- Online education platforms
- Webinars and online seminars
- Social media and networks
- Digital libraries and resources
- Mobile applications
- Virtual and augmented reality (VR and AR)
- Collaboration and teamwork tools
- Free curriculum
- Open source educational tools and resources
- Customized learning plans
- Individual or group support

These forms and methods of creating an information environment help to make lifelong learning more effective and accessible, to ensure continuous development of a person's knowledge and skills. Various criteria and methods are used to calculate the effectiveness of information support for lifelong learning. This helps to assess the quality and impact of education, as well as to identify areas for improvement.

These methods and techniques help to accurately and comprehensively assess the effectiveness of information support in the process of lifelong learning. This is important for improving the quality of education and achieving better results.

Quality measures are measures and criteria used to assess information support and the overall quality of education in the process of lifelong learning. These indicators are used to determine the quality and effectiveness of various aspects of education. It is considered useful to use the mentoring method in the field of creating a learning environment in lifelong learning.

### Conclusion.

Mentoring is a process in which a more experienced and knowledgeable person (mentor) transfers knowledge, skills, and recommendations to a less experienced person (mentee). This process supports the professional and personal development of the mentee and ensures that the mentee benefits from their experience. Mentoring can be carried out both professionally and personally.

Key objectives of mentoring: -Development of knowledge and skills: Professional development: Goal and its setting: Networking and networking: Counseling and support: Form of mentoring:

Mentoring is mainly divided into two groups: 1. Formal mentoring, 2. Informal mentoring.

Mentoring methods: -Face-to-face meetings: Online and remote mentoring: Group mentoring: Reverse mentoring:

Benefits of mentoring: -Benefits for the mentee: Benefits for the mentor:

Mentoring process: -Establishing communication: Setting goals: Developing plans and strategies: Organizing regular meetings: Ongoing support and feedback: Evaluating effectiveness.

Mentoring is a mutually beneficial process that promotes the professional and personal development of both the mentor and the mentee, and it is important that modern library and information institutions actively intervene in these processes.

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## STORYTELLING IN RUSSIAN LITERATURE: A HISTORICAL VIEW

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*Lecturer, Nakhchivan State University*<https://doi.org/10.5281/zenodo.12746210>**Abstract**

The evolution of Russian literature saw its inception with the advent of stories influenced by Western norms, championed by leading figures of the sentimentalist movement. Throughout the 19th century, luminaries like Pushkin, Gogol, and Chekhov solidified Russia's literary presence on the global stage with their seminal works. In the ensuing 20th century, socialist realism, as the official state ideology, wielded hegemonic influence over artistic expression, including within the realm of storytelling. Nonetheless, the genre of the story retained its artistic merit, producing notable writers despite adherence to ideological mandates. The dissolution of the USSR precipitated a period of democratization within Russian literature, mirroring global trends, with postmodernism emerging as the predominant literary zeitgeist.

**Keywords:** Russian literature, Soviet literature, postmodernism, democratization

**1. Introduction**

In the annals of Russian political history, the prevailing worldview of its rulers or governing elites has wielded unparalleled influence, profoundly shaping the trajectory and destiny of Russian literature. This hegemonic sway is exemplified through three pivotal events in Russian literary evolution. The first of these epochs is epitomized by the reign of Peter I. During his tenure from 1689 to 1725, Peter I enacted sweeping reforms that heralded the advent of Westernization within Russia. This epoch witnessed a liberalization of Western cultural inflow, fostering nascent attempts at the assimilation of Russian literature into the broader Western literary canon.

The denouement of this transformative period is signified by the year 1917, which marks the ascendance of the Soviet state and the subsequent dictation of literary norms and narratives by its ideological apparatus. While the rubric of "Soviet literature" ostensibly encompasses the literary output of diverse ethnicities within the Soviet Union, the primacy of Russian language, culture, and literature remained undisputed. Consequently, the geographic expanse delineated by the borders of the post-USSR Russian Federation became not only the cradle of Russian ethnicity but also the bastion of Soviet literary tradition.

The denouement of Soviet literature in 1991, concurrent with the disintegration of the Soviet Union, heralded a gradual erosion of socialist literary mores, commencing in earnest with the advent of Perestroika. In the nascent post-Soviet epoch, literature has burgeoned in tandem with the burgeoning democratization movements sweeping through society.

**2. Emerging Characteristics of the Story Genre in New Russian Literature**

The genesis of 19th-century Russian literature is rooted in the oeuvre of both elder statesmen and burgeoning talents of preceding epochs. While the corpus of 19th-century literature may not yet rival its counterparts in quantity, its historical import is underscored by a series of innovative strides. Scholars concur that this

epochal shift in Russia's political narrative demarcates the inception of "old Russian literature" before integration with the Western canon, "new Russian literature" coinciding with Peter I's reforms, and the subsequent era of "Soviet literature". Yet, the ontological contours of 19th-century Russian literature remain the subject of ongoing scholarly debate. [2]

This section examines stories that meet Western literature criteria to highlight the innovative practices of authors and identify characteristics of the story genre in old Russian literature. Some literary historians consider the end of old Russian literature to be the tsarist period of Peter I (1689—1725), marking a cultural turning point in Russian history. Peter I's reforms aimed to transform Russia into a European-like state with a strong defense, altering both the appearance and mentality of the Russian people. For example, between 1700 and 1701, Peter I issued orders for the nobility to shave their beards, wear German or French clothes, and become literate and numerate, punishing those who resisted these changes. [3]

We will explore how these reforms are reflected in the selected stories, understanding the genre's evolution. It is crucial to define what constitutes a story and which works qualify, as old Russian literature's stories do not always meet contemporary criteria. In Western literature—comprising French, English, German, and American works—the story genre has specific standards. Russian literature began adopting these Western values in the second half of the 18th century. The essential question here is: What distinguishes these stories from those in old Russian literature? Answering this will clarify the criteria for contemporary stories. [1]

In his work "Russian Culture from the Earliest Periods to the Present," V.V. Dolgov explains the shift in Russian literature during the 17th century, noting it as a period of rigid, unchangeable rules. He highlights that this era saw an innovation in narrative fiction that classical Russian literature did not recognize. Historical figures, such as churchmen, knyazs, and boyars, domi-

nated old Russian literature, leaving little room for fictionalization, as altering historical narratives was equated with lying. These works, often written by aristocrats, depicted real events like wars and societal victories, aiming to teach lessons through a serious and sacred lens.

Lihachyov, a respected scholar of old Russian literature, adds that these works sought to comfort and fascinate the reader through familiar rituals, with subjects closely tied to Russian history and life. Literature from this period often repeated previous works and focused on religion, guiding readers in line with state control mechanisms. During Catherine II's reign (1762-1796), literature's primary function was to educate and direct thought. [1]

One major distinction between old and new Russian literature is the use of narrative techniques. Old Russian literature lacked a distinct narrator, a role often assumed by the writer themselves. In the second half of the 18th century, early Western-style Russian stories, such as Mikhail Dmitryevich Chulkov's "Anyone's Mistake" (1766), began to incorporate narrative techniques from German literature while maintaining a parable-like character.

In the 18th century, three significant movements influenced Russian literature in the 19th century. The first was classicism, also known as "pseudo-classicism" by some scholars. Key figures included A.D. Kantemir, V.K. Trediakovski, and M.V. Lomonosov in its early phase, followed by M.M. Heraskov, Ya.B. Knyajnin, and G.R. Derjavin during its rise. A.J.P. Sumarokov applied classicism principles in a developed form in his tragedies and comedies. [5]

The second movement, termed "fictional realism" by V.V. Dolgov, was exemplified by D.I. Fonvizin's comedies "Brigadir" and "Nedorosl," which adhered to classicism principles while presenting events realistically.

The third movement, sentimentalism, emerged in the second half of the 18th century, influenced by Western and American literature. Sentimentalist writers idealized human emotions and nature. This period also marked the beginning of the story genre in Russian literature. Nikolay Mikhailovich Karamzin, a key sentimentalist, successfully applied Western literary criteria in his works. His long story "Poor Liza" (1792) received significant attention for its content and form. Despite classicism's disdain for prose genres like novels and stories, Karamzin's serialized novels were well-received by readers. [8]

Sumarokov, a prominent classicist, viewed novels as "less beneficial and more harmful." However, the success of Karamzin's stories indicated a shift. The quantity and quality of stories produced during this period, along with reader response, suggest that sentimentalism played a crucial role in aligning Russian literature with Western standards and gaining reader acceptance. Although not initially recognized as a serious literary movement, sentimentalism significantly contributed to the evolution of Russian literature.

The 19th century saw Russian literature fully integrate into Western literature across various genres, in-

cluding romanticism, realism, critical realism, and naturalism. Key figures in short stories from the first half of the century include Pushkin, Gogol, and Chekhov, with Turgenev, Dostoyevsky, and Tolstoy also contributing significantly.

Anton Chekhov emerged as a leading figure in the latter half of the century, pioneering the short story genre. Romanticism dominated the early 19th century, with A.S. Pushkin (1799-1837) representing both romanticism and realism. Pushkin is considered the founder of modern Russian literature, known for his innovative narrative techniques and influential characters. M. Epstein notes that Pushkin completed the secularization of Russian culture initiated by Peter the Great. [2]

Pushkin's stories can be grouped into traditional prose and poetic forms ("poema"). Notable poetic works include "Caucasian Prisoner," "Gypsies," and "Bahçesaray Fountain." His prose works, such as "The Tales of Belkin," "Little Tragedies," and "The Captain's Daughter," were pivotal in developing the story genre. "The Tales of Belkin" is seen as a transition from romanticism to realism, with the character Belkin serving as a modest narrator.

Pushkin's historical stories, like "The Captain's Daughter," were influenced by Walter Scott, and Karamzin's work also reflected historical themes. These stories brought Russian literature closer to contemporary life. N.V. Gogol (1809-1852) was the first prominent short story writer, with his collection "Evening Meetings on a Farm Near Dikanka" marking a transition from poetry to prose and from romantic stories to realistic novels. [6]

The psychological distress and eventual self-destruction of the "little person" in the big city are common themes in Gogol's Petersburg stories like "Portrait," "Memoirs of a Madman," and "The Overcoat." In these works, the narrator is typically close to the characters, occasionally sharing thoughts about events and people. In "Diary of a Madman," the main character narrates events through letters. [7]

In the 19th century, writers like Griboyedov, Pushkin, Lermontov, Goncharov, Gogol, Turgenev, Dostoyevsky, and Tolstoy addressed socio-cultural issues and World War II, influencing reforms like the abolition of serfdom in 1861. Gogol, Dostoyevsky, and Tolstoy also explored religious themes from diverse perspectives. Chekhov, a pinnacle of secular literature, also touched on religious subjects.

During this period, some writers, nostalgic for the past and with a particular religious outlook, faced severe criticism from progressive intellectuals and literary circles, who even attempted to suppress their work. One such writer was Nikolay Semyonovich Leskov (1831-1895), known for his stories. Despite recognition from Tolstoy, Chekhov, and Gorki, Leskov was marginalized during the Soviet era due to his religious views but was revived in literary discussions after the perestroika period. [7]

In 1861, Nikolay Leskov moved to Petersburg and began working in periodicals, quickly gaining attention in literary circles. However, his career took a turn due to an unfortunate incident. In 1862, amidst rumors that

students opposed to the tsarist system were causing fires in Petersburg, Leskov published an article in "Severnaya Pchela" urging the police to either confirm the students' guilt or dispel the rumors. This article led to backlash, and despite his clarifications, he was blacklisted by progressives as a conservative journalist.

Leskov's conservative identity was also shaped by his disappointment with the social and cultural changes following the abolition of serfdom, which he found unsatisfactory compared to the old order. Additionally, his religious upbringing influenced his perspectives. Known for his oppositional nature, Leskov engaged in fierce debates with both the revolutionary democratic journal "Sovremennik" and the Slavic nationalist magazine "Den".

Leskov is praised for capturing Russian life through his short and long stories rather than novels (Vedutskaya, 1996:21), a feat similarly attributed to Chekhov in later years. His stories "Lady Macbeth of Mtsensk" (1865) and "The Enchanted Wanderer" (1866), now considered masterpieces, were largely ignored at the time. In "Laughter and Grief" (1871), Leskov employs satire, continuing Gogol's tradition of self-criticism of local traits. His religious-themed stories like "The Sealed Angel" (1872), "The Enchanted Wanderer" (1873), and "Lefty" (1881) feature personal narration. Some of his works, such as "The Hare's Fur Coat" (1894), resemble Aesopian fables.

The critical environment of the 1860s was complex. Leading writers like Leskov, Turgenev, Tolstoy, Goncharov, and Dostoyevsky rejected the authority and intellectual basis of realistic criticism, according to Pecherskaya. [3]

In the realm of 19th-century short story writers, A.P. Chekhov stands out prominently. Known for his stories and dramas, Chekhov initially employed pseudonyms like "The Man Without Spleen" and "Antyosha Chehonte." His early works exuded humor but gradually evolved into a melancholic tone. Despite his initial narrative approach, Chekhov maintained an impartial stance toward his subjects, often describing events with ironic detachment. He adamantly defended this impartiality when questioned about subjective elements in his stories, emphasizing his focus on readers' interpretation. [1]

Chekhov's stories often contain narrative gaps, inviting readers to fill in the blanks. In the context of the flourishing Russian novel spearheaded by Dostoyevsky and Tolstoy in the latter half of the century, Chekhov's success is notable, particularly considering the brevity and conciseness of his narratives, a departure from the verbose style of his contemporaries. Chekhov himself acknowledged the effectiveness of leaving certain details unsaid, expressing uncertainty about the rationale behind it. [8]

In his works, Chekhov delves into the inner transformations of his characters, featuring individuals from diverse social backgrounds and occasionally incorporating animals like in "Kashtanka." Despite his focus on contemporary life, Chekhov eschewed historical subjects, unlike many of his Russian peers who found inspiration in Russian history.

The period between 1890 and 1917 marked a complex phase in Russian literature, characterized by polyphony and diverse literary movements such as symbolism, acmeism, naturalism, realism, expressionism, socialist realism, and futurism. Figures like M. Gorki and V. Mayakovsky played pivotal roles in shaping the literary landscape and societal future, while others vehemently opposed the establishment of the Soviet Union.

The year 1917 marks a significant turning point in Russian history, symbolizing the commencement of profound political, social, economic, and cultural restructuring. This period witnessed the exodus of dissident writers, known as the "first wave of immigration," who left Russia between 1917 and 1920 due to the upheaval caused by the restructuring movement. For the first time, a substantial number of literary figures departed from their cultural homeland for political reasons, leading to the division of 20th-century Russian literature into two categories: "Soviet literature" and "Russian literature abroad." [6]

Soviet literature, spanning from 1917 to 1991, was shaped by a distinct worldview influenced by the new political structure. Although many writers from the 19th century continued to contribute, the Soviet era introduced unique dynamics. Literary groups were disbanded, and the Writers' Union was established to centralize writers. Policies aimed at nationalizing literature and promoting socialist realism as the state's official literary movement were implemented. Publishing practices evolved with the emergence of terms like "gosizdat," "samizdat," and "tamizdat." Suspicious deaths of prominent writers, including suicides of Yesenin, Blok, and Mayakovsky, raised questions in literary circles.

Efforts were made to translate literature from Soviet ethnicities into Russian under the banner of "brotherhood of peoples," enriching Russian literature with diverse content. Conversely, Russian literature's strong influence on Soviet literature prompted shifts in their respective values. Soviet writers predominantly wrote in Russian to reach a vast readership. Contemporary writers like Cengiz Aytmatov and Fazil Iskender transitioned from Soviet to Russian identities, reflecting the evolving landscape of literature amidst political transformations.

The Soviet period saw the emergence of five Nobel Prize-winning Russian writers and poets: I.A. Bunin (1933), B.L. Pasternak (1958), M.A. Sholokhov (1965), A.I. Solzhenitsyn (1970), and I.A. Brodsky (1987). With the dissolution of the Soviet Union, Russian literary scholars adopted new approaches to evaluating 20th-century literature, fostering a more objective perspective. This shift is exemplified in contemporary assessments of M. Gorky, a key figure of the era, where scholars aim to uncover previously overlooked aspects of his work. [5]

Gorky initially aligned with romantic traditions before becoming a prominent advocate of socialist realism. This movement, prevalent in Soviet literature, tasked writers with educating society through portrayals of socialist ideals and heroic characters. Socialist realism blurred the lines between fiction and reality, often depicting the sacrifices made for the collective good,

particularly during World War II. Postmodernism emerged in the 1970s, challenging established literary norms and introducing unconventional narrative techniques.

Sasha Sokolov and Vladimir Nabokov are notable figures in the postmodern movement, characterized by their experimentation with narrative structure and rejection of traditional storytelling conventions. Postmodern literature encourages reader engagement, blurring the boundaries between author and audience. Works in this genre often feature fragmented narratives, unconventional use of language, and intertextuality, reflecting a departure from conventional literary forms and a rejection of established values. [4]

Following the introduction of Western literary values into Russian literature, authors continued to innovate in the story genre while building upon the foundation laid by their predecessors. Pushkin's "Stories in the form of poems" expanded the classification of story genres in Russian literature, incorporating elements of Western prose alongside unique Russian poetic traditions. These works, rooted in Russian culture and history, infused folklore and fairy tales into their content, lending originality to epic poetry and prose stories. Despite their traditional appearance, stories in the form of poems diverge from conventional story genres by blending poetry with prose and drama elements. [4]

Gogol's "Dead Souls" notably exemplifies this departure from established literary norms, employing prose in a poema format derived from his "Komedia". Recent Russian literature reflects a trend towards democratization and a rejection of Soviet literary values and traditions. While further analysis is required to fully characterize stories from this period, it is evident that Russian literature is undergoing a transformative phase.

### 3. Conclusion

In conclusion, this historical overview underscores the dynamic evolution of storytelling within Russian literature across centuries. Commencing with the assimilation of Western literary norms by sentimentalists in the 19th century, Russian storytelling flourished through the contributions of iconic figures like Pushkin, Gogol, and Chekhov, solidifying its place among global classics. However, the 20th century ushered in a period dominated by socialist realism, where the state's ideological dictates steered literary expression, including the genre of storytelling.

Despite the constraints imposed by socialist realism, noteworthy storytellers persisted, demonstrating resilience and artistic prowess within a restrictive environment. Nevertheless, with the disintegration of the USSR, Russian literature embarked on a journey of democratization, reflecting broader societal shifts. Postmodernism emerged as a prominent literary trend, challenging traditional narrative structures and inviting reader participation in meaning-making.

This historical trajectory underscores the adaptive nature of Russian storytelling, which has continuously responded to shifting cultural, political, and social landscapes. From its inception as a vehicle for Western literary influence to its role as a tool for ideological conformity during the Soviet era, storytelling in Russian literature has weathered various upheavals, demonstrating both continuity and innovation.

Looking ahead, the democratization of Russian literature presents opportunities for diverse voices and narratives to flourish, transcending the confines of ideological constraints. As postmodernism continues to shape literary expression, Russian storytelling is poised to explore new frontiers, embracing experimentation and plurality.

In summary, this overview illuminates the multifaceted journey of storytelling within Russian literature, highlighting its resilience, adaptability, and capacity for renewal. As the literary landscape evolves, storytelling remains a powerful medium through which Russian authors navigate the complexities of their cultural heritage while engaging with contemporary global discourses.

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# PHILOSOPHICAL SCIENCES

## ANALYSIS OF MODERN METHODS OF LANGUAGE TEACHING USING WEBSITES

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<https://doi.org/10.5281/zenodo.12746237>

### Abstract

This article presents an analysis of modern methods of teaching languages using websites. The article examines the benefits of such methods, including accessibility, personalizing learning and facilitating communication, and identifies challenges such as content quality and digital inequality. Recommendations for overcoming these challenges are also being discussed.

**Keywords:** teaching methods, websites, language learning, accessibility, personalization, communication, challenges, content quality, digital inequality, recommendations.

### Introduction

To begin with, the question of use of digital technologies for teaching English has been of great interest and subject of numerous scientific studies by the foreign, Russian and Kazakhstani scholars, as it is part of government policies encouraging innovations in education, in view of the digitalization of main social processes, appearance of distant learning, e-learning, and web-based educational platforms which require enhanced digital technologies to feed the growing students' needs and teachers' innovative solutions.

The integration of digital technologies in the field of education has a lengthy past, tracing back to the era of the inception of educational lantern slides and films. During the 20th century, computer-based educational programs surfaced, offering students interactive multimedia encounters. The proliferation of digital technologies in education has experienced a significant surge with the widespread adoption of personal computers and the Internet. The integration of educational websites, interactive whiteboards, and multimedia presentations has become a prevalent practice in the classrooms worldwide. The advent of digital technologies in the 21st century has considerably broadened the scope of multimedia application in the field of education. The appearance of personal electronic devices and mobile technology in the 21st century has expedited the inclination towards multimedia integration in educational settings.

### Materials and types of research

Surveys and questionnaires distributed among students in 8 classes to assess their interest in digital technologies during English lessons.

Online tools like Kahoot, OnlineTestMaker, Quizzez used in English classes for interactive tasks.

Existing scientific studies by foreign, Russian, and Kazakhstani scholars regarding the use of digital technologies in teaching English.

### Types of Research:

**Survey Research:** Conducting surveys among students in 8 classes to understand their interest in digital technologies during English lessons.

**Qualitative Research:** Analyzing student responses and feedback to online tools like Kahoot,

OnlineTestMaker, Quizzez to determine the effectiveness of modern methods of language teaching.

**Document Analysis:** Studying the findings and recommendations presented in the article to understand the benefits, challenges, and recommendations for teaching languages using websites.

**Literature Review:** Reviewing existing studies on the use of digital technologies for teaching English to provide a comprehensive analysis of the topic.

**Descriptive Research:** Describing the results of the survey on students' interest in digital technologies during English lessons and presenting Table 2 with the findings.

### Research questions

1. What are the benefits and challenges associated with teaching languages using websites?
2. What are the general attitudes of students towards incorporating digital technologies into language learning?
3. How do modern methods of language teaching using websites impact the level of student engagement and participation in language classrooms?
4. What recommendations can be made to overcome the challenges associated with integrating digital technologies into language teaching?
5. What methods can educators use to critically evaluate the quality and reliability of online content for language instruction?
6. What strategies can be implemented to address the digital divide and promote digital literacy in language education?

Surveys and questionnaires distributed among students in 8 classes to assess their interest in digital technologies during English lessons.

Online tools like Kahoot, OnlineTestMaker, Quizzez used in English classes for interactive tasks.

Existing scientific studies by foreign, Russian, and Kazakhstani scholars regarding the use of digital technologies in teaching English.

### Research results

Websites have become invaluable tools for language teaching, primarily due to the unparalleled accessibility they offer. Unlike traditional classroom settings, where learning materials are confined to

specific times and locations, websites allow learners to access language learning resources anytime and anywhere, as long as they have an internet connection. This flexibility is particularly beneficial for individuals with busy schedules or unconventional lifestyles, as it enables them to engage with language learning materials at their own convenience. The accessibility provided by language learning websites empowers learners to take control of their learning journey. Instead of being bound by rigid schedules or prescribed curriculum, individuals can tailor their learning experiences to suit their unique needs, preferences, and learning styles. Whether they prefer to study early in the morning, late at night, or during their lunch break, learners have the freedom to choose when and how they engage with language learning materials. This autonomy fosters a sense of ownership and responsibility for one's learning, motivating learners to take an active role in their language acquisition process. Furthermore, language learning websites offer a wealth of resources that cater to the diverse needs and preferences of learners. These resources encompass a wide range of formats, including text-based articles, audio recordings, video tutorials, interactive exercises, and online forums. Such diversity ensures that learners can engage with materials that align with their preferred learning modalities and cognitive styles. For visual learners, multimedia content such as videos and infographics may be particularly effective, while auditory learners may benefit from listening exercises or podcasts. Additionally, interactive exercises and online forums provide opportunities for hands-on practice, real-world application, and peer-to-peer interaction, enhancing the overall learning experience. The multifaceted nature of language learning websites extends beyond content delivery to foster a sense of community and collaboration among learners. Online forums, discussion boards, and social media groups serve as virtual meeting spaces where learners can connect with peers, exchange ideas, seek advice, and share resources. These platforms facilitate meaningful interactions and cultural exchange, allowing learners to practice their language skills in authentic contexts and gain insights into different cultural perspectives. Moreover, collaborative activities such as group projects, language exchanges, and virtual language cafes promote collaboration, teamwork, and mutual support, creating a sense of camaraderie among learners. In addition to their accessibility and inclusivity, language learning websites offer a dynamic and interactive learning environment that promotes engagement, motivation, and retention. Through features such as gamification, progress tracking, and immediate feedback, websites enhance learners' motivation by providing tangible rewards and recognition for their efforts. Gamified elements such as badges, points, and leaderboards incentivize progress and achievement, transforming language learning into a fun and engaging experience. Moreover, real-time feedback on quizzes, exercises, and assignments enables learners to monitor their performance, identify areas for improvement, and track their progress over time. This continuous feedback loop fosters a sense of

accomplishment and mastery, motivating learners to persist in their language learning endeavors. [2]

Modern methods of language teaching using websites offer a remarkable advantage in providing personalized learning experiences to learners. These websites leverage adaptive learning technologies, which utilize sophisticated algorithms to analyze learners' performance, preferences, and learning patterns. By collecting data on learners' interactions with the platform, including their quiz scores, time spent on different activities, and areas of strength and weakness, adaptive learning systems can tailor the learning experience to meet each individual's unique needs and preferences. The ability to personalize learning experiences is a game-changer in language education, as it allows learners to receive instruction that is precisely tailored to their proficiency level, learning style, and interests. For example, learners who struggle with certain grammar concepts may receive additional practice exercises or targeted explanations to reinforce their understanding, while more advanced learners may be presented with more challenging tasks or content to keep them engaged and motivated. This personalized approach ensures that learners are neither overwhelmed by material that is too difficult nor bored by material that is too easy, thus optimizing their learning outcomes. Moreover, the personalized nature of language learning websites fosters a sense of autonomy and agency among learners. By allowing individuals to choose their own learning pathways, set their own goals, and monitor their progress in real-time, these platforms empower learners to take ownership of their learning journey. This sense of control is particularly empowering for adult learners who may have busy schedules, competing priorities, or specific language learning objectives. With the flexibility to study at their own pace, in their own time, and according to their own interests, learners are more likely to stay motivated and committed to their language learning goals. Furthermore, language learning websites often incorporate gamification elements to enhance the personalized learning experience. Gamification refers to the integration of game design principles, such as points, badges, leaderboards, and rewards, into non-game contexts to motivate and engage users. In the context of language learning, gamification can take many forms, including completing quests, earning virtual currency, unlocking achievements, and competing against other learners. These gamified elements provide learners with extrinsic rewards and incentives for their efforts, making the language learning process more enjoyable and engaging. By incorporating personalized learning experiences and gamification elements, language learning websites not only cater to learners' individual needs and preferences but also create a supportive and motivating learning environment. Learners receive immediate feedback on their performance, allowing them to track their progress, identify areas for improvement, and celebrate their achievements. Additionally, the social aspect of gamification encourages collaboration, competition, and peer support, as learners can interact with each other, share resources, and celebrate their successes together. [3]

Websites play a crucial role in fostering communication and collaboration among language learners and instructors, thereby enriching the language

learning experience. One of the primary ways in which websites facilitate interaction is through online forums, discussion boards, and messaging features. These platforms provide learners with a virtual space to engage in discussions, ask questions, share resources, and seek assistance from peers and instructors. By participating in these online communities, learners can practice their language skills in a supportive environment, receive feedback on their writing and speaking abilities, and gain exposure to diverse perspectives and cultural insights. The social aspect of language learning afforded by websites is invaluable, as it enables learners to connect with others who share their language learning goals and interests. Through interactions with peers from different cultural backgrounds, learners not only enhance their language proficiency but also develop intercultural communication skills and broaden their worldview. Moreover, the sense of community fostered by online forums and discussion boards encourages collaboration and mutual support among learners, creating a supportive learning environment where individuals can learn from each other's experiences and perspectives. In addition to facilitating asynchronous communication through text-based platforms, websites may also offer virtual classrooms and video conferencing tools that enable live interactions and synchronous learning experiences. These virtual classrooms replicate the dynamics of traditional classroom settings by allowing instructors to conduct live lectures, lead group discussions, and facilitate interactive activities in real-time. Learners can participate in these sessions from the comfort of their own homes, eliminating geographical barriers and enabling access to high-quality instruction regardless of location. Furthermore, video conferencing tools allow for face-to-face interactions between learners and instructors, fostering a sense of connection and engagement that is often lacking in purely asynchronous learning environments. Through live video sessions, learners can receive personalized feedback, ask questions, and engage in conversational practice with native speakers or proficient instructors. This real-time interaction not only enhances learners' language skills but also provides them with valuable opportunities to develop fluency, pronunciation, and communicative competence. The collaborative features of language learning websites extend beyond communication tools to include collaborative learning activities and projects. For example, learners may be assigned group projects or collaborative tasks that require them to work together to achieve a common goal. By collaborating with their peers, learners can leverage each other's strengths, share ideas, and co-create knowledge, leading to deeper learning outcomes and enhanced retention of language skills. [4]

While modern methods of language teaching using websites offer numerous benefits, they also present certain challenges that educators and learners must navigate. One of the primary concerns is the quality and reliability of online content. With the vast amount of information available on the internet, ranging from reputable educational resources to

unreliable or outdated materials, educators face the task of discerning which websites are suitable for language instruction. It is essential for educators to critically evaluate online content, considering factors such as accuracy, relevance, currency, and appropriateness for their target audience. Furthermore, the abundance of online resources can be overwhelming for both educators and learners, making it challenging to identify the most effective tools and materials for language learning. Educators must invest time and effort in researching and curating online resources that align with their instructional objectives and meet the needs of their students. This process may involve consulting reviews, seeking recommendations from colleagues, and conducting trial evaluations of various websites to determine their efficacy and suitability for language instruction. Another significant challenge associated with modern methods of language teaching using websites is the digital divide, which refers to disparities in access to technology and the internet among different demographic groups. While many learners have access to high-speed internet and digital devices, others may lack reliable internet connectivity or possess limited technological proficiency, hindering their ability to fully engage with online language learning resources.[5] This digital divide exacerbates existing inequalities in education and may disproportionately affect learners from marginalized or underserved communities. To address these challenges, educators must adopt strategies to promote digital literacy and ensure equitable access to online language learning resources. This may involve providing training and support to help learners develop essential digital skills, such as navigating websites, using online tools and platforms, and critically evaluating online information. Additionally, educators can explore alternative methods of delivering language instruction, such as blended learning models that combine online resources with traditional classroom instruction, thereby accommodating learners with varying levels of digital access and proficiency. Moreover, educational institutions and policymakers play a crucial role in addressing the digital divide by investing in infrastructure improvements, expanding broadband access in underserved areas, and implementing initiatives to provide digital devices and internet connectivity to disadvantaged learners. By prioritizing digital inclusion and equity in education, stakeholders can ensure that all learners have equal opportunities to benefit from online language learning resources and participate fully in the digital age. [5,86]

Integrating these technological tools not only enhances language learning but also broadens students' horizons by exposing them to a wide array of cultural, linguistic, and educational resources from around the world.

There are many different digital technologies for teaching foreign languages to students. [1]

For example, there are many varieties of online learning platforms.

Table 1

| A group of services/platforms                                                                      | Functions in the educational process                                                                                                                                                                                                                                        | Examples                                     |
|----------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------|
| 1. Social networks and messengers                                                                  | Organization of communication between teachers and students, organization of feedback, exchange of audio, video, text and graphic content, streaming broadcasts.                                                                                                            | «Vkontakte», «WhatsApp», «Viber»             |
| 2. Platforms for interactive lectures and seminars                                                 | Translation of traditional classes into video format (in streaming format and in recordings), organization of communication between teachers and students, exchange of audio, video, text and graphic content, the possibility of organizing students' work in small groups | "Zoom", "MS Teams", "Webinar"                |
| 3. Services for online verification of students' knowledge                                         | Monitoring and analysis of students' academic performance, automation of the process of verifying the correctness of assignments in a test form.                                                                                                                            | «OnlineTestPad», Google Forms, "Master Test" |
| 4. Comprehensive educational platforms for creating and conducting a full-fledged training course. | Wide functionality for creating educational content in various formats, tools for checking, monitoring and analyzing attendance and academic performance, lesson planning, feedback and discussion, exchange of experience                                                  | "Moodle", "Edmodo", "MoodleCloud"            |
| 5. Massive open online courses                                                                     | Deepening knowledge and developing students' competencies in a narrow subject area within the framework of the specialty being mastered, obtaining practical skills, communication in the professional community, employment prospects                                      | "GreekBrains", "Skillbox", "Coursera"        |
| 6. Services for online quizzes, tests and surveys                                                  | Services for creating various types of quizzes, tests, surveys and assignments.                                                                                                                                                                                             | «Kahoot», «Wordwall», «Lerningapps»          |

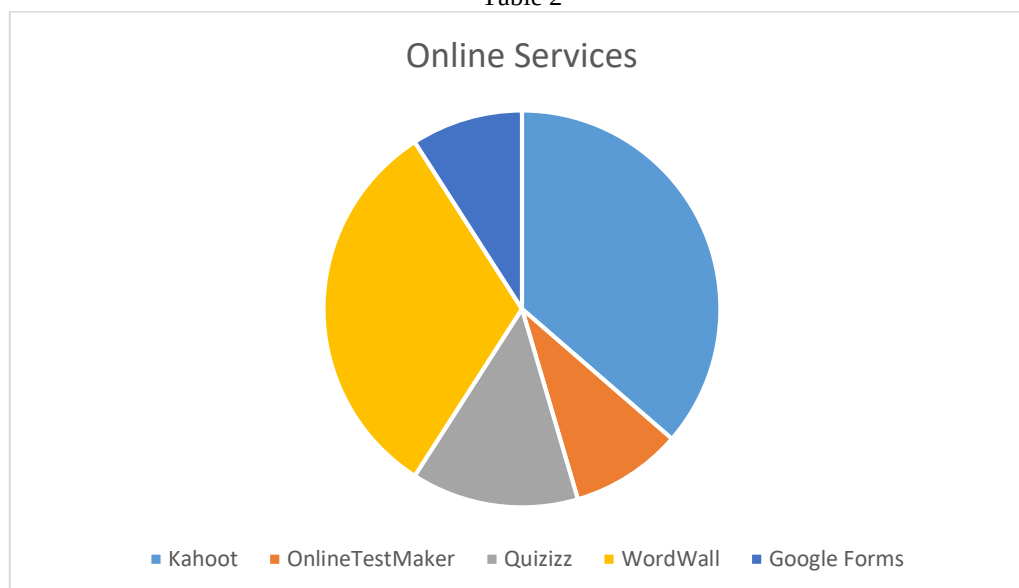
When performing interactive tasks through online platforms, students' perception and memorization of information increases, the effectiveness of memory work increases, such intellectual and emotional personality properties as attention stability, the ability to distribute it, the ability to analyze, classify develop more intensively. When discussing the difficulties of completing tasks, students analyze and evaluate their level of knowledge, develop a strategy for further behavior to achieve a higher level of knowledge, ask or offer help to each other. [6]

To consider the students' interest in digital technologies during the English lessons, a **survey** was con-

ducted among 8 classes. Survey conducted at Secondary School No. 26 included participation from 53 students across 8 classes. The results of a survey on students' interest in digital technologies during an English lesson are presented in Table 2.

The findings showcased a strong inclination and enthusiastic response towards integrating digital technologies into English teaching. Students showed significant appreciation and satisfaction towards the incorporation of diverse resources like Kahoot, OnlineTestMaker, Quizizz and similar online tools during their classes. (Table 2)

Table 2



It is important to note that the students liked the interactivity and variety of the online platforms presented, which contributed to a more exciting and effective learning process. They expressed their desire to continue using these technologies in the framework of learning English in the future, highlighting aspects such as the fun of classes, the possibility of applying the knowledge gained in practice and improving language understanding through access to a variety of interactive materials.

This positive response from students is an indicative factor in favor of further use of digital technologies in the educational process, emphasizing the importance of integrating modern technologies to improve learning and stimulate interest in learning a foreign language.

Utilizing digital technologies presents solutions to numerous foundational issues in educational content development, arising from the substantial growth in taught material, the necessity for constant updates, hurdles in creating educational texts, and shaping the educational environment. This elevated technological paradigm in educational content development ushers in a fresh dimension of learning quality.

#### *Conclusion*

Based on the information provided, a conclusion can be drawn that modern methods of language teaching using websites, such as Kahoot, Wordwall, and Learningapps, have shown positive results in engaging students and enhancing their learning experience.

These online platforms have been instrumental in increasing students' perception and memorization of information, as well as developing intellectual and emotional personality properties. The positive response from students emphasizes the importance of integrating digital technologies to improve learning and stimulate interest in learning a foreign language. However, it's important to be mindful of the challenges such as content quality, digital inequality, and the digital divide to ensure equitable access to online language learning resources. Efforts should be made to overcome these challenges and continue leveraging digital technologies to enhance the educational process and learning quality.

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# PHYSICAL SCIENCES

## THE EFFECT OF A NUMBER OF INORGANIC SALTS ON THE PHYSICAL-CHEMICAL CHARACTERISTICS OF THE PEG-DEXTRAN-WATER BIPHASIC SYSTEM

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<https://doi.org/10.5281/zenodo.12746241>

### Abstract

The presented work is dedicated to the exploration, acquisition, and investigation of two-phase water-polymer systems possessing specific characteristics relevant to concrete application areas. The study examines the impact of several inorganic salts ( $\text{NiSO}_4$ ,  $\text{CoSO}_4$ , and  $\text{MnSO}_4$ ) on phase separation processes in PEG-dextran-water two-phase systems. Additionally, the structural temperatures of these salts in water have been determined.

**Keywords:** Polyethylene glycol, dextran, water-polymer two-phase system, binodal curve, critical point, structural temperature.

As known [1], when two different polymers are dissolved in water, at values greater than certain concentrations of these polymers, the homogeneous solution separates into two phases, a homogeneous-heterogeneous phase transition occurs. When any substance is introduced into such a system, the added substance distributes unequally between the phases of the system [2]. Such non-equilibrium distribution allows for separating biological particles (such as viruses, bacteria, cells, etc.) from each other, creating opportunities for individual study and analysis. Due to its simplicity, cheapness and practical importance, the application areas of this method have expanded significantly in recent times [3].

The presented work investigates the effect of adding inorganic salts ( $\text{NiSO}_4$ ,  $\text{CoSO}_4$ , and  $\text{MnSO}_4$ ) at various concentrations to the PEG-dextran-water two-phase system, while keeping the anion constant. A phase diagram is used to characterize two-phase water-polymer systems. The phase diagram is defined by several parameters, namely the binodal curve, the critical point, the tie line, and the slope angle of the tie line. The "binodal curve" is the specific locus on the phase diagram that marks the points separating the homogeneous and heterogeneous regions of the system. Another characteristic of two-phase systems is the critical point, which is the point where the volumes and concentrations of phases in the two-phase system are equal.

Research has determined that increasing the concentrations of inorganic salts ( $\text{NiSO}_4$ ,  $\text{CoSO}_4$ , and  $\text{MnSO}_4$ ) causes the binodal curve of the PEG-dextran-water two-phase system to move away from the origin coordinates. Increasing the concentration of salt and expanding the area of the homogeneous region has made the dissolution of polymers together in water easier. On the other hand, the concentrations of the components corresponding to the critical points of the binodal increase depending on the total salt concentration (weight concentration). This indicates the dispersing effect of added salt on the two-phase PEG-dextran-water system. To restore the phase separation process, it is necessary to add structuring polymers (both PEG and dextran are water structuring polymers) to the system. The obtained results can be easily explained by Samoylov's theory [4].

Additionally, the influence of the inorganic salts on the structure of water has been investigated. For this purpose, the viscometric method has been used to determine the structural temperature ( $T_{\text{str}}$ ) of water and solutions. As known [5], if the structural temperature of the solution is greater than that of pure water, the solute structures water; conversely, it disrupts the water structure. Using optimization methods, the structural temperatures of solutions with salts in water have been determined, and the results are presented in Table 1.

| Solutions       | $T_{\text{str}}$ (K) |
|-----------------|----------------------|
| Pure water      | 139                  |
| $\text{CoSO}_4$ | 125                  |
| $\text{MnSO}_4$ | 80                   |
| $\text{NiSO}_4$ | 59                   |

Since the structural temperature of pure water is  $T_{\text{str}} = 139\text{K}$ , and the structural temperatures of all three salts ( $\text{NiSO}_4$ ,  $\text{CoSO}_4$ ,  $\text{MnSO}_4$ ) in water are lower than that of pure water, it follows that the solutes, namely

the added salts  $\text{NiSO}_4$ ,  $\text{CoSO}_4$ , and  $\text{MnSO}_4$ , disrupt the structure of water.

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# SOCIAL SCIENCES

## TERRITORIAL ACCESSIBILITY AND PEACE PROMOTION: AN APPROACH THROUGH THE DEVELOPMENT OF THE ROAD INFRASTRUCTURE NETWORK.

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### Abstract

The main objective of this research is to explore the connection between geographical accessibility and the presence of armed conflict in the department of Caldas. To conduct this analysis, a combination of layers and databases provided by Colombian government entities was used, along with the functionality of Google's DistanceMatrixApi, which allowed for the validation and adjustment of the road infrastructure network in the study area. Through the analysis of these data, it was possible to identify that rural areas, which have historically suffered the impacts of armed conflict, exhibit lower levels of accessibility compared to urban areas. This finding suggests that the presence and persistence of conflict have contributed to the limitation of efficient road connections in the department, which may have significant implications for socio-economic development and the quality of life of the local population.

**Keywords:** geographical accessibility, armed conflict, distancematrix api, peace.

### INTRODUCTION

The armed conflict in Colombia has caused significant impacts on the population and the country's development, especially in remote rural areas, where state abandonment led guerrilla groups to settle during the more than six decades of the longest-lasting armed conflict in modern history worldwide [1]. With the signing of the peace treaty between the FARC-EP, the largest and most powerful guerrilla group, and the national government in 2016, a transition to the post-conflict era and peacebuilding is expected to begin. This transition entails increased investment and attention to the country's rural areas with the aim of closing the development gap exacerbated by the presence of armed conflict in these territories [2; 3].

#### A Brief History of the Armed Conflict and its Impact on the Territory

The impact of the armed conflict on territories varied in intensity over the years, driven by different political and economic motivations. The founding of guerrilla groups (FARC, ELN, EPL) occurred in the 1960s, following a period known as "The Violence," where the two traditional political parties (Liberals and Conservatives) engaged in a "civil war" that resulted in numerous casualties, mainly in the Andean region, and ended with the formation of the National Front (1958-1974), a 16-year period during which both parties alternated power every 4 years, sidelining alternative political participation (Grupo de Memoria Histórica, 2013).

The exclusion of political participation and state abandonment of rural areas led to the formation of guerrilla groups in the 1960s, settled in remote rural areas and funded by local inhabitants, enjoying some acceptance in their early decades. Despite this, their territorial expansion was almost non-existent, which changed with the intrusion of the drug trade in the 1980s, leading to the expansion of coca cultivation and the emergence of paramilitary groups. Coca cultivation brought about changes in the social and economic dynamics of the armed conflict and the inhabitants of the remote rural areas where it was grown [4; 5]. By 1998, the armed conflict was located in specific areas of Colombian territory, a situation that changed drastically by 2002 when its geographical expansion was notable, driven mainly by the failed peace process of the government of Andrés Pastrana (1998-2002) with the guerrillas and the offensive of the paramilitaries seeking its failure [1; 6]. Then, with the implementation of Álvaro Uribe's democratic security policy (2002-2010), the armed conflict reached a peak of incidence in the national territory accompanied by the actions of the public force and the response of the guerrillas. The last stage of the armed conflict is framed by the peace talks between the FARC-EP and the national government (Juan Manuel Santos 2010-2018), a period where a few focal points of high conflict incidence still remained and culminated with the signing of the peace treaty in 2016 [3]. The end of the armed conflict paves the way for the beginning of the post-conflict period, where peace is expected to

be consolidated and the signed agreements implemented.

### Caldas and Post-Conflict

Caldas is a department located in the central-western region of Colombia (see Figure 1), with a population of 998,255 people and 27 municipalities. Its capital, Manizales, along with Villamaría, forms a conurbated area where 46.19% of the department's inhabitants reside [7]. The impact of the armed conflict in Caldas was accompanied by the replacement of traditional crops with coca cultivation in the early 1990s in the eastern area (Samaná, Norcasia, and Pensilvania), pressured by illegal armed groups from the Antioquia region [4; 5; 6]. At the beginning of the new

millennium, the presence of paramilitary groups in the area increased, initiating a confrontation between guerrillas, paramilitaries, and the army that left indelible marks among the inhabitants of this region of the department through multiple selective killings, massacres, kidnappings, and takeovers of populated centers [1]. The armed conflict in Colombia has been measured through various indices. In 2014, the Center for the Analysis of Conflicts Resources (CERAC) categorized the municipalities of Colombia according to the presence and intensity of the armed conflict in the last 8 years, defining Samaná and Pensilvania as "strongly affected and interrupted" [8].

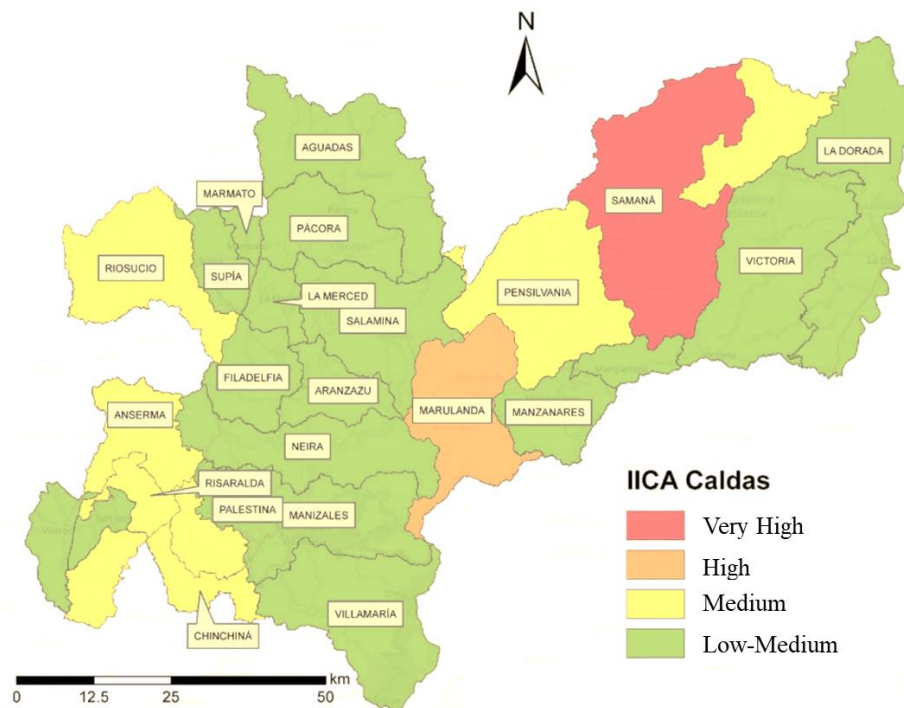


Figure 1 Caldas and IICA municipality. Source. Self made

Similarly, the National Planning Department (DNP) in 2016 defined the Armed Conflict Incidence Index (IICA) (from Low to Very High) per municipality based on data from six variables (Armed actions, homicides, kidnappings, landmines, coca crops, and forced displacement). According to this, Caldas as a department has a Medium-Low IICA; however, at the municipal level, Samaná and Marulanda register Very High and High IICA categories (see Figure 1) [9]. Finally, Salazar [6] analyzed georeferenced data from 1986 to 2015, defining Caldas as a region of recent high impact (2002-2012) due to the armed conflict. Despite the recent high incidence recorded in municipalities such as Samaná, Pensilvania, and Marulanda, no area of Caldas was prioritized in the Territorial Development Program with a Territorial Approach (PDET), which seeks the transformation of 170 municipalities in their historically rural areas affected by armed conflict, presence of illicit crops, poverty, and state abandonment in the framework of post-conflict [10]. For this reason, it is of utmost importance to define strategies with a territorial approach to prioritize government investment that will help close the gap in the rural areas

of the department of Caldas most affected by armed conflict and state abandonment, thus consolidating peace in their territories. In this research, the geographical accessibility of the department of Caldas will be calculated through travel times defined in an origin-destination matrix fed with operational speeds extracted from the Google DistanceMatrix API [11].

Subsequently, a geostatistical model will be applied to construct isochrone coverage curves and relate them to the population of each municipality to calculate weighted geographical accessibility according to urban and rural areas. This will be compared with the IICA of each municipality with the aim of seeking correlation between the variables [12]. Accessibility is a transportation model that measures the opportunities for interaction that individuals (work, education, health, recreation) have in a region through transportation supply (road infrastructure, transportation modes) [13]. Since its mathematical definition in 1959, researchers and city planners have developed various measures [14], among which are the gravity model [13; 15], the cumu-

lative opportunities model [16], and geographical accessibility [12] as the most common due to their ease of interpretation.

Likewise, as computational capabilities grew alongside the use of Geographic Information Systems (GIS), more variables have been included in the measures, providing more perspectives on accessibility, such as the socio-economic income of inhabitants, laying the groundwork for equity analysis in access [17; 18] or transportation systems [19]. In this research, the differentiation between rural and urban areas will be taken into account as a variable in the analysis of geographical accessibility in Caldas, a study area where similar analyses have been conducted before without considering the aforementioned variables [20].

## METODOLOGY

The research methodology employed is described below.

### Data Collection

The first stage involved gathering input data for the research, entirely supported by primary information. Firstly, the geopolitical and administrative division of the department was downloaded using the National Geostatistical Framework (MDN) from the National Administrative Department of Statistics (DANE), which allows the download of georeferenced polygon layers of each municipality categorized by class (urban and rural) and detailed according to the census area. Secondly, the georeferenced departmental road network was obtained from the open data portal of the Cartography and Geography sub-directorate of the Agustín Codazzi Geographic Institute (IGAC) [21]. Thirdly, the Municipal Armed Conflict Incidence Index (IICA) was downloaded from the National Planning Department (DNP) in CSV format [9]. Finally, data from the 2018 National Population and Housing Census (CNPV2018) from DANE were downloaded in CSV format from the microdata area of the same entity [7].

### Fine-tuning of Geographic Information Layers

During this stage, the necessary layers for calculating geographic accessibility were organized: the road infrastructure network and the political-administrative division of the department according to the census area.

For the fine-tuning of the road infrastructure network, two basic considerations were taken into account. The first is related to graph theory, which indicates that for transportation models, roads correspond to edges and intersections to nodes. Additionally, for geographic accessibility calculations and geostatistical models, it is necessary to maximize data in the spatial territory in order to increase its correlation and predictive accuracy. Therefore, the edges of the road infrastructure network were divided into segments of up to 300 meters using the Geopandas and Shapely libraries in Python 3.7. On the other hand, operating speeds were introduced into the network based on routes between cities calculated using the DistanceMatrix API from Google. This API was requested using geographic coordinates of two known points, providing distance and travel time, from which speeds were calculated and introduced as variables in the corresponding edges.

Additionally, fine-tuning of the political-administrative division of the department according to the census area was carried out by relating their unique codes to those of the CNPV2018, taking into account the rural and urban population and distributing them according to the polygon area. For this purpose, the Geopandas and Pandas libraries in Python 3.7 were used.

### Geographic Accessibility

For the calculation of geographic accessibility ( $A$ ) (equation 1), the travel impedance ( $C_{ij}$ ) is computed between all nodes of the road infrastructure network as origin ( $i$ ) and destination ( $j$ ) using the shortest path according to Dijkstra's algorithm [22], the road infrastructure network, and Transcad 8.0 software, following a validation process [14]

$$A = \frac{\sum_{i=1}^J \sum_{j=1}^J c_{ij}}{J-1} \quad (1)$$

After calculating geographic accessibility as the average travel time from each node of the road network to all others, isochrone curves were constructed using the ordinary Kriging geostatistical method with linear semivariogram as the structural equation. This method predicts travel times based on spatial correlation and distance between values, in this case, travel time. This model has proven to be the optimal interpolator, given its good results in various transportation-related studies [12; 23].

### Calibration and Validation

The calibration and validation process were conducted by comparing the minimum travel times between the population centers of the 27 municipalities in the department using the Google DistanceMatrixApi with the results provided by the shortest path algorithm of Transcad 8.0, using the road network adjusted in the second stage [11]. In cases where the model results were lower than reality, penalties for turns were used as a calibration variable [24]. Finally, a linear regression was employed between the data as a validation method, aiming for a regression coefficient greater than 95% and a Pearson correlation close to 1.

### Weighted Geographic Accessibility and Coverage Curves

In this stage, the accessibility isochrones were related to the political-administrative division of the department in its census area, calculating the coverage curves for total population and according to the category: urban and rural. Additionally, the weighted geographic accessibility was calculated per municipality ( $\overline{A}_m$ ) based on the category of its territory (urban and rural) using equation (2) where  $C$  corresponds to the average travel time of the accessibility isochrone  $n$  and  $p$  represents the population within it [25]

$$\overline{A}_m = \frac{p_1 \cdot \overline{C}_1 + p_2 \cdot \overline{C}_2 + \dots + p_n \cdot \overline{C}_n}{p_1 + p_2 + \dots + p_n} \quad (2)$$

## RESULTS

### Road Infrastructure and Census Division in the Department of Caldas

We begin by presenting the results of the adjustment of the road network and the polygon corresponding to the census area of Caldas, as shown in Figure 2. The departmental road network consists of 16,222 nodes, 16,274 arcs, and spans a length of 2,263 kilometers of roads. The most common speed range, between 20 and 30 km/h, accounts for 43.31% of the total length.

Additionally, the distribution of the census area is presented, where 74.35% of the population resides in urban areas, primarily in the conurbation between the capital Manizales and Villamaría.

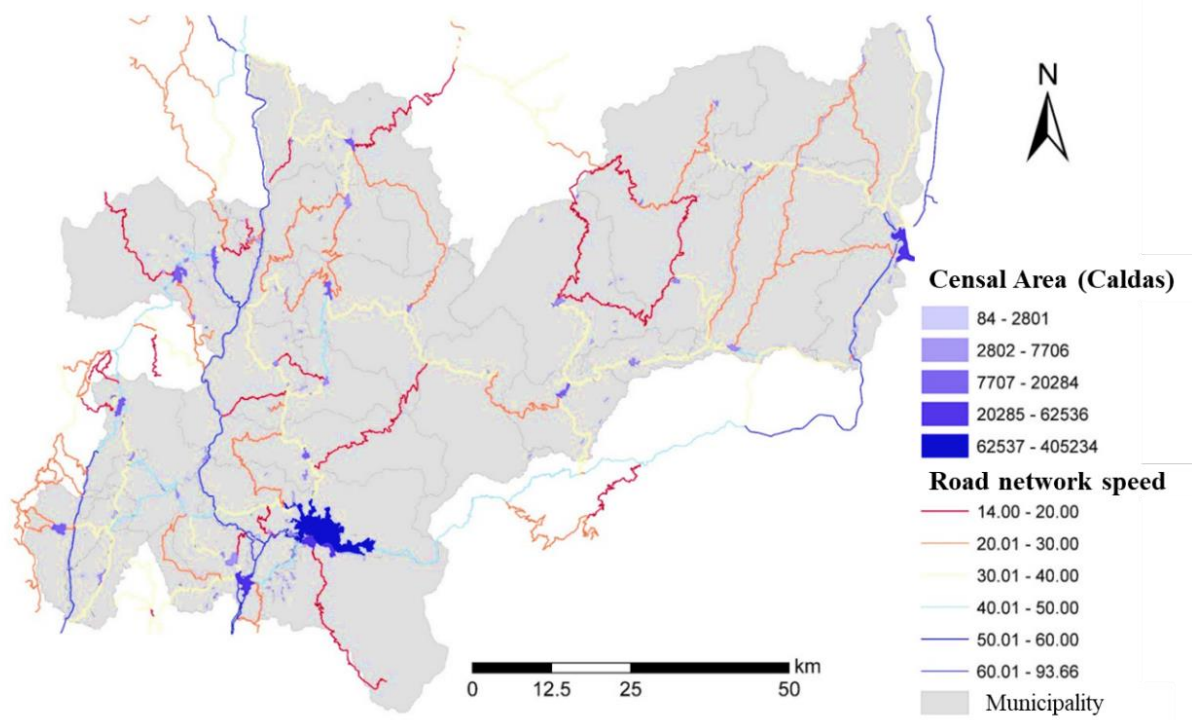


Figure 2 Censal Area and road network. Source. Self made

On the other hand, Figure 3 displays the validation of the geographical accessibility model for the Caldas department, comparing travel times between population centers calculated using the shortest path tool of Transcad 8.0 and the travel times obtained through the DistanceMatrix API from Google. In total, 749 routes covering the population centers of the 27 municipalities in the department were validated, considered both as

origins and destinations of the trips. During the calibration and modeling process, turn penalties of 0.75 minutes to the left and 0.5 minutes to the right were established. Additionally, presents some indicators of model validation, including a Pearson coefficient close to 1 (0.9902), a regression coefficient of 97%, and a p-value less than 0.001, indicating that the road infrastructure network accurately represents the mobility of the department.

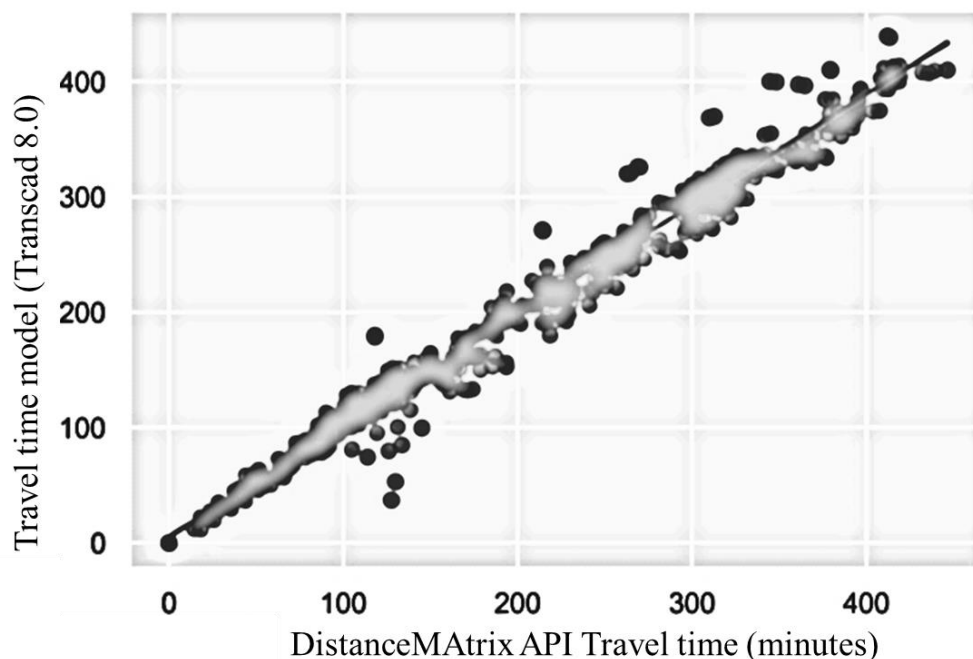


Figure 3 Travel time validation. Source. Self made

### Geographic Accessibility

Figure 4 illustrates the geographic accessibility in the department of Caldas, with a minimum average travel time of 167 minutes in the area of Manizales, the capital, and a maximum of 343 minutes in areas to the northeast of the department, where municipalities like Norcasia and Samaná are located. The blue circles highlight areas in the department with better geographic accessibility, linked to the roads connecting the capital (Manizales) with the country's two main cities, Medellín to the north and Bogotá to the east.

Consequently, municipalities along these routes benefit from good geographic accessibility, thanks to the development of necessary infrastructure to connect the capital with key economic centers nationally [20]. On the other hand, the red circle marks areas with longer average travel times. These areas have been significantly affected by the armed conflict (Samaná, Pensilvania, and Norcasia), especially in the northern parts of Samaná and Norcasia, historically where coca cultivation has been concentrated [4; 5]

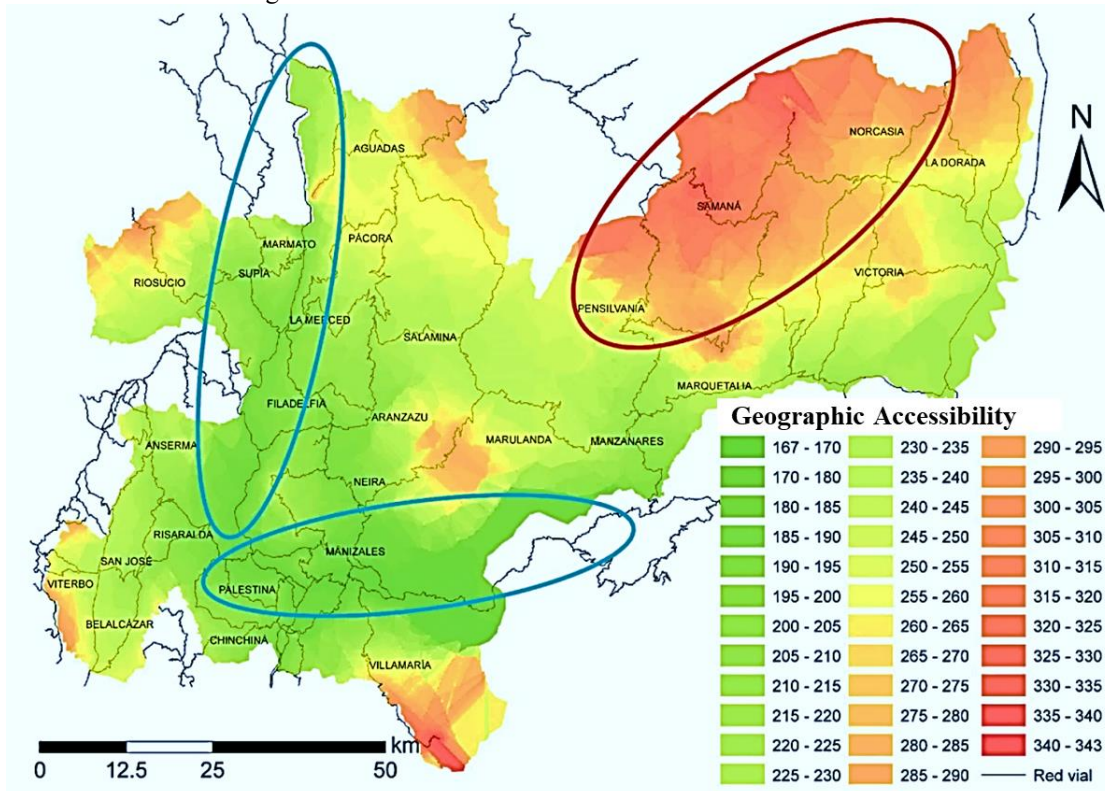


Figure 4. Geographical Accessibility. Source. Self made

In Figure 5, the cumulative curve of population percentage based on travel time is depicted, where 80% of the population of the department is covered in average travel times of 235 minutes or less. On the other hand, Figure 6 displays the cumulative curve of population percentage according to its classification, urban or rural. A marked disparity between the urban and rural areas is observed, as 80% of the population in the urban zone experiences average travel times of 230 minutes or less, while in the rural zone, the average travel time is 250 minutes. The access gap between rural and urban areas must be addressed by authorities, aiming to meet the basic needs of remote areas [26], especially to prevent a potential resurgence of armed conflict in these areas.

Therefore, population coverage through the road infrastructure network is crucial for increasing interac-

tion opportunities in rural areas, addressing fundamental issues such as agricultural trade, healthcare, and higher education [27; 28].

The results of geographical accessibility weighted by municipality, classified according to urban and rural areas, are detailed in Table 1. It can be observed that Manizales presents the best indicator, with 178.30 minutes for the urban area and 183.06 minutes for the rural area. Conversely, Norcasia shows the worst indicator of weighted geographical accessibility in the urban area, with 281.29 minutes, while Samaná has the worst indicator in the rural area, with 309.40 minutes.

Furthermore, displays the IICA values for each municipality, which were assessed alongside urban and rural geographic accessibility, revealing a direct relationship (see Table 2).

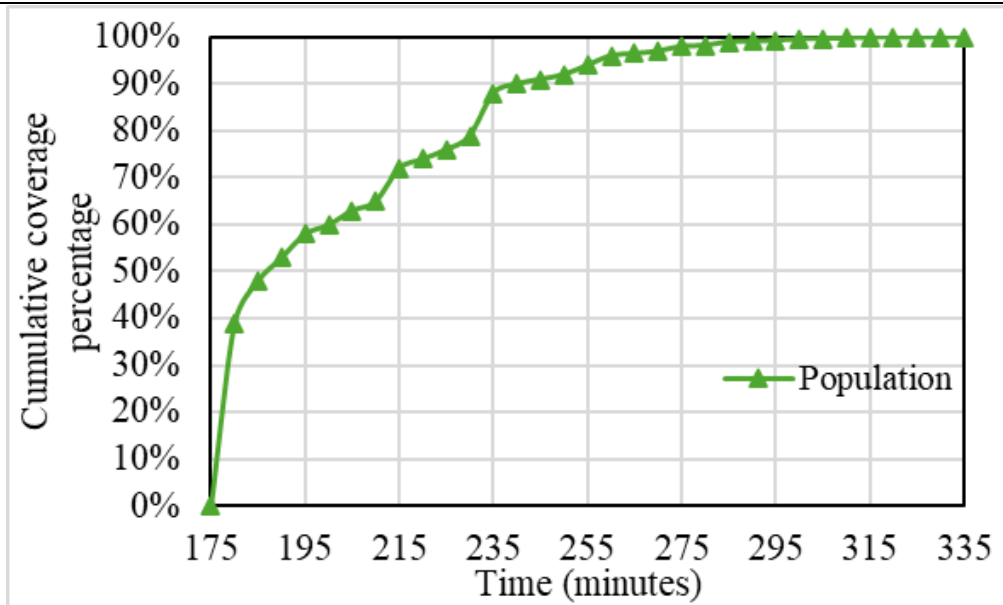


Figure 5 cumulative curve of population percentage. Source. Self made

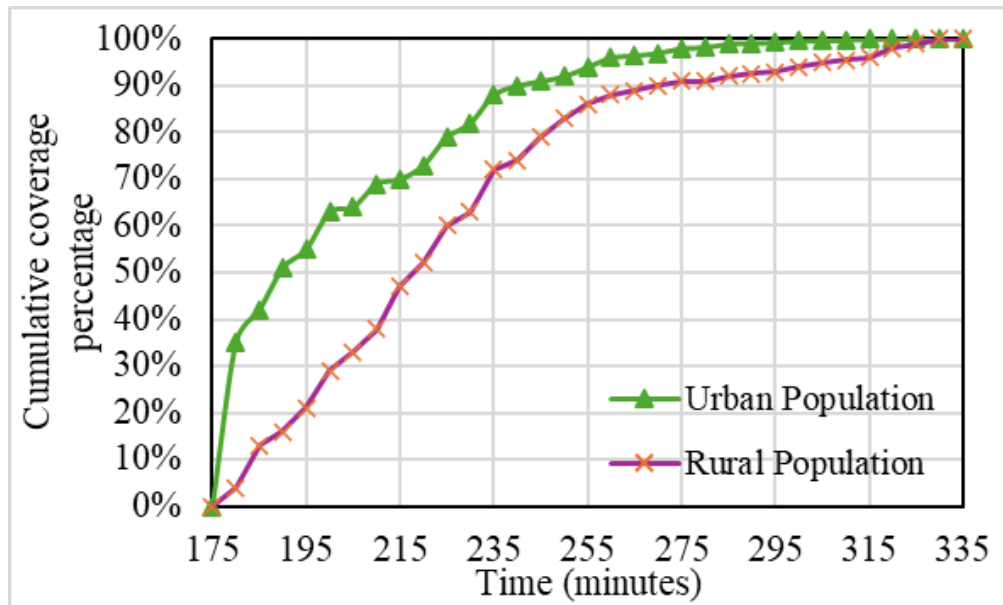


Figure 6 Cumulative curve of population percentage according to its classification, urban or rural. Source. Self made

| Municipality | IICA    |            | Urban Accessibility | Rural Accessibility |
|--------------|---------|------------|---------------------|---------------------|
| Aguadas      | 0.01715 | Low-Medium | 253.25              | 252.47              |
| Anserma      | 0.02233 | Medium     | 226.81              | 227.35              |
| Aranzazu     | 0.01073 | Low-Medium | 205.24              | 202.24              |
| Belalcazar   | 0.01952 | Medium     | 232.64              | 235.1               |
| Chinchiná    | 0.02349 | Medium     | 189.38              | 204.62              |
| Filadelfia   | 0.01505 | Low-Medium | 202.5               | 205.98              |
| La Dorada    | 0.01043 | Low-Medium | 232.55              | 251.14              |
| La Merced    | 0.0117  | Low-Medium | 218.87              | 205.02              |
| Manizales    | 0.00899 | Low-Medium | 178.3               | 183.06              |
| Manizales    | 0.01343 | Low-Medium | 212.5               | 211.93              |
| Marmato      | 0.01199 | Low-Medium | 220                 | 217.87              |
| Marquetalia  | 0.01411 | Low-Medium | 235.69              | 242.5               |
| Marulanda    | 0.05527 | High       | 242.5               | 182.5               |
| Neira        | 0.0128  | Low-Medium | 192.37              | 188.72              |
| Norcasia     | 0.02976 | Medium     | 281.29              | 284.93              |
| Pácora       | 0.0123  | Low-Medium | 252.71              | 250.66              |
| Palestina    | 0.01951 | Medium     | 197.15              | 194.07              |
| Pensilvania  | 0.02522 | Medium     | 250.93              | 279.53              |
| Riosucio     | 0.02093 | Medium     | 215.84              | 217.16              |
| Risaralda    | 0.0199  | Medium     | 212.52              | 202.66              |
| Salamina     | 0.01494 | Low-Medium | 222.98              | 231.76              |
| Samaná       | 0.08276 | Very High  | 262.5               | 309.4               |
| San José     | 0.01199 | Low-Medium | 222.43              | 237.23              |
| Supía        | 0.01548 | Low-Medium | 202.55              | 206.03              |
| Victoria     | 0.01226 | Low-Medium | 222.26              | 253.71              |
| Villamaría   | 0.0065  | Low-Medium | 179.42              | 196.52              |
| Viterbo      | 0.01887 | Low-Medium | 239.05              | NaN                 |

Table 1. Weighted geographic accessibility by municipality, urban and rural areas. Source. Self made

|       | IICA                |           |
|-------|---------------------|-----------|
|       | Pearson Correlation | p-value   |
| Urban | 0.5006              | 0.0091883 |
| Rural | 0.4178              | 0.0336726 |

Table 2 Relationship Accessibility vs IICA. Source. Self made

## CONCLUSIONS

An important conclusion is that geographic accessibility plays a fundamental role in preventing and resolving armed conflicts. The lack of adequate road infrastructure in remote areas can contribute to the isolation of communities and hinder access to basic services and economic opportunities, which in turn can fuel tensions and conflicts. Improving geographic accessibility not only facilitates the socioeconomic development of a region but can also promote social integration and reduce disparities that are often a breeding ground for armed conflict.

Weighted geographic accessibility emerges as a crucial indicator of interaction opportunities in a region and the quality of its road infrastructure network. This

indicator can be combined with others to assess road infrastructure projects and their impact on the region.

Considering the relationship between weighted geographic accessibility and the Index of Armed Conflict Incidence (IICA), the research highlights areas in the department where road infrastructure needs improvement to increase interaction potential among its inhabitants and prevent the resurgence of armed conflict. The need for special attention to the northern zone of Samaná and Norcasia in terms of road infrastructure investment to enhance connectivity with the rest of the department is evident. Additionally, the clear disparity between geographic accessibility indicators for residents of rural and urban areas underscores the widening inequality gaps.

Regarding armed conflict and the post-conflict stage in Colombia, Caldas should be included in the Prioritized Municipalities for Territorial Development (PDET), as areas like Samaná and Pensilvania have been significantly affected, according to various indices calculated by governmental and private institutions. This would enable them to create a Comprehensive Development Plan to prevent the return of conflict to the region.

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# TECHNICAL SCIENCES

## ACCIDENT RISK CONTROL IN INDUSTRIAL LIQUID AND GAS FUEL BOILERS

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<https://doi.org/10.5281/zenodo.12746264>

### Abstract

The publication describes the possible risks of an accident that may occur during the operation of industrial boilers, examines the possibilities of controlling and managing these risks, as a form of guaranteeing the safe operation of this type of equipment with increased danger, presents a study of a group industrial boilers regarding their normal and safe operation.

**Keywords:** Industrial boilers; Risk assessment of industrial boilers; Steam boilers; Accidents and risks with steam and water boilers

### 1. Introduction

Industrial boilers, as equipment working under pressure, are usually installed in industrial enterprises, where it is necessary to provide hot water for heating or for the needs of various technological processes, including those related to the hygiene of special premises, such as, for example, in processing enterprises of meat, milk, food products and others. Industrial boilers are installed in places where production processes require the provision of low-medium or high-pressure steam, for example, autoclaves, production of pre-made products, milk processing, etc. Defining and assessing the risks that may arise during the operation of industrial boilers is of utmost importance and requires special attention. Making mistakes in their design, production, operation or maintenance can lead to serious accidents, such as explosion, implosion or damage to various elements of the facility or adjacent installation, as well as to elements of the room where the industrial boiler is located. The manifestation of the accidents that occurred can be in the form of flying elements and pieces of the destroyed facility, pressure from the shock wave that arose as a result of the explosion, ignition of an explosive mixture obtained during the occurrence of the accident, leakage of fuel (liquid or gaseous, depending on the used such). These effects as a result of accidents very often cause serious injuries to personnel directly involved in the daily maintenance and operation of industrial boilers. As an indirect result of the impact of the results of the accident, people who are in the vicinity but are not part of the service personnel can also suffer. They can suffer trauma from being hit by heavy objects or flying pieces, cuts, injuries and burns. In addition, in the event of ignition of working fuel, harmful emissions may be released as a result of the accident, creating a risk of suffocation, poisoning or inflammation of the skin and respiratory tract. This publication presents the dangers and risks that may arise in the process of operating industrial boilers and the possibilities for their management and prevention. Along with this, the results of the author's

study of monitored industrial boilers and the deviations from normal operation, damage and accidents that occurred in them are also presented.

### 2. Risks with industrial boilers

#### 2.1 Risks associated with working under pressure

Industrial boilers are equipment operating under pressure. Since the environment in which they work is subject to thermal expansion and contraction, as a result of the heating of the working fluid from the combustion device, there are real risks of structural breaks and failure occurring. In this failure, the pressure that is normally in the [hermetically sealed space seeks to be released through the opening of the resulting microcrack in the material or weld and is thus in a condition to cause an explosion]<sup>2</sup>. As a result, shock may occur. An explosion can cause various structural elements or parts or pieces of them of the installation around the boiler to fly at high speed and possessing enough energy to destroy and injure.

In steam boilers, two types of explosions occur most often: gas and steam-water.

The gas explosion can occur as a result of ignition of the fuel mixture, consisting of gas or liquid fuel vapor, collected in certain parts of the combustion chamber. Such a mixture can appear with incomplete combustion of the working fuel, which is usually the result of poor burner adjustment. A gas explosion occurs if, after reaching a certain concentration of the fuel-air mixture inside the combustion chamber of the boiler, an attempt is made to ignite the combustion device (burner) without venting (purging) the chamber. The strength of this explosion depends on the amount and concentration of fuel in the resulting fuel mixture.

[The steam-water explosion occurs when the working fluid is in direct contact with superheated surfaces]<sup>2</sup>, when there are breaks in the heating surfaces inside the boiler and ingress of water on the walls of the combustion chamber or the flame tube, while there is an extreme decrease in pressure in the water space, which leads to the rapid formation of steam. As a result of the water and steam flowing through the cracks and

the sharp increase in pressure, they expand, and the resulting reactive force sharply increases its value and acquires destructive power. Safety devices can also create a pressure risk. [When the pressure is exceeded, these devices should release the excess part of it by discharging the excess pressure]<sup>3</sup>. This discharge is associated with the release of a working fluid (most often steam), which, in addition to pressure, also has a high temperature. This discharge may injure service personnel or anyone in the area of overpressure discharge. If these safety devices are damaged, the increased pressure cannot be released and there is a risk of an accident, which most often takes the form of an explosion of the boiler.

Steam regulators can also pose a risk during their operation because [if damaged, they may release a certain amount of working fluid]<sup>3</sup> and, similar to the risk of safety devices, cause injury to personnel or provoke a boiler accident.

### **2.2 Risks associated with the equipment**

The main risks associated with the equipment are the release of steam or hot water in the event of a leak and breach of the boiler casing and/or the pipes around it.

If flexible pipes are used to compensate for vibrations and if they break, there may be a risk of injury to personnel due to whiplash or dousing with a working fluid that is under pressure and at high temperature. Another risk associated with the equipment is possible leakage of working fluid under pressure in case of failure of a shut-off valve or a breakthrough through an insulating gasket of a flange connection. Released working fluid can cause burns if service personnel in this area are doused with it. With the fuel systems used, there are risks depending on the working fuel. When using gas fuel, there is a risk of gassing the working room in which the steam boiler is located and a possible risk of ignition and explosion. And when using liquid fuel (usually it is naphtha), there is a risk of spillage of naphtha and subsequent ignition and fire, which, in addition to injuries and burns, can also cause suffocation from the harmful smoke gases formed. In the event of damage to some of the control and measuring devices or the safety and protection devices, it is possible that there is a risk of an accident and even of an explosion of the industrial boiler.

### **2.3 Risks associated with incorrect actions of the personnel servicing the industrial boilers**

The main risks associated with personnel actions are:

- Insufficient knowledge of safety rules - this risk can cause accidents in boilers, due to wrong actions or decisions of personnel in critical situations
- Leaving the boilers unattended - in this risk, the staff does not guarantee a sufficient degree of visual control of the boiler during its normal operation and

thus does not have the opportunity to detect the occurrence of some preliminary indications informing about an impending accident, for example, vibrations, atypical noise, whistling, etc.

- Incorrect actions with the safety, regulating and measuring fittings - this risk almost always leads to serious accidents, because it deprives the boiler of its protection, guaranteeing correct and safe operation during operation
- Improper actions when detecting deviations in the normal operation of the boilers

### **3. Process research and analysis**

This observation and research was carried out on 132 industrial vehicles working in different spheres of industry in the Bulgaria. The boilers have capacities from 450 kW to 1200 kW.

**Type of research:** Open monitoring of facilities and analysis of documented records.

**Duration of the study:** From January 2023 to January 2024

**Sample size:** 132 industrial boilers

**Sample size calculation:** The sample size was obtained and estimated based on an analysis of the total number of registered industrial boilers in the country. The author believes that when examining 10% of the total number of registered industrial boilers, results with a confidence level of at least 95% will be obtained. The actual sample size for this study was 132 boilers, which were grouped into groups by region. The total number of groups by region is 7, and the distribution of boilers by these groups is:

- Group I - 25 pieces (out of a total of 245 pieces),
- Group II - 42 pieces (out of a total of 416 pieces),
- Group III - 10 pieces (out of a total of 103 pieces),
- Group IV - 13 pieces (out of a total of 133 pieces),
- Group V - 14 pieces (out of a total of 135 pieces),
- Group VI - pieces (out of a total of 189 pieces),
- Group VII - 9 pieces (out of a total of 92 pieces)

**Subjects and selection method:** As a result of a study, it was estimated that the study should include boilers that work in heavier operating modes, compared to the rest of the same group, and the criteria for evaluating the operating mode include: working time within 24 hours, boiler load by power, working environment (normal or extreme). As a result of the research conducted and the following results obtained for the operation of the boilers within 24 hours (fig. 1), it was found that they work between 16 and 18 hours, and their average working time is about 17 hours in one day..

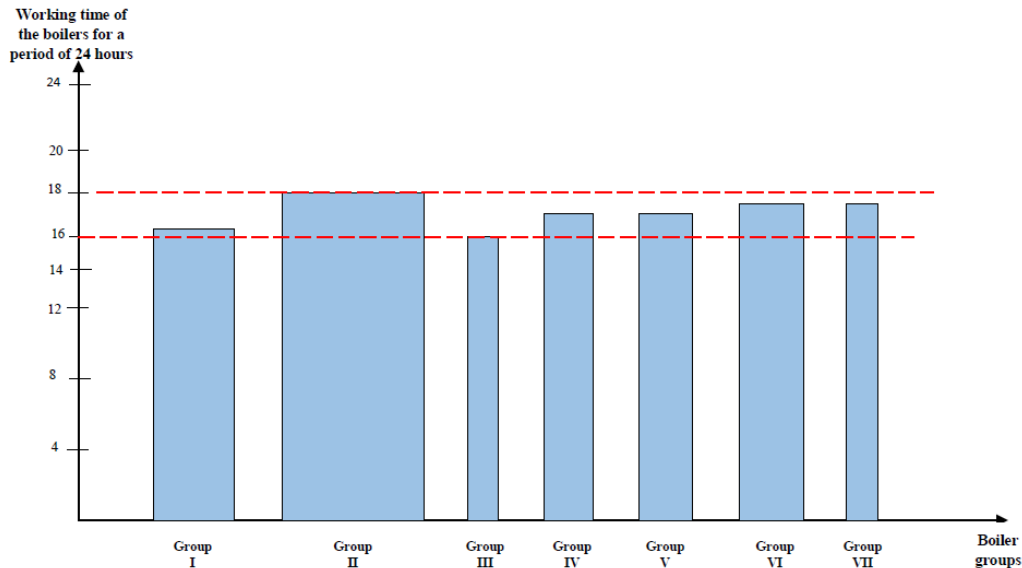


Figure 1

Regarding the load of the boilers by power, it was found that the boilers work with a variable load, which is consistent with the technological processes they serve and in which they participate. It is essential to note that, in percentage terms, boilers operate between

85% and 95% of their maximum power. Fig. 2 shows the loads of the boilers by power. Results are shown as averages for each study group.

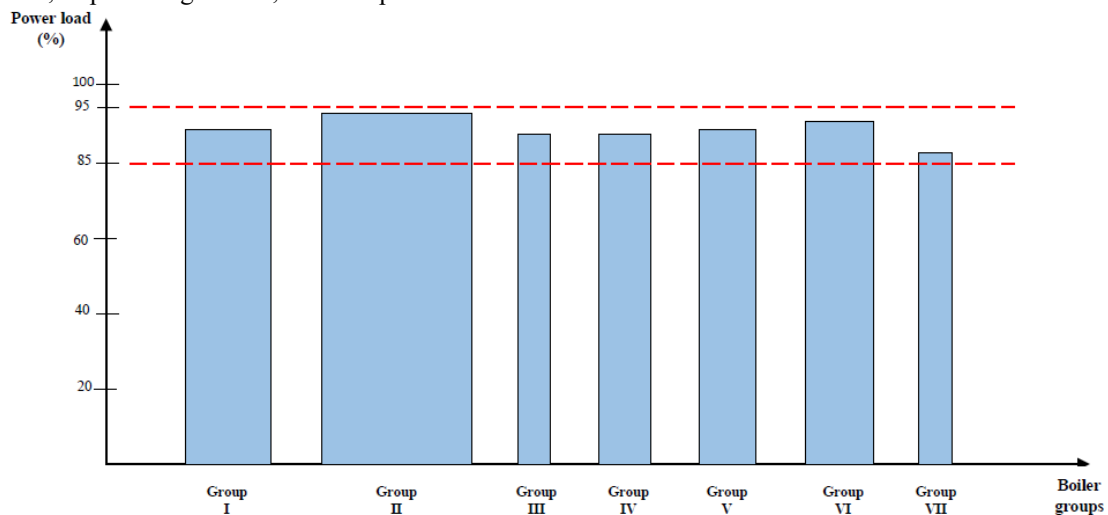


Figure 2

After analyzing the research data and establishing the impact of various risks on the normal operation of the boilers, it was found that the greatest probability of negative impact on a potential risk is the risk of

incorrect actions of the personnel ( $R_s$ ). The graph shown in Fig. 3 visualizes the impact of individual risks within the studied boilers.

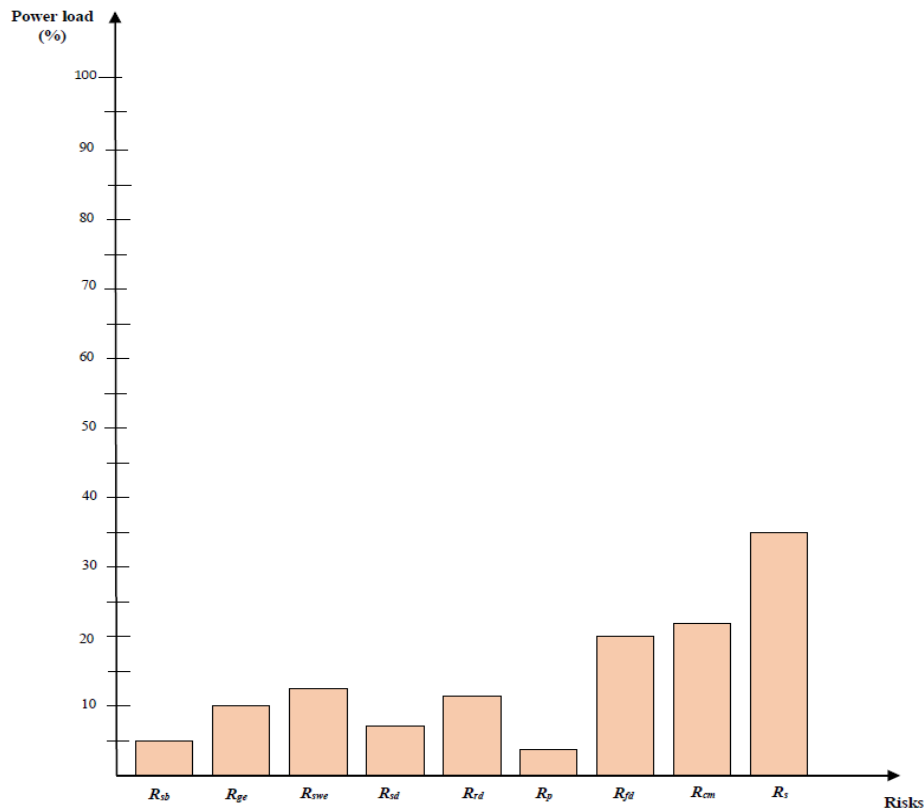


Figure 3

The individual groups of risks are indicated as follows::

- $R_{sb}$  - risk of occurrence of breaches in construction
- $R_{ge}$  - risk of gas explosion
- $R_{swe}$  - risk of steam-water explosion
- $R_{sd}$  - risk of damage to safety devices
- $R_{rd}$  - risk of damage to the regulating device
- $R_p$  - risk of damage to pipes and connections around the boiler

- $R_{fd}$  - risk of damage to the fuel system
- $R_{cmd}$  - risk of damage to control and measuring devices
- $R_s$  - risk of incorrect actions of personnel

To assess the possibilities of predicting the risk of an accident occurring in industrial boilers, it is necessary to calculate the complex risk ( $R_b$ ). The assessment of this risk is complex and is composed of the sum of all individual risks,

$$R_b = R_{sb} + R_{ge} + R_{swe} + R_{sd} + R_{rd} + R_p + R_{fd} + R_{cmd} + R_s$$

By determining the value of the complex risk, we have the opportunity to assess how much a given industrial boiler can fall into an emergency state and thus plan and carry out a complex of preventive measures and activities to avoid the occurrence of an emergency situation.

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**ANALYSIS OF THE AVAILABILITY AND TECHNICAL CONDITION OF THE COMPRESSOR FACILITY OF AZERBAIJAN****Najafgulyeva R.**

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**АНАЛИЗ НАЛИЧИЯ И ТЕХНИЧЕСКОГО СОСТОЯНИЯ КОМПРЕССОРНОГО ХОЗЯЙСТВА АЗЕРБАЙДЖАНА****Наджафгулиева Р.С.**

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<https://doi.org/10.5281/zenodo.12746272>

**Abstract**

The main link in the arrangement of the oil and gas or gas condensate field is the creation of a system of "extraction, collection, preparation and transportation" of the extracted products and the rational placement of oil and gas equipment. The technological process of oil and gas production using the gas-lift compressor method consists mainly of the operation and maintenance of wells, technological equipment and installations, compressor units installed at gas-lift or booster compressor stations (GCS or BCS) belonging to oil and gas production. Normal production activities of the entire complex of technological processes in the field of oil and gas production using the compressor gas-lift method can only be carried out on the basis of equipping oil and gas fields with highly efficient equipment.

**Аннотация**

Главным звеном в обустройстве нефтегазового или газоконденсатного месторождения является создание системы «добычи, сбор, подготовки и транспортировки» добываемой продукции и рационального размещения нефтегазопромыслового оборудования. Технологический процесс добычи нефти и газа компрессорным газлифтным способом заключается в основном в эксплуатации и обслуживании скважин, технологического оборудования и установок, компрессорных агрегатов, установленных на газлифтных или дожимных компрессорных станциях (ГКС или ДКС), принадлежащих нефтегазопромысловому производству. Нормальная производственная деятельность всего комплекса технологических процессов в области добычи нефти и газа компрессорным газлифтным способом может осуществляться только на основе обустройства нефтегазовых месторождений высокоэффективным оборудованием.

**Keywords:** gas lift, airlift, deposits, compressor, oil, gas, well, unit, deep well pump

**Ключевые слова:** газлифт, эрлифт, месторождения, компрессор, нефть, газ, скважина, агрегат, глубинный насос

В настоящее время в нефтегазовом секторе Азербайджана применяются различные методы и способы добычи нефти, включая фонтанный, штанговый насосный, газлифтный с применением электропогружных и винтовых насосов и др.

Добыча осуществляется на 27 нефтегазовых месторождениях, 13 из них находятся в море, а 14 – на суше.

Главной задачей, стоящей перед нефтяной отраслью страны как минимум является сохранение уровня стабильной добычи, а также строительство новых платформ для наращивания добычи и проведение буровых работ.

На сегодняшний день основной объём добычи осуществляется на морских месторождениях, где газлифтный способ добычи принимает доминантный характер.

Увеличение добычи нефти и газа, а также их транспортировка непрерывно связана с модернизацией данной отрасли. Широкое внедрение газлифтного способа невозможно осуществить без интенсификации добычи, эффективности подготовки и утилизации попутного нефтяного газа морских месторождений.

В системе нефтегазодобычи ГНКАР ежегодно из морских месторождений, находящихся в настоящее время на разработке, добывается в месте с нефтью попутный нефтяной газ в объёме более 2,0 млрд.м<sup>3</sup> [1].

Установлено, что на наиболее технически оснащенных месторождениях добываемый попутный нефтяной газ в количестве около 30% от общего объёма используется в качестве рабочего агента в системе газлифта и для других технических нужд, а остальные 70% транспортируются на

береговые сооружения и оттуда на переработку в ГПЗ, после которой сухой газ направляется в энергетический коридор [2].

Главным звеном в обустройстве нефтегазового или газоконденсатного месторождения является создание системы «добычи, сбор, подготовки и транспортировки» добываемой продукции и рационального размещения нефтегазопромыслового оборудования.

Поэтому система «добычи, сбор, подготовки и транспортировки газа» называется совокупностью физических подбъектов для осуществления конкретного технологического процесса, заключенного в конечной области «нефтегазовый пласт – бурение – эксплуатация нефтегазовых скважин – устья скважин – поставка продукции к потребителю» с определенными границами.

При этом система характеризуется не только своими промысловыми границами, но и технологическими параметрическими свойствами добываемой продукции и внутренней энергией.

Технологический процесс добычи нефти и газа компрессорным газлифтным способом заключается в основном в эксплуатации и обслуживании скважин, технологического оборудования и установок, компрессорных агрегатов, установленных на газлифтных или дожимных компрессорных станциях (ГКС или ДКС), принадлежащих нефтегазопромысловому производству.

Совершенно ясно, что нормальная производственная деятельность всего комплекса технологических процессов в области добычи нефти и газа компрессорным газлифтным способом может осуществляться только на основе обустройства нефтегазовых месторождений высокоэффективным оборудованием.

В этой связи усовершенствования существующей системы «компрессорной газлифтной добычи, сбора, подготовки и транспортировки продукции» нефтегазовых скважин и качественный сбор информации о технологических параметрах работы всей системы в т.ч. компрессорных агрегатов, позволяющие достоверно анализировать процесс добычи нефти и газа, являются весьма актуальными.

Решение вышеуказанных задач осуществляется, как за счет ввода в эксплуатацию новых высокоэффективных компрессорных станций, так и за счет научно обоснованного подхода в исследованиях проблемы обеспечения надежности газоконпрессорных агрегатов.

В нефтегазодобывающих управлениях нефтегазопромысловое оборудование, подобранное проектным решением должно обеспечить нормальную эксплуатацию нефтегазовых скважин, как при процессе фонтанирования, так и при механическом воздействии в призабойную зону скважин.

Для создания оптимального давления газа на устье скважины перед направлением его на забой для подъема продукции наверх необходимо помнить, что это давление может обеспечивать заданный дебит скважины. Поэтому ГКС или ДКС должны обеспечить постоянно и непрерывно газлифтные нефтяные скважины сжатым газом в соответствии с оптимальным рабочим давлением. При этом полная нагрузка для обеспечения всей системы газлифта сжатым газом падает на газомоторные поршневые компрессоры (ГМК), которые устанавливаются на ГКС или ДКС.

В настоящее время в компрессорном хозяйстве системы ГНКАР эксплуатируются более 250 единиц разных модификаций компрессоров. В том числе 81 шт. газоперекачивающих агрегатов на морских месторождениях, 9 из которых являются центробежными компрессорами с газотурбинным приводом и 72 шт. газомоторные поршневые компрессора типа 10ГКНАМ 2/5-55 и 10ГКНАМ 3/5-100). Они используются в системе газлифта скважин и транспортировки газа по магистральным трубопроводам [5].

Широкое внедрение компрессорного газлифтного способа в системе нефтегазодобычи ГНКАР позволяет осуществить стабилизацию добычи нефти и газа, повышение эффективности подготовки и утилизации добываемого попутного нефтяного газа из нефтегазовых месторождений, в т.ч. морских.

На рис.1 представлена схема расположения КС на территории Азербайджана.

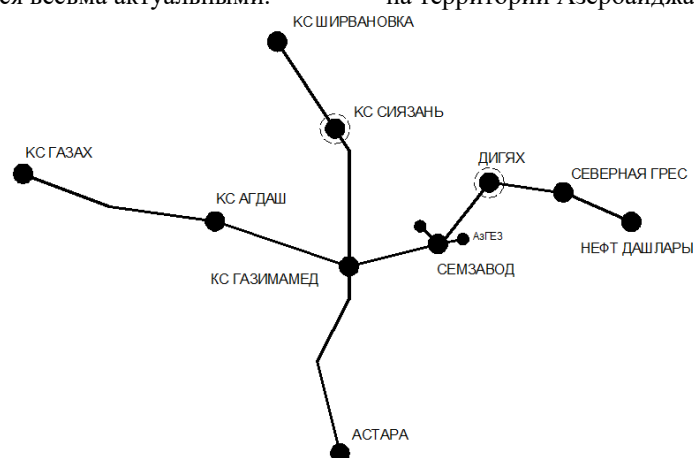


Рис.1. Схема расположения компрессорных станций на территории Азербайджана

В трех морских нефтегазовых месторождениях Азербайджана (НГДУ Нефт дашлары, 28 Мая и им. Н.Нариманова), где добывается основной объём газа, размещено наибольшее количество КС. В частности, в НГДУ «Нефт дашлары» в настоящее время из числа трех станций в двух (КС-3 и КС-4) соответственно эксплуатируются 6 и 8 ГМК типа 10ГКНАМ 2/5-55.

КС-3 построено в 1969 году. Первоначально здесь было смонтировано 4 компрессора типа 10ГКНАМ 2/5-55, в 1980 году к системе были подключены еще два компрессора. Общая производительность станции составляет 900 тысячи м<sup>3</sup>/сутки.

КС-4 был введен в эксплуатацию в 1973 году. На станции в настоящее время работают 8 газомоторных компрессоров типа 10ГКНАМ 2/5-55.

В 1997 году в станции была произведена реконструкция. Производительность было увеличено до 1200 млн.м<sup>3</sup> в сутки. Кроме этого также осуществлена реконструкция газлифтной станции с доведением дожима до 100 атмосфер - для вытеснения нефти из пластов старых месторождений требуется закачивать газ со все более высоким давлением.

В настоящее время в НГДУ «28 Мая» функционируют 3 компрессорные станции (табл.1). В КС-2, построенной 1994 году на сегодняшний день работают 9 компрессоров с общей производительностью 5,8 млн.м<sup>3</sup> в сутки. А в КС-3, построенной в 2001 году работают 3 компрессора.

В 2010 году на дожимной компрессорной станции ДКС №4 было установлено дополнительно еще 4 агрегата к имеющим 12 агрегатам, которые позволили увеличить мощность станции от 7,4 млрд.м<sup>3</sup> до 11 млрд.м<sup>3</sup> в сутки. На I и II ступени сжатия ис-

пользуются компрессора типа С33 с производительностью 1050 тысячи м<sup>3</sup>/сутки, а в III ступени компрессора типа С16. Кроме этого используются газотурбины типа Centaur 40 и Taugus 60 с мощностями, соответственно, 3500 кВт и 5740 кВт. С помощью этих агрегатов газлифтной системы значение давления достигается до 125 атм. и сохранения уровня добычи 3 млн.м<sup>3</sup>/сутки. Эта станция обеспечивает дожим попутного газа низкого давления с месторождений «Гюнешли» и «Чираг» с 5,0 до 55 атм. на выходе к береговой инфраструктуре.

При реконструкции станции также были установлены 2 охладительные установки и другие узлы и агрегаты. С вводом в эксплуатацию данной станции также резко сокращено выброс газа в атмосферу.

На компрессорной станции КС-1 НГДУ «28 Мая» имеется 3 воздушных компрессоров типа 2ГС-50. При помощи этих компрессоров давления воздуха в режиме трех ступенчатого сжатия доводится: в I ступени 1-5 атм., во II ступени 5-15 атм. и в III ступени 15-25 атм.

Анализ состояния компрессорного хозяйства в НГДУ им. Н.Нариманова показал, что в 210 скважинах эксплуатирующийся газлифтным способом, подача газа осуществляется с помощью четырёх КС. В общей сложности в этих КС установлены 43 компрессоров.

В компрессорной станции КС-2, КС-3 и КС-4 эксплуатируются в общей сложности 38 газомоторных компрессоров типа 10ГКНАМ 2/5-55 и 10ГКНАМ 3/5-100, а 5 компрессоров, размещенные в КС-1 (2 из них типа 305 VP и 3 типа ЗГП) предназначены для сжатия воздуха.

В таблице 1 приведены краткие сведения о КС в морских НГДУ ГНКАР.

Таблица 1  
Сведения о компрессорных станциях в морских НГДУ ГНКАР

| Наименование НГДУ | Общий фонд газлифтных нефтяных скважин, шт. | Компрессор                       |            | Количество КС |
|-------------------|---------------------------------------------|----------------------------------|------------|---------------|
|                   |                                             | Тип                              | Количество |               |
| 28 Мая            | 302                                         | 10ГКНАМ 2/5-55 и 10ГКНАМ 3/5-100 | 16         | 3             |
| Им.Н.Нариманова   | 175                                         | 10ГКНАМ 2/5-55 и 10ГКНАМ 3/5-100 | 43         | 5             |
| Гум адасы         | 136                                         | 10ГКНАМ 3/5-100                  | 18         | 2             |
| Нефт дашлары      | 786                                         | 10ГКНАМ 2/5-55                   | 24         | 3             |

Основной фонд скважин в НГДУ «Абшерон-нефть» эксплуатируются глубинными насосами. В незначительной части нефтяных скважин добыча осуществляется эрлифтным способом, где в двух компрессорных станциях (КС-4 и КС-5) применяются старые компрессора, снятые с производства с середины 50-ых годов XX столетия.

В компрессорной станции КС-4 установлены 16 компрессоров, в том числе 10 шт. из них типа 2СГ-50, 3 шт. – типа 2СГ-Д, 2 шт. - типа 2СГ-8 и один – типа 2СГ-4.

В компрессорной станции КС-5 эксплуатируются 5 машины типа 2СГ-50 для закачки, 3 шт. –

типа 2СГ-Д, 2 шт. - типа 2СГ-8 и 1шт. – типа 2СГ-4.

В настоящее время в НГДУ им.Тагиева функционируют четыре компрессорные станции (КС-4, КС-9, КС-16 и КС-17), где соответственно установлены 16, 8, 15 и 12 компрессоров.

В КС-4 эксплуатируются компрессора типа 2СГ-50, в КС-9 и КС-15 компрессора 2ВМ4-12/65, а в КС-17 используются 6 компрессоров типа 2СГ-50, 5 компрессоров типа ДСГ-65 и 1 типа ДСГ-100. Все компрессора применяются для эрлифтной добычи.

Согласно подписанному между Азербайджаном и Ираном соглашению для обеспечения беспре-

ребойным газоснабжением Нахичевани через соседнюю страну поставляется природный газ. С этой целью в 2011 году в Астаринском КС была осуществлена реконструкция с расширением, где использовались газомотокомпрессора типа 10ГКНА, в количестве 6 агрегатов производства ОАО «РУМО». Благодаря этому объем поставок в Иран существенно увеличился. На станции были установлены и приведены в рабочее состояние воздушные компрессоры и масляная система.

Большое компрессорное хозяйство находится на балансе ПО «Азеригаз». Одним из центральных и сложных объектов является Гарадагское подземное газохранилище (ПГХ), где осуществляется реконструкция. Планируется в ПГХ установить 5 мотоконпрессорных агрегатов, довести давления до 160 атм. и обеспечить уровень закачки до 7 млн.м<sup>3</sup>/сутки [3].

Энергии этих компрессоров достаточно для закачки газа в хранилище и последующего его извлечения и доставки до потребителей.

ПГХ «Галмаз» введено в эксплуатацию с 1975 г. В 2015-2016 годах здесь была произведена комплексная реставрационная работа. Количество используемых компрессоров на станциях доведено до 18. Ежедневный объем закачиваемого газа в ПГХ было увеличено с 4 до 8,5 млн.м<sup>3</sup>/сутки.

В настоящее время для закачки и отбора газа в ПГХ «Галмаз» и «Гарадаг» на сегодня используются 104 скважины. Фонд скважин ПГХ «Галмаз» составляет 109 единиц. В действии находятся 82 скважины. Глубина каждой скважины в среднем варьирует от 1500 до 1800 метров. На ПГХ «Гарадаг» фонд скважин составляет 42 единицы, из которых в действии находятся 22 скважины. Глубина скважин составляет 3600-3800 метров [4].

Как становится известно с вышеизложенного компрессорное хозяйство в системе ПО «Азеригаз» выполняет следующие основные функции – закачка газа в ПГХ, для сбалансирования сезонных потреблений газа; для обеспечения надежной транспортировки газа по регионам Азербайджана.

В таблице 2 приведены основные технические характеристики КС в системе ПО «Азеригаз».

Таблица 2  
Основные технические характеристики КС системе ПО «Азеригаз».

| №  | Название управления и КС, число агрегатов | Типы газоперекачивающих агрегатов                          | Дата производства газоперекачивающих агрегатов и сдачи КС на эксплуатацию (год) | Максимальная производительность одного агрегата и КС . м <sup>2</sup> /сутка | Мощность одного агрегата | Общая мощность КС | Тип и марка двигателя | Тип и марка газоперекачивающего агрегата |
|----|-------------------------------------------|------------------------------------------------------------|---------------------------------------------------------------------------------|------------------------------------------------------------------------------|--------------------------|-------------------|-----------------------|------------------------------------------|
| 1. | Хаджыгабул МГП КС Газымагомед 8 агрегат   | Центробежный с электродвигателем                           | 1986                                                                            | <u>11,0</u><br><u>32,5</u>                                                   | 4000 КВт                 | 32000 КВт         | СТД-400D-2            | Центробежный марки 280-12-7              |
|    | КС «Гарабаглы» 6 агрегатов                | Центробежный компрессор с электродвигателем марки ЦК-7/1-5 | 2012/2013                                                                       | <u>0,01</u><br><u>0,05</u>                                                   | 75 КВт                   | 450 КВт           | АИР 280 56            | Поршне-вой                               |
|    | КС «Кюрсанги» 6 агрегатов                 | Центробежный компрессор с электродвигателем марки ЦК-7/1-5 | 2004/2004                                                                       | <u>0,01</u><br><u>0,06</u>                                                   | 75 КВт                   | 675 КВт           | M3BP31 55MA6 IMB3     | Поршне-вой                               |
| 2. | Агдаш МГП, КС№2, 5 агрегатов              | Центробежный с электродвигателем                           | 1984/1986                                                                       | <u>11,0</u><br><u>27,0</u>                                                   | 4000 КВт                 | 20000 КВт         | СТД-400D-2            | Центробежный с сжатием марки 280-12-7    |

|   |                                           |                                                            |           |                                   |           |               |                              |                                                                        |
|---|-------------------------------------------|------------------------------------------------------------|-----------|-----------------------------------|-----------|---------------|------------------------------|------------------------------------------------------------------------|
| 3 | Астара МПП, КС Астара, цех №1, 2 агрегата | Газотурбинный центробежный сжатием марки ТКА-Ц6,3А/1,2-5,7 | 2005/2005 | $\frac{0,3 - 1,5}{2,0}$           | 6300 КВт  | 12600 КВт     | D-336-1Т                     | 2 пары центробежный сжатием марки: ГЦ1-70 /12-29 и 223 ГЦ 2-32/28,5-58 |
|   | КС Астара, цех №2, 6 агрегатов            | Газотурбинный поршневой компрессор марки 10 ГКНАМ-2/15-75  | 2010/2011 | $\frac{0,34 - 0,49}{2,04 - 2,94}$ | 1103 КВт  | 6618 КВт      | 10 цилиндровый газотурбинный | Поршне-вой компрес-сор                                                 |
| 4 | Сиязань МПП, КС «Сиязань», 6 агрегатов    | Центробежный сжатием марки ГПА-Ц-6,3/56М                   | 1980/1981 | $\frac{10,0}{41,7}$               | 6300 КВт  | КВт 37800 КВт | НК-12СТ                      | Центробежный сжатием марки Н-196-1,45                                  |
| 5 | Хаджыгабул МПП, КС «Га-рабаг», 2 агрегата | Газотурбинный центробежный сжатием марки ТНМ-1304-11D      | 2003/2003 | $\frac{5,0}{10,0}$                | 10500 КВт | 21000 КВт     | ТНМ-1304-11D                 | Центробежный компрес-сор марки 5V-6                                    |
| 6 | Абшерон МПП, КС «Балаханы», 2 агрегата    | ROW 370 GHS Пластинча-тый компрессор                       | 2015/2016 | $\frac{0,05}{0,05}$               | 250 КВт   | 500 КВт       | 1PS5317-9BD60-4BA3-Z         | Пластинча-тый компрес-сор                                              |

Анализ наличия и технического состояния компрессорного хозяйства в системе ГНКАР показал, что оснащенность КС не соответствует современным требованиям;

- газомоторные компрессора, установленные в КС в основном исчерпали свои ресурсы. Интенсивность текущих ремонтов и простои в агрегатах с каждым годом увеличиваются;

-используемые схемы компоновки ГМК не обеспечивают полного использования их мощностей;

-техничко-экономические показатели работы компрессорных агрегатов, ее температурный режим и распределение давлений по ступеням, а также производительность в большей степени определяется качеством охлаждения сжатого газа, нагретой воды в цилиндрах и смазанного масла в промежуточных холодильных аппаратах.

-система охлаждения, используемая (труба в трубе) для понижения температуры рабочего реагента нуждается в модернизации.

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## USE OF STEP LIFTING MODULES FOR ERECTION OF LARGE-SIZE COATINGS

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## ВИКОРИСТАННЯ КРОКОВИХ ПІДЙОМНИХ МОДУЛІВ ДЛЯ ЗВЕДЕННЯ ВЕЛИКОПРОГОНОВИХ ПОКРИТТІВ

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The article presents an analysis of the known solution of moving the roofing structure to the design height using the pull-up method. Taking into account the disadvantages and advantages of the analyzed version of the coating lifting, a structural and technological solution for the construction of large-span coatings using step lifting modules has been developed. According to the developed solution, before lifting, the coating bearing crossbars rest on lifting modules, which are located on the foundations between the paired columns. Guide profiles are fixed on inner surfaces of paired columns. During lifting, the supporting crossbars of the coating are pushed out by the lifting modules, which are alternately supported by the lower and upper lifting locks on the guide profiles. The columns of the frame work as guides to control the position of the coating during lifting and as support structures for guide profiles. The lifting operations' workability and timing can be reduced with the developed technology.

**Анотація**

В статті представлений аналіз відомого рішення переміщення покрівельної конструкції на проектну висоту з використанням методу підтягування. З урахуванням недоліків та переваг аналізованого варіанту підйому покриття розроблене конструктивно-технологічне рішення зведення великопрогонних покриттів з використанням крокових підйомних модулів. Згідно з розробленим рішенням, перед підйомом несучі ригелі покриття спираються на підйомні модулі, які розташовані на фундаментах між спареними колонами. На внутрішніх поверхнях спарених колон закріплені напрямні профілі. В процесі підйому несучі ригелі покриття виштовхуються підйомними модулями, які по чергові спираються нижніми та верхніми фіксаторами підйому на напрямні профілі. Колони каркасу працюють, як направляючі для контролю положення покриття в процесі підйому та, як опорні конструкції для напрямних профілів. Розроблена технологія дозволяє зменшити працездатність та строки підйомних робіт.

**Keywords:** lifting modules, erection of large-span coatings, structural-technological solution, push-up and pull-up methods.

**Ключові слова:** підйомні модулі, зведення великопрогонних покриттів, конструктивно-технологічне рішення, методи виштовхування та підтягування.

**Вступ**

Відомі сучасні приклади будівництва велико-розмірних одноповерхових промислових та цивільних об'єктів передбачають зведення великопрогонних покриттів з використанням кранових та безкранових технологій. Так, на першому етапі методом вільного підйому з використанням самохідних стрілових кранів на фундаментах укріплюють конструкції покриттів, монтують технологічне обладнання та укладають покрівельні прошарки [1, с.9-10]. На другому етапі методами примусового переміщення з використанням підйомників конструктивно-технологічні блоки покриттів переміщують з фундаментів на проектну висоту. Примусове переміщення покриттів виконують методом підтягування за умови розташування підйомників тягучого типу на оголовках колон або методом виштовхування, при якому покриття в процесі підйому спирається на оголовки підрощувальних стволів підйомників. Підрощення

секцій підйомників виконується за допомогою гідравлічних домкратів, розташованих на фундаментах [2]. Обидва варіанти примусового переміщення покриттів мають спільні ознаки. Це довготривалі зупинки в процесі підйому, пов'язані з подачею та фіксацією в зоні підйому основних та допоміжних конструктивних елементів. Також для відомих рішень безкранового підйому покриттів характерним є висока працездатність та складність монтажних робіт (розташування монтажних площадок на висоті до 38м) [3]. Скорочення строків підйомних робіт та зменшення працездатності монтажних процесів є актуальною задачею для вдосконалення рішень по зведенню великопрогонних покриттів.

**Аналіз досліджень і публікацій**

Велику увагу вивченню особливостей зведення залізобетонних та металевих покриттів з використанням традиційних кранових і безкранових

технологій приділяли відомі вітчизняні та закордонні вчені. Так, організаційно-технологічні рішення по монтажу крупноблочних промислових будинків і споруд методами вільного підйому описані Федоренко П.П. [4], особливості варіантів зведення покриттів з використанням примусових методів переміщення (підйому) описані в роботах Назаренко В.Ф. [5], Колесник Л.А. [6], Черненко В.К. [7], Тонкачєєв М.Г. [8], Осипов О.В. [9], Рашківський В.П. [8], Черненко К.В. [9], Собко Ю.Т. [10]. Серед закордонних вчених аналіз технологічних особливостей зведення залізобетонних покриттів представлений в роботі Fliger K. [11], технологічні особливості зведення великорозмірних просторових покриттів описані в роботі Rühle H. [12], етапи укрупнення та підйому покриттів з використанням кранових технологій відображені в роботах Yang Y. [13], Ruan R. [14], сучасні варіанти використання методів підтягування та виштовхування детально описані в матеріалах фірм-виробників підйомного обладнання Fagoli Asotech [15], DLT Engineering [16], MAMMOET [17], ENERPAC [18], SARENS GROUP [19]. В наукових працях зазначених авторів та в презентаційних матеріалах фірм-виробників сучасного підйомного обладнання детально описані процеси підйому покриттів, проте відсутній алгоритм оптимізації конструктивно-технологічних рішень зведення покриттів з використанням підйомних модулів.

#### Мета досліджень

З урахуванням недоліків та переваг відомого варіанту підйому покриття методом підтягування необхідно розробити конструктивно-технологічне

рішення зведення великопрогонового покриття з використанням крокового підйомного модуля, яке дозволить зменшити працємїсткїсть монтажних робіт на скоротити загальні строки підйомних робіт.

#### Виклад основного матеріалу

Технологія безкранового підйому великопрогоного покриття методом підтягування з розташуванням підйомних модулів на оголовках несучих колон каркасу була використана при будівництві цехів авіазаводу в м. Гостомель, Україна [5]. Гідропідйомник тягнучого типу ПШ – 330 складався з двох гідравлічних домкратів ГД – 170 (вантажопідйомність по 170 тон кожний, довжина робочого ходу штоку домкрата 1120мм), двох страхувальних гвинтів, піддомкратної і наддомкратної балок, цільнозвареної челночної стрічки (довжина 12м), яка з'єднана нижнім кінцем з тяговою стрічкою (в перерізі 600х40мм). Тягова стрічка складалась з шарнірно з'єднаних ланок довжиною 6м. Тягова стрічка шарнірно прикріплена до балки піднімаємого покриття. В якості опорних конструкцій для гідропідйомника тягнучого типу використовувались колони несучого каркасу з проміжними столиками для тимчасового спирання блоку покриття в процесі переміщення на проектну висоту. Підйом двох покрівельних блоків (загальна площа 40000 м<sup>2</sup>, розміри блоків 96х48 та 96х54 м, маса блоків до 1200 тон) на висоту 34 м був виконаний за 10 змін. Процес підйому покриття методом підтягування та вузол фіксації ригеля піднімаємого покриття показані на Рис.1.

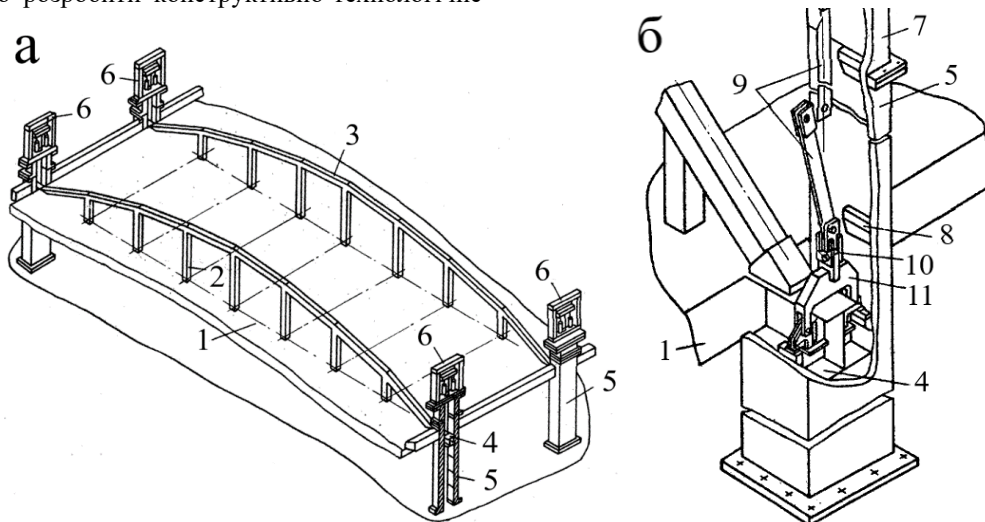


Рис.1 Підйом великопрогоного покриття методом підтягування: а – покриття в процесі підйому, б – вузол фіксації опорного ригеля піднімаємого покриття,

1- блок покриття, 2- стійка ферми покриття, 3 – верхній пояс ферми покриття, 4 – опорний ригель покриття, 5 – колона несучого каркасу, 6 – підйомник ПШ-330, 7 – опора підйомника, 8 – проміжний підйомний упор, 9 – тягова стрічка, 10 – перехідна ланка тягової стрічки, 11 – стропувальна траверса.

Процес підйому кожного блоку складався з шістьох повторних циклів. До кожного циклу входили два послідовних етапи – підйом блоку покриття на 6м та проміжне спирання покриття на опорні столики колон. В кожному циклі підйому

покриття шість разів підтягувалось до гори на висоту 1м, яка була відповідна ходу штоків домкратів та кроку отворів в тяговій стрічці. Під час підйому покриття в колонах за допомогою ручної лебідки для переміщення ригеля покриття, в міжколонному просторі демонтувались елементи решітки на

ділянці висотою 6м з подальшим монтажем решіток після підйому ригеля покриття. До недоліків аналізованого рішення відносяться зупинки, пов'язані з демонтажем міжколонних решіток перед підйомом опорного ригеля покриття та наступним монтажем решіток, демонтаж ланок тягових стрічок довжиною 6м та тимчасове спирання опорних ригелів покриття на опорні столики після кожного етапу підйому на відповідні 6м, влаштування проміжних висотних монтажних площадок на колонах для монтажу та демонтажу міжколонних решіток, складний демонтаж гідропідйомника тягучого типу ПШ-330 на висоті 34–36 м після завершення підйомних робіт з залученням стрілових кранів великої вантажопідйомності за умови забезпечення поїзду шириною 4–5 м по контуру промислового цеха, що будується [3]. До переваг аналізованого рішення можна віднести утворення жорсткого поперечного каркасу з несучих колон та міжколонних балок, контроль вертикальності підйомного процесу покриття, який забезпечувався переміщенням опорних ригелів блоку покриття між спареними несучими колонами.

Переваги розглянутого варіанту підйому покриття на проектну відмітку методом підтягування, а саме, використання спарених колон несучого каркасу в якості напрямних для переміщення конструкції покриття з рівня фундаментів до відмітки оголовків колон, були використані при розробці нового конструктивно-технологічного рішення. Згідно з розробленим рішенням кроковий підйомний модуль розташовують між спареними колонами несучого каркасу. На внутрішніх поверхнях спарених колон закріплюють напрямні профілі. Перед підйомом на рівні монтажних ригелів (висота до 2м) опорні ригелі конструктивно-технологічного блоку покриття спираються на верхні платформи підйомного модуля. В процесі виштовхування ригелів покриття на проектну висоту підйомний модуль спирається фіксаторами підйому на напрямні профілі. Загальний вигляд покриття в процесі виштовхування на проектну висоту та підйомний модуль зображені на Рис.2.

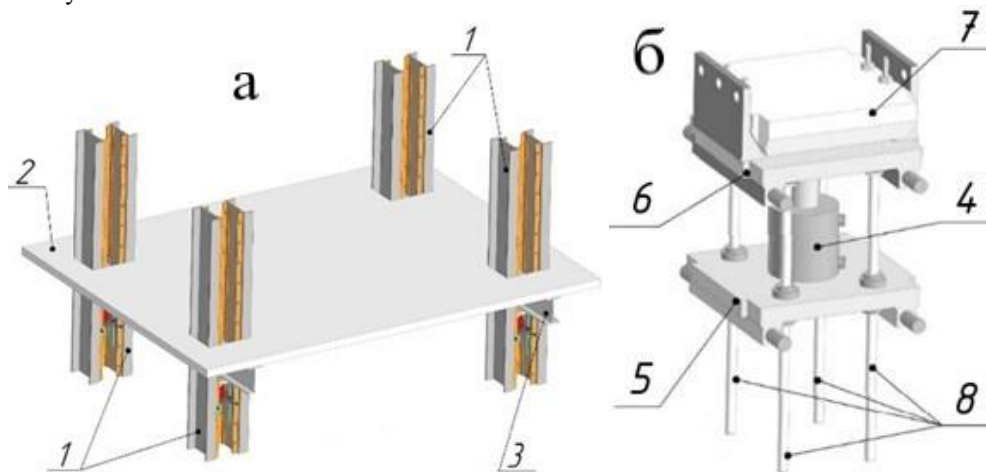


Рис.2 Зведення покриття підйомним модулем, розташованим між спареними колонами: (а) – загальний вигляд покриття в процесі підйому; (б) – підйомний модуль: 1 – колона каркасу, 2 – покриття, 3 – несучий ригель покриття, 4 – гідроциліндр, 5 – нижня платформа модуля, 6 – верхня платформа модуля, 7 – опорна рама; 8- страхувальні стержні;.

Підйомний модуль складається з гідроциліндру подвійної дії, нижньої та верхньої платформ, та страхувальних стержнів. Корпус гідроциліндра закріплений на нижній платформі модуля. Шток гідроциліндра прикріплений до верхньої платформи модуля. В верхній та нижній платформах модуля вмонтовані механізми фіксації підйому з висувними опорними циліндрами. Страхувальні стержні прикріплені до верхньої платформи модуля та проходять через ковзні гайки, які закріплені на нижній платформі модуля. На верхній платформі підйомного модуля розміщують опорну раму. Перед підйомом на опорній рамі розміщують несучі ригелі покриття.

Робочий цикл підйомного модуля складається з трьох послідовних етапів.

*Передпідйомний етап* – опорні циліндри механізмів фіксації підйому нижньої платформи модуля заводять в отвори в напрямних профілях.

Штоки гідроциліндрів модуля знаходяться в корпусах гідроциліндрів.

*Підйомний етап* - за умови сприйняття навантаження від опорної рами та ригелів покриття опорними циліндрами механізмів фіксації підйому нижньої платформи модуля, подають робочу рідину в корпуси гідроциліндрів. Штоки гідроциліндрів виштовхують верхню платформу модуля, опорну раму та ригель покриття на висоту "h", яка дорівнюється довжині робочого ходу штоків гідроциліндрів.

*Післяпідйомний етап* – опорні циліндри механізмів фіксації верхньої платформи модуля переміщують в отвори в напрямних профілях. Таким чином, навантаження від піднімаємого покриття передається з механізмів фіксації підйому нижньої платформи модуля на механізми фіксації підйому верхньої платформи модуля. Звільнені від навантаження опорні циліндри механізмів фіксації підйому

нижньої платформи можуть бути переміщені з отворів в напрямних профілях. При подачі рідини в корпус гідроциліндра виконують підтягування нижньої платформи модуля до верхньої платформи модуля на висоту "h".

В підйомній та післяпідйомній фазах, також, задіяні страхувальні стержні, які контролюють просторове положення нижньої платформи модуля в процесі її вертикального переміщення. Основні етапи робочого циклу підйомного модуля відображені на Рис. 3.

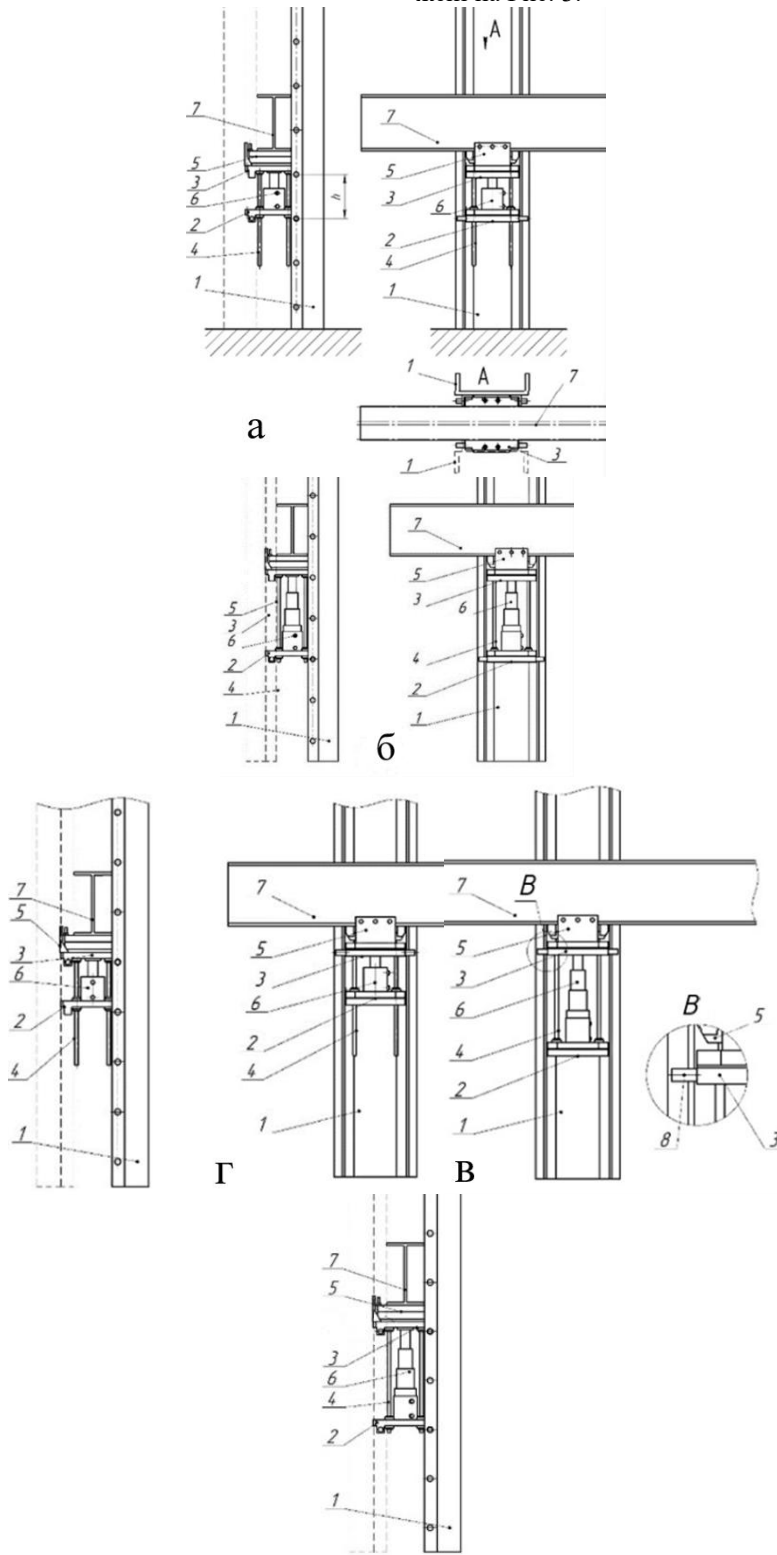


Рис.3 Основні етапи робочого циклу підйомного модуля: а – фіксація нижньої платформи в напрямних профілях, б – підйом верхньої платформи; в – фіксація верхньої платформи в напрямних профілях, г – підйом нижньої платформи; 1-колона; 2-нижня платформа модуля; 3- верхня платформа модуля; 4-страхувальні стержні; 5-опорна рама ; 6 гідроциліндр; 7-несучий ригель покриття; 8-опорний циліндр механізму фіксації підйому верхньої платформи модуля.

Технологічний процес зведення покриття методом виштовхування кроковими підйомними модулями, які переміщуються між спареними колонами, складається з трьох етапів.

*Предпідйомний етап.* З використанням автомобільних кранів на будівельному майданчику формується поперечний несучий каркас зі спарених колон і міжколонних зв'язків, виконується укрупнення покриття на низьких риштуваннях. Для спірання колон передбачені збірно-монолітні стовпчасті фундаменти. Встановлення колон на фундаменти передбачає наступні операції. Спочатку в котловані монтують збірні фундаментні плити з болтовими кріпленнями для колон. Потім на фундаментні плити встановлюють спарені колони з напрямними профілями та фіксують стик «Фундамент – колона» болтами. Далі, одночасно з монтажем міжколонних зв'язків та формуванням блоку покриття, на фундаментних плитах формують каркас армування висотою 1200мм по зовнішньому контуру колон та в міжколонному просторі, виставляють опалубку та заливають бетоном стовпчасту частину фундаменту. В міжколонному просторі на стовпчастих фундаментах виставляють підйомні модулі. В предпідйомному положенні опорні циліндри механізму фіксації підйому нижньої платформи модуля заведені в отвори в напрямних профілях. На верхній платформі модуля розміщують опорну раму та несучий ригель покрівельної конструкції. На низьких риштуваннях виконують 100% робіт по укрупненню конструктивно-технологічного великопрогонового блоку покриття та утворенню паро-, тепло- та гідроізоляційних покрівельних прошарків.

*Підйомний етап.* Переміщення опорних рам та несучих ригелів покриття на проектну висоту виконується підйомними модулями. В процесі підйому циклічно повторюються дві операції:

- фіксація нижньої платформи підйомного модуля на напрямних профілях колон та виштовхування гідроциліндром подвійної дії верхньої платформи модуля з опорною рамою та несучим ригелем покриття на висоту, яка дорівнюється довжині робочого ходу штока гідроциліндра;

- фіксація верхньої платформи підйомного модуля на напрямних профілях колон та підйом нижньої платформи модуля гідроциліндром подвійної дії на висоту, яка еквівалентна довжині робочого ходу штока гідроциліндра.

Процес підйому покриття з використанням розробленого механізованого технологічного обладнання повністю автоматизований. Контроль за операціями по переміщенню підйомних модулів та конструкцій покриття виконується операторами, які знаходяться поза зоною монтажних робіт з використанням приладів відео спостереження та фіксації, які встановлені на колонах, верхніх та нижніх платформах підйомного модуля і на несучих ригелях покриття, що піднімається. Після досягнення несучими ригелями покриття проектної висоти виконують закріплення опорної рами на оголовках спарених колон.

*Післяпідйомний етап.* Звільнені від навантаження підйомні модулі переміщують на фундаменти. В процесі опускання циклічно повторюють дві операції:

- фіксація верхньої платформи підйомного модуля на напрямних профілях колон та переміщення вниз корпусу нижньої платформи модуля та корпусу гідроциліндра;

- фіксація нижньої платформи підйомного модуля на напрямних профілях колон та переміщення вниз штоку гідроциліндра та верхньої платформи модуля.

Після опускання підйомного модуля на фундаменти, виконують демонтаж модуля.

Згідно з розробленою технологією, монтажники задіяні тільки в висотних операціях по закріпленню опорних рам несучих ригелів блоку покриття на проектній висоті між оголовками спарених колон. Впровадження автоматизованої технології зведення великопрогонових покриттів з використанням підйомних модулів, які виконують виштовхування несучих ригелів покриттів в просторі між спареними колонами, дозволяє суттєво зменшити працездатність підйомних процесів та скоротити загальні строки монтажних робіт.

### Висновки

- на закладі аналізу відомого рішення безкранового підйому великопрогонового покриття методом підтягування було розроблено технологічне рішення, згідно з яким, на першому етапі утворювався несучий поперечний каркас з проектних колон, міжколонних балок і зв'язків, виконувалось укрупнення покриттів в конструктивно-технологічний блок на низьких риштуваннях (висота до 2м). Подальший підйом несучих ригелів блоку покриття виконувався зі спіранням на підйомні модулі, переміщення яких відбувалось в міжколонному просторі з використанням напрямних профілів, закріплених на внутрішніх поверхнях спарених колон;

- процеси вертикального переміщення покриття з рівня фундаментів до оголовків колон з використанням підйомного модуля повністю автоматизовані ; монтажники задіяні тільки в висотних операціях по остаточному закріпленню несучих ригелів конструктивно-технологічного блоку покриття між оголовками спарених колон каркасу;

- розроблені підйомні модулі, взаємодіючи з напрямними профілями, закріпленими на внутрішній поверхнях спарених колон, можуть знайти своє використання при підйомі великогабаритного і важкого технологічного обладнання в просторах виробничих цехів, коли для монтажу конструкцій на проектній висоті неможливе використання класичних кранових технологій методом вільного підйому, а також, при переміщенні великопрогонових покрівельних блоків масою 1200-2400 тон на висоту більшу, ніж 34 м.

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№136/2024

**Norwegian Journal of development of the International Science**

ISSN 3453-9875

It was established in November 2016 with support from the Norwegian Academy of Science.

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