

## **ENGLISH TERMS DENOTING SHALE GAS PRODUCTION: TERMINOLOGICAL NOMINATION AND TRANSLATION INTO UKRAINIAN**

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### **INTRODUCTION**

Ukraine refers to those countries, economic development of which is largely constrained by the lack of domestic energy resources. Due to this fact, this country has been actively involved in the process of development of new hydrocarbon deposits, including production of unconventional gas (shale gas, coalbed methane, tight gas reservoirs, etc.). Therefore, scientific and technical translation, especially the translation of shale gas industry terms has become extremely relevant in modern linguistics.

At the present stage of science development we observe a great interest in the study of different terminological systems. The scholars very often focus their attention on the factors that influence the formation of branch terminologies.

Most linguists admit that terminological character is one of the main peculiarities of scientific style, representing the informative nucleus of the scientific language lexis. Despite a great number of already created classifications of term formation and the ways of their translation, this problem was not thoroughly studied, especially in the shale gas domain translation.

The present research is aimed at describing the main features of scientific and technical terminology, analyzing semantic and syntactic ways of terminological nomination in English shale gas production terminology, outlining the strategies of English terms translation by means of the Ukrainian language. The language material of the study is the English shale gas production terms registered in terminological dictionaries and technical texts dealing with shale gas industry.

### **1. Scientific and technical texts: basic features and translation**

Scientific and technical progress and intensification of international cooperation in different spheres of human activity are enhancing the role of terminological lexis in modern languages at present. In this regard, it becomes necessary to translate a large amount of scientific and technical literature, what explains an urgent need in investigation of different terminological systems, the study of general theory of terminology, peculiarities of formation of such language units as terms, their translation, development and interaction with spoken and literary forms of language<sup>1</sup>.

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<sup>1</sup> Зарівна О. Т. Основні способи та прийоми перекладу науково-технічних текстів у вищих навчальних закладах / О.Т.Зарівна // Вісник Чернігівського державного педагогічного університету. – 2011. – № 85. С. 98.

Scientific and technical texts are written in a particular style, which distinguishes them from other types of texts. This style is used to express scientific concepts and provides the exchange of scientific and technical information among people. Scientific style is characterized by the following features: 1) simplicity, exactitude and clarity; 2) objectivity; 3) abstract character; 4) generalization; 5) density of information; 6) brevity or laconism; 7) emotional neutrality; 8) absence of ambiguity; 9) impersonality; 10) logical consistency; 11) use of terms, symbols and figures, etc.

Scientific and technical literature differs from conversational language or language of fiction in certain lexical, grammatical and stylistic peculiarities. Lexical peculiarities are especially noticeable, as they concern terminological units that are in abundance in scientific texts. Terms tend to have only one meaning, however, the phenomenon of polysemy often appears. Thus, the term can refer to more than one object, and therefore be ambiguous. Scientific terms can be not fully specified in one theory; the complete reference of the term is made up of its partial references.

If lexical differences in the text are obvious, in grammatical aspect they are far less distinct, but not less various. The following peculiarities of grammatical structure of scientific and technical texts are the most noticeable: 1) the existence of long sentences; 2) the usage of multicomponent attributive word-combinations; 3) the usage of attributes, which were formed by means of the whole syntactic groups' contraction; 4) the usage of passive constructions, syntactic constructions; 5) omission of some function words (articles, auxiliary verbs) especially in the tables, schemes, specifications<sup>2</sup>.

Besides lexical and grammatical difficulties in translation, the scientists distinguish the stylistic ones. The existence of stylistic problems of scientific and technical translation are connected with discrepancies in stylistic and genre norms of information presentation in scientific and technical texts of the source language and target language, peculiarities of the usage of words and set-expressions<sup>3</sup>. O. Klyuchnyk and H. Hrytsjyk distinguish the following stylistic peculiarities of scientific and technical texts: 1) translation of the so-called metaphorical terms; 2) translation of figurative and nonfigurative phraseology; 3) translation of different cliché<sup>4</sup>.

The most typical lexical feature of scientific and technical literature is the saturation of the text with special terms and terminological phrases. Terms make up the basis of professionally oriented foreign language communication, reception and dissemination of information. Hence, the effectiveness of

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<sup>2</sup> Коваленко А. Я. Загальний курс науково-технічного перекладу / А.Я. Коваленко. – К.: Інкос, 2002. С. 145.

<sup>3</sup> Gentzler E. Contemporary Translation Theories / E.Gentzler. London: Routledge, 1993. P. 154.

<sup>4</sup> Ключник О. Труднощі науково-технічного перекладу: стаття з наукової конференції / О. Ключник, Г. Грицюк. – К., 2013. С. 4.

assimilation of terms in the language affects professionally oriented foreign language communication.

Terms are words or phrases that have linguistic properties like other vocabulary units. The difference between a term and a common language word lies predominantly in the meaning. Terms express scientific concepts and usually belong to a specific field of science and technology. The information gained from the collective experience, which is fixed in terms, constitutes that foundation on which modern professional and scientific knowledge is based. Thus, the term is a necessary prerequisite for the development of scientific and technical knowledge<sup>5</sup>.

Most often in scientific literature the term is defined as a word, word-combination, or simply a language sign, representing the scientific concept of special and professional spheres of knowledge. However, many contemporary terminologists, such as T. Panjko<sup>6</sup>, F. Nikitina<sup>7</sup>, digressed from such a conservative understanding of a term. They suggest the following definition of the term: a word or word – combination, one or more meanings of which are special. Such interpretation of the term is based on polysemy and presupposes, that the word in one of its meanings relates to common language, and in some other – to one or more terminological systems.

As far as terms constitute an enormous part of scientific and technical texts, they present the main difficulties in translation<sup>8</sup>. In the linguistic aspect terms, like other words of the language, are often characterized by ambiguity. In some cases, the same term has different meanings in different sciences.

Reasonable interpretation and application of terms in scientific and technical translation helps to reveal the essence of the texts belonging to different technical areas. The proper understanding and adequate translation of the source language terms is the first commandment of scientific literature translator<sup>9</sup>.

Many scholars have identified the basic techniques of term translation. Translation of terms presupposes the proficiency in the field of science, to

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<sup>5</sup> Литвиненко Е. В. Классификация англоязычной терминологии относящейся, к машинам и оборудованию для строительства, эксплуатации и ремонта автомобильных дорог и сооружений / Е.В. Литвиненко // Вестник ХНАДУ, 2012 № 57. С. 229.

<sup>6</sup> Панько Т.І. Українське термінознавство / Т.І. Панько, І.М. Кочан, Г.П. Мацюк. – Львів, : видавництво «Світ», 1994.

<sup>7</sup> Нікітіна Ф.О. Семантичні та словотворчі проблеми сучасної термінології / Ф.О. Нікітіна. – Київ: Видавництво при Київському держ. ун. видавн. об'єднання «Вища школа», 1978.

<sup>8</sup> Ключник О. Труднощі науково-технічного перекладу: стаття з наукової конференції / О. Ключник, Г. Грицюк. – К. 2013. С. 2.

<sup>9</sup> Кузик З.В. Деякі зауваги до науково-технічного термінологічного перекладу з німецької мови в галузі фотограмметрії / З.В. Кузик // Вісник Національного університету «Львівська політехніка». – 2008. – № 620. С. 161.

which translation is referred, understanding of the source language terms and knowledge of the target language terminology. When translating scientific and technical literature, interaction of the term with the context is essential. A. Kovalenko defines two stages in the process of term translation: the first is clarification of the term in context, while the second is the translation of meaning into target language<sup>10</sup>.

Technical translation is the translation used for the exchange of special scientific and technical information between people speaking different languages. The basis of technical translation is formal logical style, which is characterized by precision, absence of emotional colouring and impersonality.

Scientific and technical literature uses the same language means as other types of written communication, but certain lexical and grammatical components have absolutely different meaning. In this connection the linguists face a very important task – to detect and describe the specificity of usage in science and technology given language components and elaborate the ways of adequate and exact translation of these units into other languages<sup>11</sup>.

In translating terms it is important to choose a well-defined strategy of translation, which is determined by the ultimate goal. Peter Newmark sets out the definition of the notion of “translation strategy”: “...these are appropriate methods of translation for most types or subtypes of text in order to provide a basis for the formulation of the principles of individual rules and tips needed by the translator”<sup>12</sup>. A particular strategy is chosen depending on many factors such as the type or purpose of translation, set by the translator (rendering of the general content, localization of translation, conveying the style, etc.).

Peter Newmark suggests the following classification of translation strategies: 1) word-for-word translation; 2) literal translation; 3) faithful translation; 4) semantic translation; 5) adaptation; 6) free translation; 7) idiomatic translation; 8) communicative translation<sup>13</sup>.

A different translation strategy is offered by V. Karaban, who distinguishes five main types of grammatical transformations that help to avoid difficulties in translation: permutation, substitution, addition, omission and complex transformation<sup>14</sup>.

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<sup>10</sup> Коваленко А. Я. Загальний курс науково-технічного перекладу / А.Я. Коваленко. – К.: Інкос, 2002. С. 257.

<sup>11</sup> Пумпянский А.Л. Чтение и перевод английской научной и технической литературы: Лексика, грамматика, фонетика, упражнения / А.Л.Пумпянский.– Мн.: ООО «Попурри», 1997. С. 234.

<sup>12</sup> Newmark Peter. Paragraphs on Translation / Peter Newmark. – Clevedon: Multilingual Matters, Ltd., 1993. P. 45

<sup>13</sup> Newmark Peter. Paragraphs on Translation / Peter Newmark. – Clevedon: Multilingual Matters, Ltd., 1993. P. 45

<sup>14</sup> Карабан В. І. Переклад англійської наукової і технічної літератури / В. І. Карабан. – Вінниця: Видавництво «Нова Книга», 2004. С. 18–20.

According to the author permutation is a grammatical transformation that results in changing the order of words in a phrase or sentence. In addition to permutations, the translator can use the substitution of the word by a word-combination, a word-combination may be substituted by a sentence, several simple sentences – by complex sentences and vice versa. Addition is a strategy, which results in the increase of the number of words or word forms in the sentence in translation. Omission is understood as a strategy opposite to addition, that is omission of a certain linguistic element.

The classification of translation strategies given above, in our viewpoint, is elaborated by the author in order to avoid inappropriate literal translation (“grammatical literalism”) and learn to use grammatical translation transformations, owing to which the literal translation is adapted to the norms of the target language and becomes adequate.

L. Barkhudarov distinguishes two very important transformational strategies or techniques used in the translation of terms: concretization and generalization<sup>15</sup>. Concretization is described by the author as the process in which a unit with a broader content is rendered in the target language by a unit with more specific content. In the Ukrainian language the author suggests resorting to the substitution of a word or phrase that has a wide range of meanings by an equivalent, which specifies the meaning according to the context or stylistic requirements. It should be taken into account that application of concretization in translation demands creativity on the part of the translator. In our research concretization of meaning is understood as a lexical transformation which results in the substitution of the word (term) of broader semantics in the original by a word or term of narrower semantics in the target language.

In the process of translation of lexical elements equivalents can be formed not only as a result of narrowing of the English words meanings, but their broadening as well. In this case specialists apply generalization as a lexical translation transformation that is opposite to the concretization transformation. The main essence of generalization is substitution of the word of narrow meaning in the source language by the word with broader meaning (very often a hyponym) in the target language. Transformation of generalization is usually used in translation of general language and general scientific layers of lexical composition of scientific and technical texts. Since its application can lead to a certain loss of accuracy of information, it should be used with caution in the cases when the usage of dictionary equivalent of the translated word may violate grammatical or stylistic norms of the target language.

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<sup>15</sup> Бархударов Л. С. Язык и перевод (Вопросы общей и частной теории перевода) / Л. С. Бархударов. – М.: «Международ. отношения», 1975. С.130.

## 2. English shale gas industry terms formed by means of semantic way and strategies of their translation

Semantic way of word-formation is of particular importance for the language of science since it can be applied to meet the growing need for creation of new terms (through semantic transformation of existing words). As V. Danilenko states, the semantic method was among the first methods of terminological nomination<sup>16</sup>. It is significant that the words taken from general vocabulary and adapted for nominating specific concepts can be often used in various fields. In different terminological systems these words are used to express one of the intrinsic meanings that have been determined contextually, not losing their connection with literary language.

The main essence of semantic method is that “different meanings of the same word are transformed into different words that are perceived as etymologically independent and dependent”<sup>17</sup>. This method of word formation is very closely related to the polysemantic nature of the word, i.e. to the formation of derivative meanings. Formation of derivative meanings, or semantic derivation is a characteristic process of functioning of the literary as well as technical vocabulary. In the process of further functioning of the words, derived meanings can be disposed and separated from the core meanings, creating new words.

Language material of the research presents shale gas production terms selected from lexicographical sources and technical texts. The analysis showed that a number of terminological units of the sample have become terms of this domain as a result of semantic way of term formation. These lexical units are polysemantic denoting different common language meanings and are characterized by a terminological meaning in oil and gas terminology.

The word *allocation* has two meanings, fixed in the explanatory dictionary: 1) *an amount or share of something that is given to someone or used for a particular purpose*; 2) *the process of deciding to give an amount or share of something to someone* [Macmillan English Dictionary]. The translation dictionary suggests the following variants of translation: 1) *призначення*; 2) *розподіл*; 3) *локалізація* [М.І. Балла Англо-український словник]. In oil and gas terminological system the term *allocation* acquires new shades of meaning as a result of likeness of the scientific concept with the common language ones: *визначення норм видобутку нафти (витрат нафтопродуктів)*, *розподіл* [Англо-український нафтогазовий словник]. Accordingly, a new technical term is formed without losing its original meaning and not going out of use in everyday language. Some authors transliterate the term *allocation* which, in our

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<sup>16</sup> Даниленко В. П. Русская терминология: опыт лингвистического описания / В. П. Даниленко. – М.: Наука, 1977. С. 89–96.

<sup>17</sup> Прохорова В. Н. Русская терминология (лексико-семантическое образование) / В. Н. Прохорова. – М.: Филологический факультет, 1996. С. 8.

opinion, is a wrong practice, since it reveals the lack of equivalent in the target language. In this case, we suggest turning to the strategy of adaptation which means trying to find an accurate equivalent in the Ukrainian language. The analysis of all the contextual meanings in the technical texts under study showed that the meaning *ліміт видобутку нафти* is the most appropriate translation. This phenomenon can be illustrated by the example: *Allocation, observed in this region, is much higher than in neighbourhood wells, where production is beyond any limits* [Holditch Stephen Hydraulic fracturing]. *Ліміт видобутку нафти на цій ділянці значно вищий, ніж у сусідніх свердловинах, де видобуток здійснюється без обмежень.*

The terminological unit *appraisal* is another example of the term formed by means of semantic way. In the explanatory dictionary this term is defined as 1) *a statement or opinion judging the worth, value, or condition of something;* 2) *a meeting between a manager and a worker to discuss the quality of someone's work and how well they do their job* [Longman Dictionary of Contemporary English]. The main common language meaning of this lexical unit is translated as *оцінка* [М.І. Балла Англо-український словник]. On the basis of metaphorical likeness between the common language and terminological concept, in the oil and gas terminology this term is also translated as *оцінка, експертиза* [Англо-український нафтогазовий словник]. In combination with the noun *well* it becomes a part of the expression *оцінкова свердловина* [Англо-український нафтогазовий словник], acquiring attributive functions. In this case, in translation we use the strategy of specification, specifying the meaning of the English term. For example: *The first step in field development is exploration and appraisal well testing; therefore, accuracy and efficiency is paramount in well-test design, execution, and evaluation* [Holditch Stephen Hydraulic fracturing]. *Перший крок при розбурюванні родовища полягає у дослідженні та перевірці оцінкової свердловини; ось чому точність та ефективність роботи є найголовнішим чинником під час проектування, реалізації та оцінки рентабельності свердловини.*

The term *fatigue* is a semantically reconsidered common language word being characterized by the meaning *very great tiredness, exhaustion* [Longman Dictionary of Contemporary English]. In common language it is translated as *втома*, although in a scientific text this word receives secondary meaning on the basis of semantic analogy *втома (металу)* [Англо-український нафтогазовий словник]. In this case it is advisable to use method of concretization to achieve more accurate translation. For example: *Fatigue occurs when a material is subjected to repeated loading and unloading and if the loads are above a certain threshold, microscopic cracks will begin to form at the stress concentrators such as the surface, persistent slip bands, and grain interfaces* [Holditch Stephen Hydraulic fracturing]. *Втома металу трапляється тоді, коли певний матеріал часто піддається різноманітному навантаженню, і коли воно*

перевищує ліміт витривалості, починають утворюватися мікроскопічні тріщини, що з'являються на концентраторах напруги, наприклад, на поверхні металу, смугах ковзання та площинах розмежувань.

The term *exploration* in common language is a polysemantic word used in the meanings: 1) *a journey around an area to learn about it or to search for something valuable*; 2) *a thorough examination or discussion of a subject, idea etc.* The translation of this word in common literary language is *дослідження* [М.І. Балла Англо-український словник]. This means that we again observe the phenomenon of semantic way of term formation in shale gas industry terminology. The term *exploration* in this terminological system acquires a new meaning, while the common language one remains unchanged. In technical texts on oil and gas industry this term is translated as *детальна розвідка, розвідувальні роботи на родовищі* [Англо-український нафтогазовий словник]. For instance: *Shale gas exploration is an expensive, high-risk operation, so offshore and remote area exploration is generally only undertaken by very large corporations or national governments* [Holditch Stephen Hydraulic fracturing]. *Детальна розвідка сланцевого газу є дорогим та дуже ризикованим процесом, тому вона проводиться лише величезними корпораціями чи урядами держав як на морських платформах, так і на земельних ділянках.*

The term *trap* was also formed by means of semantic method in English oil and gas terminology. As a common language word it is characterised by several meanings: 1) *a piece of equipment used for catching animals*; 2) *a bad or unpleasant situation that is difficult to change or escape from*; 3) *a trick that is designed to catch someone*; 4) *a mistake or problem that you should try to avoid* [Macmillan English Dictionary]. In shale gas industry this term denotes *a configuration of rocks suitable for containing hydrocarbons and sealed by a relatively impermeable formation through which hydrocarbons will not migrate* [Schlumberger Oilfield Glossary]. All the common language meanings of this word explicitly or implicitly resemble the terminological one by the semantic component of *catching* or *impossibility of escaping*. The translation dictionary registers several variants of translation of this term into Ukrainian: 1) *капкан*; 2) *пастка, западня* [М.І. Балла Англо-український словник]. We consider literal way of term translation (*пастка*) to be the most appropriate as it best reveals the meaning of the term in this case. For example: *The targets of exploration were conventional traps characterized by a reservoir of higher permeability covered by low permeability shale* [Holditch Stephen Hydraulic fracturing]. *Дослідження були націлені на традиційні пастки, які характеризувались колекторами з високою проникністю, що були перекриті низькопроникними сланцями.*

Another lexical unit worth analyzing is the term *gas pocket*. In technical texts, there are different versions of translation of this terminological unit, such as *газова кишеня, заповнена газом порожнина, газова раковина, газова*



*бульбашка, велика газова поря* [Англо-український нафтогазовий словник]. Thus, we consider it appropriate to suggest translating this term as *газова кишеня*. This is an example of semantic way of term formation on the basis of metaphoric likeness. In terminology metaphor is a device that expresses some concrete scientific idea with the help of a certain image already familiar to us. In semantic way of term formation analogy is considered to be the main basis for metaphorical transition in semantic formation of terms. In this case the noun *pocket* in one of its common language meanings denotes a *small area where the situation is very different from the area surrounding it* [Longman Dictionary of Contemporary English]. This meaning is analogical to the oil and gas definition: *a gas-filled cavity in rocks, especially above an oil pocket*. This is the case when the term should be translated literally, with application of the strategy of literal translation. For example: *A gas-filled cavity in rocks, especially above an oil pocket is called a **gas pocket*** [Holditch Stephen Hydraulic fracturing]. *Порожнина у гірських породах, заповнена газом і розташована переважно над нафтовою порожниною, називається газовою кишенею.*

Lexical unit *calibration* in the explanatory dictionary is fixed in the meanings, bearing clear technical character 1) *the process of checking or slightly changing an instrument or tool so that it does something correctly*; 2) *a set of marks on an instrument or tool used for measuring, or the act of making these marks correct* [Longman Dictionary of Contemporary English]. Thus, this term was not formed by means of semantic way of term formation in shale gas terminology, it has just acquired a new shade of meaning in this domain, referring to a particular concept. Though the translation dictionary fixes the variant of translation of this term *калібрування*, we consider it more appropriate to translate it as *градуювання (приладу)* [Англо-український нафтогазовий словник], as far as there exists in Ukrainian such technical term, revealing the technological process denoted by this term much better. Therefore, we should resort to the method of adaptation and use the equivalent in the target language. In some cases, it is possible to translate the term *calibration* using descriptive method: *вимірювання характеристик приладу*, which is also appropriate. If the term is repeated several times in the text, it is advisable to use the suggested one-word translation, in case the text is designed for professionals. For instance: *Most instruments and sensors are designed to meet certain accuracy specifications; the process of adjusting an instrument to meet those specifications is referred to as **calibration*** [Holditch Stephen Hydraulic fracturing]. *Більшість приладів та вимірювальних апаратів створюються відповідно до чітких та точних вимог; процес налаштування чи зміни приладу, що повинен відповідати вимогам, називають **градуванням**.*

The analysis of English shale gas sublanguage showed that semantic way of term formation is a relatively spread way of terminological nomination. We arrived at the conclusion that the following strategies are predominant in

translation into Ukrainian the English shale gas terms formed by means of semantic reconsideration of meaning: adaptation, concretization, generalization and literal translation.

### **3. Syntactic method of formation terms denoting shale gas production and strategies of their translation**

The linguists V. Leichyk and S. Shelov have elaborated the typology of terms, which is considered to be very helpful for the translator, since he/she may conduct a search of necessary terms in the dictionary based on this typology<sup>18</sup>. When translator deals with the terms in a particular field, he/she should consider the typical structure of terms of this industry. Therefore, the translator must examine the so-called attributive complexes – two, three or multicomponent word-combinations in which the key components – nouns and adjectives – may depend on a particular noun, located in any position to the right from the key component.

These attributive complexes are a basis of syntactic method of term formation that can be defined as the use of terminological word-combinations denoting certain scientific notions. The analysis showed that the English shale gas production terminological system contains a great number of terms formed by this way of term formation. The syntactic method of creating terms in our research is based on the classifications elaborated by S. Horelikova and V. Danilenko.

Classification of two-component terms formation according to the type of connection between the components<sup>19</sup>:

1) both components denote objects, the second of which is a part of the first component e.g. *machine frame* (*корпус пилы*);

2) both components denote objects, however, in this case the first component is a type of the second one e.g. *commutator machine* (*коллекторная машина*);

3) the first component denotes an object, while the second component denotes its characteristics, such as weight, area, thickness, pressure, speed, etc. e.g. *machine weight* (*вага пилы*);

4) the first component, similar to the third case, denotes an object while the second component denotes a property or any other parameter e.g. *chamber pressure* (*тиск в камері*);

5) the first component denotes an object, and the second component denotes an action, directed at the object or happening to it e.g. *motor vibrations* (*вібрація двигуна*);

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<sup>18</sup> Лейчик В. М., Шелов С. Д. Лингвистические проблемы терминологии и научно-технический перевод / В. М. Лейчик, С. Д. Шелов. – М., 1990. С. 32–33.

<sup>19</sup> Гореликова С. Н. Природа термина и некоторые особенности терминообразования в английском языке / С. Н. Гореликова // Вестник ОГУ. 2002. – № 6. – С. 129–136.

6) the first element indicates the substance – metal, wood, liquid, gas, etc., and the other one denotes an object e.g. *bronze washer* (бронзова шайба).

The first type of relation in which the second component is a part of the first one is illustrated by the following terms: *basement fault* – розлом фундаменту, *basement structure* – структура корінних порід, *clay stabilizer* – антикоагулянт глини, *flow system* – система регулювання потоку, *reservoir boundary* – контур пласта, *winch brake* – гальмо лебідки, *reservoir model* – модель пласта колектора, *scale inhibitor* – інгібітор відкладень, *shale lithofacies* – літофація сланців, *stress gradient* – градієнт напруги.

Translating all the above mentioned terms into the Ukrainian language it is recommended to render the first component after the second one, taking into account that the second component is dependent on the first one. We also believe that it would be wrong to render the first component by means of an adjective, since the meaning of a technical notion can be lost. Therefore, translating two-component terms, we apply the strategy of literal translation, sometimes changing the places of components in translation into the target language.

The second syntactical type of connection between two-component terms is similar to the first one when both components denote objects, however, in this case the first component is a part of the second one. For example: *carbonate concretion* – карбонатне стягнення, *carbonate rock* – карбонатна гірська порода, *coal seam* – вугільний пласт, *cylinder bushing* – циліндрова втулка, *debris flow* – уламковий потік, *downhole tools* – свердловинне обладнання, *drainage area* – дренажна зона, *life cycle* – експлуатаційний цикл, *ray zone* – продуктивний пласт, *neutron log* – нейтронний картаж, *rope throat* – поровий канал, *sand plug* – ніщана пробка, *shale engineering* – сланцева розвідка, *shelf deposit* – шельфове родовище.

Translating these terms, we follow the strategy of literal translation, which presupposes the choice of a particular equivalent in a target language. The first component in all of the above mentioned terms is translated with the help of an adjective, and the second element is rendered by a noun. In translating such constructions, the first element may also be omitted, for instance the term *shelf deposit* when repeated in a technical text can be translated simply by the word *родовище*, as it is clear from the context that it is a shelf deposit.

The third type of relations between two-component terms differs from the first two by the fact that the second component complements the first one, indicating its characteristics, such as weight, area, thickness, pressure, speed etc. In this case we observe the relation of belonging of the second component to the first one.

In our study this type of relation is represented by the following terminological units: *fluid viscosity* – в'язкість рідини, *formation compressibility* – стискання породи, *rock matrix porosity* – пористість

скелета породи, *slip direction* – напрям ковзання, *transformation ratio* – коефіцієнт трансформації, *well performance* – експлуатаційні характеристики свердловини.

These terms are characterized by the relation of belonging of one of the components, thus, in order to preserve it we translate the first component of the English term by means of the genitive case and the second one by the nominative case adhering to the strategy of literal translation and concretization.

Another type of relations between the components is similar to the previous one when the first component denotes an object while the second one denotes a property or any other parameter. However, there is no relation of belonging of the second component to the first one which may be illustrated by the following terms from the domain of shale gas production: *bottomhole temperature* – температура на вибої свердловини, *completion fluid* – рідина для завершення свердловин, *bottomhole pressure* – навантаження на долото при бурінні свердловини, *resistivity logging* – каротаж за методом опору.

Translating the above given terms we do not recommend using genitive case, since there is no relation of belonging. It would be incorrect to translate the term *bottomhole temperature* as температура вибою свердловини, but only as температура на вибої свердловини.

One more type of relations of two-component terms is represented by the cases when the first component denotes an object, and the second one denotes an action, directed at the object or happening to it. For example: *core treatment* – обробка керну, *temperature sensing* – вимірювання температури, *fracture treatment* – операція із гідророзриву пласта, *borehole flushing* – промивання стовбура свердловини, *formation compressibility* – стисливість породи, *fracture initiation* – ініціювання гідророзриву, *fracture stimulation* – інтенсифікація гідророзриву пласта, *hydrocarbon generation* – генерація вуглеводнів, *water coning* – формування конуса обводнення.

In almost all the cases the relation of belonging between the terms is observed, for example: *temperature sensing*, *core treatment*. Therefore, translating these terms we make use of genitive case for the second component. However, the translation of the term *fracture treatment* is slightly different, rendered by the word-combination операція із гідророзриву пласта, i.e. the relation of belonging has not been preserved in the Ukrainian variant of translation. In translation the strategy of concretization of the notion is applied, what can be accounted for the source language term being rather ambiguous.

The last type of relation in forming two-component terms is when the first element indicates the substance – metal, wood, liquid, gas, etc., and the second denotes an object. The following examples illustrate the terms of shale gas production formed on the basis of the given syntactic relation: *acid treatment* – кислотна обробка, *bituminous shale* – бітумінозний сланець, *calcareous algae* – вапнякові водорості, *carbonate reservoir* – карбонатний

*колектор, coring fluid* – кернів флюїд, *steel core* – сталеве осердя, *hydrogen index* – водневий індекс, *oxygen scavenger* – кисневий очищувач, *oxygenated water* – вода, насичена киснем, *sand proppant* – піщаний проппант, *silica sand* – кварцовий пісок, *steel casing* – сталева обсадна труба.

These terms are translated into Ukrainian by the model: «attribute + noun». In this case the strategy of literal translation was applied.

V. Danilenko<sup>20</sup> identifies the most typical models of nominal word-combinations of attributive types frequently found in technical literature. Our study showed that shale gas terms formed by means of syntactic way can be classified according to this system. The most common model of two-component terms word-combinations in our sample is “adjective + noun”. There are a lot of terms among the selected examples formed according to this model. For instance: *abandoned well* – ліквідована свердловина, *absolute pressure* – абсолютний тиск, *analytical tool* – спосіб аналізу, *artificial fracture* – штучний розрив, *bituminous shale* – бітумінозний сланець, *black shale* – чорний сланець, *braided stream* – розгалужений потік, *brittle rock* – крихка порода, *complex folding* – складна складчастість, *cylindrical joint* – циліндричний стик, *isothermal change* – ізотермічна зміна, *connecting pipe* – штуцер, *cumulative recovery* – сумарний видобуток, *directed drilling* – похило-направлене буріння, etc.

Most of the above mentioned terms are translated by means of application the strategy of literal translation, but there are terms which have their equivalents in the Ukrainian language. For example, there are two variants of translation of the term *connecting pipe* – з'єднувальна труба and *штуцер*. We would recommend to choose the second variant, since in Ukrainian there is a technical term *штуцер*. In this case we use the strategy of adaptation in the target language in order to make the term sound natural and clear for experts familiar with the technology of shale gas production. The term *analytical tool* should be translated as *спосіб аналізу*. In this case the strategy of free translation that completely changes the construction of the English term is applied.

The second widespread model of terms word-combinations is “noun + noun”. The following shale gas terms represent the units formed by means of this model: *basement fault* – розлом у фундаменти, *basement structure* – основна структура порід, *bottomhole temperature* – температура на вибої свердловини, *caliper log* – кавернограма, *carbon dioxide* – двоокис вуглецю, *clay stabilizer* – антикоагулянт глини, *coal seam* – вугільний пласт, *collar locator* – локатор муфти обсадної колони, *completion fluid* – розчин для розкриття пласта, *core analysis* – ядерний аналіз, *correlation chart* – кореляційна таблиця, *corrosion inhibitor* – антикорозійна добавка, etc.

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<sup>20</sup> Даниленко В. П. Русская терминология: опыт лингвистического описания / В. П. Даниленко. – М.: Наука, 1977. С. 104.

Translation of the above mentioned terms is different depending on the connections between the components. Some terms word-combinations have been translated with application of the strategy of literal translation. For example: *correlation chart* – *кореляційна таблиця*, *core analysis* – *керновий аналіз*. In translation of some terms the strategy of concretization has been applied, for instance: *completion fluid* – *рідина для завершення свердловин*, *collar locator* – *локатор муфти обсадної колони*, *character log* – *діаграма акустичного хвильового каротажу*. The strategy of adaptation has been used in translation of terms which have been replaced by their Ukrainian equivalents used in technical literature, for example: *caliper log* – *кавернометрія*.

Our language material revealed the existence of two-component word-combinations, the first component of which is a compound adjective and the second – a noun. This model is not widely used in our material. For instance: *acid-based fluids* – *рідина на кислотній основі*, *capillary-bound water* – *вода, зв'язана по капілярах*, *clay-rich sediment* – *глинистий осад*, *resin-coated sand* – *пісок з полімерним покриттям*, *water-based fluid* – *буровий розчин на водній основі*.

Translating the terms formed according to the mentioned model, we suggest applying the strategy of literal translation, in some cases beginning translation with the last component. For instance, *capillary-bound water* has been translated as *вода, зв'язана по капілярах* and *water-based fluid* – as *буровий розчин на водній основі*. Though, the term *clay-rich sediment* is translated not as *осад, багатий на глину*, but *глинистий осад*, since this construction better meets the norms of the Ukrainian language.

Another model of terminological word-combinations worth analysis is “noun + noun + noun”. This model represents three-component terms, that are less common in our language material comparing to the two-component ones. Among the selected terms for our investigation, the following units represent the considered model: *bottomhole treating pressure* – *тиск обробки на вибої свердловини*, *coil tubing intervention* – *використання гнучких насосно-компресорних труб*, *field development plan* – *програма освоєння родовища*, *gas pipeline specifications* – *характеристики газопроводу*, *pressure buildup test* – *аналіз зростання тиску у гирлі свердловини*, *production-data analysis* – *аналіз даних про видобуток*, *rock matrix porosity* – *пористість скелета породи*.

Different translation strategies depending on the relations between the words, representing one term, have been applied in translation of three-component terminological units consisting of nouns. Most terms have been translated by means of rearranging components, i.e. in our case beginning with the final word. For example: *field development plan* – *програма освоєння родовища*, *rock matrix porosity* – *пористість скелета породи*, *production-data analysis* – *аналіз даних про видобуток*. Translating such terms beginning with the first component can result in senseless set of words in the target language.

As the analysis proved, it is better to resort to descriptive translation complying with general meaning of the English term, if the Ukrainian language lacks a direct equivalent: *pressure buildup test* – *аналіз зростання тиску у гирлі свердловини*. Apparently, the Ukrainian translation of three-component terms is usually longer than the source language terminological units, since often descriptive translation should be applied due to the absence of a short equivalent.

Three component terms word-combinations in our sample can also follow the model “adjective + noun + noun”. For example: *minimum horizontal stress* – *мінімальна горизонтальна напруга*, *acoustic rock transmittivity* – *акустична проникність породи*, *full stroke admission* – *повне наповнення*, *allowable hole deviation* – *допустиме відхилення стовбура свердловини*, *differential thermal analysis* – *диференційний термографічний аналіз*.

In translation of three-component terms following this model the strategy of literal translation is applied, as there is no rearranging of components and for the equivalent of each unit of the word-combination the first meaning in the dictionary is usually chosen in Ukrainian.

The results of the research proved that translation of two- and three-component terms is a complicated task. Therefore, the translator should analyze in detail the relationships and connections between the components and consider the relation of belonging and word order in the composition of the term.

The analysis of translation of terms word-combinations in shale gas production terminology enabled us to highlight the following strategies of translation: 1) description strategy, presupposing transfer of a word meaning by means of an extended explanation; 2) use of genitive case in translation; 3) literal translation, when for the equivalent of a word of the source language the first meaning in the dictionary is usually chosen in the target language; 4) strategy of transcription, when letters of the target language are used for rendering of the sound form of the source language word; 5) translation by means of different prepositions. In our research the most widely applied translation strategies appeared to be descriptive translation, literal translation and use of genitive case.

## CONCLUSION

Scientific and technical texts are characterized by specific lexical, grammatical, and stylistic features. Terminology is the basis of scientific style, and the term embodies the main features of scientific language and complies with the principles of scientific discourse.

The present study was aimed at determining certain peculiarities of English shale gas production terms formation and suggesting the strategies of their translation into Ukrainian. In our investigation we focus on two ways of terminological nomination in the investigated terminology – the semantic

and syntactic ones, as they are especially interesting from the point of view of their translation into Ukrainian.

Shale gas terms formed by means of semantic way appeared in this terminological system as a result of semantic transformation of common language words. In this case we observe the second use of lexical units accompanied by reconsideration of their semantics. The analysis enabled us to conclude that the following strategies are predominant in translation the English shale gas terms formed by means of semantic reconsideration of meaning: adaptation, concretization, generalization and literal translation.

Terminological units formed by means of syntactic way of term formation constitute the greatest number of terms in our language material. Two-component word-combinations are much more numerous than the three-component ones. Two-component terms in our study are classified according to the type of connection between the components. On the basis of this classification the shale gas terms were selected and the strategies of their translation were suggested. According to another classification terminological word-combinations are subdivided into different models of nominal word-combinations of attributive types, such as "noun + noun", "adjective + noun", "noun + noun + noun", "adjective + noun + noun". The English shale gas production terms formed by means of syntactic method are usually translated with application of the following translation strategies: descriptive translation, literal translation and use of genitive case in translation.

We distinguished two very important transformation techniques that were used in translation of certain shale gas production terms: specification and generalization. In our material specification was used when the unit with more general meaning was conveyed into the target language with more specific content. On the contrary, generalization was used when the translation was to be more general.

We arrived at the conclusion that the following translation strategies are the most common in translation of the English shale gas terms into Ukrainian: literal translation, adaptation strategy and strategies of concretization and generalization.

The results of our study proved the relevance of investigation of the ways of terminological nomination in shale gas production terminology and enabled us to state that while translating the English shale gas terms into Ukrainian it is necessary to consider the ways of term formation, peculiarities of the target language and to choose an appropriate strategy providing a successful result.



## SUMMARY

The present paper deals with investigation of the ways of terminological nomination in the English shale gas production terminology and strategies of their translation. Two main ways of shale gas terms' formation are studied: semantic and syntactic ones.

Semantic way of term formation is connected with reconsideration of lexical units' semantics. Two-component and three-component word-combinations represent in our material shale gas terminological units formed by means of syntactic way. The analysis of syntactic way of term formation in our research is performed according to different classifications based on the types of connection between the components and models of nominal word-combinations of attributive types.

The research on translation strategies enabled us to conclude that the following strategies are predominant in translation of the English shale gas terms: literal translation, descriptive strategy, use of genitive case. Besides, concretization and generalization appeared to be important transformation techniques in translation of shale gas production terminology.

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