PECULIARITIES OF ENGLISH METALLURGICAL TERMS ON THEIR UKRAINIAN TRANSLATION

Larysa Mosiyevych[1]

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Abstract. The purpose of the paper is to study the structural, lexical and grammatical peculiarities of English metallurgical terms, to investigate their influence on translation into Ukrainian. Methodology. The research was carried out on the material of English metallurgical terms, taken from dictionaries and Internet sources. Using methods of component analysis and dictionary definitions analysis, we studied structural, grammatical and lexical peculiarities of those terms. Then a comparative analysis of English terms and their Ukrainian translation was carried out. The results have shown that English metallurgical terms are divided into simple, complex, compound and derivative terms according to their structure. It has been observed that English complex (binary) metallurgical terms are formed according to five models: N + N; Adj + N; P. I (G) + N; P. II + N; Prop. N + N. The most productive model of English binary terminological phrases is N + N model (30.3%).

It has been noticed that the majority of complex terms are multicomponent, they comprise terms consisting of three or more words. It has been found out that a number of components in multicomponent terms in the target language may decrease or increase due to the different grammatical structures of the English and Ukrainian languages. Consecutive translation of words in multicomponent terms is rarely preserved: an English terminological phrase, which mainly has semantic development of components from the left to the right, is often translated into Ukrainian from the right to the left.

If the number of components is large, a term tends to become an abbreviation. Research has shown that a common technique to translate abbreviated terms is translation by its full form.

Terms consisting of one or two words, as a rule, do not cause difficulties in translation, with the exception of synonymy and polysemy. Synonyms

[1] Candidate of Philological Sciences,
Associate Professor at Department of Foreign Languages for Professional Purposes,
Institute of Foreign Philology, Zaporizhzhia National University, Ukraine

can influence the translation of terms. They appear in terminology due to some processes: usage of synonymous attributive components, functioning of doublets which belong to national variants of the English language, alternation of nuclear components within a complex term.

The terms containing proper names are called eponymous. While translating names of inventors, scientists into Ukrainian they are transcribed/ transliterated and put to the end of a phrase in Genitive case. However, there are some cases when proper names do not pass to the target language at all. A small number of pragmatonyms has been identified in terms as well.

1. Introduction

Translation of English metallurgical terms into Ukrainian is a topical problem for Ukraine due to existing Russian-language standards in technical terminology. The selection of metallurgical terms as a research material is caused by a significant and remified terminological base that makes a research more accurate, and a great importance of metallurgical branch for industrial Zaporizhzhia region, where there are some metallurgical powerful plants.

The purpose of a paper is to analyse influence of structural, grammatical and lexical peculiarities of English metallurgical terms on their translation into Ukrainian. To achieve the goal, the following tasks should be fulfilled: to analyze structural peculiarities of English metallurgical terms (types of terms, formation models, abbreviations); to study lexical peculiarities of English metallurgical terms (synonymy, polysemy among the terms); to examine principal techniques of translation of common and eponymous terms; to investigate ways of translation of multicomponent terms.

The development of civilization is accompanied by emergence of numerous terms in various fields of science and technology. In our paper we will use the definition of a term by L'Homme [17, p. 55]: "the term is a word or a phrase that is used to express a concept, accepted in a relevant professional field and used in specific conditions". Kvetko P. indicates that "a term is a word or a verbal complex which is relevant to a notion in a specific structured field of knowledge (science, engineering), which interact with other words and verbal complexes and create together a closed-loop system characterized by informative character, unambiguity, precision and expressive neutrality" [16, p. 21].

Much attention has been paid to some practical issues of terminology translation through the prism of grammatical difficulties [15; 11]; multicomponent terminological units [10], technical translation [14; 19; 20]. In recent years, the Ukrainian linguists Bilozerska, Karaban [1; 5] etc. have been actively working out issues of terminology translation. The case study under discussion has not been actively analyzed on the English-Ukrainian contrastive basis.

In spite of diverse prisms of terminology study, all linguists come to a conclusion that terms are characterized by the following features:

1) clear definition of meaning – the term does not simply express the concept, but is based on its scientific definition;

2) unambiguity – for terms within one field of knowledge polysemy is unacceptable. However, in practice, some terms can have several meanings;

3) denotative meaning – terms do not possess connotative meaning, i.e. in terms have no stylistic color.

2. Survey methodology

In order to achieve the research aims the following methods of contrastive and semantic analysis have been applied. The data for analysis were taken from dictionaries and Internet sources. The principal method of our research is contrastive analysis. Contrastive analysis is a set of research techniques and description of language through its comparison with another language to identify it specific features. That method enables analysis of translation changes in the form on grammatical and lexical levels, selection of correct equivalents, and ways of translation of multicomponent terms.

Word-formation analysis was used to identify formation mechanisms of terminological derivatives and structural models of English metallurgical terms.

The comparative method enables to reveal in what way a translator overcomes the translation difficulties as well as to demonstrate what elements of the source text are left untransmitted in translation. The comparative method gives us information about correlation of individual elements of the source language and the target language (techniques and methods of translation). That correlation depends on the relationship between language systems involved in translation and some extra-linguistic factors.

The functional approach was used to study lexical-semantic aspects of English metallurgical terminology taking into account synonymy, polysemy,

thus, allowing us to focus on the specific terminology of metallurgy in modern English.

The quantitative method was used for calculating a number of multicomponent terms in terminology of metallurgy.

3. Discussion

Structural characteristics of metallurgical terms

As noted by Karaban V. [5, p. 243], for the correct translation of a term it is important to know its word-forming and morphological structure. In modern terminology researchers offer a variety of structural classifications of terms. Kiyak T. divides terms into: 1) terms-root words; 2) derivative terms; 3) terms-complex words; 4) terms-phrases; 5) terms-abbreviations; 6) letter symbols; 7) symbols-signs; 8) nomenclature [6, p. 14]. Other researchers divide the terms into: 1) simple; 2) complex (composites); and 3) terminological phrases with prepositional or non-prepositional connection of elements [15; 19]. In our paper we divide metallurgical terms into:

a) *simple terms* (are those that consist of one word with or without affix): *flake, flap, flask.* Analyzing English terms from metallurgy, we found out that a lot of simple terms undergo conversion. Many terms can be both a noun and a verb, or an adjective, for example:

alloy – сплав, сплавляти; легуючий елемент, легувати (noun and verb);

base – піддон (печі), неблагородний (метал) (noun and adjective).

b) *derivative terms* (that a prefix or suffix is added to a stem to form a new word): suffixes: *grader; breaker*; prefixes: *misapplication; misrun*; suffixes and prefixes: *self-feeder, unwinder*. Derivation gives a possibility to create new terminological phrases based on a particular component, i.e. the same component serves as a basis for the formation of other terminological phrases.

c) *compound terms* (when a unit is formed from two or more words): *blowpipe, bootleg*;

d) *complex terms* (consist of at least two or more words or phrases): *melting unit, declutching safety device.* It is pointed out that complex terms constitute the majority of all terms in a language [9, p. 134].

A study of English binary metallurgical terms showed that they are based on five models:

1) N + N: *slime water, crane ladle*;
2) Adj + N: *eccentric shaft; cold blast, dead flange*;
3) P. I (G) + N: *casting block, brazing brass, Sizing block*;
4) P. II + N: *shaped blank, sectionalized borescope*;
5) Prop. Name + N: *Martin furnace, Miguet furnace*.

We should note that the largest number of terminological phrases are created on the basis of such nuclear components as: alloy, furnace, process, product.

Thus, the most productive model of English binary terminological phrases in this terminology is N + N model (67 units, 30.3%). That model provides conciseness and clarity, simplicity of formation, semantic capacity. According to a number of components the metallurgical terms are divided into:

One-component: *Steel – сталь, Ore – руда, Coke – кокс*;

Two-component: *Wet crushing – мокре дроблення , Mold crush – обвал форми, Slag crust – шлакова корка;*

Three-component: *Metal slitting cutter – дискові ножиці для різки листового металу, Valve surge damper – демпфер клапанної пружини*

Four-component: *Temperature dependence of internal friction – температурна залежність внутрішнього тертя; Ladle car pushing device – маневровий пристрій ковшів.*

The widespread use of terminological phrases in scientific and technical texts is dictated by need to nominate complex multicomponent concepts, clarify professional objects and concepts. They are of great importance because they have a clear scientific definition, stability and semantic integrity of a concept being denoted.

Analysis of metallurgical terminology showed that 64% of the studied terms are multicomponent. 80% of them consist of three words.

There are a small number of terms consisting of five components. Their presence can be explained by impossibility of replacing them with more concise structures.

Thus, we have found out that according to structure metallurgical terms are divided into simple, compound, derivative and complex terms. English binary terminological phrases comprise the majority of all terms. Their most productive model is N + N. A great number of terms are the terms consisting of three words. Based on the structural analysis of multicomponent terms

in metallurgy, we can conclude that the structure of terms is diverse. The main way to create multicomponent terms is non-prepositional government.

Lexical characteristics of metallurgical terms

Among lexical peculiarities of metallurgical terminology we examined synonymy, polysemy and homonymy.

All the linguists come to agreement that a term should be monosemantic, accurate, strictly systemic, stylistically neutral.

The linguist Ghrynev-Ghrynevych S. distinguishes three groups of requirements for a term:

1) in aspect of form a term should correspond to language norms, be lexically brief, have derivative opportunities and invariance; be semantically transparent;

2) in aspect of content a term should be monosemantic, have no synonyms;

3) in aspect of functional use a term should have a wide usage in professional environment, be accepted by international community, be modern [2, p. 40].

With the development of terminology, a number of requirements for a term has increased, they began to include:

– compliance with norms and rules of a national language;
– inclusion in the system of concepts of a specific knowledge area;
– full meaning;
– be context independent;
– lack of synonyms within one terminology system;
– brevity;
– derivative perspectives.

The problem is connected to the fact that a terminological unit must have unambiguous ratio between the signifier and the signified, which prevents the development of synonymy, polysemy and homonymy of terms. However, studies of terminology in different branches of knowledge prove the opposite: a term undergoes lexical and semantic processes.

Extensive application of many synonyms/doublets/variants is especially typical of the dynamically developing terminology, when the process of terminology categorization is already finished, but the search for a preferred term is still in progress. Synonyms are lexical items which have the same meanings [11, p. 52].

Scientific language tries to avoid synonyms, but they still exist. This indicates, first of all, state of formation of terminological systems. However, language itself regulates the choice of one term from a synonymous pair. Scientists identify different sources of synonymy in terminology, namely: different variants of translation of a term; simultaneous definition of a term by several researchers; existence of full and short form of one concept; parallel use of modern and outdated, official and colloquial terms; use of different aspects of one object.

Synonymy is considered an «unacceptable» phenomenon in terminology, as each concept must have only one exact name, but terminological synonyms continue to increase by means of borrowings.

Synonymy in English metallurgy terminology is mostly represented by doublets – semantically identical units. They are not absolute synonyms, as they demonstrate different linguistic ways of nominating a concept, different frequency of use and compatibility. Doublets are absolute synonyms with different forms» [2, p. 105].

One can point out the following ways of appearance of doublets in metallurgical terminology:

1) different gradation of value: *breakdown (пошкодження механізму), failure (вихід з ладу), emergency (аварійна ситуація) – аварія;*

2) different derivatives of the first components of terms: *rolling guides, roller guides (арматура);*

3) different etymology of term elements: *sleeve, tyre (**Saxon** origin), bandage (**French** origin) – бандаж; girder (**French** origin) – beam (**Old English** origin) (балка); iron (**Saxon** origin), ferrum (**Latin** origin) – залізо*;

4) use of synonymous attributive components: *temperature curve – thermal curve* (температурний режим); *thermal treatment, heat treatment* (термічна обробка);

5) alternation of components in attributive phrases: ***gauge** bullhead, bullhead **groove** – калібр «гладка бочка», **spo**t welding, **button** welding – точкове зварювання; **non**-alloy steel, **un**alloyed steel – нелегована сталь*;

6) different variants of translation (transcription and dictionary equivalent): *alunite – ануліт, квасцовий камінь; crocus – крокус, окис заліза в порошку*.

It can be added that, if in a terminological system there is a synonymous pair consisting of borrowings and words of a mother tongue, preference should be given to autochthonous lexical units. To select the best term from a number of synonyms, it is necessary to determine whether its internal form corresponds to a lexical meaning of a term. However, the complete elimination of terminological synonyms from active usage is impossible, which makes absolute standardization unacceptable.

Thus, the presence of doublet terms in a terminological system is impractical, as it violates the «law of a sign» and complicates understanding between professionals. However, other researchers (Leichik, Shelov) consider this phenomenon to be positive, because it indicates the expansion of a special language for professional implementation [9, p. 30; 13, p. 34]. To our mind any terminology should be subject to universal laws of language, so the synonymy among terms as a linguistic phenomenon occupies an important place in terminological studies.

The main problem for Ukrainian terminology translation is inaccurate differentiation of adjectives:

transient ***design*** *situation* **– *короткострокова (перехідна)*** *розрахункова ситуація,*

persistent ***design*** *situation* **– *постійна (усталена)*** *розрахункова ситуація,*

accidental ***design*** *situation* **– *особлива (аварійна)*** *розрахункова ситуація.*

Speaking about Ukrainian-language metallurgical terminology synonyms mainly refer to the process / result distinction: *калібрування* (as a process) – *sizing, калібровка* (as a result) – *grooving, roll pass design.* As we can see the term design has different variants of translation.

The term *speed* is also represented in English metallurgical terminology by two synonyms: speed and velocity. For example: *Resonant* ***speed*** *– резонансна швидкість, frequent operating* ***speed*** *– часта експлуатаційна швидкість, melting* ***velocity*** *– швидкість плавління.* The difference between speed and velocity is: speed is withot direction, velocity – with direction.

Metallurgical professions are also expressed by synonyms: *нагнітальник (нагнітач) і задувальник, виправляч і правильник, укладальник металу і штабелювальник металу*. Synonymy in Ukrainian translation can be caused

by alteration of suffixes -льник – -івник/-ач (яч): *гартувальник – гартівник, набиральник – набирач*; -ювач/-івник – -овщик: *обпилювач – обпиловщик, кранівник – крановщик*. Some names are still used as calque form the Russian language. Those synonyms are unjustified and should be unified.

The linguists warn that the existence of two or more terms to denote one concept hides the danger that one of these terms may narrow or expand its semantic structure, and eventually begin to denote a completely different concept. The scientists call such terms paired and consides their existence to be possible only under the conditions when they correspond to one concept.

The translation of English terminology of metallurgy into Ukrainian can be complicated by polysemy, which implies the presence of several logically different meanings in the word. For example, when translating into Ukrainian, a translator should know that *Forming* has several meanings: 1) штамповка; 2) формозміна; 3) формовка штрипса; 4) профілювання.

There are other polysemic terms in metallurgy which depend on context: ***agitator*** *– мішалка; агітаційний чан;* ***bar*** *– барабан, бочка, пруток, штанга, стержень, брус, балка, рейка, бар (одиниця тиску);* ***banding*** *– смугастість, бандажування, обв'язка бунтів стрічкою.* Polysemy is also typical for term *jet*: 1) струмінь; 2) сопло, форсунка; 3) фурма.

Thus, synonymy and polysemy in terminology is an undesirable phenomenon, but it is quite real, its existence contributes to unification of a professional language, because as time passes one of the units begins to dominate, pushing the other into the background.

Polysemy is based on the most commonly used terms, or those that reflect the most common concepts in a particular industry. According to researchers, polysemy in terminology is undesirable [4], as it denies one of the most important recommendations given for a term. Polysemy of terms leads to inaccuracy of a system, so special attention should be paid to removal of all ambiguous terms or to the consolidation of one term by one meaning. We consider this phenomenon to be inevitable as manifestation of a general tendency to save means of verbal expression.

Since the metallurgical terminology is based on related branches of science, the same term can function in different branches of science as interdisciplinary one. This fact shows that polysemy is revealed not only between terms of one terminological system, but also between terms of different industries.

One can mention another lexical phenomenon among metallurgical terms – homonymy. The linguists identify four main properties of homonymy in terminology – "two in terms of expression (identity of sound and spelling) and two in terms of content (difference in lexical and coincidence of grammatical meanings)". There are some cases when one term has one meaning in metallurgical terminology and different meaning in another terminological system or a general literary language. Examples are: *Bitch, bay, bumper, charge, bar, bed.* They have one meaning in general English and other meanings in metallurgy and other industries.

The existence of synonymy and polysemy arises the issue of unification and harmonization of terms. According to T. Kiyak, unification is the elimination of variety of forms (synonymy) or unification of meanings, i.e the elimination of polysemy and semantic homonymy, that are so undesirable within the terminology of one scientific field [7, p. 78].

Ukrainian science should pay special attention to harmonization of technical terminology with a corresponding terminology of international standards. There is a problem in Ukrainian terminology, connected with a lack of appropriate Ukrainian terms agreed by experts in a particular field. The work on harmonization of European standards with domestic ones causes serious problems, because many terms adopted in Eurocodes do not always correspond to the content of similar terms in Ukrainian technical documentation. For example, for a Ukrainian engineer the word «construction» means a product (column, beam, plate, etc.), which in Europe is denoted by the word «structure». In the Ukrainian environment, the word «structure» in the usual sense means some system of organization (structure of society, microstructure of metal, etc.).

Thus, on the one hand, lexical peculiarities of English metallurgical terms (synonymy, polysemy, homonymy) can cause certain difficulties in Ukrainian translation, and, on the other hand, sometimes a translator can face a problem of choosing a suitable Ukrainian equivalent due to an existence of synonyms among Ukrainian terms (mainly, among the names of metallurgical professions).

Grammar differences

Grammar differences are caused by different grammatical systems of the English and Ukrainian languages. The results of that contrast can be seen in translation:

1) Change of Common case in English into form of Genitive case in Ukrainian:

roll adjustment – регулювання валків;
water descaler – гідрозбив окалини;
Shear stress – напруження зсуву;
pressure governor – регулятор тиску;

2) Change of a word combination in English into a word in Ukrainian:

tie rod – стяжка,
cooling bed – холодильник (для охолодження прокату),
cast iron – чавун.

The opposite change (a word into a word combination) can be seen as well:

sorter – сортувальна машина;
train – група клітей;
spanner – гайковий ключ,
buckle – повздовжній вигин.

3) Change of singular into plural and vice versa:

Crudes – сира руда;
Branner – матерчаті валики;
heavy section – крупносортні профілі;
Backfin – закати.

4) Introduction of preposition into the target language:

Bendability – здатність до згинання;
Corrosion allowance – допуск на корозію;
Ingot stirrup – кліщі для злитків.

5) Change of N+N model into Adj. +N. in the target language:

Lump stone – шматковий флюс;
Arm stirrer – лопатная мешалка;
Mill cinder – прокатний шлак.

6) Change of two-word terms into compounds in the Ukrainian language:

reinforced concrete – залізобетон,
skim bob – шлакоуловлювач;
thermal capacity – теплоємність;

The opposite change can be seen:

Stockyard – шихтовий двір;
Blackwash – формовочна фарба.

There are also some morphological differences in terms of the source (SL) and the target languages (TL). For example, the prefix *self* has the following translation options:

*Self-capasitance – **власна** ємність;*

*Self-feed – **автоматична** подача;*

*Self-saturation – **само**насичення*.

It should be noted that some English terms may include prepositions that can change translation: e.g. *blowing-**down** – видування, blowing-**in** – задування, blowing-**out** – кипіння форми.* Some terms with prepositions can create a synonymous row: *to boil down, to boil off* (to evaporate).

The translation of terms with «body» component may differ:

*Body of casting – **тіло** виливки;*

*Body of flame – **язик** полум'я;*

*Body of roll – **бочка** прокатного валка.*

The translation of terms with «block» component can also vary:

finishing block – чистовий волочильний барабан;

former block – формуючий орган;

gravity block – волочильна машина барабанного типу;

hammer block – баба молоту;

head block – рама льотки;

hearth block – лещадь.

One should touch upon extralinguistic differences when some English terms have different meanings in British and American English. In the dictionary they are marked «Am.». For example, the term *sand cutting* in British English has a meaning «змішування формувальної суміші», but in American English – «дезінтеграція формувальної суміші «. Some terms are used only in American English: *sand additive (добавка до формуючій суміші), stuck ingot (запресований злиток), H-steel (прожарювана сталь).* The difference between lift (BrE) and elevator (AmE) is reflected in example:

*attendant-controlled **lift** – **ліфт** з провідником,*

*belt(-type bucket) **lift** – стрічковий ковшовий **елеватор**,*

*continuous bucket **lift** – ковшовий **елеватор**.*

A translator must be aware of those peculiarities.

So, we have found out that there are some differences between English and Ukrainian metallurgical terms at grammatical, lexical levels, as well

as at extralinguistic level (differences in AmE and BrE). Unlike lexical and extralinguistic differences, differences at grammatical level do not prevent the achievement of translation equivalence, because they allow to express identical categorical meanings in the source and the target languages.

Techniques of translating English metallurgical terms into Ukrainian

Terms are units of linguistic and professional knowledge that ensure the intercultural communication effectiveness. For this reason, equivalent translation of terminology is of great significance in translation of scientific and technical texts. The most important problem in achieving translation equivalence of scientific and technical texts is the reproduction of the original content of a text using the terminological system of the target language. The difference in the terminological systems of the source language and the target language is the cause of the greatest difficulties in translating scientific and technical texts.

None of the scholars provide detailed instructions on translation of terms, as they are a special group of scientific and technical vocabulary. The translator must not only be fluent in English, but also be proficient in the specific field to which the target text belongs, as the meaning of terms is closely linked to a context, and may vary depending on the field of use. Only with an effective combination of these two conditions an adequate translation of any scientific and technical literature can be made.

In current development of translation studies significant attention is paid to the optimization of translation of terminological units in professional languages. Having analyzed the material we identified the following types of translation of English metallurgical terms into Ukrainian:

1) descriptive translation which is mainly used in translation of highly specialized metallurgical terms. It allows to convey the meaning of a term quite accurately, although it complicates the syntactic structure of the target text. Descriptive translation is used for both one-component and multicomponent terms. Examples:

Izod test piece – зразок Ізода для випробування на ударну в'язкість;

Desco process – метод лиття під тиском з використанням разових стрижнів;

Young blow – продування з зупинкою під час падіння полум'я;

dovetail slot – виріз у вигляді ластівчиного хвоста;

spheroidishing – нагрівання та охолодження з метою отримання сфероїдальної форми карбідів в сталі;

Alfameter – пристрій, для виміру кута волоки.

We can observe that using descriptive translation all basic features of a concept denoted by a term in the source language are accurately and completely conveyed in the target language.

2) lexical equivalent – a constant lexical correspondence, which exactly coincides with the meaning of a word. Terms that have equivalents in the target language play an important role in translation. They serve as reference points in a text, disclosure of other terms meanings. They provide an opportunity to clarify the nature of a text. Such key terms are: *alloy – сплав, ore – руда, brass – латун*, *floss – пудлінговий шлак.*

3) analogue translation – is based on principle of selection of analogue, i.e. an Ukrainian expression, which is adequate to an English one by meaning, but completely or partially different from it by imagery. Example: *ball stanchion bed – поле «гусячих» шийок (у ножиць), poly – V belt – багаторядний клиновий* (поліклиновий); *spiral cleaner – гвинтове сортування, «змійка».*

4) Transformations. Transformations are used in terminology translation when in the source text there are terms that have a different structural and functional order than in the target language. In our paper we analyzed the following types of transformations:

– grammatical:

a) change of singular into plural: *Loose ashes – попіл*, *Regulation – технічні умови, Plant residue – хвости (кол. мет.);*

b) change of a part of speech in term components: *end product – кінцевий продукт* (noun in the source language is translated as adjective); *roasted product – продукт випалювання* (Participle II is translated as noun); *rustless property – стійкість проти іржавіння* (adjective with a negative suffix is translated as preposition).

The need to replace parts of speech is explained by typological differences in phrases of Ukrainian and English. Thus, in English a noun is often put before a head word that contradicts a typological structure of a phrase in Ukrainian where adjectives, participles can be put before a head word but not nouns.

c) addition. A number of components in the target language can increase: *dead dipping acid – суміш кислот для матового випускання*; *slag analysis – хімічний аналіз шлаку; butt weld – стикове зварювальне з'єднання; bosh angle – кут нахилу заплічок (дом.).*

d) omission. A number of components in the target language can decrease: *Glide process – сковзання; Mud accumulation – забруднення*; *Peptizining agent – пептизатор*. As a result of omission two-word terms in the source language become one-word terms in the target language.

– lexical:

a) specification: *semiproducer furnace – напівгазова топка* (translation specifies a source of furnace operation, i.e. gas).

Lexical transformations are used in few cases to translate terms of metallurgical sphere.

5) Literal translation is a fairly common translation technique of metallurgical terms. This is a technique when the constituent parts of a word are translated by the corresponding elements in the target language. Literal translation can be used only when the translation equivalent does not violate the rules of word combination in the Ukrainian language. It is not always a mechanical operation to transfer the original form into the target language. For example: *cutting apparatus – різальний апарат; total absorption – повне поглинання; free acid – вільна кислота.*

6) Transcription/transliteration of terms is common when a term in the target language consists of international terminological elements of Latin or ancient Greek origin. A positive feature of transcription and transliteration is reliability: a translator transmits only phonetic or graphic side avoiding interpretation of a new concept and misinterpretation of a word. The disadvantage of this technique is that the concept may remain unclear to a recipient. It should be mentioned that in the dictionary of metallurgical terms there are few examples of transliteration: *Bolt – болт; Converter – конвертер; accumulator – аккумулятор; aerator – аератор; slab – сляб.* Some chemical elements are also transliterated: *magnetite – магнетит, ledeburite – ледебурит*, *Wustite – в'юстит, babbit – бабіт.*

There are few metallurgival terms consisting of names of inventors. Those names are transcribed and put at the end of a terminonoligal phrase in Genitive Case: ***Bourdon pressure*** *gauge – манометр Бурдона;* ***Hooke's*** *coupling – шарнір Гука;* ***Venturi*** *meter – витратомір із трубкою Вентурі.*

When using transliteration, we should not forget about «false friends of a translator», incorrect reproduction of which can lead to incorrect interpretation of a content of a text, and thus obtain incorrect information: *data – дані (not "дата"), solid – твердий (not "солідний"), clay – глина (not "клей"), probe – зонд (not "проба"), composition – склад, (not "композиція").*

However, it should be noted that transcription/transliteration, on the one hand, leads to internationalization of terminological systems, and, on the other hand, that process may result in a number of unreasonable borrowings that will not embellish the Ukrainian language and may change its terminology system.

It can be observed that some metallurgical terms are translated into Ukrainian as terms of foreign origin: ***grab*** *bucket – грейфер;* ***grapple*** *– грейфер.* We can see that they are two synonymous rows. *Grapple* is a word of German origin and has the meaning «wide-reaching device mounted on hoists and excavators. Table 1 demonstrates the principal techniques of translation of English metallurgical terms into Ukrainian.

Table 1

Techniques of translation of English metallurgical terms into Ukrainian

Techniques of translation of metallurgical terms	Quantitative identificators (%)
Equivalence	26
Grammar transformations	24
Transcription/transliteration	17
Literal translation	14
Descriptive translation	11
Analog translation	8

As Table 1 shows the most common techniques of translation of metallurgical terms are equivalence and grammar transformations. The descriptive translation is used when translating terms with narrow meaning.

Translation of eponymous terms

Metallurgical terms differ from other terms because they may include proper names. Kochergan M. offers the following classification of proper names:

1) anthroponyms – names of people;
2) toponyms– geographical names;
3) theonyms – the names of deities;
4) zoonyms – nicknames of animals;
5) astronomers – the names of celestial bodies;
6) cosmonyms – names of zones of outer space and constellations;
7) chrononyms («quasi-proper names») – names of time segments associated with historical events;
8) ergonomics – names of associations of people: societies, organizations, etc. [9, p. 187].

In our paper we have identified anthroponyms and pragmatonyms among metallurgical terms. There is no group of pragmatonyms in this classification. Pragmatonym is a nomen for defining a brand, or a trademark.

Proper names in metallurgical terms mainly include names of engineers-inventors. M. Leichyk names those terms as eponyms: these are "terms, the elements of the structure of those are proper names, which denote the authors of relevant objects, phenomena, units of measurement" [9, p. 12]. Usually the translation of proper names is done by transliteration and transcription or descriptive translation. But in our study only transliteration is observed:

– ***Glotzl*** *pressure ceil – плоский клапанний датчик тиску Глотцля,*
– ***Martin*** *furnace – мартенівська піч,*
– ***Miguet*** *furnace – піч Міге,*
– ***Osmund*** *furnace – піч Осмунда.*

When translating into Ukrainian the names of inventors in terms, they are transcribed / transliterated and mainly put at the end of a phrase in Genitive Case. But there are cases when proper names do not pass to the target language at all, or become as processes:

Parker *process – процес паркеризації (фосфатування),*

Kennedy*'s critical velocity – незаіляющая швидкість, (нерозмиваюча швидкість),*

Raymond *standard penetration – динамічне зондування,*

Peltier *air cooler – термоелектричний охолоджувач повітря.*

In some cases the words "by method of/ by" (за методикою, за) are added to proper names:

Herbert *cloudburst hardness – випробування поверхневим наклепом* ***за методикою Герберта****,*

Kelly *ball impact – визначення рухливості [жорсткості] за* ***методом Келлі****,*

Brinell *hardness tester – верстат для випробування твердості* ***за*** *Бринеллєм,*

Rockwell *hardness tester – верстат для випробування твердості* ***за*** *Роквеллом.*

In some terms proper names appear only in the target language: *cell cadmium – елемент* ***Вестона.***

There are sporadic cases when proper names are translated by descriptive translation: ***Mannesmann*** *powder process – процес отримання металевих порошків шляхом турбулентного продування струменя чавуну.*

Metallurgical terms also abounds in brand names marked in dictionaries as «firm.» These are mainly patented names of alloys written with a capital letter and reproduced in the Ukrainian language through transliteration and written in quotation marks: *Accoloy – «Аколой», Adnic – «Адник», Tam – «Тем» (феротитан), Alni – «Алні»* тощо.

Thus, proper names are part of metallurgical terms and usually transliterated. Sometimes they may be omitted in the target language if they do not carry important information.

Translation of abbreviations among metallurgical terms

Due to increase in components in terminological phrases, abbreviations are being actively used. For example, M.P.A. (Metal Powder Association), HBT (hot blast temperature). The appearance and widespread use of such abbreviations is primarily due to convenience. However, the strong saturation of a text with abbreviations often leads to difficulties in their interpretation in any language.

Abbreviation is a compound word formed from the first letters or other parts of words that are part of a name or a concept. The corresponding components of an initial phrase are called «decoding». Therefore, the abbreviation can be understood only as a result of such «decoding», except special cases [8, p. 13]. However, with the widespread use of an abbreviated word and its more or less long existence in a language, an abbreviation can be understood without deciphering. There is a twofold nature of the

connection between sound and meaning: first, a compound word has no independent meaning and, accordingly, is not realized outside the form and the meaning of the original phrase; secondly, they mean the correspondence not of two units – abbreviations and phrases, but of their elements, from which it can be concluded that each component of the abbreviation has the meaning of the corresponding word in the original phrase.

It should be noted that translation of an abbreviation into the target language has always been a great difficulty. This is due to the fact that there are many abbreviations that are not recorded in dictionaries or are rarely used. Karaban V. suggests to distinguish methods of translation of abbreviations in a professional language [6, p. 48]:

1) transcoding (transcription or transliteration) of abbreviation;

2) translation by appropriate full form of a word or a phrase;

3) translation by appropriate abbreviation used in the TL.

Metallurgical terminology does not abound in abbreviations, but we have analyzed some of them. According to the research material, the most frequent way of translating abbreviations is a complete translation of all components:

NBS (National Bureau of Standards) – Національне Бюро Стандартів;

MA (metals and alloys) – метали та сплави;

HSS (High-speed steel) – швидкоріжуча сталь;

CS (Cast steel) – літа сталь.

Some abbreviations are translated by corresponding abbreviation used in the TL (sometimes with the help of descriptive translation): ***VLN*** *process – процес* ***ВЛН*** *(плавка сталі з дуже низьким вмістом азоту в кисневих конвертерах*), ***OLP*** *converter process – процес* ***ОЛП.***

A total descriptive translation can be used: ***M.V.B****. process – процес твворення тонкої окисної плівки занурення в розчин хромових солей,* ***E.R.W****. process – процес контактного зварювання.*

One should mentioned some abbreviations are polysemic. For instance, abbreviation **NDT** has two meanings: 1) *nondestructive test – випробування без руйнування зразка;* 2) *null ductility transition – температура перехода до нульової пластичності.*

Abbreviations with capital letters can have different meanings: ***m.p.*** *(melting point) – точка плавлення,* ***MP*** *(molding pressure) – тиск пресування.*

There are sporadic cases when abbreviation can be transliterated in the TL: *Al-Dip process – альдіп-процес.*

Thus, the tendency to abbreviation and activation of abbreviations in metallurgical terminology is caused by possibility of expressing current scientific concepts in shortened form. The study showed that a common way of translating abbreviations is full translation. It should also be noted that when translating abbreviations of a professional language of metallurgical industry, a translator must be as careful as possible, because translation of these lexical units requires the use of an exact correspondence that would successfully and accurately convey the meaning of the SL. Moreover, some abbreviations have two meanings that causes certain difficulties.

Translation of multicomponent metallurgical terms into Ukrainian

As noted above, complex terms predominate in metallurgical terminology. According to V. Danylenko, it is due to a fact that complex terms are able to reflect the necessary characteristics of a concept [3, p. 46]. A multicomponent term is based on a single-component term by a logical development of already existing knowledge and addition of supplementary linguistic means necessary for an adequate representation of a differentiate feature of a new concept. In comparison with monosyllabic terms analytical terms show the ability to specify meanings through dependent words. The complex form of a multicomponent term allows to reproduce the meaning of a particular concept more accurately, to convey more differential features of a concept, thus, it contributes to its semantic accuracy.

The ability of a terminological combination to include a significant number of terminological elements can be considered a positive factor, since each added terminological element reveals a concept more precisely, but in the process of functioning and using in speech this quality becomes one of the main drawbacks of a multicomponent term – it becomes cumbersome, inconvenient in usage.

Metallurgy assimilates related sciences – technical (mechanics, transport), natural (chemistry, ecology), physical and mathematical. That is why, in our opinion, the metallurgical terminology system (MTS) is characterized by a large number of complex terms.

Analysis of dictionary articles of metallurgical terminology showed that 64% of the studied terms are multicomponent. Three-component terms account for 80% of all multicomponent terms.

Structural analysis of every component in terminological phrases helps to determine the structure of the whole terminological phrase that is essential for translation. The structural and semantic analysis of terminological phrases consisting of a large number of components requires a lot of attention. If in two-component terms semantic connections are established between two adjacent lexical units and these connections are relatively easy to trace, then in the case of terms consisting of three or more components, semantic connections can exist between any of them.

In three-component phrases the first component has clarifying information about a subject, it acts as a differentiator of a concept, for example: *heat-treatment corrosion – тріщина, що утворюється при термообробці, liquid flux cover – покриття з рідкого флюсу.*

Three-component terms in metallurgy are mainly formed by the following models:

1) Adj.+ N+N:

– Differential aeration corrosion – корозія, яка обумовлена диференційною аерозією;

– Effective capture cross-section – ефективний перетин захоплення;

– Metallurgical blast cupola – металургійна вагранка;

In this model an adjective often has clarifying information about a subject, in which it acts as a differentiator of a concept. Such phrases arise due to complexity of two-component structures through further specification.

In terminology of metallurgical industry the functioning of the structure Adj. + N + N is dominant for three-component terms. The use of structures that have a noun in the second and final positions is explained by the fact that the element in the second position is the head in original two-component term, and the element in the final position is the head in three-component term. In the TL an adjective is mostly saved at the first position. Prepositions can be added in the TL.

2) N+Adj.+N:

– cast detachable chain – ланцюг з литих гакових ланок;

– crystal of high symmetry – кристал з високою симетрією;

3) N + N + N:

– blast box cover – кришка повітряної коробці;

– corrosion test coupon – зразок для корозійних випробувань;

– fire crack in rolls – розпал поверхні валків;

The terminological phrase in the TL may not preserve all the nouns: some of them can be replaced by adjectives, or prepositions can be included.

4) Participle II (P. II)+ N + N:

– closed-type bucket – ківш із кришкою;

– mounted load carrier – начіпний кузов;

5) Participle I (P.I)+ N + N:

– falling curtain of penetrant – падаюча завіса рідини, що протікає;

– heating curve of charge – крива нагріву матеріалів доменної плавки.

The given model implies addition of some components into the TL. Three-component terms of that model can become four-or five component ones.

The analysis showed that the group of three-component terms is based on two-component terms, that is characterized by close structural and semantic connections. The use of a noun as a head word in the final position is characteristic for all types of three-component terms.

Four-component metallurgical terms are represented by a small number of phrases. This is due to inconvenience of pronouncing and writing such multicomponent terms as they are only semantically connected. The derivational basis for their creation is mainly three-component terms-phrases. In metallurgical terminology four-component terms are constructed by nine models:

1)Adj.+N+N+N: *hydraulic bale tension control – гідрорегулювання щільності пресування паків;*

2**)** P.II+N+P.I+N: *cranked side-cutting fitting – колінчаста ланка бічного різання;*

3) Adj.+N +Adj.+N: *internal gear final drive – кінцева передача з внутрішніми зубцями; low-pressure pneumatic conveyor – пневмотранспортер низького тиску; rod-type elevating conveyor – прутковий елеватор;*

4) **N+N+N+ N**: *hand control signal box – панель для дистанційного керування;*

5) Adv. + Adj. + N + N: *most unfavourable action of load – найбільш несприятливий вплив навантаження;*

6) N+P.II +N+N: *force-fed auger elevator– шнековий елеватор із примусовою подачею; gas-shielded arc cutting – дугове різання в захисному газі;*

7) P.II+N+N+N: *Observed lattice parameter curve – експериментальна крива параметрів решітки;*

8) N+N+P. I +N: *roller-chain connecting clip – пружинний замок;*

9) Adv.+ P.II+N+N: *electrically ignited oil furnace – нафтова топка з електричним запалюванням;*

Out the nine represented models the first one is the most productive. In total, they comprise 20% of all multicomponent terms. Four-component terms do not always preserve four components in the TL. Five-component terms are formed by three models:

1) P.I+N+N+P.I+N: *operating characteristic curve of sampling plan – крива оперативних характеристик вибіркового контролю;*

2) N+P.II+Adj.+N+ P.I: *gas-shielded metal arc cutting – дугова різка металевим електродом в захисному газі;*

3) Adj.+N+N+N+N*: first cut and finish scrap delay – простій печі під час завалювання брухту.*

The existence of terms consisting of five components can be explained by impossibility of replacing them with more concise constructions. These terms are also formed by maximum complication of term units of a simpler structure, and, therefore, they are characterized by the same types of relations as four-component terms-phrases.

As we can see from the above examples, the multicomponent nature of terms is achieved by clarifying or specifying the meaning expressed by a head word. When translating into Ukrainian the structural composition is not always identical to multicomponent terms in the SL, so a preliminary analysis of a structure of a term is required.

Multicomponent terms contradict the rule that a term should be relatively short. But, due to its clarity existence of such term constructions is quite justified. Based on the use of prepositions, terminological phrases are divided into two types:

1) structurally open: *mounted load carrier – начіпний кузов; tungsten carbide die – волока з карбіду вольфраму;*

2) structurally close: *anchor of shearing resistance – кут опору, кут різання; diffusion of interstitial carbon – дифузія атомів впровадження вуглеця.*

Prepositions in the TL are not preserved.

Increasing the length of phrases causes some difficulties in use. Long phrases are mostly preserved when they are rarely used. If a phrase is

used frequently, it is usually reduced by loss of some components, i.e. by ellipticization process. However, arbitrary reduction of term units often leads to a violation of one of the requirements for a term – accuracy. Therefore, the main task during standardization of Ukrainian scientific terminology in any field is to ensure the optimal length of a multicomponent term. The optimal length of a term is considered to be one that allows accurately to convey the basic features of a special concept.

We can say that the more meanings a term has, the fewer components there are in its structure and vice versa. Thus, multicomponent terms in metallurgical industry are characterized by one meaning.

The main difficulties of translation of multicomponent terms are caused by the fact that components of a phrase and the relationship between them may be divergent. As constituent elements of a phrase, the terms can refer to completely different areas of science and technology or be represented by not similar parts of speech.

Multicomponent terms consist of a head word (HW), one or more left attributes (A), which clarify and modify the meaning of a term. English multicomponent terms are characterized by the left-hand deployment, while Ukrainian multicomponent terms are characterized by the right-hand deployment. This fact must be taken into account when translating multicomponent terms.

In general, the structure of English terminology group can be represented as follows: A3,4…←A2←A1←**HW**

For example: *chilled water jacketed* ***tank*** *–* ***танк*** *із сорочкою для циркуляції охолодженої води*. The final component, tank, is a head word in a phrase, so translation into Ukrainian should be started by it. That is, we translate multicomponent terms into Ukrainian mainly from the right to the left [4, p. 82; 21, p. 65].

Let us give more examples: the term *hydrogen loss* ***analysis*** is translated beginning with a final component *analysis –* ***випробування*** *на втрату водню.*

– Beam divergence ***angle – кут*** *розбіжності пучка;*

– coated electrode metallic ***arc*** *–* ***дуга*** *під час зварювання покритим металевим електродом.*

There are some cases when multicomponent terms have linear translation, word by word, from the left to the right: *composite briquette for*

steelmaking or ironmaking furnace charge – композитне пресування для сталеливарної або композитної шихти; прутки гарячекатанні круглі – hot-rolled round bars; злитки для виробництва сортового проката – ingots for rolling bars.

Thus, to translate a multicomponent term consisting of three or more components means:

1) to establish intercomponent connections in a terminological phrase;

2) to find a main component – a head word of a term-phrase and to translate it;

3) to translate all the basic components within a multicomponent term, which are semantically coherent, taking into consideration context and peculiarities of metallurgical terminology;

4) to perform translation of a multicomponent term (usually translating into Ukrainian from the right to the left, starting from a main component, taking into consideration translation of all components made before;

5) to check correctness of translation using dictionaries, reference books, ets. to make sure that in professional environment that term really exists.

The general structural scheme of Ukrainian terminology group can be represented as follows:

HW→A1→A2→A3,4…

Let us analyse the translation of multicomponent terms into English. The term ***стан*** *холодної прокатки* is translated as *cold rolling* ***mill.*** The head word in the SL, стан, becomes the final head word in the TL. Analogue example is: ***Валки*** *сортових станів – section mill* ***rolls***.

Multicomponent terms can lose some components while being translated (*агрегат газокисневого рафінювання металу – gas-oxygen refiner*), or, add components (*розливання сталі у виливниці – pouring steel into ingot moulds*).

As Superanskaya points out, all terminological systems develop according to the same scheme – as science develops, more and more terms appear, consisting of two and more words [12, p. 56]. The presence of a large number of terms-phrases is characteristic of young and developing sciences. In spite of a fact, metallurgical industry is rather old, a great number of terminological phrases indicates that it develops and changes under the influence of extralinguistic processes (the appearance of new

equipment, new alloys etc.). This fact emphasizes the relevance of a study of metallurgical terminology once more.

As evidence of presence of a large number of multicomponent terms, not only in young industries, let us give an example of construction terminology, in which more than 60% of multicomponent terms.

So, a significant number of metallurgical terms are multicomponent terms. Analysis of that terminology system made it possible to identify productive term-formation models. The most numerous group are three-component terms, which are created according to the following models:

– Adj + N + N,
– N + Adj + N,
– N + N + N,
– P.II + N + N,
– P.I + N + N.

Thus, an algorithm of translation of multicomponent terms into Ukrainian can be developed: you need to find a head word (usually the last one) and, starting from it, translate the whole term from the left to the right. English multicomponent terms with a typical left-hand deployment are characterized by dependent components located to the left of the head component, while Ukrainian multicomponent terms are characterized by a right-hand deployment. This fact must be taken into account when translating multicomponent terms.

4. Conclusions

The obtained results have proven the research questions. Translation difficulties are closely related to the lingual characteristics of terms (structural peculiarities, synonymy, polysemy).

In regard to the structure of metallurgical terms, it has been found out that they are subdivided into simple, compound, derivative and complex terms. There are about two times more complex terms (64 %) than simple ones (36 %). The more words are included in one term, the narrower and more precise the meaning of it is. The most numerous group are three-component terms, which are created according to the following models: Adj + N + N, N + Adj + N, N + N + N, P.II + N + N, P.I + N + N.

Speaking about lexical peculiarities the translation of English terminology of metallurgy into Ukrainian can be complicated by polysemy and synonymy.

The existence of synonymy and polysemy arises the issue of unification and harmonization of terms. The synonyms in metallurgical terminology are represented by the doublets which are not absolute synonyms. The ways of their formation are: different etymology of term elements, the use of synonymic attribute elements, the parallel functioning of a term and a commonly used word, the alternation of the last components in the attribute phrases. Identification of polysemic expressions in metallurgical terminology is difficult, if not impossible, without a sufficient knowledge of the respective metallurgical issue and without a reasonable context available which helps delineate the topic, a branch of metallurgy, etc. There are many terminological polysemes used in that terminology requiring very accurate and precise choice of equivalents in the target language.

It is worth noting, grammar differences do not prevent the achievement of translation equivalence, because they allow to express identical categorical meanings in the source and the target languages. They influence a change of a part of speech in the TL, an introduction or omission of a preposition.

The results of the conducted analysis suggest that a translator applies a variety of translation techniques in metallurgical terms: equivalence, descriptive translation, literal translation, transcription.

Multicomponent terms cause the most numerous difficulties in translation process. They may cause problems due to their length and non-prepositional bonds (in most cases). The algorithm of translating English metallurgical multicomponent terms should be as follows: in non-prepositional attributive word-groups, we should start translating a term from the head word, that takes the final position in the phrase, and direct the further translation from the headword to the left. In Ukrainian-English translation that scheme is reverse. The number of components in the source term and the target term may not coincide.

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