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Galina POCHTARUK,

orcid.org/0000-0001-8009-9503

Candidate of Philological Sciences,

Senior Lecturer at Foreign Languages Department

of Odesa State Academy of Civil Engineering and Architecture

(Odesa, Ukraine) galina.pochtaruk@gmail.com

Olga ZAITSEVA,

orcid.org/0000-0002-9764-9126

Candidate of Philological Sciences,

Head of Foreign Languages Department

of Odesa State Academy of Civil Engineering and Architecture

(Odesa, Ukraine) zayenka.57@gmail.com

Sergei MYKHAILIUK,

orcid.org/0000-0002-5414-2042

Senior Lecturer at Foreign Languages Department

of Odesa National Polytechnic University

(Odesa, Ukraine) smixal57@gmail.com

**MODELS OF SYNTACTIC AND LEXICAL COMPATIBILITY
OF LEXICAL-SEMANTIC VARIANTS OF THE NOUN “UNIT” IN SCIENTIFIC
AND TECHNICAL DISCOURSE TEXTS (THE TECHNICAL AREA
“AUTOMATION OF HEAT AND POWER PROCESSES”)**

The article deals with the issue of implementation of the models of lexical and syntactic compatibility in which lexical-semantic variants of the noun “unit” are actually embodied during its functioning in the analyzed texts. (The analysis of realization of the semantic structure of the noun “unit” in texts was presented in the previous study published earlier). The following characteristics of the compatibility models were determined: the percentage of different models in the implementation of LSVs of the noun “unit” in AHPP texts; parts of speech with which the unit noun is combined when syntactic compatibility is implemented; thematic groups of parts of speech, combined with the noun “unit” in the formation of lexical compatibility. As a material the text corpus of the field “Automation of Heat and Power Processes” (AHPP) referred to scientific and technical discourse was used. The noun “unit” belongs to a high-frequency zone of the created probabilistic and statistical model (frequency vocabulary) of specialty AHPP since the absolute frequency of occurrence of “unit” is 670 tokens. The analysis demonstrates that from all definitions of the noun “unit” fixed in the normative Webster’s dictionary in the AHPP text corpus only the first two definitions were used with rather high frequency – LSV1 (46.5% of all occurrences of this word found in the AHPP text corpus) and LSV2 (18.3% of all occurrences of this word in the AHPP text corpus). Other seven definitions were used in texts incidentally, very seldom. The analysis of syntactic compatibility shows that the total of models of compatibility of the noun “unit” makes up 5 units in both LSVs. The most frequent models of compatibility turned out to be: LSV1 in AN model (36.1% of all models used with this meaning) and NN (23.3% of all models with LSV1); in LSV2 also the AN models (46.4% of all LSV2 models) and NN (13.0% of the total of LSV2 models). The results of the study of lexical compatibility show that the noun “unit” both in LSV1 and LSV2 has quite broad combinative possibilities.

Key words: *frequency, semantic shade, probabilistic-statistical model, meaning, thematic group, dictionary definition.*

Галина ПОЧТАРУК,

orcid.org/0000-0001-8009-9503

кандидат філологічних наук,

старший викладач кафедри іноземних мов

Одеської державної академії будівництва та архітектури

(Одеса, Україна) galina.pochtaruk@gmail.com

Ольга ЗАЙЦЕВА,

orcid.org/0000-0002-9764-9126

кандидат філологічних наук,

завідувач кафедри іноземних мов

Одеської державної академії будівництва та архітектури

(Одеса, Україна) zayenka.57@gmail.com

Сергій МИХАЙЛЮК,

orcid.org/0000-0002-5414-2042

старший викладач кафедри іноземних мов

Одеського національного політехнічного університету

(Одеса, Україна) smihal57@gmail.com

**МОДЕЛІ СИНТАКСИЧНОЇ ТА ЛЕКСИЧНОЇ СУМІСНОСТІ
ЛЕКСИКО-СЕМАНТИЧНИХ ВАРІАНТІВ ІМЕННИКА “UNIT”
У ТЕКСТАХ НАУКОВО-ТЕХНІЧНОГО ДИСКУРСУ (ТЕХНІЧНА ГАЛУЗЬ
«АВТОМАТИЗАЦІЯ ТЕПЛОЕНЕРГЕТИЧНИХ ПРОЦЕСІВ»)**

У статті розглянуто питання реалізації моделей лексичної та синтаксичної сумісності, в яких лексико-семантичні варіанти (ЛСВ) іменника “unit” фактично втілені під час його функціонування в аналізованих текстах. (Аналіз реалізації семантичної структури іменника “unit” у текстах був представлений у попередньому дослідженні, опублікованому раніше). Були визначені такі характеристики моделей сумісності: процентне співвідношення різних моделей у разі реалізації ЛСВ іменника “unit” у текстах; частини мови, з якими поєднуються цей іменник у разі реалізації синтаксичної сумісності; тематичні групи частин мови, поєднані з іменником “unit” у разі формування лексичної сумісності. Як матеріал було використано текстовий корпус галузі «Автоматизація теплових та енергетичних процесів» (АТП), віднесений до науково-технічного дискурсу. Іменник “unit” належить до високочастотної зони створеної імовірно-статистичної моделі (частотного словника) спеціальності АТП, оскільки абсолютна частота зустрічальності іменника “unit” становить 670 лексем. Аналіз демонструє, що з усіх визначень іменника “unit”, зафіксованих у нормативному словнику Вебстера в текстовому корпусі АТП, були використані лише перші два визначення з досить високою частотою – ЛСВ1 (46,5% усіх використань цього слова, знайдених у текстовому корпусі АТП) та ЛСВ2 (18,3% усіх використань цього слова в текстовому корпусі АТП). Інші сім визначень були використані в текстах дуже рідко. Аналіз синтаксичної сумісності показує, що загальна кількість моделей сумісності іменника “unit” становить 5 моделей в обох ЛСВ. Найчастішими моделями сумісності виявились: ЛСВ1 у моделі АН «прикметник + іменник» (36,1% всіх моделей, що використовуються з цим значенням) та NN «іменник + іменник» (23,3% всіх моделей з ЛСВ1); у ЛСВ2 також АН-моделі (46,4% всіх моделей ЛСВ2) та NN (13,0% від загальної кількості моделей ЛСВ2). Результати дослідження лексичної сумісності показують, що іменник “unit” як у ЛСВ1, так і в ЛСВ2 має досить широкі комбінаційні можливості.

Ключові слова: частота, семантичний відтінок, імовірно-статистична модель, значення, тематична група, словникова дефініція.

Analysis of Publications and Problem Statement.

The analysis of compatibility is an important part of researches when developing the problems connected with a dichotomy “language – speech” as it reflects the speech embodiment of this or that lexical-semantic variant (LSV). In this case the language acts as a potential, and the speech functions as implementation of its (language) potential capacity (Адмони, 1964). A semantic structure of a word is a set of lexical-semantic variants, which are fixed in lexicographic resources of the language, and at the same time it is presented as a complex of models of compatibility which are reflected in the text (speech).

The issue of compatibility is one of the most difficult and simultaneously the most perspective problems of linguistics. The main complexity is that the

way of implementation of different types of lexical-semantic variants in speech can be identified on the basis of a context only, i.e. in a concrete speech environment (Медникова, 1974). It is in this case that the certain speech characteristics coded in concrete models of compatibility come to light in a word which enters into lexical-semantic and grammatical links with the other words in the speech.

The compatibility in linguistics was considered in many aspects, firstly, in applied aspects to compile the various types of word combination dictionaries (Benson et. al., 1997; Волкова та ін., 1971; Hidekel et. al., 2004; Melnikova, 2000; The Course of the English Language), secondly, in theoretical aspect, with an entry into such a combined branch of modern linguistics and computer sciences as machine translation (Bobokhodzhayeva, 2000; Dantsevich et. al.,

2012; Grosheva, 2004; Kitsey, 2008) since the results of the analysis of different types of discourses were presented. It should be noted that practically all the mentioned works included such a component as statistical calculations of functioning the grammatical and lexical phenomena analyzed by the researchers.

The goal, material and methods of the study.

Earlier, in one of the published papers the issue was examined to what extent the semantic structure of the noun “unit” is realized in the texts of scientific and technical discourse (Pochtaruk et. al., 2018). The purpose of the given article is as follows: to describe the models of lexical and syntactic compatibility in which LSVs are actually embodied during the functioning of the noun “unit” in the analyzed texts. Wherein the following characteristics of the compatibility models were determined: the percentage of different models in the implementation of LSVs of the noun “unit” in AHPP texts; parts of speech with which the unit noun is combined when syntactic compatibility is implemented; thematic groups of parts of speech, combined with the noun “unit” in the formation of lexical compatibility. Thus, this article is essentially a continuation of the previous study.

As a material the text corpus “Automation of Heat and Power Processes” (AHPP) specialty was used as it was in the paper by G. Ya. Pochtaruk, O. Yu. Zaitseva. The text corpus was formed on the basis of the articles of scientific journals of the United Kingdom and the USA: Power, Power Engineering, Process Engineering. The total amount of the AHPP text corpus included 200 thousand tokens.

The main methods used to achieve the goal set in the article are as follows: the contextual analysis of texts on “Automation of Heat Power Processes” (AHPP) specialty; method of expert assessment, i.e. a poll of the experts of this field of engineering who were taking part in compilation of the text corpus; a statistical method of calculation of frequency of this or that model usage, etc.

To describe the models of syntactic and lexical compatibility, the following standard markers are used: N – noun; A – adjective; prp – preposition; Ving – participle I; Ven – participle II; d – numerical, pronoun.

The research description.

The noun “unit” belongs to a high-frequency zone of the created probabilistic and statistical model (so called frequency vocabulary) of specialty AHPP since the absolute frequency of occurrence of “unit” is 670 tokens.

In the study all lexical-semantic variants are stated in accordance with the dictionary definitions

presented in the normative (Webster’s Third New International Dictionary, 2002).

The first and the most frequently used LSV (LSV1) of the noun “unit” is: “first natural number; number that is the least whole number and is expressed by the number 1”. So far as 46.5% of all occurrences of these word that come across in the AHPP text corpus refer to this meaning the analysis of its lexical and syntactic compatibility is of considerable interest. So,

- the AN model can be found in the text corpus very intensively – 36.1% of all models found in this LSV, e.g. *industrial unit, small unit, several units, cooling unit, an opposed-fired unit*;

- the NN model makes up 23.3% of all models with this LSV, e.g. *acceleration units, power units, display unit generator unit*;

- the NprpN model – 10.0%, e.g. *operation of unit, use for units, tests of units, application of units*;

- the NV model – 10.0% of all LSV1 models, e.g. *units will give, the unit monitors, the unit controls, units provide*;

- the VingN, NisVen model – 7.1%, e.g. *returning a unit, the unit is shown*.

In total these models make up 82% of all LSV1 models.

It is apparent from the given examples, which are typical for LSD1 noun “unit” that the main models of this LSV are substantive and verbal phrases. The kernel models with a dependent component but in preposition only turned out to be characteristic for LSV1 substantive phrases. In this case the dependent component in preposition is expressed by: a) a noun – 23.3%; b) an adjective – 12.4%; c) a pronoun – 9.5%; d) verbal forms – 7.6%; e) a numeral – 6.5%.

The fact is frequent enough when in LSV1 realization of the noun “unit” in the considered text corpus the models of word combinations in which the attributive elements of “unit” are expressed by compound words, e.g. *dual-thermocouple unit, a 650-MW unit, iron-selective-electrode unit*. Thus, the noun “unit” LSV1 in the given technical area has broad syntactic compatibility since it is used with many compatibility models which are characteristic for “unit”.

The study of lexical compatibility has showed that the noun “unit” with LSV1 can enter into a combination with adjectives, nouns and verbal forms having some concrete semantics:

- with adjectives having: a) estimating semantics, for example, *new, modern, complete individual*;
- b) denoting dimensional and quantitative characteristics, e.g. *small several, large, most*;
- c) with terms used in various technical areas of knowledge, e.g. *photometric, colorimetric, nuclear*;

– with nouns: a) expressing the name of process, e.g. *acceleration unit, detection unit, blow-down unit*; b) designating devices, units, e.g. *display unit, detector unit, two-furnace unit, multi-burner unit*; c) designating the environment, form, e.g. *microwave unit, mechanical-draft unit, steam unit*; d) having proper names or expressed by an abbreviation, for example, *CTS unit, PBRS unit, FTSS unit, SCR unit, Harrington unit, FTW unit*;

– with verbs in different forms: a) designating specific production processes or maintenance for performance of which a certain system is designed, e.g. *a cooling unit, peaking unit, generating unit*; b) relating to a general scientific layer of lexis, e.g. *operating units, remaining units*;

– with verbs in different forms used in compound words: a) designating design features, e.g. *mixed-bed unit, free-standing unit, sophisticated unit*; b) denoting the peculiarities of work or maintenance, e.g. *coal-fired unit, oil-fired unit*;

Thus, we can draw a conclusion that LSV1 of the noun “unit” has broad combinative features in the AHPP technical area.

The LSV2 of the noun “unit” is as follows “a single thing (as a magnitude or number) that constitutes an undivided”. It has quite high frequency of usage and makes up 18.3% of all occurrences of this word in the AHPP text corpus. The noun “unit” plays a role of a word-substitute in this subject area when it is necessary to avoid repetition of the term naming this device. The analysis of phrases with LSV2 reveals the most frequent implementation of syntactic compatibility models with this LSV, their total percentage makes up 81.1% of all its syntactic phrases. Thus:

– the AN model has a percentage 46.4% of all LSV2 models, e.g. *modern units, each unit, stoker-fired unit, larger units*;

– the NN model possesses 13.0% out of total of the LSV2 models, e.g. *utility units, a process unit, air-craft-derivative units*;

– VN model, percentage 7.2%, e.g. *has kept the unit*;

– NV model, percentage 11.6%, e.g. *units start up, unit provides*;

– the dN model – 10.1% of all LSV2 models, e.g. *this unit, any unit, those units*.

From the given examples it is obvious that substantive and verbal phrases are typical for LSV2 of the noun “unit”. For substantive phrases of the analyzed LSV kernel models with a dependent component generally in preposition are characteristic. At the same time the last can be expressed by: a) a noun – 13% from all LSV2 models; b) an adjective – 14.5%;

c) verbal forms – 17.4%; d) a pronoun – 7.2%; e) a numeral – 7.2%.

A small amount of kernel models of NN and VenN phrases in which the dependent component is expressed by a compound word can be found in the AHPP text corpus in the implementation of LSV2 of the noun “unit”, e.g. *aircraft-derivative units, full-size units, single-column unit; coal-fired units, stoker-fired units, split-range units*.

In analyzing the lexical compatibility of LSV2 of the noun “unit” in the AHPP text corpus it was revealed that the noun “unit” can enter a combination to adjectives, nouns and concrete verbal forms of a certain semantics:

– adjectives: a) having estimated semantics, e.g. *modern, older, quitter*; b) units indicating a certain field of activity, e.g. *industrial units, nuclear units*;

– the nouns designating: a) name of processes, e.g. *utility unit*; b) name of properties and features of a form, e.g. *coal unit, single-column unit, full-size unit*;

– the verbs in different forms expressing: a) name of constructional features, e.g. *peaking unit*; b) features of work, operation and maintenance, e.g. *coal-fired units, stoker-fired units, oil-fired units*.

Although the research shows that LSV2 of the noun “unit” has quite broad combinative possibilities nevertheless they are much more modest in comparison to LSV1 opportunities, and are characterized by a smaller variety of the semantic shades. The distinctive LSV2 sign is also such characteristic as a desemantization (reduction of semantic structure) which is observed in the AHPP text corpus where this LSV is used as a word-substitute, which makes it necessary to use a wider context for determination of its meaning. The use of LSV2 of the noun “unit” in the given specialty texts in substituent function follows directly from its lexical-semantic nature, generalization of its conceptual basis providing the interchangeability in the antecedent expressed earlier by any other lexical unit of this category.

All other LSVs of the noun “unit” are as follows:

LSV3 “number that divides every element of a set of number”;

LSV4 “determinate quantity (as a length, time, heat, value or housing) adopted as a standard of measurement for other quantities of the same kind”;

LSV5 “fractional part of the width of a printing character (as 1/18 of ordering Roman capital M) used in measuring the set of a piece of type and being of the same width for all types of the same point size and proportionally wider or narrower for larger or smaller point size”;

LSV6 “an amount of work used in education in calculating student credits”;

LSV7 “an amount of a biologically active agent to produce a specific result under strictly controlled conditions”;

LSV8 “one percent per ton of a fertilizing ingredient”;

LSV9 “single thing or person or group that is a constituent and isolable member of some inclusive whole; member of an aggregate that is the least part to have clearly definable separate existence and that normally forms a basic element of organization within the aggregate”.

These LSVs do not find the broad usage in the AHPP subject area texts, i.e. the frequency of their occurrence is very low. Therefore here it is difficult to speak about prevalence of any models of distribution or semantic groups of the words which are combined with these LSVs. Nevertheless the authors have made an attempt to definitely classify those grammatical and lexical phrases in which LSV3, LSV4, LSV5, LSV6, LSV7, LSV8 and LSV9 the noun “unit” are used. The most characteristic models for these LSVs are AN and NN indicating the estimated, dimensional and quantitative characteristics or identifying the process, e.g.:

(LSV3) *drive units, reel-to-reel units;*

(LSV4) *microprocessor units, (this) of latter unit, remote unit;*

(LSV5) *generating units, natural-circulation unit;*

(LSV6) *system unit, all units;*

(LSV7) *usable unit, turbidity units;*

(LSV8) *engineering units;*

(LSV9) *commercial units.*

Conclusions.

All above said allows drawing the following conclusions.

1. From all definitions of the noun “unit” recorded in the normative Webster’s dictionary in the AHPP text corpus only two definitions were used with rather

high frequency – LSV1 (46.5% of all occurrences of this word found in the AHPP text corpus) and LSV2 (18.3% of all occurrences of this word in the AHPP text corpus). Other seven definitions were used in texts incidentally, very seldom.

2. The analysis of syntactic compatibility shows that the total of models of compatibility of the noun “unit” makes up 5 units in both LSVs, the most frequent models of compatibility turned out to be: LSV1 in AN model (36.1% of all models used with this meaning) and NN (23.3% of all models with LSV1); in LSV2 also the AN models (46.4% of all LSV2 models) and NN (13.0% of the total of LSV2 models).

3. The results of the study of lexical compatibility show that the noun “unit” both in LSV1 and LSV2 has quite broad combinative possibilities. However in the noun “unit” used with LSV2 they are much more modest in comparison to LSV1 opportunities, and they are also characterized by a smaller variety of semantic shades that perhaps is a consequence of the fact that LSV2 plays a word-substitute role when it is necessary to avoid repetition of the term identifying the device.

4. As for the other seven LSVs which are included into semantic structure of the noun “unit” according to the normative Webster’s dictionary the frequency of their occurrence in the AHPP text corpus is very insignificant, therefore, we can speak about unrepresentative quantitative values of their usage in the texts that is why they can be negligible.

As the AHPP text corpus is not the only one in which the noun “unit” was studied it is planned to consider its functioning in text corpora of other areas relating to scientific and technical discourse in the future with the following comparison of the results of the parallel study carried out.

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