

MORPHOLOGICAL ASPECT IN TRANSLATING THERMODYNAMIC TERMINOLOGY

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Abstract: Several studies on translation have been carried out, namely on the problem of untranslation, translation of terms from various fields, and the formation of target language terms with spelling adjustments. One of them is the field of thermodynamics which is part of the field of Mechanical Engineering, which has many terms borrowed from Dutch and English. Therefore, the researchers are interested in investigating the morphological aspects of the translation of thermodynamic terms using the natural borrowing technique. This study used qualitative research methods. Researchers took terminology data from two books, namely *The Fundamental of Engineering Thermodynamics* and *Fluid Mechanics*. The results showed that the forms of borrowing that occurred were (1) borrowing by adjusting spelling and pronunciation adjustments; (2) borrowing with spelling adjustment without pronunciation adjustment; (3) borrowing without spelling adjustment, but with pronunciation adjustment; (4) adjustments to the spelling of prefixes and bound forms found 15 forms of adjustment; (5) suffix spelling adjustments found 20 forms of adjustment; and (6) a combination of translation and borrowing. In short, morphological aspects in translating thermodynamics terms are very important because they relate to the technique used.

Keywords: translation, fluid mechanic terminology, borrowing techniques, morphological analysis

INTRODUCTION

Translation has an essential role in communication. It is a medium for transferring knowledge or information and connecting people of different languages and cultures. By using it, people can learn and understand each other's language and culture. It does change not only words but also transfers cultural equivalence. Better translations should be accepted by everyone in logic and based on facts; Thus, the message contained in the source language (SL) can satisfy the target language (TL) readers with the information in it (Fitria, 2018).

There are various kinds of writings with English as the source language translated into target languages in various countries, including Indonesia. The translations are various non-academic writings (literature)

and academic writings such as education, science, medicine, history, technology, law, politics, art, religion, business & economics, biographies, autobiographies, etc. (Fitria, 2018).

Many kinds of research in translation have been carried out related to techniques, methods, and translation processes, untranslation problems, translation of terms in various fields, and the formation of target language terms with spelling adjustments. Moreover, the problem of untranslation is a common problem because it is difficult to find the equivalent from the source language to the target language. Hartono (2017) summarizes six factors outside the text that affect the translation results: authors, translators, readership, norms, cultures, and discourse. In several studies that have been done, cultural

factors are the most common factors that cause untranslation. One of the studies has been conducted by Utami (2014). This paper mainly discusses the term culture in Laskar Pelangi, a work by Andrea Hirata (2008), whose English version was published in 2009. Catford (1965: 93) proposes two types of untranslatability, which he calls linguistic and cultural.

The inability of cultural translation is caused by the absence of the target language culture of the relevant situational features for the source-language text. Aspects that may emerge as culture-specific concepts include ecological, social, material, religious, and linguistic culture (Nida, 1969). For example, the word *Tarak* is an example of cultural ecology. Therefore, the translator usually saves more ecological words in the source language. There are words related to plants, which may not be found in the target language such as *pohon gayam*, *pohon santigi*, *kacang jengkol*, *biji rambutan*, *buah aren*, *pohon medang* and *pohon angsana* and etc. There are also some words about the animals in the region: *burung prigantil*, *ular pinang barik*, *batu satam*, *ular manau*, and *burung jalak kerbau*.

Apart from Utami (2014), several researchers discussed the same problem, namely untranslation due to cultural factors, for example, Gunathilaka & Ariyaratne (2019); Apriyani (2020); Wang (2014); and Keshavarzi & Mohammadi (2016). However, the problem of untranslation caused by the translators' factor because they have to translate a field of science has never been done. Therefore, related to this problem, the researcher will examine the dominant factors causing the problem of untranslation, namely the factors of the writer, translator, and the thing being discussed.

Many translation activities for specific fields have been carried out, and it is not easy. Each field has special terms that have no equivalent in the target language. The research that has been done in the translation of terms in various fields has discussed chiefly techniques and methods of translation and assessment of translation quality. One of them was carried out by Handayani (2009). In her research, Handayani discusses four things: translation techniques, translation methods, translation ideology, and translation quality,

which are assessed from three aspects: accuracy, readability, and acceptability.

In discussing the translation method, the researcher relies on V-diagram from Newmark (1988) by using two tendencies: the source language and the target language. Six techniques tend to lead to the source language, namely natural borrowing, pure borrowing, English-Latin borrowing, English-Greek borrowing, calque, and literal translation. In contrast, the other seven techniques lead to the target language, namely transposition, amplification, addition, parenthesis, description, subtraction/omission, and inversion. The tendency of the data towards the source language, the researcher concludes that the translation of medical terms in Clinical Medicine Lecture Notes uses the ideology of foreignization.

In addition to Handayani (2009), several researchers also researched translations from various fields, for example, in the field of mechanical engineering (Fachruddin et al., 2018), law (Biel, 2008), translation of terminology (Nagy, 2014). For example, in mechanical engineering conducted by (Fachruddin et al., 2018), researchers researched translation techniques and translation quality assessment. Therefore, the authors will develop existing research on translation techniques, especially natural borrowing, and analyze the morphologically formed linguistic rules.

One field that has a particular term is the field of thermodynamics. Thermodynamics is the science of energy, specifically discussing the relationship between heat energy and work (Ansyah & Ramadhan, 2018). It is part of the mechanical engineering field widely studied by people worldwide, especially at the university level. Thermodynamics in engineering emphasizes how to convert one energy into another. For example, a car engine converts the chemical energy in the fuel into heat energy, and then it is converted again into motion energy that will drive the wheels of the car. Mechanical engineers use the principles of thermodynamics in heat transfer, thermofluids, and energy conversion. They use it to design engines, power plants, heat, ventilation, HVAC systems, heat exchangers,

heat sinks, radiators, refrigerators, insulation, and more.

This research uses books as the primary data and lists the terms mentioned in the books. The books used are *Fluid Mechanics* (White, 2001) and *the Fundamentals of Engineering Thermodynamics* (Moran & Saphiro, 1987). These two books have been translated into the Indonesian language as *Mekanika Fluida* and *Termodinamika Teknik*.

The translators of these translated books use specific translation techniques to get results commensurate with the source language. However, when they cannot find a suitable translation result, the translation technique that is commonly used is the borrowing technique. Borrowing is a translation technique in which the translator borrows words or expressions from the source language. The loan can be pure (pure borrowing) or naturalized borrowing (naturalized borrowing). An example of pure borrowing is "The magnitude of the difference is called a gage pressure or a vacuum pressure." which translates to "*Besarnya perbedaan tekanan ini disebut sebagai tekanan gage (gage pressure) atau tekanan vakum (vacuum pressure).*" These two translation techniques are one way to avoid untranslatability and enrich new terms in the target language.

In the natural borrowing technique, the translator can adjust the spelling of the source language into the target language. For example, according to the General Guidelines for Forming Terms (2007), translators can adjust the spelling of suffixes from the source language (English) into the target language (Indonesian). For example, the spelling of the suffix -ics in English to -ka in Indonesian is found in the word "mechanics," which translates to "*mekanika*" and "thermodynamics" translates to "*termodinamika*."

It encourages researchers to examine the translation of thermodynamic terms with the borrowing technique of terms to find out the morphological linguistic rules formed from the results of these translations.

RESEARCH METHOD

This research uses a qualitative research design. Bogdan & Biklen (1998) stated that qualitative methodology is a research

procedure that produces descriptive research reports in written or spoken words from people and observable behavior. Miles & Huberman (1984) stated that qualitative research could work with a smaller sample than the total population. In addition, this research took samples of thermodynamic term translation data using natural borrowing translation techniques and then analyzed the morphological formation of linguistic rules.

The research locations are in the Mechanical Engineering study program and the Reference room of UMY Faculty of Engineering, with the object of research being two books in the field of thermodynamics, namely *The Fundamental of Engineering Thermodynamics* (Moran & Saphiro, 1987) and the translated version, namely *Termodinamika Teknik* (Moran & Saphiro, 2004); and *Fluid Mechanics* (White, 2001) and its translated version, namely *Mekanika Fluida* (White, 1986).

In collecting data, the researchers collected the thermodynamics terms contained in reference books, then compared the English terms and the results into Indonesian. The glossary of terms is used as primary data by researchers.

This data collection uses the see method. The listening method is listening to written or spoken language with a note-taking technique. It includes recording, categorizing, and clarifying the data obtained from written sources (Mahsun, 2005). In this case, the researcher categorized the data based on the translation technique used by the translator and only took the data using natural borrowing translation techniques.

Furthermore, to answer the research problem, the researchers analyzed and categorized the data into several categories, namely data with accompanying suffixes and affixes, to find rules that are formed morphologically from the data.

FINDINGS AND DISCUSSION

Borrowing Techniques

In a translation study, Molina and Albir (2002) state that borrowing is a translation technique by borrowing SL words or terms directly into TL. It is used when the translator cannot find the equivalent of the SL in the TL, which is considered equivalent. In addition, it can be done to introduce foreign terms and is

also used if the SL cultural terms are already known and considered familiar to TL readers. It consists of two types, namely pure borrowing and natural borrowing. Pure borrowing, for example, the word *gong*, which translates to "gong," while natural borrowing, for example, *dhumpal*, translates to "dumpal". In pure borrowing, there is no change in the form of SL. For example, the term *gong* in SL is taken directly in TL "*gong*." However, the aspect of material culture embodied in *gong* is only found in SL culture, so TL cannot help but maintain the form of the term "gong" to reduce its meaning in the resulting translation (TL).

Furthermore, in natural borrowing, there is an adjustment to the form of SL in TL by removing the "h" consonant. The pronunciation of the consonant "d" in TL is the same as "dh" in SL. Therefore, the translation of the term *dhumpal* is "dumpal" with a fixed reference to the SL because the pronunciation does not change and only the form changes slightly.

The translation of thermodynamics terms includes many borrowing techniques, both pure borrowing and natural borrowing. The exact equivalent has not been found in the TL. Therefore, the TL can add to the vocabulary taken from the SL loan. The following is examples of the translation of thermodynamic terms using natural borrowing techniques:

Table 1. Examples of natural borrowing

No.	SL	TL
1	<i>Fluid</i>	Fluida
2	<i>Mechanics</i>	Mekanika
3	<i>Geometry</i>	Geometris
4	<i>pipe</i>	Pipa
5	<i>Experiment</i>	Eksperimen

The following are examples of the result of translating thermodynamic field terms using pure borrowing techniques.

Table 2. Examples of pure borrowing

No.	SL	TL
1	<i>gage</i>	Gage
2	<i>vacuum</i>	Vacuum
3	<i>piezoelectric</i>	Piezoelectric
4	<i>sensor</i>	Sensor
5	<i>momentum</i>	Momentum

Morphological Aspect in Translation

Verhaar (1996) states that morphology is a branch of linguistics that identifies the basic units of language as grammatical units, while Samsuri (1988) defines morphology as a branch of linguistics that studies the structure and forms of words. In translating, the morphological aspect is an important part to pay attention to. Words are essential in translation to achieve adequate equivalence (Sriyono, 2018). Armstrong (2005) states that words have an important role because they can move around in a clause or sentence structure. In addition, word construction in English as the source text and Indonesian as the target text can provide different interpretations due to differences in morphological patterns (Sriyono, 2018).

Morphology is an essential aspect of linguistic expertise for translators to learn. Furthermore, morphology and how words are made between the source text and the target text can be investigated in translation studies. The difference in morphological structure between the source text and the target text must be considered when deciding the equivalent required between the two texts. The following are the categories of morphological aspects in translation:

Lexical Category (word class)

Using some words in a sentence requires knowledge of lexical categories in nouns, verbs, and adjectives. There are several ways to help identify the lexical Category of a word. One way is to focus on closely related tenses. In English, "fork" and "forks," "book," and "books" denote parallel patterns of related shapes, and words with parallel forms fall into the same Category as a noun. The words "old," "tall," and "bright" have different patterns. Unlike nouns, "old," "tall," and "bright" have no form associated with -s ("olds," "talls," and "brights"). In contrast, related forms end in -er and -est: "older/oldest", "taller/tallest", "brighter/brightest". They are called adjectives. Finally, words, for example, "jump" and "kick" appear with parallel endings, namely "-ed" as in "jumped" and "kicked," "-ing" as in "jumping" and "kicking," and "-s" as in "jumps" and "kicks." Other words that have this pattern include "laugh," "play," and

"return"—all of which fall into the category of verbs.

In Indonesian, *garpu* and *garpu-garpu*, *buku* and *buku-buku* indicate the plural form of nouns in the repeated tenses. In addition, repeated words are also used in the verb category, such as *jalan-jalan* and *pergi-pergi*. It shows the intensity of an activity. Reduplication is also used for adjective categories, such as *baik-baik* and *cepat-cepat*, which also show intensity. Indonesian only has one form of the verb. In contrast to English which has four forms, namely verb I (e.g., take, go, sleep), verb II (e.g., took, went, slept), verb III (e.g., taken, gone, slept), and verb -ing (e.g., taking, going, sleeping). In Indonesian, every activity at different times still uses the same verb form, for example, "I eat meatballs today.", "I ate meatballs yesterday.", "I will eat meatballs tomorrow." and "I'm eating meatballs now."

From the explanation above, the translation of the thermodynamics terms in noun category is translated as follows:

- 1) ST: Fluid mechanics is the study of fluids, either in motion (fluid dynamics) or at rest (fluid statics), and the subsequent effects of the fluid upon the boundaries, which may be either **solid surfaces** or interfaces with other fluids.

TT: *Mekanika fluida adalah telaah tentang fluida yang bergerak atau diam dan akibatnya yang ditimbulkan oleh fluida tersebut pada batasnya. Batas itu dapat berupa permukaan yang padat atau fluida lain.*

- 2) ST: Since fluid flow is a branch of mechanics, it satisfies a **set of well-documented basic laws**, and thus a great deal of theoretical treatment is available.

TT: *Karena aliran fluida itu merupakan cabang mekanika, ia memenuhi seperangkat asas kekekalan yang telah dikenal dengan baik sehingga penelaahan teoretisnya pun telah banyak dilakukan.*

- 3) ST: Thus most textbooks concentrate on **flat plates, circular pipes, and other accessible geometries**.

TT: *Sehingga kebanyakan buku teks memusatkan pembahasannya pada lempeng datar, pipa bulat, dan bentuk-bentuk geometris lain yang lebih mudah.*

- 4) ST: From the point of view of fluid mechanics, all matter consists of only **two states**, fluid and solid.

TT: *Dari balik kacamata mekanika fluida, semua bahan tampak terdiri atas dua keadaan saja, yakni fluida dan zat padat.*

- 5) ST: A liquid, being composed of relatively **close-packed molecules** with cohesive solid forces, tends to retain its volume and will form a free surface in a gravitational field if confined from above.
- TT: *Karena terdiri dari molekul tetrap-rapat dengan gaya kohesif yang relatif kuat, zat cair cenderung mempertahankan volumenya dan akan membentuk permukaan bebas dalam medan gravitasi, jika tidak tertutup dari atas.*

From the data mentioned above, the writer observes that nouns in the plural form in English are rarely translated into the plural into Indonesian. For example, "surfaces" is translated to "permukaan," "plates" is translated to "lempeng," and pipes" translates to "pipa." These terms are not translated as "permukaan-permukaan," "lempeng-lempeng," and "pipa-pipa." There are examples of data that are translated according to their shape, namely "geometries" into "bentuk-bentuk geometri." Moreover, in the term "two states," the term translates to "dua keadaan."

In addition to noun categories, thermodynamic terms are also found using adjective categories and are always followed as the object being described.

- 6) ST: **Fluid mechanics** is the study of fluids, either in motion (fluid dynamics) or at rest (fluid statics), and the subsequent effects of the fluid upon the boundaries, which may be either solid surfaces or interfaces with other fluids.

TT: **Mekanika fluida** adalah telaah tentang fluida yang bergerak atau diam dan akibatnya yang ditimbulkan oleh fluida tersebut pada batasnya. Batas itu dapat berupa permukaan yang padat atau fluida lain.

- 7) ST: Since **fluid flow** is a branch of mechanics, it satisfies a set of well-documented basic laws, and thus a great deal of theoretical treatment is available.

TT: Karena **aliran fluida** itu merupakan cabang mekanika, ia memenuhi seperangkat asas kekekalan yang telah

dikenal dengan baik sehingga penelaahan teoretisnya pun telah banyak dilakukan.

- 8) ST: *The theory of **turbulent flow** is crude and heavily backed up by experiment (Chap. 6), yet it can be quite serviceable as an engineering estimate.*

TT: Teori **aliran bergolak** adalah sederhana dan disokong kuat oleh eksperimen (Bab 6), namun bisa juga dimanfaatkan dengan cukup baik dalam taksiran-taksiran perekayasaan.

- 9) ST: *From the point of view of fluid mechanics, all matter consists of only two states, fluid and **solid**.*

TT: Dari balik kaca mata mekanika fluida, semua bahan tampak terdiri atas dua keadaan saja, yakni fluida dan **zat padat**.

- 10) ST: *The technical distinction lies with the reaction of the two to an applied shear or **tangential stress**.*

TT: Secara teknis perbedaannya terlatak pada reaksi kedua zat itu terhadap tegangan geser atau **tegangan singgung** yang dialaminya.

In English and Indonesian, adjectives have the same function: explaining the noun form of words, for example, "beautiful girl" "gadis cantik." What is different is the wording. In English, the arrangement is MD (explain-explained), while in Indonesian, the arrangement is DM (explained-explain). Even in terms of thermodynamics, the translation of adjectives from English into Indonesian has the same function, for example, "fluid mechanics" and "fluid flow." The word "fluid" is translated as "fluida" and in that phrase acts as an adjective because it explains the words "mechanics," "mekanika," and "flow" "aliran" becomes "mekanika fluida" and "aliran fluida." There are times when nouns are translated into noun-adjectives. For example, the word "solid" is translated into "zat padat."

Word parts in the form of morphemes

"Girl," "ask," "tall," "uncle," and "orange" are all words that cannot be split down into less meaningful pieces. Most words, on the other hand, have multiple meanings. "Grandmother," "bookshelf," "homemade," "asked," "taller," "oranges," and "uncles" are examples of words with two constituents. These words' meanings or lexical categories have been altered by adding components. Morphemes are the significant parts of a word.

For instance, "grandmother," "bookshelf," "homemade," and "asked." In words like "look," "kite," and "height," most morphemes have a lexical meaning. Others reflect grammatical categories or semantic ideas such as past tense ("-ed" in "looked"), plural ("-s" in "kites"), and degrees of comparison ("-er" in "kites") ("-er" in "taller") (Finegan, 2008, 41).

Certain bound morphemes change the Category of words to which they are attached, as in the underlined parts of these words: "doubtful," "establishment," "darken," "frighten," and "teacher." When added to the noun "doubt," "-ful" lowers the adjective "doubtful." "-ment" is added to the verb "establish," deriving the noun "establishment." The adjective "Dark" has "darken" as a verb, "fright" is a noun, "frighten" is a verb, "teach" is a verb, "teacher" is a noun. In English, derived morphemes tend to be added to the end of words (suffixes) (Finegan, 2008, 42).

There are two morphological processes, namely derivation, and inflection. The derivation is the process of affixing a syllable that changes the class of the word. For example, the affix on the word "sing" becomes "singer." Meanwhile, "sing" is a verb that means to sing. So when it gets the suffix "er," it turns into the noun "singer."

In contrast, inflection is the process of forming a new word by adding an affix to a word that does not change the class of the word. In other words, if a word gets a prefix, suffix, or infix, then the word class of that word is still the same. For example, the word "book" becomes "books." This is because the first "book" is a single book, while "books" is a plural book. However, both "book" and "books" are still the same nouns. Examples of inflections in verbs include the word "study," which changes to "studies," "studied," and "studying." The affix forming the word "study" into several words does not change the word class. They are still a verb.

In Indonesian, we also know the process of derivation and inflection. In Indonesian, we can find, for example, the word "pukul" to "pemukul" and "pemukulan." The affix derivation process results in changes in the meaning and class of words. For example, the word "pukul," which is a verb, turns into a noun when it gets the affix "pe-" becomes "pemukul" and the affix "pe-an" becomes "pemukulan." Examples of inflection in

Indonesian, for example, are the words "*buah*" and "*buah-buahan*." The word "*Buah*" is a singular noun, while "*buah-buahan*" is plural. In this case, reduplication results in new words changing from singular to plural. Therefore, in Indonesian, to show plural nouns, we only need to duplicate the word. For example "*orang*" becomes "*orang-orang*," "*rumah*" becomes "*rumah-rumah*," and so on.

Process of translating thermodynamics terms by using naturalized borrowing technique

According to the General Guidelines for Writing Terms (2005), the translation process is carried out in two ways, namely direct translation, and borrowing. The borrowing process is done by using the naturalized borrowing technique because this process adjusts the form of SL to TL. There are some considerations to translate terminology into Indonesian terms using the borrowing process. Foreign terms that will be borrowed: (1) increase the inter translatability of foreign languages and Indonesian copies given future needs; (2) make it easier for Indonesian readers to understand foreign texts because they are known first; (3) more concise when compared to the Indonesian translation; (4) facilitate the agreement between experts if the equivalent translation has too many synonyms; (5) more suitable and appropriate because it does not contain bad connotations.

Here are the borrowing processes in thermodynamics terms from English to Indonesian:

Prioritizing its visual form

The process of borrowing thermodynamic terms in English by prioritizing its visual form is divided into several processes, such as (1) borrowing by adjusting spelling and pronunciation adjustments. For example, the term "geometry" is translated into "*geometri*" by changing "-y" into "-i," and "constantant" /is translated into "*konstantan*" by changing "c-" into "k-" and omitting "-t" at the end of the word. Those processes are the effort to adjust the spelling and pronunciation with the Indonesian language; (2) borrowing with spelling adjustment without pronunciation adjustment. For example, the term "atmosphere" is translated into "*atmosfer*." "-

phere" has the same pronunciation as "-fer" in Indonesian. Another term is "phase" which is translated into "*fase*." "pha-" has the same pronunciation as "fa-" in the Indonesian language; (3) Borrowing without spelling adjustment, but with pronunciation adjustment, for instance, the term "digital" is translated into "digital" in Indonesian, but they have different pronunciation. In English, "digital" is pronounced into [dɪdʒ.ə.təl] with [dʒ] sound, while in Indonesian, this term is pronounced [dɪɡɪtal] with [g] sound. Another example is the term "gas" which is pronounced [gæs] with [æ] sound, while in Indonesian, it is pronounced [gas] with [a] sound.

Borrowing of affixes and bound forms

The process of borrowing affixes and bound forms of foreign terms in thermodynamic terms is divided into two processes. Those are (1) prefix spelling adjustment and bound form; and (2) suffix spelling adjustment. In the first process, the writers found 15 adjustments which consist of:

- 1) The prefixes "ad-", "ac-", "to" which means "adjacent to", "attached to" are adjusted into "ad-" and "ak". For example, the word "acceleration" becomes "*akselerasi*" with "ac-" adjusted to "ak." In addition, the word "accounting" is translated into "*akunting*" with the adjustment of the prefix "ac-" to "ak-."
- 2) The prefix "aut-", "auto-" which means "alone", "acts alone" did not change. For example, "automobile" is translated into "*automobil*." It is seen that the prefix "auto-" does not change in the target language.
- 3) The prefixes "co-", "com-", "con-" which means "with", "together", "related to" turn into "ko-", "kom-", "kon" in Indonesian. The spelling "c" is pronounced [k]. Therefore, the Indonesian translation adjusts the sound and changes the spelling to "k." For example, the word "computer" translates to "*komputer*" and "cohesive," which translates to "*kohesif*."
- 4) The prefixes "em-", "en-" which means "in," "inside" do not change when translated into Indonesian. For example, the word "empirical" becomes "*empiris*,"

and the word "energy" becomes "*energi*." So the prefixes "em-" and "en-" in the two words do not change in the target language.

- 5) The prefix "ex-," which means "outside," becomes "ex." The prefix "ex-" reads [ex], so the Indonesian translation following the sound becomes [eks]. For example, the word "exact" translates to "*eksak*" and "experiment" translates to "*eksperimen*."
- 6) The prefix "hyper-" which means "above", "over", "super" becomes "*hiper*". It is because, in Indonesian, the vowel [ai] in the prefix "hyper" is changed to sound [i], thus becoming "*hiper*." For example, "hyperbolas" is translated into "*hiperbola*."
- 7) The prefixes "im-," "in-," "il-" which means "no," "in," "into," do not change when translated into Indonesian. For example, the word "*internal*" translates to "internal," and the word "inertia" translates to "*inersia*."
- 8) The prefix "inter-," which means "between," "mutual," does not change in Indonesian. So, for example, the word "interferometer" remains "*interferometer*," and "interpolation" translates to "*interpolasi*."
- 9) The prefix "iso-," which means "same," still translates to "iso." For example, in the word "isothermal," which is translated into "*isotermal*," the prefix "iso" does not change.
- 10) The prefix "para-" which means "beside", "closely related to", "almost" is still translated "para-". For example, the words "parameter" and "paramagnetic" are translated into "*parameter*" and "*paramagnetik*." In the word "paramagnetic," only "-magnetic" changes due to adjustment to "*-magnetik*."
- 11) The prefix "proto-," which means "first," is still translated into "proto," for example, in the word "prototype." This word is translated into Indonesian into "*prototipe*" with the adjustment in the "-type" to "*-tipe*."
- 12) The prefix "pseudo-," "pseud-" which means "false," is still translated into "pseudo-," "pseud." So, for example, the word "pseudoplastic" is translated into "*pseudoplastik*" (*plastik semu*) in Indonesian. However, the part of the

word "-plastic" has changed, which has been adjusted to "*-plastik*."

- 13) The prefix "semi-," which means "half," "a little more," "some" is still translated as "*semi*-." For example, the word "semiconductor" is translated into "*semikonduktor*."
- 14) The prefixes "super-," "sur-" which means "more than," "above" are still translated into "super-," "sur-," for example, the word "supersonic" which is translated into "*supersonik*."
- 15) The prefix "trans-" which means "to/across", "through", "to divert" is still translated into "trans-," for example the words "transport" and "translation" are translated into "*transport*" and "*translasi*". The word "transport" does not change in the target language.

From the 61 adjustments to the spelling of prefixes and bound forms in General Guidelines for Writing Terms (2005), 15 adjustments were found in the books of Engineering Thermodynamics and Fluid Mechanics for terms in the field of thermodynamics. Some of them underwent spelling adjustments, such as the word "computer" being "*komputer*" and "conductive" being "*konduktif*." However, some are not adjusted, such as the word "parameter" becomes "*parameter*" and "translation" becomes "*translasi*." While in the second process, the suffix adjustment, the writers found 20 adjustments which consist of:

- 1) The suffix "-air" (Dutch), "-ary" (English) changes to "-er" in Indonesian. For example, the word "capillary" becomes "*kapiler*."
- 2) The suffix "-al" (English) is still translated into "-al" in Indonesian. For example, the word "digital" is still translated into "*digital*" without any adjustments in the target language.
- 3) The suffix "-ance", "-ence" (English) changes to "-ans", "-ens" in Indonesian, for example the words "resistance" and "inductance" are translated into "*resistans(i)*" and "*induktans(i)*". There is a suffix "-i" in the suffix "ans-" in each of these words. Similarly, the word "capacitance" becomes "*kapasitans(i)*."
- 4) The suffix "-ant" (Dutch, English) changes to "-an" in Indonesian. For example, the

- words "refijerant" and "constant" are translated into "refijeran" and "konstan."
- 5) The suffix "-ar" (English) becomes "-ar," "-er" in Indonesian. For example, the words "molar" and "capillar" are translated into "molar" and "kapilar."
 - 6) The suffix "-atie" (Dutch), "-(a)tion" (English) translates to "-(a)si" in Indonesian. For example, the words "deformation" and "cavitation" are translated into "deformasi" and "kavitasi".
 - 7) The suffixes "-eel," "-aal" (Dutch), "-al" (English) are translated into "-al" in Indonesian. For example, the words "material" and "thermal" are translated into "material" and "termal."
 - 8) The suffix "-fiek" (Dutch), "-fic" (English) changes to "-fik" in Indonesian. For example, the word "specific" is translated to "spesifik."
 - 9) The suffix "-iek" (Dutch), "-ic, -ique" (English) changes to "-ik". For example, "technique" becomes "teknik" and "static" becomes "statik."
 - 10) The suffix "-isch" (Dutch), "-ic, -ical" (English) changes to "-is" in Indonesian. So, for example, the words "mechanical" and "technical" are translated into "mekanis" and "teknis."
 - 11) The suffix "-icle" (English) changes to "-ikel" in Indonesian. For example, the word "particle" translates to "partikel."
 - 12) In Indonesian, the suffix "-ica" (Dutch) and "-ics" (English) change to "-ika" and "-ik". The difference with the previous data, namely the suffix "-ic, -ical" (English) which becomes "-is" in Indonesian is the word class. For words, for example, "mechanics" is different from the word "mechanical." The first is a noun. The second is an adjective. Examples of words with the suffix "-ics" are "kinematics" and "thermodynamics," which translate to "kinematika" and "termodinamika."
 - 13) The suffixes "id, -ide" (English) change to "-id, -ida" in Indonesian. For example, "fluid" translates to "fluida" in Indonesian.
 - 14) The suffix "-isatie" (Dutch), "-ization" (English) changes to "-isasi" in Indonesian. For example, the words "magnetization" and "polarization" are translated into "magnetisasi" and "polarisasi."
 - 15) The suffix "-iteit" (Dutch), "-ity" (English) changes to "-itas" in Indonesian. For example, the words "density" and "capacity" are translated into "densitas" and "kapasitas."
 - 16) The suffix "-lyse" (Dutch), "-lysis" (English) changes to "-lysis" in Indonesian by replacing the letter "y" with "i," for example, in the word "analysis," which translates to "analisis."
 - 17) The suffix "-or" (English) remains "-or" in Indonesian. For example, the words "refrigerator" and "capacitor" are translated into "refrijerator" and "kapasitor."
 - 18) The suffix "-teit" (Dutch), "-ty" (English) changes to "-tas" in Indonesian. It is the same as forming terms with the suffix "-iteit" (Dutch), "-ity" (English) to "-itas". For example, the words "density" and "capacity" are translated into "densitas" and "kapasitas."
 - 19) The suffix "-ter" (Dutch), "-tre" (English) changes to "-ter" in Indonesian. In the global version of English, nowadays, it is more likely to use the "-ter" pattern than "-tre". The word "centre" becomes "center." In the example of using the suffix "-ter", the words "diameter" and "piezometer" are translated the same in Indonesian, namely "diameter" and "piezometer."
 - 20) The suffix "-uur" (Dutch), "-ure" (English) changes to "-ur" in Indonesian. For example, the word "temperature" is translated to "temperatur."

From the 51 adjustments to the spelling of prefixes and bound forms in General Guidelines for Writing Terms (2005), 20 adjustments were found in the books of Engineering Thermodynamics and Fluid Mechanics for terms in the field of thermodynamics.

Combination of translation and borrowing

Some techniques are applied to translate English terms of thermodynamics, such as literal translation, natural borrowing, pure borrowing, transposition, reduction, etc. Based on the previous studies done by Fachruddin et al. (2018), the use of natural borrowing techniques is most often compared to the other techniques with a percentage of 32% as the author applied this technique to translate thermodynamic terms. Usually, the terms are in the form of a phrase, such as "fluid flow" translated into "aliran fluida." The

word "fluid," which is translated into "*fluida*" is a kind of borrowing a word, and the word "flow" means "*aliran*" is translated literally. Other examples are "cohesive force," "hydrostatic behavior," and "gas flow," which are translated into "*gaya kohesif*," "*perilaku hidrostatis*," and "*aliran gas*."

CONCLUSION

Translating thermodynamics terms has almost the same experience when translating various other fields. Therefore, the field of translation today cannot be separated from terminology. However, thermodynamics terms are more familiar absorbed from English. So, the form of absorption of terms is from English into Indonesian. The forms of borrowing that occur are (1) Borrowing by adjusting spelling and pronunciation

adjustments. For example, geometry is translated into "*geometri*." (2) Borrowing with spelling adjustments without pronunciation adjustments, for example, the atmosphere is translated to "*atmosfer*." (3) Borrowing without spelling adjustments, but with pronunciation adjustments, such as gas, which is still translated into "gas." (4) Adjustment of Spelling of Prefixes and Bound Forms found 15 forms of adjustment. (5) Adjustment of Spelling Suffixes found 20 forms of adjustment. And (6) a combination of translation and absorption, for example, "fluid flow," which is the absorption of the word fluid (*fluida*) and the translation of the word flow (*aliran*). Therefore, we can conclude that morphological aspects in translating thermodynamics terms are fundamental because they relate to the technique used.

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