

# Strategies Used in Translation of Scientific Texts to Cope with Lexical Gaps (Case of Biomass Gasification and Pyrolysis Book)

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**Abstract**—Lexical gap in translation is deeply debated during the history of translation studies. Many theories have been put forward to explain the possible strategies of filling lexical gaps. This descriptive study aims to investigate some of these strategies used in the translation of a special technical book, *Biomass Gasification & Pyrolysis (Practical Design and Theory)*, this book was a suitable option, since it has modern topics, some of which have not been discussed or even existed in the target language (Persian). In this study, seventy new terms which have not been employed in Persian (in that field) were selected and examined, the qualitative and quantitative analysis of the words indicated that loan word, loan translation, loanblend were the most prominent strategies to cope with new lexicons; in addition, it also showed that loan translation had the highest rate of usage (68.5%) among other techniques and in scientific contexts it is widely preferred.

**Index Terms**—lexical gap, scientific text, loan word (borrowing), loan translation, loan renditions, loanblend, generic term

## I. INTRODUCTION

Nowadays science and technology are growing fast, new equipment is invented, new phenomena are discovered; consequently, new terms enter languages. As most western countries (and few eastern ones) are pioneers in the technology development, their languages are enriched with new vocabulary, among them, English, which is the international communication language, or lingua franca, has been receiving a wide range of scientific terms. Science did not always flow from the west to east but in the golden Islamic age Middle Ages was the scientific center of the world. The Arabic language was synonymous with learning and science for hundreds years; many scientific terms from Islamic communities were transferred to western languages such as, algebra, the names of the stars, Algorithm etc.

Translation has a major role in the dissemination of science, and definitely this worldwide role for transfer of knowledge cannot be ignored. The translation impacts on science are unlimited; medicine, religious context, philosophy and astronomy and then chemistry were the earlier majors which were rendered (Wright, 1993).

On the other hand the various levels of technology development in countries can create major lexical gaps between source language (SL) and target language (TL), it can be said that the physical environment of a speech community is also involved in creating lexical gaps in the sense that words are made by speakers to refer to objects around us (Al-Ghazali, 2012).

However, globalization and the advent of the internet have increased translation pace; besides, the cultural and scientific concepts always transfer from high developed society to less developed society so that translators have to provide the languages with same equivalents. The term equivalent<sup>1</sup> refers to two or more entities being of equal value, corresponding value, or having same use or function as something else<sup>2</sup> (House, 2009), nevertheless sometimes they are pushed to borrow the exact words.

### A. Lexical Gap

Lexical gaps are instances of lack of direct lexeme in one language while comparing two languages during translation. Bentivogli and Pianta (2000) underlined that a lexical gap occurs whenever a language expresses a concept with a lexical unit whereas another language expresses the same concept with a free combination of words, in other word, language is more flexible and all languages have capabilities to express any experience in corresponding terms (House, 2009).

According to the dictionary of translation (2004) a lexical gap appears “if one word in one language does not have any counterpart in another language” which causes the translator to paraphrase source term. Lyons defined lexical gap as empty places in semantic fields where a language needs to compact some concepts, he also looked at lexical gaps through hierarchical lexical structures and believed lexical gaps are potential but non existing words (Lyons, 1997 p302-304). Darwish (2010, 244P) has suggested that lexical gaps can occur in translation if a same concept is expressed

differently in target and source languages or culture and taxonomy of two languages are not similar. In light of these definitions he presented various strategies such as loan words and calque to overcome this deficiency. Larson (1998) classified lexical equivalents to known and unknown and provide them with some techniques including descriptive phrase, related words, specific generic words, modifying generic word, loan translation and cultural substitutions.

Lexical gap can create a problem for the translator and it is difficult to convey the meaning in the target language (Mollanazar, 2001). This could cause some types of untranslatability based on universal translatability principle; however, we have to know that the lexical gaps in science are not always absolute, sometimes one word is used for in one technical field can also be used in other fields. And some terms are often made of different parts which shows different capabilities of a piece of equipment or a scientific process, so if translators know the stems and descriptions of those terms, they might be able to interpret the concept of whole terms. In fact the scientific term is not formed at once, every word or better say every new thing is constructed gradually using works of predecessors. Nevertheless, all lexical gaps are not relatives; there are some terms which are invented in special fields and it will take time to become popular and common among all experts.

The subject of the book, Biomass Gasification Pyrolysis (Practical Design and Theory), written by Prof. Prabir Basu and published by Elsevier in 2010 is quite new in the world. Biomass is the renewable ancient energy sources, but technology of biomass conversion has recently been made; hence, Persian language, target text, is almost lacking in these concepts. Neither specific dictionary nor technical text book in TL could offer so much help to clarify the meaning; only a limit number of articles, dictionaries of related disciplines, books, and the most obviously the internet sources with useful definition and description in SL language could provide translators with great information for new words.

Dividing texts into three categories, Newmark (1988) put the scientific or academic text into informative group. "Format of informative text is often standard: a textbook, a technical report, an article in newspaper, or a periodical, and a scientific paper (Newmark, 1988)". Every detail in academic text can be significant, so vocabulary has crucial influences and translation should be accurate and awkward. In translation of these terms, several methods were used. These selective methods were discussed by other translators and theoreticians mostly on cultural texts. In fact the subject of the lexical gap in cultural context is more challenging than other fields; Rahimkhani (2013) has reported that most translators could not be successful in tasks of efficiently rendering the Qur'anic allusions in Hafez poetry. Al-Gazalli (2012) believes lexical gaps are more prominent in religious texts than other text-types; while unfortunately less attention has been paid to technical texts which enter new terminology into languages. In this research study the lexical gaps been between two academic texts in two languages, English and Persian (Farsi) have been examined

### B. Persian Language

Persian language, also called Fārsī, member of the Indo-Iranian language family. It is the official language of Iran, modern Persian is most closely related to Middle and Old Persian (Britannica, 2014). Farsi is written in Arabic prescribed form and has many Arabic loanwords. However Persian contacts with other languages such as French, English, and Turkic have resulted in many borrowings.

## II. REVIEW OF LITERATURE

Different research studies were carried out using applicable techniques to grapple with lexical gaps. Li JM (2007) analyzed the lexical gaps in translation of Chinese old medical texts, transliteration was one of the methods he applied. Ghazali (2012) has notified that the lexical gap in religious and cultural context is rather challenging. Shabanirad (2011) worked on procedures of translation of cultural lexical gaps in literary texts, Hosseini Masoum (2013) reported that in advertisement equivalence, translators were interested in loan words and loan translation in order to indicate originality of products. Heidari Tabrizi (2007) has argued and *exemplified* different types of lexical gaps and usage of strategies such as loan blending, loan translation, loan shift, coinage in Persian language. In terms of vocabulary, Bateni (2006) investigated societies contacts leading to language changes and then put forward loan words, loan shift, loan translation, loan rendition and loan blending as different language borrowing approaches in Persian language

Mirzaei (2014) investigated the procedures the EFL students in two intermediate and advanced levels had employed to translate some cultural words, he found that circumlocution (avoiding topics) was widely selected by both groups. Chen discussed different methods of borrowing lexicons from English to Chinese including phonetic transcription, transliteration and loan blend and Zue (2011) believed that contact languages between English and Chinese led to many loan words in Chinese languages. Qibin (2007) concluded that the loan translation is a more appropriate way to transfer new words to the target language in comparison with descriptive forms and loan words. Qihuan (2009) suggested that loan translation is more helpful than equivalent translation in foreign terminology. Bentivogli & Pianta (2000) and Janssen (2004) deal with MultiWordNet model and Multilingual Lexical Database respectively.

This paper will focus on methods of coping with lexical gaps in scientific contexts. In this study we set out to determine what strategies were employed and to what extent they were used in the academic text to fill lexical gaps.

## III. METHODOLOGY

### A. Material

The data were gathered from an academic text, the academic text is a book, the contents of which have not been translated before. Seventy new scientific and technical terms with their translated equivalents were selected; the terms were mostly associated with the names of modern and complicated device and machines. The majority of them have not existed in Persian scientific contexts and some were very new for that field of science. So provision of appropriate target equivalents can help readers or students figure the meanings.

### B. Procedure

To make inference from data, and the elicited and distributed data were listed into one table. Analyzing the equivalents we could point out the type and then frequency of applied equivalents. It is essential to mention that there are a group of expressions which were translated by two strategies. The other important point is that none of the terms were made up of one semantic unit or word, but rather some have consisted of different units to present one process or a modern technology. Therefore, it was decided to omit its classifier repeating in every term and examined only the new components, for instance there were different gasifiers in this book such as fix bed gasifier, side fed gasifier. To determine the type and frequency and classification of equivalents, we first examined the generic classifier (gasifier) exclusively and then specific parts (fix bed, side fed) were separately taken into consideration. To apply the results to a larger text or the book the percent values were scaled up accordingly.

TABLE 1:  
RESULTS OF THE ANALYSIS

Strategies	Loan translation	Loan word	Loan blend	generic terms	Loan rendition	descriptive
frequency	48	11	5	5	3	1
Percentage	68.5%	15.7%	7.1%	7.1%	4.2%	1.4 %

## IV. RESULTS

The results, as shown in table 1, indicate that the loan translation, loan word, loan blend generic terms, loan rendition and descriptive phrase are the techniques employed by translator to tackle with new expressions and terms. From the data in table 1 it is apparent that the loan translation has the highest and descriptive method has the lowest usage. The loan word is the second highest strategy. Loan blend generic terms and loan rendition have less but not necessarily unimportant roles.

To have a widespread view about the aforementioned strategies it is necessary to define, discuss and analyze them with some examples

### A. Calque or Loan Translation

In loan translation or calque, source term is replaced by TL material, in other words “Calque is a special kind of borrowing where SL expression or structure is translated in literal translation” (Vinay&Darbelnet, as cited in Munday 2001). However the precise word to word corresponding is not always possible. According to table 1, the loan translation was the most preferred technique to tackle lexical gaps, the findings of current study are consistent with those of Qibin (2007) and Qihuan (2009). The following terms are examples of loan translation.

#### Example1

Throated (gasifier)      Throatless (gasifier)

The dry-ash (gasifier)      Slagging (gasifier)

Up-fed (gasifier)      Side -fed (gasifier)

Although in all of the above examples, loan translation, itself, has a significant function in both clarifying and defining the meaning of vocabulary, it is fundamental to remember that the loan translation does not always present the complete meaning of terms and may give a general view about concept. Therefore before the selection of TL equivalent it is essential to analyze the components of words different techniques such as description, contrastive pair (Larson, 1998).

When source language has closely related pairs, it will not be very difficult to find components of meaning which distinguish one from another. Sometimes the contrastive pair may help the translator define the best equivalent for those words.

*The throated and throatless are two gasifiers with considerable similarities and one clear structural difference. Also, up-fed and side -fed gasifiers are two reactors whose feeding points are located in various places. The dry-ash and slagging gasifiers are a contrastive pair. Dry ash can be rendered literary (loan translation), but the meaning of slagging in TT (target text) is mainly identified with both the contrastive pair and description of the book itself:*

*....The British Gas/Lurgi consortium developed a moving-bed gasifier that works on the same principle as the dry-ash gasifier, except a much higher temperature(1500–1800 °C) is used in the combustion zone to melt the ash (hence its name, slagging gasifier). Such a high temperature requires a lower steam-to-fuel ratio (~0.58) than that used in dry-ash units. (Basu, 2010, p172).....*

The above definition shows the contrastive component of these gasifiers, (dry ash and melting ash), so *slagging gasifier* was translated as:

Slagging gasifier گازساز خاکستر مذاب (back translation = a melting ash gasifier)

### B. Loan Words

In borrowing, SL word is transferred directly to TL (Vinay and Darbelnet, as cited in Munday 2001). All languages always receive new vocabulary from other languages. While some linguists are against this process, others believe that borrowing, not always, but sometimes, can enrich languages, and it is an inevitable change in the history of human language. Lexical borrowing is obviously the most popular type of languages' exchange (Ghasemi & Sattari 2010). Loan words are new borrowing terms which need to be employed in the target language.

In Persian scientific texts, we have a wide range of borrowed words which have been used since a long time ago such as oxygen, nitrogen, oxide, hydrogen, gas etc. Loan words had been transferred to TL before and are known and adopted by speakers of TL while loan words are almost unknown and sometimes sound weird for TL society. "The concepts of loan words become clearer for people with the constant repetition during the time" (Heidari Tabrizi, 2007)". Loan words are usually transferred to the target language through transliteration (Zhu, 2011) which is defined as words or letters in the characters of another alphabet (Meriam Webster dictionary).

It can be observed that loan words are helpful in identifying terms with similar meaning in the target language. For instance although *decomposition*, *degradation*, *pyrolysis* and *cracking* are processes of breaking molecules or materials into smaller parts, they own different features. From a scientific point of view these differences, even trivial, are significant; therefore, they must acquire proper equivalents.

#### Example 2

Reforming                      رفرمینگ  
Pyrolysis                      پیرولیز

However, it should be noted that for some loan words, TL equivalents have been suggested but they are not welcomed by experts or specialists, as an illustration, pyrolysis has one equivalent (گرمماکافت) in target language which has rarely been applied in academic texts.

### C. Loan Rendition

In this strategy, all parts of a term are not rendered word by word, rather the term will be analyzed and then considering one prominent feature or a special function, new equivalents will be made<sup>2</sup> (Bateni, 2006). Loan rendition sometimes is called approximate loan translation (Gomez, 1997), in other words loan renditions do not match all elements of SL term and the loan rendition is rarely used. (Hogg, black and Burchfield, 2000, p315)

*Stirred tank reactor* is the simplest type of reactor. It is composed of a reactor and a mixer such as a stirrer, a turbine wing or a propeller. So, mixer is a prominent constituent of this reactor, by use of which the TL equivalence has been made.

#### Example 3

Cold quench operation      عملیات سرد کن سریع یا آبی (back translation: instantaneous cooling down operation)  
Stirred tank (reactor)      راکتور همزن دار (back translation: (a reactor) with the mixer)

### D. Loan Blend

Loan blend is a technique in which one part of the model is transliterated while the rest of the term is rendered word by word (Chen, 2013). Loan blend is an approach between loan word and loan translation, or a combination of two aforementioned strategies.

#### Example 4

Plasma gun                      تفنگ پلاسمایی  
Gasifier                          گاز ساز

In above example first part of words (plasma and gas) were loan and borrowed words and the second parts were translated

### E. Generic Term

"Sometimes the source language uses specific terms but the receptor language only has one generic word in that semantic area" (Larson, 1998). In this case, we can use both the generic term and specific term in the form of a modifier to distinguish the meaning of words in TL or provided that the meaning of context does not change, sometimes only generic term can be used.

#### Example 5

Riser                      لوله ی بالا بر (back translation: the hoisting pipe)  
Right-of-way trimming      هرس کردن (only trimming has been translated)

<sup>1</sup> Translated by Author

<sup>2</sup> Translated by Author

Sometimes loan words are employed with classifiers to let the readers gain more information about new words; besides, "It is helpful to use the general classifier term before loan words, so that readers are able to understand the accurate meaning of loan words (Heidari Tabrizi, 2007)". In following example we use both generic and loan words.

#### Example 6

Pyrolyzer تجزیه کننده های پیرولیزی (back translation: pyrolysis decomposer)

Trummel ظرف استوانه ای ترامل (back translation: the cylindrical container of Trummel)

#### F. Descriptive Phrase

It is not expected that target equivalents are to be used in same form of source words. Decoding the meaning of different components of vocabulary, sometimes translators use a phrase or clause as equivalent. "Because many of vocabulary in texts are semantically complex, it will be expected many times a single word will be translated by several words that are a descriptive phrase in target language (Larson, 1998)". However this technique is not able to provide concise equivalents suit to scientific context. Based on table 1, only 1.4 % of strategies are descriptive phrase

#### Example 7

Entertainment فرار ذرات به خارج (back translation: escape of particles to out)

### V. CONCLUSION

Scientific texts involve continually increasing lexis referring to the new discoveries and inventions which are not quickly lexicalized across the world's languages (Al-Ghazali, 2012). Qibin (2007) has reported that loan translation is superior to transliteration and descriptive form and loan translation will play an important role in translation of loan words.

With a brief review of the translation of book and also according to table 1, the readers will find out that SL words were widely translated through the loan translation, other strategies had less but not necessary unimportant roles in constructing TL equivalents. For the Source terms usually have the capability of defining themselves, the loan translation obviously is not only the easiest and best but also the most discretionary option. Nevertheless we should also know that the loan translation does not always provide an acceptable TL equivalent; therefore, before selecting this approach the meaning of terms should be interpreted carefully. In addition, we cannot predict how much these new terms are welcomed and used by experts in other languages.

By and large the world and our lives have always been under the influence of technology; languages along with life style ought to develop, but such development usually does not happen fast, because people first must get acquainted with new concepts; besides, creating new terms requires a strong cultural and linguistic background in every society, moreover it is a time consuming process, consequently sometimes techniques such as loan words and loan translation can serve useful functions.

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