

# Application of Translation in International Exchange of Railway Engineering Technology: A Case Study of China's High Speed Railway

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## ABSTRACT

To meet the requirements and do more relevant research of China's railway industry and technological innovation, this paper starts from characteristics, difficulties as well as strategies and principles involved in railway technical terminology translation based on the English translation version of *China's High Speed Railway*, from the level of translation process and state respectively, and then analyze terminology translation in terms of lettered technical terminology translation, terminology translation of modifiers and translation of complicated technical terminology. The method of railway technical terminology translation is then explored and close relationship between foreign communication of railway engineering technology and translation is revealed. Providing the aim of source text, transliteration and free translation should be combined during the translation process. The final part of this paper is devoted to the solution of problems in terminology translation process railway engineering field. Through this research, it is helpful to widen train thought in railway technical terminology translation.

**Keywords:** *Railway, Technical Terminology, Case Study, Translation Strategies.*

## 1. INTRODUCTION

With the advancement of economic globalization, cultural communication becomes increasingly frequent, facilitating the requirements of different types of translation [1]. Currently, a spurt of progress in China's high-speed multiple units technology has injected new vitality and vigor into the international railway development; hence, the translation of railway technical materials is inseparable for China's railways to be internationalized, particularly for the export of China's railway technology and equipment; a standardized edition of China's railway technical specifications is called for to provide service for those operation and construction personnel in prospective importing countries [2]. Byrne (2006) points out that every year, technical translation could occupy 90% in the total translation output [3]. Engineering English is an important component of However, a glimpse of related literature may detect that the research about Chinese railway engineering translation is far from enough. In fact, it has become a bottleneck which constrains China's railways from going global.

This paper would base its analysis on *China's*

*High-speed Railway*, a book vividly introduces basic high-speed railway knowledge concerning roadbed, high level bridge, propulsion, power supply, and so on. To translate this book needs domain and industry knowledge as well as advanced translation methods. By reviewing railway technical terminology translation and its characteristics, the author induces some methods of technical terminology translation with scientific terms, searching corresponding expressions of the target language. The ultimate goal is to provide references for railway technical translation [4].

## 2. CHARACTERISTICS OF RAILWAY TECHNICAL TERMINOLOGY

Generally, according to the point of view of Fang Mengzhi (2002), railway engineering terminology generally have the following features:

- Accuracy: terminology should reflect the essential characteristics of the conception; singleness, normally one word has one meaning.
- Systematicness: terminology in a specific field should be at a finite hierarchical relationship and

consist of a system together.

- **Simplicity:** terminology should be simple and concise and easy to understand and remember, rational and try to be “as the name suggests”.
- **Stability:** once the term is named, it should not be easily changed. After determination, it also can be derived to new terms from the old terms through the method of forming word or phrase [5].

A list of the basic characteristics of railway engineering terminology is proposed by Wang Weiping (2003) after he analyzes the expression forms of railway engineering English and general and special meanings of linguistic unit, such as strong specializations with new conceptions [6]. Specifically, railway terminology is highly technical, it has abundant professional symbols and nominalizations are widely used. Nominalization makes it possible for verbs, adjectives and other grammatical units to convert into nouns and noun phrases, forming the meaning of verbs and adjectives, and meanwhile, possessing the grammatical functions and meaning of nouns, which is precise, rigorous and objective, meeting the need of objective and exact requirement in railway industry. Besides, research on railway engineering terminology is an interdisciplinary subject across fields. With the unceasing progress of science and technology in railway, while retaining the original vocabulary, railway science and technology terms continue to absorb new vocabularies in new fields, and the phenomenon of new translation of old words emerges too. Thus, railway technical terms are characteristic of being old but new.

### **3. DIFFICULTIES IN TRANSLATING RAILWAY TECHNICAL TERMINOLOGY**

Firstly, from the level of translation process, Mary Snell-Hornby (2001) points out that the more professional and more pragmatical the text is, and the more simplified and more specific the scenes involved in, the easier it is to determine the aims and functions of the translation [7]. The railway technical specification is of professionalism and pragmaticism, and with a relatively simpler scene. During the process of railway translation, the purposes and functions will be laid more emphasis, always with the target language readers' understanding and application of the translation as core. Furthermore, it demands higher accuracy and fluency. On one hand, translators shall be committed to defining the basic unit of translation of railway technical specifications to ensure the unity of “key information” in the translation process. On the other hand, it is imperative to follow the criteria of target language.

Secondly, from the level of state, there are two main difficulties lies ahead in terms of translating railway technical terminology:

- 1) Being Featured with High Professional Technical

#### **Requirements**

The railway technical specification is of professionalism and pragmaticism and with a relatively simpler scene. In doing translation, the purposes and functions would be focused, always with the target language reader's understanding and use of the translation as core. As a result, the language criterion of the target language plays a more important role in the translation process than common translation, thus demanding higher accuracy and fluency. On one hand, translators shall be committed to defining the basic unit of translation of railway technical specifications to ensure the unity of “key information” in the translation process. On the other hand, it is imperative to follow the criteria of target language.

#### **2) Having Difficulty in Railway-translation Talents Cultivation**

People engaged in standard translation come from all walks of life with different professional backgrounds, work experiences, and professional knowledge: Some major in language learning, and others major in professional technology. Although those major in languages with comparatively good command of English, their inefficiency in professional knowledge of railway engineering adds difficulty to their understanding of source text. And for those working in railway engineering, their English is relatively poor and are not competent in translation. As a result, neither of the translations of these two groups is satisfactory. Therefore, it is the key to guarantee the quality of standard translation to integrate railway professional technical knowledge with English translation skills in translating of railway standard [8].

### **4. TRANSLATION STRATEGIES AND PRINCIPLES OF RAILWAY TECHNICAL TERMINOLOGY**

In terms of translation process, scientific and technological content is particular focused on rigorous logic, compacted ideas and accurate conceptions. It is the vividness of language, usually the secondary consideration, which causes obstacles for its translators and target readers. To solve this problem, strategy of free translation is usually applied. Transformation involved in free translation is deeper than transliteration, which usually does some adjustments on level of language and constituent elements of dialogue. To apply which kind of translation strategy depends on the objective, target, discourse category and some other factors, translators should first understand original text thoroughly, and meanwhile have a particular logical thinking ability. Complete transliteration or free translation should be avoided in translation. According to the aim of source text, transliteration and free translation should be combined.

From the quality requirements and management methods of translation promulgated by the state over the years, it is not difficult to tell that on the one hand, the translation of technical specifications shall follow the original text faithfully and interpret the original information completely and accurately, on the other hand, it must conform to the language specifications and expression habits of the target language. The two aspects are the core principles to be followed when evaluating the translation of railway technical specifications in China.

For terms with internationally common expressions, try to use common expressions and avoid making up words. The self-made words not only reflect the professional level of the translators, but also affect international communication. A unified style should be formed in the same translation system. For terms with Chinese characteristics, self-made words are allowed in accordance with the expression habits of English. In the meantime, certain terms need to be determined in accordance to the actual situation of projects. In addition, attentions should be paid to distinguish minor differences of similar words in railway engineering when determining terms.

**5. CASE STUDY**

From the quality requirements and management methods of translation promulgated by the state over years, a conclusion might be drawn that translation of technical specifications must follow the original text faithfully and interpret the original information completely and accurately. Moreover, Moghadam and Far (2015) points out that equivalence plays an important role in technical terminology translation [9]. And it ought to conform to the language specifications and expression habits of the target language. In the following part, the author will first discuss the classification of railway technical terms and then conclude appropriate translation strategies.

**5.1. Lettered Technical Terminology Translation**

With deepening of reform and opening up, a great many of new phases and technical terms are constantly flowing over into China; thereby, new form of language has come into being. Lettered words, for example, is the product of such internationalization [10].

**5.1.1. Pure Lettered Technical Terminology**

There are plenty of technical terms specific in the domain of railway engineering, and some technical terms are, idiomatically, presented directly in English, mostly in the form of acronyms, which can be straightly back to English in zero translation. Qiu Maoru (2001) points out that zero translation means no translation at all [11]. Take some CTCS-3 systems and air brake systems for instance:

**Table 1.** Pure lettered technical terminology [12]

	ST	TT
CTCS-3 Systems	车载安全计算机	VC
	轨道电路信息接收	TCR
	人机界面	DMI
	列控中心	TCC
	无线闭塞中心	RBC
	临时限速服务器	TSR
Air Brake Systems	停放制动控制阀	PVB
	防滑排风阀	DV
	紧急制动电磁阀	EBV

In order to handle with the problem arisen from the professional railway technical terms, the author adopts zero translation to compensate for the deficiency of other methods and ensure the accuracy of translation. The application of zero translation is a convenient form of communication in the railway engineering industry. Those foreign words are directly taken into the Chinese characters; they can be straightly brought back to English without being translated. They are translated into English terms through zero translation.

**5.1.2. Technical Terminology Consisting of Alphabets in Chinese**

Some railway technical terms contain alphabets, most of which symbolize images or certain concepts. In most cases, we should keep the letters intact in that such image-meaning or shape-meaning translation makes it more understandable and accurate.

**Table 2.** Technical terminology consisting of alphabets in Chinese [12]

ST	TT
V 形钢构拱组合桥	V-Shaped Pier Rigid-Frame and Arch Combined Bridge
U 形垫圈	U-shaped washer
CA 砂浆垫层	CA Mortar
P 波/S 波	P Wave/ S Wave

The first two terms of “V 形钢构拱组合桥” and “U 形垫圈” in Chinese with an obvious hidden meaning have the capitalized English letter of “V” and “U” which is still maintained in their English translations. And the term of “CA 砂浆垫层” is translated into “CA Mortar” because it is the idiomatic expression in railway engineering and it is the acronym of cement asphalt mortar (乳化沥青水泥砂浆).

As a result, in translation of the Chinese technical terms which include capitalized English letters, such letters are usually kept in their translations. And for the Chinese expressions with an obvious connection between “the letter” and meaning of the phrase, if the capitalized letters similar to the geometric shape carried by the Chinese character could be found in English, it

should be considered to keep those English letters in translation, for those letters will make the translation more idiomatic and concise; on the contrary, corresponding expressions in English should be understood with the accuracy explained in translation principles taken into consideration.

In the railway professional terminology, aiming to be more concise and standardized, some acronyms are often defaulted. These acronyms are usually defined during the first translation, and after many technical exchanges and project practices, they are gradually recognized by the entire railway industry.

**5.2. Terminology Translation of Modifiers**

The China’s High Speed Railway is an informative and technical book. Modifiers are frequently used to express accurate meanings. Modifiers will make the statement concise and rigorous. On the contrary, lack of modifiers will cause conceptual obscurity and theoretical misunderstanding [13].

**5.2.1. Terminology Translation of “Noun+Noun” Structure**

Some railway technical terms in the source text are made up of two or more nouns with the form of “attributives + head nouns”. It is a quite common phrase structure in Chinese phrases.

**Table 3.** Terminology translation of “noun+noun” structure [12]

ST	TT
轨道板	rail slab
信号机	signaling light
公里标	kilometer post
单相工频	single-phase industrial frequency

Looking up for the correct translation based on the correct understanding of phrases is also necessary in that the original meaning of the terms and the pre-translation knowledge are of great importance to a translator. The terms in Chinese can be regarded as the ones constructed of two parts of nouns such as “轨道” + “板”，“信号” + “机”，“公里” + “标” 和 “单相” + “工频”. And their translation versions in English are composed of nouns combined in the same sequence as those in Chinese, which offers a new thinking method that the translation of Chinese terms of “attribute+noun” structure into the same word structure in English could be taken into consideration.

**5.2.2. Terminology Translation of “Adjective+Noun” Structure**

In the source text, the railway technical terms in Chinese with a structure of “adjective + noun” also take up a large part of nouns phrases. Such terms are typical

ones in such technical text, and some are listed as follows.

**Table 4.** Terminology translation of “adjective+noun” structure [12]

ST	TT
高速道岔	High Speed Railway Turnout
无缝钢轨	seamless rail
硬路肩	hard shoulder
正馈线	positive feeder
应答器	transponder

Those terms in Chinese are constructed of two parts with the latter nouns modified by the former adjectives. And in most cases, the Chinese adjectives are translated into the words of the same of speech in English and the latter Chinese nouns are translated into the nouns or noun phrases in English, such as “无缝” translated into “seamless” and “钢轨” into “rail”; “硬” translated into “hard” and “路肩” into “shoulder”; “正馈” translated into “positive” and “线” into “feeder”; The translation method, hence, concentrating on the division of the two parts, namely, the two words consist of the phrase of the railway technical term, the search for equivalent English expression for each part, and the combination of each part’s translation in the same order as the term in Chinese.

**5.2.3. Terminology Translation of “Verb+Noun” Structure**

For the Chinese technical terms constructed of a verb and a noun, the action delivered by the former verb is usually aimed to reflect the state, characteristics or function of the concept designated by the latter noun, or is applied as a way or method for the construction or formation of the object designated by the noun. Translation versions of such terms are quite flexible and very different, which requires the translator to search for the most accurate and idiomatic corresponding expressions in English. The functions of the actions designated by the verbs can be divided into such following groups:

**Table 5.** Terminology translation of “verb+noun” structure [12]

ST	TT
制梁场	beam fabricating yard
分路器	demultiplexer
转辙机	Point Machine
逆变器	inverter

For the railway technical terms in Chinese, the former part, namely, the verb is usually used to describe the state of the latter object modified by the noun, and initiative structure often exists between two parts. For

instance, “制梁” means “制作梁体” in Chinese which then implies a verb between “梁体” and “场” to be applied. The translation, hence, can bring out the initiative meaning by adopting the past participle of the word “fabricating” as the modifier for the noun “yard” which is more understandable and idiomatic

### 5.3. Translation of Complicated Technical Terminology

The technical terms of complicated technical terms refer to those phrases consist of three or more words, bearing a much more complicated structure with a great many of modifiers which are difficult to analyze and figure out their scientific meanings. Some typical examples are listed as follows.

**Table 6.** Translation of complicated technical terminology [12]

ST	TT
无砟轨道板精调	Ballastless Track Slab Fine Adjustment
纵连板式无砟轨道	Longitudinally Connected Ballastless Track
轨道板钢筋绑扎	rail slab Reinforcing steel Binding
三臂凿岩台车	three- armed drill jumbo
三相异步交流电动机	three-phase asynchronous motor
水泥粉煤灰碎石桩	Cement Fly-ash Gravel

As shown above, these complicated terms usually contain multiple words and ample meanings, combined together to form complex phrases. And the complicated terms can also be regarded as the ones composed of sub phrases. Consequently, the author tries to understand the meaning of the phrases by resorting to different materials firstly. And then the author could divide each complicated term into sub phrases based on their meanings and the logical relationship between each sub phrase. And then, the author also needs to select the key word of the term which is usually a noun or noun phrase. It is essential to determine the central part because it will be placed at the beginning of the translation of the larger phrase. Finally, the equivalent expressions to sub phrases should be found out by the translator and combined in accordance with the logical relationship of railway engineering and grammatical rules of source language. In this method, the translation could be concise and idiomatic.

Take “水泥粉煤灰碎石桩” for instance. By searching for relevant information, the author has understand the meaning and the logical relationship between each sub phrase, so it can be divided as “水泥/粉煤灰/碎石/桩”, and a coordinating relationship exists between “水泥”, “粉煤灰” and “碎石”, and they jointly compound of “桩”. Therefore, the “桩” is determined as the central part. And the author is also required to find out the corresponding expression for

each part, with “水泥” translated into “cement”, “粉煤灰” into “fly-ash” and “碎石” into “gravel”. Finally, because “水泥粉煤灰碎石桩” is made up of “cement”, “fly-ash” and “gravel” with water mixing, so “桩” is just a kind of physical condition and need not to be translated. The whole larger phrase can be translated as “Cement Fly-ash Gravel”.

And other complicated terms can also follow such translation rules. “纵连板式无砟轨道” can be divided as “纵连板式/无砟/轨道”. There is a subordination relationship between the three parts, and the central noun is “轨道” with “无砟” identifying the design and materials of rail track. Hence, the whole phrase is translated as “Longitudinally Connected Ballastless Track”; “三相异步交流电动机” can be divided as “三相/异步交流/电动机”. The sub phrase “三相” and “异步交流” both modify “电动机”, presenting the operating principle of this kind of motor. Thus, the term could be translated as “three-phase asynchronous motor”.

For the technical terms of words, the translation strategies is first to look up the words in online dictionaries for their corresponding translations, and then to repeatedly check the translations by trying to utilize the relevant engine and some term bases to search for the most idiomatic, concise and scientific ones. The Chinese terms of “adjective+noun” and “noun+noun” structures are often translated into railway technical terms in English of the same word structures, but terms of “verb+noun” structure could be translated much more flexible. Finally, in terms of complicated phrases, the translation process might be much more difficult but there are still some translation strategies and methods to solve the problem which include phrases division based on the understanding of its meaning and the logical relationship between each words, the determination of its central nouns or noun phrases, and the search for corresponding phrases and expressions in target languages for each part as well as the combination of all parts conforming to English grammatical rules.

## 6. CONCLUSION

Nowadays, with the economic prosperity and increasing importance of railway engineering exchanges with foreign countries, the translation quality of railway technical materials affects not only the implementation and operation efficiency of project, but also China’s right of speech in all fields in the world. The language norms of technical translation represent the process of standardization and internationalization of China’s railways. Inaccurate translation of a foreign language and translation in pieces will cause difficulties in understanding and cause barriers in communication, and even cause misapprehension. Therefore, when translating Chinese railway technical specifications, it is necessary to be accurate and follow the language

criterion of the target language. Basic translation theories and skills should be grasped and assistant translation tools should also be learned appropriately. As a translator in new century, it is necessary to foster the ability of applying assistant translation tools and combine the translation theories to guide our practice so as to enhance the translation efficiency and quality.

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