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安徽工程大学

Anhui Polytechnic University

# 硕士学位论文

题 目 《车辆工程基本原理与先进理念》

(第一章) 英汉翻译实践报告

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专业学位类别 翻译硕士

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**A Report on the E-C Translation Practice**  
**of Basic Fundamentals to Advanced Concepts**  
**of Automobile Engineering (Chapter1)**

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**A Report on the E-C Translation Practice of *Basic  
Fundamentals to Advanced Concepts of Automobile  
Engineering* (Chapter 1)**

**Han Xiang**

**A thesis submitted in conformity with the requirements  
For the degree of Master of  
Translation and Interpreting  
In English Translation**

**Supervised by Associate Prof. Yang Huiyong**

**School of Foreign Studies**

**Anhui Polytechnic University**

**Wuhu**

**May 2024**

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## **Acknowledgments**

As the translator approaches the conclusion of her postgraduate journey, she finds herself both emotional and immensely gratified by the wealth of gains and personal growth accumulated over the past three years. She firmly believes that her progress and accomplishments are a testament to not only her diligent efforts but also the invaluable help and support extended by numerous individuals.

Foremost in her gratitude is her esteemed supervisor, Professor Yang, whose profound knowledge and meticulous guidance have profoundly impacted her. Each insightful comment and thoughtful concern have left a lasting impression on the translator. Professor Yang's academic guidance is complemented by his compassionate care and constant encouragement, which have been invaluable in her personal and professional growth.

The translator is deeply appreciative of the original book's author for his contribution to her translation practice report. His vast knowledge in the field of automotive engineering has been instrumental in her learning and understanding.

She is also profoundly grateful to her parents for their unwavering dedication and support. Coming from a modest background, they have consistently strived to cater to her academic needs, ensuring that she is equipped to pursue her ambitions. Their love and sacrifice are a source of immense gratitude and inspiration.

As she bids farewell to her student life, the translator hopes to carry forward the enthusiasm for learning and positivity that have characterized her journey. She aspires to continue refining and enhancing herself, ensuring that the lessons learned during her postgraduate experience are a driving force in her future endeavors.

## 摘 要

本次翻译实践原文选自帕布 TL (Prahbu TL) 所著的《车辆工程基本原理与先进理念》(*Basic Fundamentals to Advanced Concepts of Automobile Engineering*) 第一章。车辆工程作为科技竞争、经济结构优化及交通强国建设的关键领域, 对国家经济发展意义重大。为助力车辆工程翻译研究, 笔者选取第一章为源文本。本章主要阐述车辆系统的工作原理。源文本语言客观专业、逻辑性强, 旨在传递事实、信息、知识及观点。根据凯瑟琳娜·赖斯的文本类型理论, 该文本属于信息型文本。因而, 确保译文忠实性、连贯性、读者友好性是本次翻译实践报告的重点。在翻译过程中, 笔者遵循了严复提出的“信、达、雅”标准, 确保译文忠实、通顺、简洁。

在翻译过程中, 译者遇到的重难点包括词义标准化确定、句子结构转换、文章逻辑表达三个方面。信息型文本中的技术词与专有名词词义难以确定, 需要结合语境、对比分析平行文本、请教专家、浏览学术网站等, 可采用增译法、移译法与音译法。在翻译长难句时, 需充分考虑英汉语言之间的差异, 并合理地对英文中的被动语态进行转换, 如译为汉语主动句或汉语无主句。同时, 还需对修饰词, 如定语、状语进行适当移动和调整。此外, 篇章连贯也不可能忽视。可以通过省略多余信息、显化翻译逻辑, 确保读者理解和接受。

此次翻译实践暴露了笔者的诸多不足。源文本中的数学和物理知识理解困难, 中英文思维差异导致译文可能不够精确。但笔者也深入

学习了车辆工程知识，提升了翻译能力，笔者希望此次翻译实践可以为同类型文本的翻译提供有益的参考。

**关键词：**《车辆工程基本原理与先进理念》；信息型文本；句子结构转换；篇章连贯；翻译逻辑

## Abstract

The source text is selected from the first chapter of *Basic Fundamentals to Advanced Concepts of Automobile Engineering* by Prahbu TL. This book has been published by Nestfame Creations Private Limited in 2021. Automobile engineering is important for the development of national economy as a crucial field in technological competition, economic structural optimization and the construction of a country with strong transportation network. To contribute to the translation research in automobile engineering, the translator has selected the chapter 1 as the source text, which introduces the working principles of systems. The source text has objective and professional expressions and a strong logic, aiming to convey facts, information, knowledge, and opinions. According to Katharina Reiss's theory, the source text is an informative text. Therefore, ensuring the faithfulness and the coherence of the source text and achieving reader-friendliness are the key points of this translation practice report. During the translation process, the translator followed Yan Fu's criteria of "faithfulness, expressiveness, and elegance". The target text must be accurate, coherent, and concise.

In this translation practice, the difficulties of translation include determination of word meaning standardization , transformation of sentence structure, and representation of text cohesion. The meanings of technical words and proper nouns in this informative text are difficult to

determine, so it is necessary to combine the context, compare and analyze parallel texts, consult experts, browse academic websites, etc. The translator has also adopted addition, transference and transliteration. When translating long and difficult sentences, it is necessary to fully consider to the differences between the English and Chinese, and reasonably convert English passive sentences into Chinese active sentences or non-subjects sentences. At the same time, the modifiers, such as attributes and adverbials need to be moved and adjusted appropriately. In addition, text cohesion cannot be ignored. It is necessary to omit extraneous contents and express text logic for readers' understanding and acceptance.

This translation practice has uncovered numerous shortcomings. Understanding the mathematical and physical concepts in the source text proved challenging, and the differences in Chinese and English thinking patterns may have resulted in inaccuracies in the target text. Nevertheless, it has also provided an opportunity for the translator to delve deeply into the knowledge of automobile engineering and enhance translation skills. The translator hopes that this translation practice will serve as a valuable resource for the translation of similar texts in the future.

**Key Words:** *Basic Fundamentals to Advanced Concepts of Automobile Engineering*; informative text; sentence structure

transformation; text cohesion; the text logic

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## **Chapter 1 Translation Task Introduction**

### **1.1 Description of the Task**

The translation practice is an excerpt from the book "*Basic Fundamentals to Advanced Concepts of Automobile Engineering*" by Prahbu TL. The book was published by the Nestfame Creations Private Limited in 2021. No Chinese translation has been published yet. The book is an introduction of automobile engineering. As the quality and quantity of China's automobile imports and exports continue to improve, coupled with the rising demand for new energy vehicles in international markets, the field of automobile engineering has garnered increasing recognition and attention. Consequently, numerous reports and publications pertaining to automotive engineering have emerged, leading to a substantial surge in demand for these resources.

The chapter 1 is selected as the source text. There are 8,751 words in the source text and 10,958 words in the target text, which meets the word count requirements for a Master's thesis in Translation Studies.

### **1.2 Introduction of the Source Text**

This book spans 11 chapters, totaling 1,377 pages. Chapter 1 lays the foundation for automobile engineering, while Chapter 2 delves into advanced concepts within the field. Chapter 3 explores the constructional features of IC engines, two-stroke cycle diesel engines, and their respective advantages and disadvantages. Chapter 4 introduces hybrid electric vehicles. Chapter 5 focuses on automotive transmissions, including clutches, clutch construction, and flywheels. Chapter 6 primarily discusses vehicle dynamics. Chapter 7 provides an overview of IC engine performance. Chapter

8 introduces various types of automotive fuels and lubricants. Chapter 9 traces the history and working principles of automotive electrical and electronic systems. Chapter 10 introduces the concept of urban transportation systems, their evolution, and their impact. Lastly, Chapter 11 analyzes the characteristics of vehicle design data.

For this translation practice, the translator select Chapter 1 as the source text. This section introduces the essence of automobile engineering and elaborates on related knowledge, including ABS (Anti-lock Braking System), CRDI (Common Rail Direct Injection), and DTSI (Digital Twin Spark Ignition System).

### **1.3 Significance of the Task**

At the national level, the translation of automobile engineering texts plays a crucial role in fostering the development of domestic automobiles. Through this translation practice, the translator aims to assist domestic engineers in gaining insights into the current research status of related fields overseas, facilitate research and development in corresponding domestic fields, and ultimately contribute to the advancement of domestic automobile engineering in the future.

At the local level, there are numerous automobile engineering graduates in Anhui Province every year, who may encounter difficulties in reading English literature. The translator hopes that this translation practice can assist them in better analyzing related problems and contribute to the cultivation of high-quality automobile engineering talents in Anhui Province.

At the personal level, through this practice, the translator not only can gain valuable knowledge in automobile engineering but also can enhance her translation skills and theoretical application abilities.

## Chapter 2 Pre-translation Preparations

Translation is a complex process, and preparations before translation is the first and most important step. Before starting a translation practice, several preparatory steps need to be taken to guarantee a successful outcome. Here are some essential preparations:

### 2.1 Analysis of the Source Text Type

Reiss K, a representative of the German functionalist school, classifies texts into three main types: informative text, expressive text and operative text (Reiss&Rhodes, 2004:26). Informative text primarily focuses on the content of the information transfer and the effect of the communication. The source text belongs to the category of informative text, which is highly specialized and often contains a significant amount of specialized knowledge in automotive engineering.

Therefore, when translating such texts, the translator need to be aware of the principles and standards of translation. Yan Fu summarizes the criteria of "faithfulness, clarity, and fluency" in his practical experience of translation, and the translator believes that these three principles can be referenced when translating this informative text.

First, accuracy is of paramount importance in the informative text, as any slight inaccuracy may have serious consequences. The content of the source text must be conveyed precisely so that readers can fully understand the relevant information and apply it in practice. Yan Fu places "faithfulness" at the forefront of the three principles and defines it clearly, emphasizing that the translation must be faithful to the original text. Therefore, the translator should adhere to the principle of "faithfulness", ensuring that the source text is accurately understood, the relevant concepts are expressed precisely, and any potential translation errors are avoided.

When translating this informative text, due to the differences between the source

language and the target language, the translator has to make syntactic adjustments in the target text to make it reader-friendly. In this case, the translator should follow the principle of "expressiveness", which means that the translation should be smooth, fluent, easy to understand, and conform to the grammatical and idiomatic requirements of Chinese. This involves ensuring that the translation is grammatically correct, logically coherent, and culturally appropriate for the target audience. Avoiding ungrammatical and incoherent expressions is crucial to achieving clarity in the translation.

The "elegance" in scientific and technical translation is often interpreted as "conciseness". The language of this informative text is direct, objective, and concise. Therefore, the translator should follow the principle of "elegance", which means that the target text should be as short and succinct as possible, avoiding redundant words and unnecessary repetitions.

## **2.2 Collection of Parallel Texts**

In translation practice, parallel texts refer to reference materials that closely match the content and style of the source text. The translator can improve the target text by referring to corresponding expressions and terminology in the parallel texts, thus enhancing the accuracy and fluency of the translation. Therefore, it is important for translators to collect and analyze parallel texts.

Determine the direction of the search: The first step is to identify the type and field of the parallel texts that would be most relevant. In this case, the translator can search for parallel texts in the field of automobile engineering, which matches the specialized content of the source text.

Select keywords: Browse the source text and select the keywords that express the central topic. The translator can select "automobile engineering", "ABS" and so on.

Use a search engine: Enter keywords into a search engine to find information in the relevant field. The translator can use some search engines, such as Baidu, Google,

etc.

Find official websites: If the source text relates to a specific field, the translator can visit the official websites of the relevant field to see if there are corresponding parallel texts. The translator can look up the official websites of automobile engineering in foreign countries.

Use online dictionaries: Online dictionaries contain a large number of parallel texts. The translator can enter keywords into online dictionaries such as Yuda Dictionary, Oulu Dictionary, Collins English Dictionary, and Longman Dictionary to find relevant sentences.

Remember, the goal is to find parallel texts that are as close as possible to the source text in content, terminology, and style. This will ensure that the target text is accurate, fluent, and appropriate for the target readers.

## 2.3 Preparation of Glossary

The importance of a glossary in translation cannot be overstated, especially when dealing with long and complex sentences filled with technical words, such as "Windshield Washer", "Anti-Lock Braking System", etc.

Without a pre-prepared glossary, the translator may face difficulties in understanding the source text and capturing the intended information accurately. To ensure consistent translation of repeated words or phrases, the translator can compile a glossary by collecting and analyzing parallel texts, consulting experts, browsing academic websites, and utilizing dictionaries.

Here's an updated version of the example glossary (Table-1):

| Source language     | Target language |
|---------------------|-----------------|
| pole wheel          | 棘轮              |
| wheel hub           | 轮毂              |
| quick release valve | 快放阀             |

|              |     |
|--------------|-----|
| relay valve  | 中继阀 |
| idling speed | 怠速  |
| over boost   | 超增压 |

Table-1

## 2.4 Application of Translation Tools

The use of auxiliary tools, which usually can be divided into two categories: paper tools and electronic tools, can usually improve the accuracy of the target text.

As the text contains many technical words, "*The Complete Glossary of Automobile Engineering Terms*" and "*The Standard Dictionaries of Science and Technical Terms*" are selected as paper-based translation aids and DeepL, ChatGPT, MemoQ translation software and related websites are selected as electronic translation aids.

The MemoQ translation software is used for preliminary translation.

Firstly, the translator can import the untranslated file into MemoQ (Table-2), and secondly, create translation memories and termbases. Having completed these steps, the translator then can access the main page, double-click on the document, and enter the translation interface to carry out the translation (Table-3).

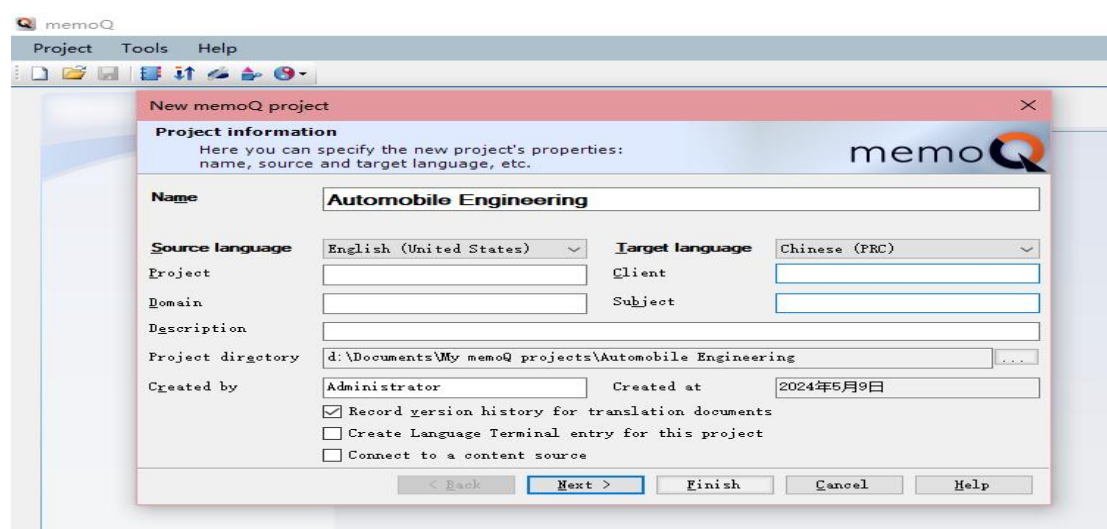


Table-2

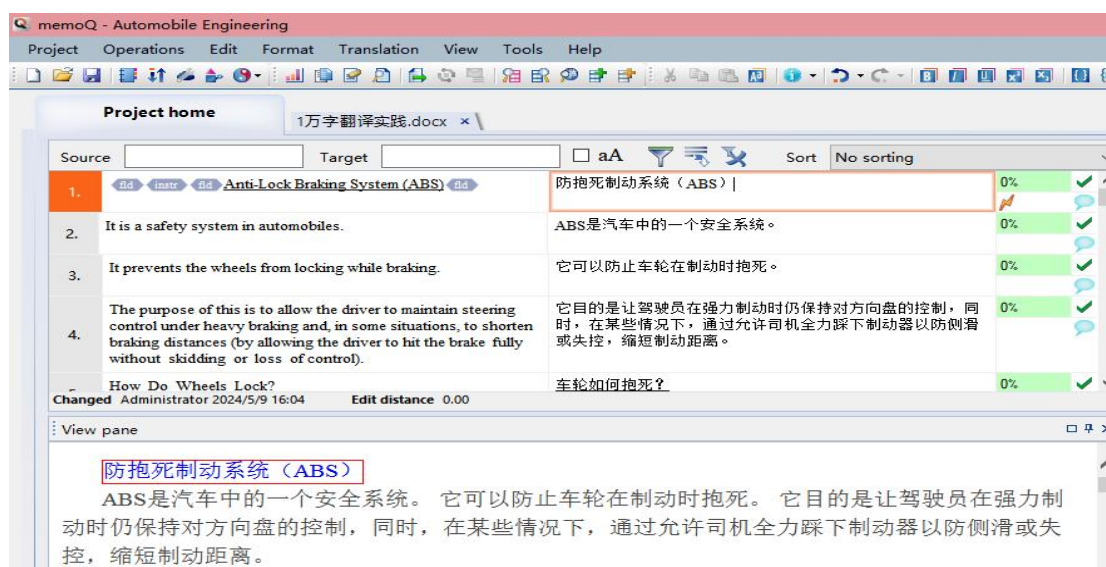


Table-3

As the source text is an informative text, the translator leverages ChatGPT extensively as a translation aid. In terms of technical words, ChatGPT(Table-4) can make use of its massive corpus to provide information for the translator's reference. In terms of discourse, ChatGPT(Table-5) can imitate the style of the source text to embellish the target text.

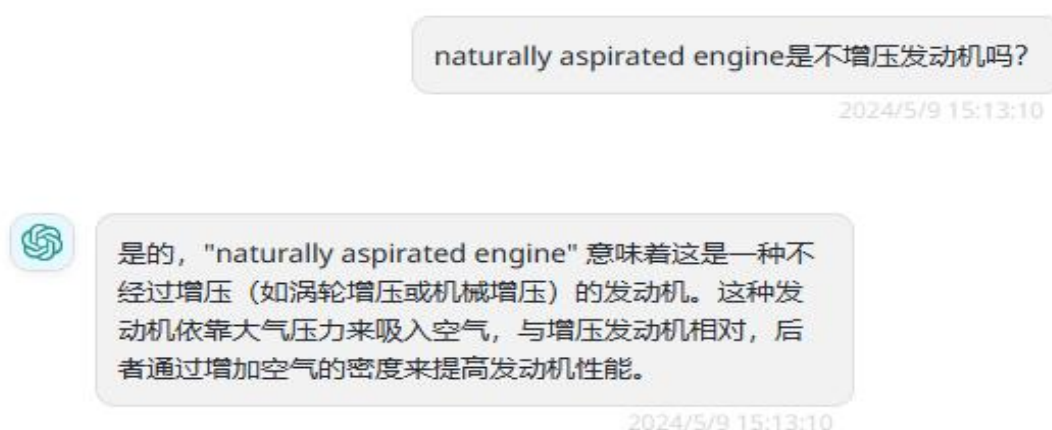


Table-4

删除 复制

请模仿汽车工程中文文本语言风格，将下面这段中文润色：在制动过程中，如果施加的制动力超过了道路和轮胎之间的摩擦力，车轮就会抱死。这种情况多发于紧急制动情况下，尤其是湿滑路面上的紧急制动。当前轮抱死时，车辆沿运动方向滑行。当后轮抱死时，车辆左右摇摆。若车轮抱死，则车辆无法避开障碍物，从而导致事故。侧滑也会缩短轮胎的寿命。

2024/5/9 15:21:17



在制动过程中，若施加的制动力超过了道路和轮胎之间的摩擦力，车轮将发生抱死现象。这种情况常见于紧急制动情况下，尤其是在湿滑的路面上进行紧急制动时。当车轮抱死时，车辆将沿着运动方向滑行。而当后轮抱死时，车辆则会产生左右摇摆的情况。若车轮发生抱死，车辆将无法避开障碍物，从而可能导致事故的发生。此外，侧滑现象还会加速轮胎的磨损，缩短其使用寿命。

2024/5/9 15:21:17

Table-5

## Chapter 3 Case Study

Case study constitutes the most crucial segment of the translation practice report. In this chapter, the translator will elaborate on the methods and strategies employed, supported by specific examples from the source text, focusing on three key aspects: the determination of word meanings, the transformation of sentence structures, and the reproduction of textual cohesion.

### 3.1 Standardization of Word Meaning

Standardization of word meaning is essential, particularly given the abundance of technical words and proper nouns in the source text. To capture their precise meanings, the translator has not only consulted relevant websites, dictionaries, and books, but also sought the expertise of professionals, including automobile engineers. Additionally, various translation methods such as addition, transference, and transliteration have been employed to ensure accurate and appropriate renderings.

#### 3.1.1 Processing of Technical Words

In scientific and technical English, words can be roughly divided into technical words, sub-technical words and non-technical words. Technical words, as the name suggests, are words in specialized fields that express specific meanings. Technical words are used in a more rigorous and unique way. Therefore, it's important to standardize the translation of technical words.

#### Example 1

|    |                                                                                                                                                                                                                          |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST | A turbocharged engine can be more powerful and efficient than a <b>naturally aspirated engine</b> because the turbine forces more intake air, proportionately more fuel, into the combustion chamber than if atmospheric |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|     |                                                                         |
|-----|-------------------------------------------------------------------------|
|     | pressure alone is used (Prahbu, 2021:41).                               |
| TT1 | 与自然进气发动机相比，涡轮增压发动机更强劲、更高效，因为比起仅使用大气压力，涡轮通过强迫进气，可以将更多的燃料按比例送入燃烧室。        |
| TT2 | 与自然吸气发动机相比，涡轮增压发动机更强劲、更高效，因为比起仅使用大气压力，涡轮通过强迫进气，可以将更多的燃料按比例送入燃烧室。        |
| TT3 | 与自然吸气发动机/不增压发动机相比，涡轮增压发动机更强劲、更高效，因为比起仅使用大气压力，涡轮通过强迫进气，可以将更多的燃料按比例送入燃烧室。 |

Analysis: In the TT1, the phrase "naturally aspirated engine" was rendered as "自然进气发动机," based on the literal meaning of "aspirated" as "进气式的." However, upon consulting automobile engineering terminology dictionaries, it was found that the preferred word was "自然吸气发动机" (TT2).

Subsequent research on terminology websites reveals an alternative description, "不增压发动机," which accurately describes the engine's lack of a turbocharger. Further analysis via ChatGpt clarifies that the key distinction between supercharged and non-supercharged engines lies in the installation of a turbocharger. Turbocharged engines accelerate combustion, achieve more complete combustion, recirculate exhaust gases, and enhance thermal efficiency. In contrast, naturally aspirated engines rely solely on atmospheric pressure to force air into the combustion chamber.

Adhering to Yan Fu's criteria of "faithfulness", which requires fidelity to the source text, the translator revises the terminology to "自然吸气发动机/不增压发动机" in the TT3, ensuring both standardization and accuracy in the translation of "naturally aspirated engine."

## Example 2

|     |                                                                                                                                                                                                            |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | If a slower moving vehicle is detected, the <b>ACC</b> system will slow the vehicle down and control the clearance, or time gap, between the <b>ACC</b> vehicle and the forward vehicle (Prahbu, 2021:29). |
| TT1 | 如果检测到有移速较慢车辆， <b>ACC</b> 将减速自身车辆，并控制 <b>ACC</b> 车辆与前方车辆间距，或时间间隔。                                                                                                                                           |
| TT2 | 如果检测到有移速较慢车辆，自适应巡航控制系统（ <b>ACC</b> ）将减速自身车辆，并控制 <b>ACC</b> 车辆与前方车辆间距或时距。                                                                                                                                   |

Analysis: Scientific and technical translation is to introduce advanced science and technology overseas, which has particularly strict requirements for accuracy (郑声滔, 1986:13) In the TT1, the acronym "ACC" was directly incorporated into the target text. However, upon further research, it is discovered that "ACC" can refer to multiple terms, including "Activated Calcium Carbonate (活性碳酸钙)" and "Advanced-technology (高科技)," which could lead to misunderstandings.

To address this issue, it is determined that the acronym should be translated as its full name along with the abbreviation when it first appears. For subsequent occurrences, only the acronym should be used. This approach ensures the translation remains concise while minimizing the risk of misinterpretation, thus fulfilling Yan Fu's "faithfulness" criterion.

### Example 3

|     |                                                                                                                                                                                                                      |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | More accurately measured and timed mixture spray in the combustion chamber significantly reducing unburned fuel gives CRDI the potential to meet future emission guidelines such as <b>Euro V</b> (Prahbu, 2021:33). |
| TT1 | 燃烧室中更精确的数据测量、定时混合物喷洒，大大节省了未燃燃料，使 CRDI 有满足未来的排放标准（如 <b>欧 V 标准</b> ）的潜力。                                                                                                                                               |

|     |                                                                                                         |
|-----|---------------------------------------------------------------------------------------------------------|
| TT2 | 燃烧室中更精确的数据测量、定时混合物喷洒，大大节省了未燃燃料，使 CRDI 有满足未来的排放标准（如欧 V 标准——限定汽车最大颗粒排放为 0.005 克/公里，氮氧化物排放量为 0.2 克/公里）的潜力。 |
|-----|---------------------------------------------------------------------------------------------------------|

Analysis: Addition is the effort made by translators to supplement new information to make the source text much easier for target audiences while ensuring a complete transmission of main information (黄忠廉, 2009:5). Addition in translation aims to enrich the target text, ensuring its completeness, fluency, and relevance to the target audience. This aligns with Yan Fu's "expressiveness" criterion.

In the TT1, "Euro V" was translated as "欧 V 标准," which is a literal translation without any contextual clarification. However, this translation alone might not be sufficiently informative for readers unfamiliar with the emission standards.

To enhance the readability and comprehension, a brief explanation should be provided in TT2, stating that "欧 V 标准" refers to "欧 V 标准——限定汽车最大颗粒排放为 0.005 克/公里，氮氧化物排放量为 0.2 克/公里". This elaboration helps readers grasp the specific emissions data associated with the "Euro V" standard, thus fulfilling the "expressiveness" criterion of scientific and technical translation.

#### Example 4

|     |                                                                                                                                                                                                                                                                  |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | This technology provides a combination of the light weight and twice the power offered by two-stroke engines with a significant power boost, i.e. a considerable " <b>power-to-weight ratio</b> " compared to quite a few four-stroke engines (Prahbu, 2021:36). |
| TT1 | 与许多四冲程发动机相比，该技术将二冲程发动机的轻便化与两倍功率相结合，动力得到了明显提升，即具有相当可观的“比功率”。                                                                                                                                                                                                      |

|     |                                                                                      |
|-----|--------------------------------------------------------------------------------------|
| TT2 | 与许多四冲程发动机相比,该技术将二冲程发动机的轻便化与两倍功率相结合,动力得到了明显提升,即具有相当可观的“比功率”(动力与车体重量的比值,比值越大车辆的动力性越好)。 |
|-----|--------------------------------------------------------------------------------------|

Analysis: In the TT1, "power-to-weight ratio" was translated as "比功率". However, to ensure that readers fully understand the concept and its importance, a more detailed explanation is required. The "比功率" (power-to-weight ratio) refers to the ratio of a vehicle's power output to its weight, and a higher power-to-weight ratio typically indicates better vehicle performance further is clarified. This further clarification assists readers in comprehending the significance of this technical word and its role in determining the effectiveness of a vehicle's power boost.

### 3.1.2 Processing of Proper Nouns

When dealing with informative texts, translators often encounter proper nouns that are unfamiliar foreign terms, lacking clear categorization or attributes, thus posing challenges in accurate translation. To overcome these difficulties, the adoption of techniques such as "transference" and "transliteration" can be effective.

#### Example 5

|     |                                                                                                                                                      |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | This was extensively prototyped in the 1990s with collaboration between <b>Magnetic Marelli</b> , Centro Ricerche Fiat and Elasis (Prahbu, 2021:33). |
| TT1 | 20 世纪 90 年代,在玛涅蒂马瑞利、菲亚特研发中心和埃纳西斯的通力合作下,该产品的原型得到了广泛应用。                                                                                                |
| TT2 | 20 世纪 90 年代,在 <b>Magnetic Marelli</b> 、 <b>Centro Ricerche Fiat</b> 和 <b>Elasis</b> 的通力合作下,该产品的原型得到了广泛应用。                                            |

Analysis: Yan Fu's "faithfulness" criterion emphasises the importance of accurately reproducing the technical content of the source text in the target text. When

dealing with proper nouns in the source text that lack corresponding expressions in the target language, zero translation can be employed to preserve the technical integrity of the original text. The concept of zero translation, introduced by Professor Qiu Maoru in the inaugural issue of Chinese Translation in 2001, does not mean the absence of translation but rather the non-use of target language words to translate source language terms. (丘懋如, 2001:24).

Zero translation can be divided into absolute zero translation and relative zero translation. Absolute zero translation involves "transference", which refers to the direct transplantation of words from the source text to the target text. In the current translation landscape, "relative conversion" or the "original form transfer" of symbols can sometimes more effectively convey the meaning of the original language and enhance readability for target readers.

In the TT1, the company names "Magnetic Marelli" "Centro Ricerche Fiat" and "Elasis" were initially translated as "玛涅蒂马瑞利," "菲亚特研发中心," and "埃纳西斯" in TT1. However, as indicated in the article "浅论企业名称的中英文互译", many globally recognizable company names are typically untranslated (满&赵, 2012:227). Given that the aforementioned company names in the source text are generally familiar to the public, the translator opts for "transference", directly retaining the original words from the source text in the target text. This approach ensures tha the names are recognized without the need for translation.

### Example 6

|     |                                                                                                                                                                                           |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | The first passenger car that used the common rail system was the 1997 model <b>Alfa Romeo 156 2.4 JTD</b> , and later on that same year <b>Mercedes-Benz C 220 CDI</b> (Prahbu, 2021:33). |
| TT1 | 1997 年生产的阿尔法罗密欧 <b>156 2.4 JTD</b> 是第一辆使用共轨系统的乘用车。同年，梅德赛斯奔驰 <b>C 220 CDI</b> 也开始使用共轨系统。                                                                                                   |

|     |                                                                                                      |
|-----|------------------------------------------------------------------------------------------------------|
| TT2 | 1997 年生产的 <b>Alfa Romeo 156 2.4 JTD</b> 是第一辆使用共轨系统的乘用车。同年, <b>Mercedes-Benz C 220 CDI</b> 也开始使用共轨系统。 |
|-----|------------------------------------------------------------------------------------------------------|

Analysis: The "Alfa Romeo 156 2.4 JTD" and "Mercedes-Benz C 220 CDI" in example 6 are the types of cars. While Alfa Romeo and Mercedes-Benz have standard translations in the target language, namely "阿尔法罗密欧" and "梅赛德斯-奔驰" as seen in TT1. However, the translator notices that most Car-4S-Shops in China do not translate these car names into Chinese. For instance, the signage of a "Mercedes-Benz" 4S-Shops still uses the English name, without translating it into Chinese as "梅赛德斯-奔驰.", and the translator realizes that the specific car models are widely recognized by readers.

Moreover, translating only the brand names while leaving the model specifications untranslated would create a sense of discontinuity in the target text. To maintain consistency and readability, the translator opts to directly incorporate the entire model names, including the specifications, into the target text in TT2.

### Example 7

|     |                                                                                                                                                                                                                                                                                                |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | The common rail system prototype was developed in the late 1960s by Robert Huber of Switzerland and the technology further developed by Dr. Marco Ganser at the Swiss Federal Institute of Technology in Zurich, later of Ganser-Hydromag AG (est.1995) in <b>Oberägeri</b> (Prahbu, 2021:33). |
| TT1 | 共轨系统的原型, 于 20 世纪 60 年由瑞士的罗伯特-胡贝尔 (Robert Huber) 开发。后来被苏黎世瑞士联邦理工学院的马可-甘瑟博士 (Dr. Marco Ganser) 改良, 最后由瑞士 <b>奥贝格瑞</b> 的 Ganser-Hydromag AG 公司 (创立于 1995 年) 改进。                                                                                                                                    |

|     |                                                                                                                                             |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------|
| TT2 | 共轨系统的原型，于 20 世纪 60 年由瑞士的罗伯特-胡贝尔（Robert Huber）开发。后来被苏黎世瑞士联邦理工学院的马可-甘瑟博士（Dr. Marco Ganser）改良，最后由瑞士奥贝拉杰里的 Ganser-Hydromag AG 公司（创立于 1995 年）改进。 |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------|

Analysis: Relative zero translation refers to the flexible use of the target words in an adapted way to express the source words appropriately, in order to make it easier for the readers to understand, which meets the requirements of "expressiveness". Relative Zero Translation contains "transliteration". Generally speaking, the translation of geographical names mainly follows the principle of "transliteration", which refers to the transcription of geographical names from one language to another on the basis of pronunciation.

In example 7, the initial translation of "Oberägeri" to "奥贝格瑞" in TT1 was based solely on the English pronunciation. However, upon realizing that Switzerland is a multilingual country with German, French, Italian, and Romansh as its official languages, the translator discovers that "Oberägeri" originates from German due to the presence of the character "ä". The translator finally applies German pronunciation rules to ascertain the correct pronunciation of the word and then translates it to the more accurate Chinese equivalent, "奥贝拉杰里".

### Example 8

|     |                                                                                                                                                                                |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | During the First World War French engineer <b>Auguste Rateau</b> fitted turbochargers to Renault engines powering various French fighters with some success (Prahbu, 2021:42). |
| TT1 | 第一次世界大战期间，法国工程师奥古斯特·拉特奥（Auguste Rateau）在雷诺发动机上安装了涡轮增压器，为各类法国战斗机提供动力，并取得了一定成功。                                                                                                  |

|     |                                                                              |
|-----|------------------------------------------------------------------------------|
| TT2 | 第一次世界大战期间，法国工程师奥古斯都·拉多（Auguste Rateau）在雷诺发动机上安装了涡轮增压器，为各类法国战斗机提供动力，并取得了一定成功。 |
|-----|------------------------------------------------------------------------------|

Analysis: In accordance with Lu Xun's belief in accurately translating foreign names based on their pronunciation, rather than assigning them Chinese personal names (张义宏, 2022:15), the translator adheres to the principle of "transliteration."

In example 8, when encountering the name "Auguste Rateau," the initial translation "奥古斯特·拉特奥" in TT1 is based on English pronunciation. However, upon realizing that Auguste Rateau is a French engineer, as stated in the source text, the translator shift to determining the pronunciation according to French rules. This results in the refined translation of "奥古斯都·拉多" in TT2, which more accurately reflects the French pronunciation of the name.

## 3.2 Transformation of Sentence Structure

In the source text, the sentence structure is complex and the passive voice is frequently used. It is important to transfer the sentence structure to match the reader's expressive habits when translating. The British translation theorist J. C. Catford first put forward the concept of "translation transformation" in his book *"A Linguistic Theory of Translation"*, which he explained as follows: Departures from formal correspondence in the process of going from the source language to target language (Catford, 1965:73). This theory places more emphasis on the transmission of textual content than on the formal reproduction of the source text, and is well suited to the translation of informative texts.

### 3.2.1 Conversion of Passive Sentences

When translate English into Chinese, there are often structural inequalities, and

voice is a very representative category (赵晨好, 2019:556). Compared to Chinese, the passive sentences are used much more often in English especially in scientific and technical English.

### Example 9

|     |                                                                                                                                                     |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | This <b>was extensively prototyped</b> in the 1990s with collaboration between Magnetic Marelli, Centro Ricerche Fiat and Elasis (Prahbu, 2021:33). |
| TT1 | 20 世纪 90 年代, 在 Magnetic Marelli、Centro Ricerche Fiat 和 Elasis 的通力合作下, 该产品 <b>被广泛原型化</b> 。                                                           |
| TT2 | 20 世纪 90 年代, 在 Magnetic Marelli、Centro Ricerche Fiat 和 Elasis 的通力合作下, 该产品的原型 <b>得到了广泛应用</b> 。                                                       |

Analysis: The passive sentences in English are usually neutral, while the passive sentences in Chinese is usually negative which have some unfortunate implications.

Chinese is a formally weak language. We do have the character "被" available to indicate the passive voice, but we are not obsessed with the relationship between the subject and the predicate verb, so Chinese always use the active voice (刘宓庆, 2012:217).

Converting English passive sentences into Chinese active sentences can reduce subjective language, increase objectivity and fairness, and make the source text more persuasive. In the TT1, "was extensively prototyped" was translated as "该产品被广泛原型化", which is a negative expression and may lead target readers to believe that the product is of poor quality. However, the source text indicates that this product is a beneficial and cost-effective option for the market and the public. What's more, TT1 and TT2 meet the requirement of "faithfulness", but the passive voice used in TT1 didn't fit the Chinese habit of expression and didn't meet the requirement of "expressiveness". The requirement of "expressiveness" for scientific and technical

translation is the same as that for general translation, which means the target text should be smooth, fluent, easy to understand, and meets the grammatical requirements of Chinese. Therefore, the final translation is "该产品的原型得到了广泛应用".

### Example 10

|     |                                                                                                                                                                          |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | The brake linings would last considerably longer before requiring maintenance and <b>the</b> potentially "brake fade" <b>problem could be avoided</b> (Prahbu, 2021:38). |
| TT1 | 制动闸衬在需要维护之前可使用更久，同时，潜在的“制动失效”问题也能被避免。                                                                                                                                    |
| TT2 | 制动闸衬在需要维护之前可使用更久，同时，也可 <b>避免</b> 潜在的“制动失效”问题。                                                                                                                            |

Analysis: In TT1, the "problem could be avoided" was directly translated as the Chinese passive voice "问题也能被避免". However, the source text indicated that the brake linings would last longer before requiring maintenance, and it is because the brake linings could last longer that "brake fade" could be avoided. So "the problem could be avoided" was translated as Chinese active voice "避免...问题", which is capable of expressing the source sentence's logic and is more in line with Chinese expressions, thus meeting the requirement of "expressiveness".

### Example 11

|     |                                                                                                                        |
|-----|------------------------------------------------------------------------------------------------------------------------|
| ST  | By energizing the solenoids, the modular valve can <b>be switched</b> to any of the following modes (Prahbu, 2021:28). |
| TT1 | 通过给螺线管通电，组合阀可 <b>被切换</b> 至以下任一模式。                                                                                      |

|     |                                  |
|-----|----------------------------------|
| TT2 | 通过给螺线管通电，可 <b>切换</b> 组合阀至以下任一模式。 |
|-----|----------------------------------|

Analysis: Chinese narrative tends to be from the perspective of the doer, whereas English narrative is often from the perspective of the recipient. It is often the case that passive sentences in English that do not require or cannot name the doer of the action can be translated into Chinese non-subject sentences (刘明东, 2001:2). In the TT1, the passive voice in the source text was translated as a Chinese "被" sentence, but the doer of the source text is not clear so the passive sentence in English can be transferred into non-subject sentence in Chinese. Subsequently, the translator translates the subject of the source text into the object of the target text as "切换组合阀", thus meeting the requirement of "elegance".

### Example 12

|     |                                                                                            |
|-----|--------------------------------------------------------------------------------------------|
| ST  | A toothed wheel (pole wheel) <b>is fitted</b> to the rotating wheel hub (Prahbu, 2021:26). |
| TT1 | 一个齿形表面的轮子（棘轮） <b>被安装</b> 在旋转的轮毂上。                                                          |
| TT2 | 在旋转的轮毂上 <b>安装有</b> 一个齿形表面的轮子（棘轮）。                                                          |

Analysis: In the TT1, the translation of "is fitted" as "被安装" was carried out in accordance with the sentence structure of the source text. However, this translation is not appropriate in this context. This is because if "is fitted" is translated as "被安装", the doer will be clear, but the source text does not indicate the doer. The translator proposes that the source text should be adjusted as a Chinese non-subject sentence. This adjustment makes the sentence more fluent and easier to read, and avoids semantic confusion.

### 3.2.2 Adjustment of Modifiers

Modifiers are words, phrases, or clauses that modify other components of a sentence. Here the translator will analyze the differences in the position of English-Chinese modifiers in relation to attributes and adverbs.

#### Example 13

|     |                                                                                                                                                                     |
|-----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | <b>A magnetic sensor mounted on each wheel</b> in close in close proximity to the teeth, generates electrical pulses when the pole wheel rotates (Prahbu, 2021:26). |
| TT1 | 磁传感器装在每个轮子上，紧贴着轮齿，当棘轮旋转时，会产生电脉冲。                                                                                                                                    |
| TT2 | 每个轮子上装有的磁传感器，紧贴着轮齿，当棘轮旋转时，会产生电脉冲。                                                                                                                                   |

Analysis: Attributes are used to modify, qualify, or describe the qualities and characteristics of a noun or pronoun. Adjectives, nouns, pronouns, numerals, prepositional phrases, the infinitives and phrases and sentences that are equivalent to adjectives can be used as attributes. Both English and Chinese are languages that possess a considerable number of attributes. Chinese is an analytical language with an open sentence beginning, which results in the vast majority of Chinese attributes being prepositional. In contrast, English is a comprehensive language with an open sentence ending, and the position of attributes is very flexible, either prepositional or postpositional.

Generally speaking, the sentence structure of scientific and technical English is not very compact, but there is a clear distinction, clear references and close correlation between sentences. This requires the translator to organize the target text according to the inherent logical relationship of the source text, and to describe the ideas of the source text in "domestication" sentences, which meets the requirement

of "expressiveness" of scientific and technical translation. Therefore, the translator adjusted the position of attributes.

In the TT1, the "mounted on each wheel" was translated into Chinese verb-object structure "磁传感器装在每个轮子上". Although this translation is also entirely accurate, it fails to convey the core message. It is preferable to place the attribute "mounted on each wheel" in front of the modified word "a magnetic sensor", which is more effective in highlighting the key content. "每个轮子上装有的磁传感器" in TT2 allows readers to identify the location of the magnetic sensor with greater ease.

#### Example 14

|     |                                                                                                                                                                   |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | When a wheel is lock, the ECU sends an electrical signal to the modulator valve solenoid, <b>which release pressure from the brake chamber</b> (Prahbu, 2021:26). |
| TT1 | 当一个车轮抱死时，ECU 为了释放制动气室的压力，向调节阀螺线管发送电信号。                                                                                                                            |
| TT2 | 当一个车轮抱死时，ECU 向调节阀螺线管发送电信号，从而释放制动气室的压力。                                                                                                                            |

Analysis: In example 14, the clause "which release pressure from the brake chamber" is an attribute clause. The attribute prepositional method was employed in the TT1 as "为了释放制动气室的压力", which deviates from the conventional Chinese thinking pattern of "first cause, then effect". When translating texts with a lot of clauses, it is advisable to disrupt the order of the source text and reorganize the target text according to the logical relationship of the source text. It is therefore recommended that the postpositional method, as exemplified by the TT2, be employed.

### Example 15

|     |                                                                                                                                                                            |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | With ABS, the vehicle remains completely stable <b>even when the driver continues to press the brake pedal during braking</b> , thus avoiding accidents (Prahbu, 2021:26). |
| TT1 | 有了 ABS，车辆也能保持十分稳定，即使司机在制动过程中持续踩制动踏板，也能避免事故发生。                                                                                                                              |
| TT2 | 有了 ABS，即使司机在制动过程中持续踩制动踏板，车辆也能保持十分稳定，从而避免事故发生。                                                                                                                              |

Analysis: The adverbials are essential sentence modifiers and have different functions in different languages. In Chinese, adverbials are conjunctive components that appear before a verb or adjective, which modify or restrict the verb or adjective, indicating the state, mode, time, place, or degree of the action. In English, adverbials modify a verb, adjective, adverb, or the whole sentence.

In the TT1, the translator followed the original English word order and translated the source text as "有了 ABS，车辆也能保持十分稳定，即使司机在制动过程中持续踩制动踏板，也能避免事故发生". At this point, the position of the adverbial "即使司机在制动过程中持续踩制动踏板" is exactly the same as the English adverbial. The sentence appears to be complete and harmonious, but it is not in line with the habits of Chinese thinking, which tends to state the facts first and then the conclusion. Therefore, the prepositional method is deemed appropriate, which states the fact "即使司机在制动过程中持续踩制动踏板" first, and then the conclusion "车辆也能保持十分稳定", thus meeting Yan Fu's criterion of "expressiveness".

### 3.3 Representation of Textual Cohesion

The concept of cohesion is a semantic one; it refers to relations of meaning that

exist within the text, and that define it as a text (Hasan&Halliday, 1976:4). Halliday and Hasan are the first to introduce the concept of textual cohesion, pointing out that textual cohesion is an important means and component of textuality.

### 3.3.1 Manifestation of Text Logic

When individuals speak or write, they can be understood by others because they meet two fundamental conditions: complying with grammar and adhering to logical thinking. The semantic relations of a chapter must be based on logical relations and be revealed by a certain logical structure, so the text logic delivery is an important element in translation.

#### Example1 16

|     |                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | The radar headway sensor sends information to a digital signal processor, which in turn translates the speed and distance information for a longitudinal controller. <b>The result?</b> If the lead vehicle slows down, or if another object is detected, the system sends a signal to the engine or braking system to decelerate. <b>Then</b> , when the road is clear, the system will re-accelerate the vehicle back to the set speed (Prahbu, 2021:29). |
| TT1 | 雷达测距传感器将速度和距离信息传输到数字信号处理器,后者又将信息传输到纵向控制器。 <b>结果表明</b> ,如果前车减速,或测距传感器检测到其他物体,ACC系统就会向发动机或制动系统发送减速信号。 <b>然后</b> ,当道路畅通时,系统将加速车辆,使其回到设定速度。                                                                                                                                                                                                                                                                                                                     |
| TT2 | 雷达测距传感器将速度和距离信息传输到数字信号处理器,后者又将信息传输到纵向控制器。 <b>当前方车辆减速</b> ,或测距传感器检测到另一个物体,自适应巡航控制系统就会向发动机或制动系统发出减速信号。 <b>因此</b> ,当道路畅通时,系统将重新加速车辆,使其回到设定速度。                                                                                                                                                                                                                                                                                                                  |

Analysis: Example 16 consists of several long sentences, and if each sentence is translated separately, it will not express the logic and completeness of the source text. Therefore, the translator must adjust the word order according to the logical relationship of the sentences to match the logical structure of Chinese. The logical structure is "generalization", "analysis" and "reasoning". At first, the translator translated "the result" as "结果表明", which is a literal translation. There is no "results" in the whole text. The former content only explains the speed and distance information transmission direction. The latter content is an analysis of the working principle of the ACC system. "The result" should be deleted because even if it is deleted, the translation also reflects the logical relationship of the source text, and this kind of translation also meets the requirement of "elegance". "Then" should be translated as "因此" rather than "然后" to better emphasize the information focus of "reasoning". Thinking logically from a Chinese perspective can help the translator clarify the complex and varied relationships between words and phrases in Chinese, so that the translator can accurately express the process logic of the source text.

### Example 17

|    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST | <p>It is very interesting to know about complete combustion in automobile engineering, <b>because</b> in actual practice, perfect combustion is not at all possible due to various losses in the combustion chamber as well as design of the internal combustion engine. <b>Moreover</b> the process of burning of the fuel is also not instantaneous. However an alternate solution to it is by making the combustion of fuel as fast as possible. <b>This can be done by</b> using two spark plugs which spark alternatively at a certain time interval so as increase the diameter of the flame &amp; burn the fuel instantaneously. This system is called DTSI (Digital Twin Spark Ignition system). In this system, <b>due to</b> twin sparks, combustion will be complete. (Prahbu, 2021:36).</p> |
|----|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

|     |                                                                                                                                                                                                                |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| TT1 | 了解车辆工程中的完全燃烧非常有趣， <b>因为</b> 在实际应用中，由于燃烧室的各种损失以及内燃机的设计，无法实现完全燃烧。 <b>此外</b> ，燃料的燃烧过程也不是瞬间发生的。然而，完全燃烧可以通过尽可能加快燃料燃烧速度来实现。 <b>可以</b> 使用两个火花塞在一定时间间隔内交替点火，以增加火焰直径并瞬间燃烧燃料。这个系统被称为 DTSI。该系统中， <b>由于</b> 双火花塞，燃烧将会更加完全。 |
| TT2 | 了解车辆工程中的完全燃烧非常有趣，在实际应用中，由于燃烧室的各种损失以及内燃机的设计，无法实现完全燃烧， <b>且</b> 燃料的燃烧过程也不是瞬间发生的。然而，完全燃烧可以通过尽可能加快燃料燃烧速度来实现—— <b>通过</b> 使用两个火花塞在一定时间间隔内交替点火，以增加火焰直径，使燃料瞬间燃烧。这个系统被称为 DTSI。该系统中，燃料 <b>将在双火花塞的作用下</b> 完全燃烧。           |

Analysis: English is a "hypotaxis" language, which uses more connectives and emphasizes structural integrity, while Chinese is a "parataxis" language, which uses fewer connectives and emphasizes logical relationships. The TT1 is a literal translation of the source text. For example, "because" was translated as "因为", "moreover" was translated as "此外" and so on. Although there are no translation errors in the TT1, there are too many connectives that do not suit the shortness of Chinese. It is better to delete the word "因为" because the phrase "due to" indicates a causal relationship. In addition, "moreover" is translated as "且", which combines the first and second sentences of the source text to make the sentence more concise and coherent. The fourth sentence of the source text is used to illustrate the way of achieving what is expressed in the third sentence, so the third sentence of the source text can be connected with the fourth sentence by using a dash. In the last sentence of the TT1, "due to twin sparks, combustion will be complete" was translated as "由于双火花塞，燃烧将会更加完全" in the order of the source text, which is not suit the Chinese expression. Therefore, "due to" should be translated as "在.....的作用下" instead of "由于" to make the target text more fluent while following to the logic of

the source text.

### 3.3.2 Ellipsis of Extraneous Contents

Grammatical cohesive devices mainly include reference, substitution, and ellipsis (Wu&Mo, 2022:209). Since translation is cross-language process, and there are more or less differences in usage between the two languages, some words are indispensable in the source text but extraneous in the target text. To make the target text more logical, "ellipsis" is effective.

#### Example 18

|     |                                                                                                                                                                                                                                                              |
|-----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | Pole Wheel is a toothed wheel made of ferrous material. It normally has teeth on the face. <b>In some cases where</b> it is not possible to install the sensor parallel to the axle, the pole wheels are designed with teeth on periphery (Prahbu, 2021:27). |
| TT1 | 棘轮是由铁质材料制成的有齿轮。它通常是齿状表面。 <b>某些情况下</b> ，轮速传感器若不能平行地安装在车轴上，棘轮就会设计成外围有齿的样式。                                                                                                                                                                                     |
| TT2 | 棘轮是由铁质材料制成的有齿轮。它通常是齿状表面。轮速传感器若不能平行地安装在车轴上，棘轮就会设计成外围有齿的样式。                                                                                                                                                                                                    |

Analysis: Ellipsis contributes to a text's cohesiveness and informs one in the interpretation of the intended meaning (Orang'I D O, 2021:40). Halliday and Hasan (1976:3) argue that "ellipsis" occurs when what is structurally necessary in English is not necessary to be rendered when translated into Chinese. For example, "In some cases where" was translated into "在某些情况下，轮速传感器若不能平行地安装在车轴上，棘轮就会设计成外围有齿的样式" in the TT1, which is too long and doesn't fit in with Chinese expressions. The phrase "In some cases where" in the source text is

only for the completeness of the English grammatical expression, and even if it is omitted, it will not affect the complete expression of the source text.

### Example 19

|     |                                                                                                                                                                                                                                                                                                                                                                                                          |
|-----|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ST  | The <b>ECU</b> is the core component of the ABS system. Wheel speed sensor signal are the input to the <b>Electronic Control Unit</b> . The <b>ECU</b> computers wheel speeds, wheel deceleration and acceleration. If any wheel tends to lock, the <b>ECU</b> actuates the corresponding Modulator valve to prevent wheel lock. The <b>ECU</b> is normally mounted in driver's cabin (Prahbu, 2021:27). |
| TT1 | <b>ECU</b> 是 ABS 的核心部分。 <b>ECU</b> 可接收轮速传感器发出的信号。 <b>ECU</b> 可计算轮速、轮减速和轮加速。若任一车轮有抱死的趋势， <b>ECU</b> 就会驱动相应的调节阀，以防止车轮抱死。 <b>ECU</b> 通常安装在驾驶室内。                                                                                                                                                                                                                                                             |
| TT2 | <b>ECU</b> 是 ABS 的核心部分，通常安装在驾驶室内。它可接收轮速传感器发出的信号、计算轮速、轮减速和轮加速。若任一车轮有抱死趋势，它会启动相应的调节阀调节。                                                                                                                                                                                                                                                                                                                    |

Analysis: Ellipsis plays an important role in text cohesion. The source text of example 19 was translated as "ECU 是 ABS 的核心部分。ECU 可接收轮速传感器发出的信号。ECU 可计算轮速、轮减速和轮加速。若任一车轮有抱死的趋势，ECU 就会驱动相应的调节阀，以防止车轮抱死。ECU 通常安装在驾驶室内。" in the TT1, but it turns out the word "ECU" is repeated too many times, resulting in a logical incoherence and a cumbersome translation, so "ellipsis" is a good method to reduce the repetitions in the latter text. The sentence structure is more compact, the meaning is more prominent, and the internal connectivity of the text is effectively enhanced in the TT2.

## Chapter 4 Conclusion

### 4.1 Proofreading

In order to ensure the quality of translation, post-translation proofreading also plays a vital role in the translation process.

Firstly, during the initial review phase, the translator carefully compared the source text with the target text to ensure the highest level of accuracy. Word by word and sentence by sentence, the translator scrutinized the target text, searching for any missing translations or mistranslations that might have occurred. The goal was to capture every nuance and detail in the source text and faithfully reproduce it in the target text. In addition to checking for translation accuracy, the translator also examined the text for basic errors in spelling, grammar, and punctuation. These are crucial aspects of any written work, and the translator took them very seriously. By carefully proofreading the text, the translator aimed to eliminate any errors that might distract the reader or hinder their understanding of the content.

Secondly, during the in-depth review phase of the translation process, the translator paid particular attention to scrutinizing technical words and proper nouns. The accuracy of these words is crucial in maintaining the integrity and precision of the target text, especially in technical or specialized texts. For any technical words that the translator encountered and was uncertain about, she did not hesitate to consult relevant resources, such as dictionaries, glossaries, or even experts in the field. This ensured that the usage of these technical words in the target text was accurate and appropriate.

Having ensured the accuracy of the technical words, the translator then moved on to check the accuracy and naturalness of the general vocabulary used. The goal was to ensure that the choice of words was consistent with the idiomatic usage and cultural context of the target language. This involved checking for any instances of mistranslation, inappropriate word choices, or cultural misunderstandings that could potentially alter the meaning or tone of the text.

The final step in the review process was to assess the logic and coherence of the target text. The translator carefully examined the flow of ideas, the structure of sentences and paragraphs, and the overall narrative to ensure that the target text read smoothly and made sense in the target language. This involved checking for any logical inconsistencies that might confuse the reader. The translator's aim was to produce a fluent and comprehensible target text that not only conveyed the meaning of the source text but also felt natural and authentic in the target text.

## **4.2 Gains**

After this translation practice, the translator has gained as follows:

During the translation process, there are various technical words, semi-technical words, and proper nouns to deal with. These words are often abbreviations or compound words. Proper nouns, in particular, may not have a direct equivalent in the target language, leaving the translator to choose between zero translation or an addition. It is therefore a challenge for the translator to ensure that these words are translated accurately in order to maintain professionalism, while at the same time ensuring readability for the target language reader. When processing these words, the translator can consult professional dictionaries, browse relevant websites and seek help from vocabulary forums. If the translator can't find useful information online, she can consult experts in related fields offline. Be sure to translate these words accurately.

This translation practice text is an English-to-Chinese text. English is a 'hypotactic' language, with many changes in structure and form, such as tenses and voices, singular and plural nouns, and changes in comparative adjectives, etc. Chinese is a 'paratactic' language, with no specific morphological changes and more emphasis on meaning. Sometimes the sentences do not even have a subject, and conjunctions are rarely used. The target text should flow logically and present information in a clear and concise manner. To make the text more reader-friendly, it is necessary to adjust the sentence structure. Passive voice is frequently used in English, but active

voice is more common in Chinese. Passive sentences in Chinese often convey a negative meaning. There is also a shift in the position of modifiers in English, especially in informative texts, due to the prevalence of long and complex sentences. English modifiers can be prepositional, postpositional, or used as interjections, whereas Chinese modifiers are generally prepositional. Therefore, it is important to pay special attention to this point.

Textual cohesion is an important means and component of textuality. The semantic relationships within a text must be based on logical connections. Therefore, the target text should accurately convey the logical structure of the source text without being constrained by its form. What's more, Chinese is a "paratactic" language, so sentences sometimes have no subject and conjunctions are rarely used. To achieve text cohesion, the translator has used "ellipsis" to remove extraneous content. The translation methods and theories used for different types of texts are not quite the same. Unlike translating literary texts such as novels, when translating informative texts, the language should be concise, intuitive and easy to read for readers.

It is well known that the cultural differences between Chinese and English can affect the work of translation work. Therefore, when dealing with the E-C translation of scientific and technical texts, the translator must learn to consult professional books and materials, accumulate bilingual knowledge, carefully consider the differences between the source language and the target language, and produce appropriate renditions for the target text.

### **4.3 Limitations**

During the translation process, several challenges will arise due to the complexity of automobile engineering. Despite having a basic understanding of automotive engineering, the translator may encounter unfamiliar concepts and technical words. Additionally, the presence of intricate mathematical and physical knowledge within the source text may pose a significant challenge, demanding a high

level of accuracy and comprehension.

Secondly, non-native English proficiency may introduce inaccuracies stemming from the inherent differences in thinking patterns between English and Chinese. Moreover, the presence of numerous non-English words in the source text necessitates extensive research and collection of parallel texts to ensure the translation's quality.

Currently, the utilization of CAT (Computer-Assisted Translation) tools is limited, and a lack of proficiency in their application leads to decreased translation efficiency. It is advisable to enhance proficiency in CAT tools to improve translation speed and accuracy.

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## Appendix 1: Glossary

| 序号 | 英文                                           | 中文          |
|----|----------------------------------------------|-------------|
| 1  | Adaptive Cruise Control (ACC)                | 自适应巡航控制     |
| 2  | ACC Module                                   | 自适应巡航模块     |
| 3  | Accelerator                                  | 加速器         |
| 4  | Anti-Vibration Mountings                     | 抗震支架        |
| 5  | Anti-lock Braking System (ABS)               | 防抱死制动系统     |
| 6  | Brake Chamber                                | 制动气室        |
| 7  | Brake Pedal                                  | 制动踏板        |
| 8  | Blink Code Switch                            | 闪烁代码开关      |
| 9  | Brake Lining                                 | 制动衬片        |
| 10 | Brake Fade                                   | 制动失效        |
| 11 | Controller Area Network                      | 控制器局域网      |
| 12 | Checksum                                     | 校验和         |
| 13 | Cruise Switch                                | 巡航开关        |
| 14 | Common Rail                                  | 共轨管线        |
| 15 | Crankshaft                                   | 曲轴传感器       |
| 16 | Constant-pressure Turbocharged               | 恒压涡轮增压发动机   |
| 17 | Cold Starting                                | 冷启动         |
| 18 | Compression Ratio                            | 压缩比         |
| 19 | Compressor                                   | 压气机         |
| 20 | Crane                                        | 起重机         |
| 21 | Crankshaft                                   | 曲轴          |
| 22 | Centrifugal Supercharger                     | 离心式增压器      |
| 23 | Delivery Port                                | 出气口         |
| 24 | Digital Signal Processor                     | 数字信号处理器     |
| 25 | Distributor Pump System                      | 分配泵系统       |
| 26 | Digital Twin Spark Ignition System<br>(DTSI) | 数字式双火花塞点火系统 |
| 27 | Dissipation Capability                       | 散热能力        |

|    |                               |           |
|----|-------------------------------|-----------|
| 28 | Diesel Cycle                  | 狄塞尔循环     |
| 29 | Electrical Pulse              | 电脉冲       |
| 30 | Electronic Control Unit (ECU) | 电子控制单元    |
| 31 | EPDM                          | 三元乙丙橡胶    |
| 32 | Exhaust Break                 | 排气制动器     |
| 33 | Exhaust Passage               | 排气通道      |
| 34 | Euro V                        | 欧 V 标准    |
| 35 | Electronic Control Box        | 电子控制箱     |
| 36 | Electromagnetic Brake         | 电磁制动器     |
| 37 | Electromagnetism              | 电磁原理      |
| 38 | Eddy Current                  | 涡流        |
| 39 | Exhaust Brake                 | 排气制动器     |
| 40 | Flashes                       | 闪蒸现象/闪烁   |
| 41 | Fuel Injector                 | 燃油喷射器     |
| 42 | Fuel Atomisation              | 燃油雾化      |
| 43 | Four-stroke                   | 四冲程       |
| 44 | Friction Brake                | 摩擦制动器     |
| 45 | Fins                          | 散热片       |
| 46 | Gearbox                       | 变速器       |
| 47 | Crane                         | 起重机       |
| 48 | Garrett-Turbocharged          | 加勒特涡轮增压   |
| 49 | Hydraulically Operated Common | 液压共轨柴油发动机 |
| 50 | High-pressure Pump            | 高压泵       |
| 51 | Heat Loss                     | 热损失       |
| 52 | Interlock Connector           | 联锁连接器     |
| 53 | Inlet Port                    | 进气口       |
| 54 | Instrument Panel              | 仪表盘       |
| 55 | Instrument Cluster            | 仪表盘       |
| 56 | Infrared Sensor               | 红外传感器     |
| 57 | Injection Cycle               | 充注周期      |
| 58 | Inline Pump System            | 管道泵系统     |

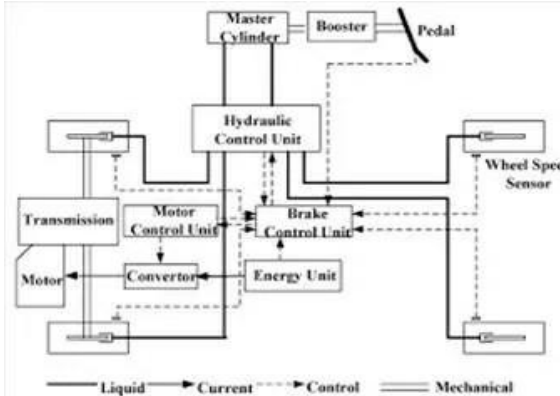
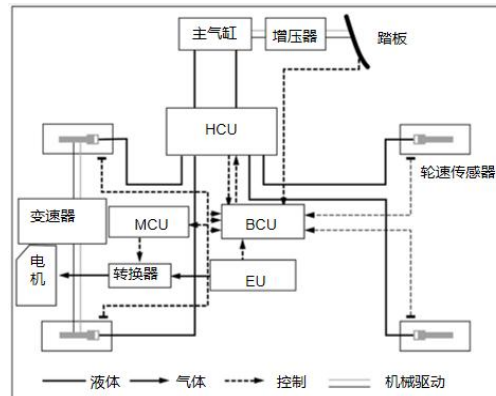
|    |                            |                    |
|----|----------------------------|--------------------|
| 59 | Idling Speed               | 怠速                 |
| 60 | Ignition Distributor       | 点火分电器              |
| 61 | Ignition Timing            | 点火正时               |
| 62 | Intake Air                 | 进气                 |
| 63 | Intake Valve               | 进气阀                |
| 64 | Longitudinal Controller    | 纵向控制器              |
| 65 | Lift                       | 升降机                |
| 66 | Magnetic Sensor            | 磁传感器               |
| 67 | Modulator Valve            | 调节阀                |
| 68 | Microprocessor             | 微处理器               |
| 69 | Magnetic Flux              | 磁通                 |
| 70 | Naturally Aspirated Engine | 自然吸气发动机/<br>不增压发动机 |
| 71 | Nozzle                     | 喷嘴                 |
| 72 | Off Highway Switch         | 非高速开关              |
| 73 | Over Boost                 | 超增压                |
| 74 | Otto Cycle                 | 奥托循环               |
| 75 | Pole Wheel                 | 棘轮                 |
| 76 | Permanent Magnet           | 永磁体                |
| 77 | Polyurethane               | 聚氨酯                |
| 78 | Piezoelectric Valve        | 压电阀                |
| 79 | "Pilot" Injection          | 预喷射/先导喷射           |
| 80 | Plunger                    | 柱塞                 |
| 81 | Preload                    | 预载荷                |
| 82 | Pressure Accumulator       | 蓄压器                |
| 83 | Power-to-weight Ratio      | 比功率                |
| 84 | Piston Rings               | 活塞环                |
| 85 | Quick Release Valve        | 快放阀                |
| 86 | Relay Valve                | 中继阀                |
| 87 | Reservoir                  | 储气罐                |

|     |                                |          |
|-----|--------------------------------|----------|
| 88  | Radar Headway Sensor           | 雷达测距传感器  |
| 89  | Rotor                          | 转子       |
| 90  | Retarders                      | 缓速器      |
| 91  | Rear Axle                      | 后轴       |
| 92  | Rheostat                       | 变阻器      |
| 93  | Rigid Vehicle                  | 刚性车辆     |
| 94  | Stator                         | 定子       |
| 95  | Spark Advance                  | 点火提前角    |
| 96  | Sweep Long-range Sensor        | 长距离扫描传感器 |
| 97  | Solid-state Gyro               | 固态陀螺仪    |
| 98  | Sheathing                      | 包板       |
| 99  | Throttle                       | 节流阀      |
| 100 | Transmission                   | 变速器      |
| 101 | Timing Pulse                   | 正时脉冲     |
| 102 | Timing Cam                     | 正时凸轮     |
| 103 | Throttle Setting               | 节流阀调定    |
| 104 | Two-stroke                     | 二冲程      |
| 105 | Thermal Efficiency             | 热效率      |
| 106 | Twin Overhead Cam              | 双顶置凸轮    |
| 107 | Turbocharger                   | 涡轮增压器    |
| 108 | Unit Injector                  | 泵喷嘴      |
| 109 | Unit Injection System          | 单元喷射系统   |
| 110 | Vehicle Application Controller | 车辆应用控制器  |
| 111 | Valve Timing                   | 气门正时     |
| 112 | Valve Stem                     | 阀杆       |
| 113 | Waste Gate                     | 废气旁通阀    |
| 114 | Winch                          | 绞车       |
| 115 | Wheel Speed Sensor             | 轮速传感器    |

## Appendix 2: Source Text and Target Text

| Source Text                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Target Text                                                                                                                                                               |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Anti-Lock Braking System (ABS)                                                                                                                                                                                                                                                                                                                                                                                                                                        | 防抱死制动系统 (ABS)                                                                                                                                                             |
| It is a safety system in automobiles. It prevents the wheels from locking while braking. The purpose of this is to allow the driver to maintain steering control under heavy braking and, in some situations, to shorten braking distances (by allowing the driver to hit the brake fully without skidding or loss of control).                                                                                                                                       | ABS 是汽车中的一个安全系统，可以防止车轮在制动时抱死。ABS 的目的是让驾驶员在强力制动时仍保持对方向盘的控制，同时，在某些情况下，通过允许司机全力踩下制动器以防侧滑或失控，缩短制动距离。                                                                          |
| How Do Wheels Lock?                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 车轮如何抱死？                                                                                                                                                                   |
| During braking, wheels lock if the brake force applied is more than the friction between the road and tyre. This often happens in a panic braking situation, especially on a slippery road. When the front wheels lock, the vehicle slides in direction of motion. When the rear wheels locks, the vehicle swings around. It is impossible to steer around an obstacle with wheels locked. Locked wheels can thus result in accident. Skidding also reduce tyre life. | 在制动过程中，若施加的制动力超过了道路和轮胎之间的摩擦力，车轮将发生抱死现象。这种情况常见于紧急制动情况下，尤其是在湿滑的路面上进行紧急制动时。当车轮抱死时，车辆将沿着运动方向滑行。而当后轮抱死时，车辆则会产生左右摇摆的情况。若车轮发生抱死，车辆将无法避开障碍物，从而可能导致事故的发生。此外，侧滑现象还会加速轮胎的磨损，缩短其使用寿命。 |
| What Does ABS Do?                                                                                                                                                                                                                                                                                                                                                                                                                                                     | ABS 工作原理                                                                                                                                                                  |
| The system detects when the wheel are about to lock and momentarily release                                                                                                                                                                                                                                                                                                                                                                                           | ABS 系统可以检测到车轮即将抱死的情况，并瞬间释放对抱死车                                                                                                                                            |

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| <p>the pressure on locking wheel. The brakes are reapplied as soon as the wheels have recovered.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>轮的的压力。车轮恢复正常后，会重新施加制动压力。</p>                                                                                                                                                         |
| <p><u>A toothed wheel (pole wheel) is fitted to the rotating wheel hub. A magnetic sensor mounted on each wheel in close in close proximity to the teeth, generates electrical pulses when the pole wheel rotates.</u> The rate at which the pulses are generated (frequency) is a measure of wheel speed. This signal is read by electronic control unit (ECU). <u>When a wheel is lock, the ECU sends an electrical signal to the modulator valve solenoid, which release pressure from the brake chamber.</u> When the wheel recovers sufficiently, the brake pressure is reapplied again by the switch off signal to the modulator valve.</p> | <p>在旋转的轮毂上安装有一个齿形表面的轮子（棘轮）。每个轮子上装有的磁传感器，紧贴着轮齿，当棘轮旋转时，会产生电脉冲。脉冲产生的速度（频率）是轮速的一个衡量指标。该信号由电子控制单元（ECU）读取。<u>当一个车轮抱死时，ECU 向调节阀螺线管发送电信号，从而释放制动气室的压力。</u>当车轮充分恢复转动后，通过向调节阀发送关闭信号，制动压力会再次施加。</p> |
| <p>The modulator valve has an addition hold' state which maintains pressure. In break in the chamber, thus optimizing the braking process. The cycling of modulator valve (5 to 6 times per second) is continued till the vehicle comes to a controlled stop.</p>                                                                                                                                                                                                                                                                                                                                                                                 | <p>调节阀有一个额外的“hold”状态，可维持制动压力。在制动气室中出现故障时，该状态可优化制动过程。调节阀循环（每秒 5 至 6 次）持续进行，直至车辆平稳停下。</p>                                                                                                 |
| <p><u>With ABS, the vehicle remains completely stable even when the driver continues to press the brake pedal during</u></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <p><u>有了 ABS，即使司机在制动过程中持续踩制动踏板，车辆也能保持十分稳定，从而避免事故发生。</u></p>                                                                                                                             |

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| braking, thus avoiding accidents.                                                                                                                                                                                                                                                                                                                                |                                                                                                                                        |
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| Components:                                                                                                                                                                                                                                                                                                                                                      | 组件:                                                                                                                                    |
| The anti-lock braking system consists of following components.                                                                                                                                                                                                                                                                                                   | ABS 由以下部件组成。                                                                                                                           |
| Wheel Speed Sensor                                                                                                                                                                                                                                                                                                                                               | 轮速传感器                                                                                                                                  |
| <p>The wheel speed sensor consists of a permanent magnet and coil assembly. It generates electrical pulses when the pole wheel rotates. The rate at which the pulses are generated is a measure of wheel speed. The voltage induced increases with the speed of rotation of the wheel and reduces with increasing gap between the pole wheel and the sensor.</p> | <p>轮速传感器由一个永磁体和线圈组件组成。在棘轮旋转时，它可产生电脉冲，脉冲产生的速度是轮速的一个衡量指标。随着轮速的增加，电压也增强；而随着棘轮和传感器之间的间隙加大，电压则减弱。</p>                                       |
| Pole Wheel                                                                                                                                                                                                                                                                                                                                                       | 棘轮                                                                                                                                     |
| <p><u>Pole Wheel is a toothed wheel made of ferrous material. It normally has teeth on the face. In some cases where it is not possible to install the sensor parallel to the axle, the pole wheels are designed with teeth on periphery. The pole wheel fitted on standard 9-20, 10-20 tires has normally</u></p>                                               | <p><u>棘轮是由铁质材料制成的有齿轮。它通常是齿状表面。传感器若无法与轴平行安装，棘轮就会设计成外围有齿的样式。安装在 9-20、10-20 规格轮胎上的棘轮通常有 100 个等距的齿，而对于胎径小于 9 毫米的车辆，则安装有 80 个等距的齿的棘</u></p> |

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| 100 evenly spaced teeth. 80 evenly spaced teeth pole wheels are used for the vehicles having the tyre diameter less than 9mm.                                                                                                                                                                                                                                                              | 轮。                                                                                                    |
| Sensor Extension Cable                                                                                                                                                                                                                                                                                                                                                                     | 传感器延长电缆                                                                                               |
| The sensor extension cable is a two core cable which connects the wheel speed sensor to the Electronic Control Unit. The inner core sheathing is of EPDM rubber and the outer sheathing is polyurethane which provide abrasion resistance to the cable. The cable has a module plug with two pins is connected to the control assembly. The cable has two cores—brown and black in colour. | 传感器延长线是一条双芯电缆，将轮速传感器连接到 ECU。电缆内芯包板是三元乙丙橡胶材质，外芯包板涂有聚氨酯，为电缆提供耐磨性。电缆带有一个两针模块插头，与控制组件相连。电缆有两根芯线，分别是棕色和黑色。 |
| Electronic Control Unit                                                                                                                                                                                                                                                                                                                                                                    | 电子控制单元（ECU）                                                                                           |
| <u>The ECU is the core component of the ABS system. Wheel speed sensor signal are the input to the Electronic Control Unit. The ECU computers wheel speeds, wheel deceleration and acceleration. If any wheel tends to lock, the ECU actuates the corresponding</u> Modulator valve to prevent wheel lock. The ECU is normally mounted in driver's cabin.                                  | <u>ECU 是 ABS 的核心部分，通常安装在驾驶室内。它可接收轮速传感器发出的信号、计算轮速、轮减速和轮加速。若任一车轮有抱死趋势，它会启动相应的调节阀调节。</u>                 |

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| The ECU consists of 7 major circuits,                                                                                                                                               | ECU 由 7 个主要电路组成,                                  |
| > Input circuit                                                                                                                                                                     | > 输入电路                                            |
| > Master circuit                                                                                                                                                                    | > 主电路                                             |
| > Slave circuit                                                                                                                                                                     | > 从电路                                             |
| > Driver circuit                                                                                                                                                                    | > 驱动电路                                            |
| > Feedback circuit                                                                                                                                                                  | > 反馈电路                                            |
| > Power supply circuit                                                                                                                                                              | > 电源电路                                            |
| > Fail safe circuit                                                                                                                                                                 | > 失效保护电路                                          |
| The functions of ECU                                                                                                                                                                | ECU 的功能                                           |
| > It receives wheel speed signal from the sensor. The wheel speed signals are processed and appropriate output signals are sent to the modular valves in the event of a wheel lock. | > 接收传感器传来的轮速信号。对轮速信号进行处理，并在车轮锁定的情况下向组合阀发送适当的输出信号。 |
| > It continuously monitors the status and operation of ABS components and wiring.                                                                                                   | > 持续监测 ABS 工作状态与接线状况。                             |
| > It alerts the driver in the event of occurrence of any electrical fault in the ABS system by actuating a warning lamp.                                                            | > 在 ABS 系统发生电气故障时，ECU 会启动警告灯向驾驶员发出警报。             |
| > It disconnects the exhaust brakes during ABS operations.                                                                                                                          | > 在 ABS 工作期间，ECU 会断开排气制动器。                        |
| > It enables the service technician to read the faults in the system either through a diagnostic controller or a blink code lamp.                                                   | > ECU 使维修技术人员能够通过诊断控制器或闪烁代码灯，读取系统故障。              |
| Modulator Valve Cable                                                                                                                                                               | 调制阀电缆                                             |
| The Modulator valve cable has three cores. There are two solenoid interface                                                                                                         | 调制阀电缆有三根芯线。有两条螺线管接线和一条公共地线。内                      |

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| lines and a common ground line. The inner core sheathing is of EPDM type and the outer sheathing is polyurethane which provide abrasion resistance to the cable.                                                                                                                                                                         | 芯线护套是三元乙丙橡胶（EPDM）材质，外芯线护套涂有聚氨酯，为电缆提供耐磨性。                                                       |
| The cable has a three pin moulded socket is connected to the modulator valve solenoid at one and an interlock connector with locking feature at the other end. The cores are brown, blue and green.                                                                                                                                      | 该电缆有一个三针模制插座，一端连接到调制阀上，另一端是一个带有锁定功能的联锁连接器。电缆芯线是棕色、蓝色和绿色。                                       |
| Modulator Valve                                                                                                                                                                                                                                                                                                                          | 调节阀                                                                                            |
| ABS Modulator valve regulate the air pressure to the brake chamber during ABS action. During normal braking it allows air to flow directly from inlet to delivery. Modulator valve cannot automatically apply the brakes, or increase the brake application pressure above the level applied by the driver through the dual brake valve. | ABS 调节阀在 ABS 工作期间调节制动气室内压力。在正常制动时，调节阀允许空气直接从进气口流向出气口。调节阀无法自动施加制动，也不能通过双制动阀将制动施加压力增至超过驾驶员所施加水平。 |
| There is an inlet port, Delivery port and Exhaust passage.                                                                                                                                                                                                                                                                               | 调节阀有一个进气口、出气口和排气通道。                                                                            |
| > The inlet port is connected to the delivery of quick release valve or relay valve.                                                                                                                                                                                                                                                     | > 进气口与快放阀或中继阀的出气口相连。                                                                           |
| > The delivery port is connected to the brake chamber.                                                                                                                                                                                                                                                                                   | > 出气口与制动气室相连。                                                                                  |
| > The exhaust passage vents air from the brake chambers.                                                                                                                                                                                                                                                                                 | > 排气通道将空气从制动气室排出。                                                                              |
| The modulator valve has two                                                                                                                                                                                                                                                                                                              | 调节阀装有两个螺线管。通过                                                                                  |

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| solenoids. <u>By energizing the solenoids, the modular valve can be switched to any of the following modes.</u>                                                                                                                                                                                                                                                                                                                                                                                                             | <u>给螺线管通电，可切换组合阀至以下任一模式。</u>                                                                                            |
| > Pressure                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | > 压力                                                                                                                    |
| > Pressure hold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | > 保持压力                                                                                                                  |
| > Pressure release                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | > 释放压力                                                                                                                  |
| Quick Release Valve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 快放阀                                                                                                                     |
| Quick release valve are fitted in air braking system to release the air from the brake chamber quickly after release of brake pedal. This prevents delay in brake release due to long piping runs or multiples of brake chamber being exhausted through the brake valve.                                                                                                                                                                                                                                                    | 快放阀安装在空气制动系中，在松开制动踏板后迅速释放制动气室中的空气。这可防止由于管道过长或多个制动气室通过制动阀排气而导致的制动释放延迟。                                                   |
| Relay Valve                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 中继阀                                                                                                                     |
| Relay valve provides a means of admitting and releasing air to and from brake chamber quickly, in accordance with the signal pressure from the delivery of the dual brake valve. Air from the reservoir passes through the valve into the brake chamber. The pressure applied to the brake is equal to the signal pressure from the dual brake valve. When the brake pedal is released the signal pressure is released. The pressure in the brake chamber is released directly through the exhaust port of the relay valve. | 中继阀可根据双腔制动阀传递的压力信号，快速吸收与释放制动气室内的空气。储气罐内的空气通过中继阀进入制动气室。施加在制动器上的压力等于双腔制动阀传递的压力信号。当松开制动踏板，信号压力也被释放。制动气室中的压力就直接通过中继阀的排气口释放。 |
| Warning Lamp                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | 警告灯                                                                                                                     |

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| Vehicle are fitted with an ABS warning lamp. It is a LED indicator lamp amber in colour and lights up when the system has detected any electrical fault. ABS warning lamp is located on the instrument panel in form of a driver.                | 车辆装有一个琥珀色的 LED 指示灯——ABS 警告灯。当系统检测到有电气故障时，警告灯就会亮起。ABS 警告灯位于驾驶员仪表盘上的一个灯中。              |
| Blink Code Lamp                                                                                                                                                                                                                                  | 闪烁代码灯                                                                                |
| This lamp is green in colour and is used to indicate the stored faults in the system to the service technician on operating a blink code switch. The nature of fault in the system can be diagnosed by the number of flashes.                    | 闪烁代码灯是绿色的，当维修技术员按下闪烁代码开关，可指示系统中存在的故障。系统中故障的性质可通过此灯闪烁次数来判断。                           |
| Off Highway Switch                                                                                                                                                                                                                               | 非公路开关                                                                                |
| This is an optional switch in front of the driver which can be switched ON when the vehicle is operating off highway. In this mode, ABS control will; allow higher wheel slip to achieve shorter stopping distance than with normal ABS control. | 非公路开关是驾驶员前方的一个可选开关，当车辆在非高速公路上行驶时，可打开此开关。当开关打开时，ABS 允许更远的车轮滑动距离，以实现比正常 ABS 控制更短的制动距离。 |
| Blink Code Switch                                                                                                                                                                                                                                | 闪烁代码开关                                                                               |
| A momentary switch that grounds the ABS Indicator Lamp output is used to place the ECU into the diagnostic blink code mode and is typically located on the vehicle's dash panel.                                                                 | 是一个将 ABS 指示灯输出接地的瞬时开关，用于将 ECU 置于诊断闪烁代码模式，通常位于车辆的仪表板上。                                |
| ADAPTIVE CRUISE CONTROL                                                                                                                                                                                                                          | 自适应巡航控制（ACC）                                                                         |
| Adaptive Cruise Control (ACC) is an automotive feature that allows a vehicle's                                                                                                                                                                   | ACC 是一项汽车性能。此性能使车辆巡航控制系统根据环境调整                                                       |

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| <p>cruise control system to adapt the vehicle speed to the environment. A radar system attached to the front of the vehicle is used to detect whether slower moving vehicles are in the ACC vehicle path. <u>If a slower moving vehicle is detected, the ACC system will slow the vehicle down and control the clearance, or time gap, between the ACC vehicle and the forward vehicle.</u> If the system detects that the forward vehicle is no longer in the ACC vehicle path, the ACC system will accelerate the back to its set cruise control speed. This operation allows the ACC vehicle to autonomously slow down and speed up is controlled is via engine throttle control and limited brake operation.</p> | <p>车速。安装在车辆前部的影像系统，可帮助检测移速较慢的车辆是否在自适应巡航控制规划的行驶路径上。<u>如果检测到有移速较慢车辆，自适应巡航控制系统（ACC）将减速自身车辆，并控制 ACC 车辆与前方车辆间距或时距。</u>如果 ACC 系统检测到前方车辆不再处于其划的行驶路径中，系统将加速，使车速重回已设定的巡航控制速度。此操作能够实现车辆自主减速和加速的控制，主要通过调节发动机节流阀以及实施有限的制动操作来实现。</p> |
| <p>HOW DOES IT WORK?</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <p>工作原理</p>                                                                                                                                                                                                             |
| <p><u>The radar headway sensor sends information to a digital signal processor, which in turn translates the speed and distance information for a longitudinal controller. The result? If the lead vehicle slows down, or if another object is detected, the system sends a signal to the engine or braking system to decelerate.</u> Then, when the road is clear, the system will re-accelerate the vehicle back to the set speed.</p>                                                                                                                                                                                                                                                                             | <p><u>雷达测距传感器将速度和距离信息传输到数字信号处理器，后者又将信息传输到纵向控制器。当前方车辆减速，或测距传感器检测到另一个物体，自适应巡航控制系统就会向发动机或制动系统发出减速信号。</u>因此，当道路畅通时，系统将重新加速车辆，使其回到设定速度。</p>                                                                                  |

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| <p>The adaptive cruise control (ACC) system depends on two infrared sensors to detect cars up ahead. Each sensor has an emitter, which sends out a beam of infrared light energy, and a receiver, which captures light reflected back from the vehicle ahead.</p>                                                                                                                                                                                                                                                                                                                                                        | <p>ACC 系统依靠两个红外传感器来探测前方车辆。每个传感器都有一个能发出一束红外光能的发射器，和一个能捕捉前方车辆反射光的接收器。</p>                                                                                                                                         |
| <p>The first sensor, called the sweep long-range sensor, uses a narrow infrared beam to detect objects six to 50 yards away. At its widest point, the beam covers no more than the width of one highway lane, so this sensor detects only vehicles directly ahead and doesn't detect cars in other lanes. Even so, it has to deal with some tricky situations, like keeping track of the right target when the car goes around a curve. To deal with that problem, the system has a solid-state gyro that instantaneously transmits curve-radius information to the sweep sensor, which steers its beam accordingly.</p> | <p>第一个传感器，称为长距离扫描传感器。通过狭窄的红外光束来探测 5.5m—45.7m 内的物体。传感器最宽处光束覆盖范围不超过一条高速公路车道宽度。因此，这种传感器只能探测到正前方车辆，无法探测到其他车道上的车辆。即便如此，它还是得处理一些棘手的情况，比如当车辆转弯时必须追踪正确的目标。为解决这个问题，该系统配有一个固态陀螺仪，它能即时将曲线半径信息即时传输给扫描传感器，后者根据这些信息调整其光束。</p> |
| <p>Another challenge arises when a car suddenly cuts in front of an ACC-equipped car. Because the sweep sensor's beam is so narrow, it doesn't "see" the other car until it's smack in the middle of the lane. That's where the other sensor, called the cut-in sensor, comes in. It has two wide beams</p>                                                                                                                                                                                                                                                                                                              | <p>另一方面，由于扫描传感器的光束很窄，当一辆汽车突然插入到装有自适应巡航系统的车辆前面时，ACC 系统“看不到”另一辆车，除非这辆车出现在车道正中间。这就是另一个传感器——切入式传感器作用所在。它有两个宽大的光束，</p>                                                                                               |

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| that "look" into adjacent lanes, up to a distance of 30 yards ahead. And because it ignores anything that isn't moving at least 30 percent as fast as the car in which it is mounted, highway signs and parked cars on the side of the road don't confuse it.                                                                                                                                                                                                       | 可以“看”到相邻车道，光束最远可达 160 米。且它会忽略移动速度比安装它的汽车快至少 30% 的东西，因此，高速公路标志和路边停放的汽车不会让它感到困惑。                                                         |
| Information from the sensors goes to the Vehicle Application Controller (VAC), the system's computing and communication centre. The VAC reads the settings the driver has selected and figures out such things as how fast the car should go to maintain the proper distance from cars ahead and when the car should release the throttle or downshift to slow down. Then it communicates that information to devices that control the engine and the transmission. | 传感器传出的信息被 ACC 系统的计算、通信中心——车辆应用控制器（VAC）接收。VAC 读取驾驶员设置的参数，并计算出汽车应该以多快的速度行驶，以与前方汽车保持适当的距离，以及汽车应该何时松开节流阀或降档减速。然后，VAC 将这些信息传达给控制发动机和变速器的设备。 |
| There are several inputs:                                                                                                                                                                                                                                                                                                                                                                                                                                           | 有几个输入端：                                                                                                                                |
| System on/off: If on, denotes that the cruise-control system should maintain the car speed.                                                                                                                                                                                                                                                                                                                                                                         | 系统开/关：如果开关打开，则巡航控制系统应保持当前车速。                                                                                                           |
| Engine on/off: If on, denotes that the car engine is turned on; the cruise-control system is only active if the engine is on.                                                                                                                                                                                                                                                                                                                                       | 发动机开/关：如果开关打开，则汽车发动机启动；只有当发动机启动时，巡航控制系统才会激活。                                                                                           |
| Pulses from wheel: A pulse is sent for every revolution of the wheel.                                                                                                                                                                                                                                                                                                                                                                                               | 车轮脉冲：车轮每转一圈，就会发出一个脉冲。                                                                                                                  |
| Accelerator: Indication of how far the accelerator has been pressed.                                                                                                                                                                                                                                                                                                                                                                                                | 加速器：表明加速器被按压程度。                                                                                                                        |

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| Brake: On when the brake is pressed; the cruise-control system temporarily reverts to manual control if the brake is pressed. | 制动器：当制动器受压时开启；巡航控制系统会暂时恢复到手动控制。  |
| Increase/Decrease Speed: Increase or decrease the maintained speed; only applicable if the cruise-control system is on.       | 加速/减速：增加或降低当前速度，只适用于巡航控制系统开启状态下。 |
| Resume: Resume the last maintained speed; only applicable if the cruise-control system is on.                                 | 恢复：恢复最后保持的速度；只适用于巡航控制系统开启状态下。    |
| Clock: Timing pulse every millisecond. There is one output from the system:                                                   | 时钟：每毫秒产生一个计时脉冲。系统有一个输出：          |
| Throttle: Digital value for the engineer throttle setting.                                                                    | 节流阀：工程师节流阀调定的数字值。                |
| ADAPTIVE CRUISE CONTROL FEATURES                                                                                              | ACC 功能                           |
| Maintains a safe, comfortable distance between vehicles without driver interventions                                          | 在无驾驶员干预的情况下，保持车辆间距安全、适当。         |
| Maintains a consistent performance in poor visibility conditions.                                                             | 在能见度低的情况下保持性能稳定。                 |
| Maintains a continuous performance during road turns and elevation changes                                                    | 在道路转弯和海拔变化中保证性能持续。               |
| Alerts drivers by way of automatic braking.                                                                                   | 通过自主制动警示驾驶员。                     |
| PHYSICAL LAYOUT                                                                                                               | 物理结构                             |
| The ACC system consists of a series                                                                                           | ACC 系统由一系列组件、系统                  |

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| of interconnecting components and systems. The method of communication between the different modules is via a serial communication network known as the Controller Area Network (CAN).                                                                                                                                             | 互连而成。不同模块之间通过一个串行通信网络——控制器局域网（CAN）通信。                                                            |
| ACC Module – The primary function of the ACC module is to process the radar information and determine if a forward vehicle is present. When the ACC system is in 'time gap control', it sends information to the Engine Control and Brake Control modules to control the clearance between the ACC Vehicle and the Target Vehicle. | ACC 模块——ACC 模块的主要功能是处理雷达信息并确定前方是否有车辆。当 ACC 系统处于"时距控制"模式时，会向发动机控制模块与制动控制模块发送信息，以控制本车辆和前车之间的距离。    |
| Engine Control Module – The primary function of the Engine Control Module is to receive information from the ACC module and Instrument Cluster and control the vehicle's speed based on this information. The Engine Control Module controls vehicle speed by controlling the engine's throttle.                                   | 引擎控制模块——发动机控制模块的主要功能是接收来自 ACC 模块和仪表盘的信息，并根据这些信息控制车速。发动机控制模块通过操纵发动机节流阀来控制车速。                      |
| Brake Control Module – The primary function of the Brake Control Module is to determine vehicle speed via each wheel and to decelerate the vehicle by applying the brakes when requested by the ACC Module. The braking system is hydraulic with electronic enhancement, such as an                                                | 制动控制模块——制动控制模块的主要功能是通过每个车轮来确定车速，在 ACC 模块请求时通过施加制动来减速车辆。制动系统是液压系统，而不是完全的电子控制制动系统，具有电子增强功能，例如 ABS。 |

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| <p>ABS brake system, and is not full translativity brake by wire.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                            |
| <p>Instrument Cluster – The primary function of the Instrument Cluster is to process the Cruise Switches and send their information to the ACC and Engine Control Modules. The Instrument Cluster also displays text messages and tell-tales for the driver so that the driver has information regarding the state of the ACC system.</p>                                                                                                                                                                                                                                                                                                                                                                                                        | <p>仪表盘——仪表盘的主要功能是处理巡航开关信号，并将信息发送给 ACC 模块和引擎控制模块。仪表盘还显示文本信息和指示灯，以便驾驶员了解 ACC 系统状态。</p>                                                                                                                                                                       |
| <p>CAN – The Controller Area Network (CAN) is an automotive standard network that utilizes a 2 wire bus to transmit and receive data. Each node on the network has the capability to transmit 0 to 8 bytes of data in a message frame. A message frame consists of a message header, followed by 0 to 8 data bytes, and then a checksum. The message header is a unique identifier that determines the message priority. Any node on the network can transmit data if the bus is free. If multiple nodes attempt to transmit at the same time, an arbitration scheme is used to determine which node will control the bus. The message with the highest priority, as defined in its header, will win the arbitration and its message will be</p> | <p>CAN——CAN 是一种汽车标准网络，利用 2 线总线来传输、接收数据。网络上的每个节点都能在一个信息帧中传输 0 至 8 个字节的数据。一个信息帧由一个消息头，0 至 8 个数据字节，以及一个检查和组成。消息头是一个唯一标识符，用于确定消息的优先级。如果总线空闲，那么任何网络节点都可传输数据。如果多个节点尝试同时传输数据，则使用仲裁方案来确定哪个节点将控制总线。具有最高优先级的消息（由其头部定义）将赢得仲裁，其消息也会被传输。输掉的消息会在检测到总线空闲状态后，立即尝试重新发送。</p> |

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| transmitted. The losing message will retry to send its message as soon as it detects a bus free state.                                                                                |                                                        |
| Cruise Switches – The Cruise Switches are mounted on the steering wheel and have several buttons which allow the driver to command operation of the ACC system. The switches include: | 巡航开关——巡航开关安装于方向盘上，具有多个按钮，驾驶员通过操作按钮，控制 ACC 系统运作。巡航开关包括： |
| 'On': place system in the 'ACC standby' state                                                                                                                                         | “On”：将系统置于"ACC 系统备用"状态                                 |
| 'Off': cancel ACC operation and place system in the 'ACC off' state                                                                                                                   | “Off”：取消 ACC 系统操作，将系统置于'ACC 系统关闭'状态                    |
| 'Set +': activate ACC and establish set speed or accelerate                                                                                                                           | “Set+”：激活 ACC 系统，设定速度或加速                               |
| 'Coast': decelerate                                                                                                                                                                   | “Coast”：减速                                             |
| 'Resume': resume to set speed                                                                                                                                                         | “Resume”：恢复到设定速度                                       |
| 'Time Gap +': increase gap                                                                                                                                                            | “Time Gap+”：增加间隔                                       |
| 'Time gap -': decrease gap                                                                                                                                                            | “Time Gap-”：缩小间隔                                       |
| ADVANTAGES                                                                                                                                                                            | ACC 优点：                                                |
| The driver is relieved from the task of careful acceleration, deceleration and braking in congested traffics.                                                                         | 驾驶员无需在拥堵交通中小心谨慎地制动、加速、减速。                              |
| A highly responsive traffic system that adjusts itself to avoid accidents can be developed.                                                                                           | 可以开发一个反应灵敏的交通系统，通过自我调节避免交通事故。                          |
| Since the braking and acceleration are done in a systematic way, the fuel efficiency of the vehicle is increased.                                                                     | 车辆制动和加速均系统化运行，提高了车辆燃油效率。                               |
| DISADVANTAGES                                                                                                                                                                         | 缺点                                                     |

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| A cheap version is not yet realized.                                                                                                                                                                                                                                                                                                                                                                        | 优惠版还未开发完成。                                                                                                                                           |
| A high market penetration is required if a society of intelligent vehicles is to be formed.                                                                                                                                                                                                                                                                                                                 | 若要形成一个智能汽车社会，就需要高市场渗透率。                                                                                                                              |
| Encourages the driver to become careless. It can lead to severe accidents if the system is malfunctioning.                                                                                                                                                                                                                                                                                                  | 助长驾驶员的粗心大意。一旦ACC系统出现故障，就会造成严重交通事故。                                                                                                                   |
| The ACC systems yet evolved enable vehicles to cooperate with the other vehicles and hence do not respond directly to the traffic signals.                                                                                                                                                                                                                                                                  | 目前已经演进的ACC系统使车辆能够与其他车辆合作，因此不会直接响应交通信号。                                                                                                               |
| CRDI (Common Rail Direct Injection)                                                                                                                                                                                                                                                                                                                                                                         | 共轨直喷 (CRDI)                                                                                                                                          |
| CRDI stands for Common Rail Direct Injection meaning, direct injection of the fuel into the cylinders of a diesel engine via a single, common line, called the common rail which is connected to all the fuel injectors.                                                                                                                                                                                    | CRDI，意味着燃油通过一个单一的公共管线——共轨，直接喷入柴油发动机的气缸中，该共轨与所有燃油喷射器相连。                                                                                               |
| Whereas ordinary diesel direct fuel-injection systems have to build up pressure anew for each and every injection cycle, the new common rail (line) engines maintain constant pressure regardless of the injection sequence. This pressure then remains permanently available throughout the fuel line. The engine's electronic timing regulates injection pressure according to engine speed and load. The | 传统的柴油直喷系统在每个喷射周期中都必须重新积聚压力。而新的共轨发动机，无论喷射顺序如何，都能保持恒定压力，且这种压力将始终在燃料管道中保持可用状态。共轨发动机的电子计时系统根据发动机转速和负载调节喷射压力。ECU根据从凸轮、曲轴传感器收集的数据，精确调整喷射压力。换句话说，使压缩和喷射两个过程 |

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| <p>electronic control unit (ECU) modifies injection pressure precisely and as needed, based on data obtained from sensors on the cam and crankshafts. In other words, compression and injection occur independently of each other. This technique allows fuel to be injected as needed, saving fuel and lowering emissions.</p>                                                | <p>实现了独立操作。这种技术使燃油按需喷射，不仅节省了燃料，还降低了排放。</p>                                                                                                                                                     |
| <p><u>More accurately measured and timed mixture spray in the combustion chamber significantly reducing unburned fuel gives CRDI the potential to meet future emission guidelines such as Euro V.</u> CRDI engines are now being used in almost all Mercedes-Benz, Toyota, Hyundai, Ford and many other diesel automobiles.</p>                                                | <p><u>燃烧室中更精确的数据测量、定时混合物喷洒，大大节省了未燃燃料，使 CRDI 有满足未来的排放标准（如欧 V 标准——限定汽车最大颗粒排放为 0.005 克/公里，氮氧化物排放量为 0.2 克/公里）的潜力。</u>如今，CRDI 发动机几乎被广泛应用在 Mercedes-Benz、Toyota、Hyundai、Ford 等众多柴油汽车中。</p>           |
| <p>History</p>                                                                                                                                                                                                                                                                                                                                                                 | <p>历史</p>                                                                                                                                                                                      |
| <p><u>The common rail system prototype was developed in the late 1960s by Robert Huber of Switzerland and the technology further developed by Dr. Marco Ganser at the Swiss Federal Institute of Technology in Zurich, later of Ganser-Hydromag AG (est.1995) in Oberägeri. The first successful usage in a production vehicle began in Japan by the mid-1990s. Modern</u></p> | <p><u>共轨系统的原型，于 20 世纪 60 年由瑞士的罗伯特·胡贝尔（Robert Huber）开发。后来被苏黎世瑞士联邦理工学院的马可·甘瑟博士（Dr. Macro Ganser）改良，最后由瑞士奥贝拉杰里的 Ganser-Hydromag AG 公司（创立于 1995 年）改进。2 世纪 90 年代中期，日本首次在量产车中成功使用共轨系统。现代共轨系统</u></p> |

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| <p>common rail systems, whilst working on the same principle, are governed by an engine control unit (ECU) which opens each injector electronically rather than mechanically. <u>This was extensively prototyped in the 1990s with collaboration between Magnetic Marelli, Centro Ricerche Fiat and Elasis. The first passenger car that used the common rail system was the 1997 model Alfa Romeo 156 2.4 JTD, and later on that same year Mercedes-Benz C 220 CDI.</u></p>                                                                                                                                                                                                                  | <p>虽与传统共轨系统工作原理相同，但它是由 ECU 通过电子控制，打开各个喷嘴。<u>20 世纪 90 年代，在 Magnetic Marelli、Centro Ricerche Fiat 和 Elasis 的通力合作下，该产品的原型得到了广泛应用。1997 年生产的 Alfa Romeo 156 2.4 JTD 是第一辆使用共轨系统的乘用车。同年，Mercedes-Benz C 220 CDI 也开始使用共轨系统。</u></p>                                                                         |
| <p>Common rail engines have been used in marine and locomotive applications for some time. The Cooper-Bessemer GN-8 (circa 1942) is an example of a hydraulically operated common rail diesel engine, also known as a modified common rail. Vickers used common rail systems in submarine engines circa 1916. Early engines had a pair of timing cams, one for ahead running and one for astern. Later engines had two injectors per cylinder, and the final series of constant-pressure turbocharged engines were fitted with four injectors per cylinder. This system was used for the injection of both diesel oil and heavy fuel oil (600cSt heated to a temperature of approximately</p> | <p>共轨发动机在船舶、机车中的应用已有一段时间。Cooper-Bessemer GN-8 (约 1942 年) 是液压操纵的共轨柴油发动机（也称为改进型共轨柴油发动机）的典范。约 1916 年，Vickers 公司在潜水艇发动机中使用了共轨系统。早期的发动机有一对正时凸轮，分别用于前进、后退。此后的发动机，每个气缸装有两个喷嘴，最终系列的恒压涡轮增压发动机每个气缸装有四个喷嘴。共轨系统用于喷射柴油和重燃料油（600 粘度加热至约 130℃），还用于装配有柴油发动机的各类公路车，从 Fiat Nuova Panda 等城市轿车到 Audi A6 等行政车辆，不一而足。</p> |

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| <p>130 °C). The common rail system is suitable for all types of road cars with diesel engines, ranging from city cars such as the Fiat Nuova Panda to executive cars such as the Audi A6.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                            |
| <p>Solenoid or piezoelectric valves make possible fine electronic control over the fuel injection time and quantity, and the higher pressure that the common rail technology makes available provides better fuel atomisation. In order to lower engine noise, the engine's electronic control unit can inject a small amount of diesel just before the main injection event ("pilot" injection), thus reducing its explosiveness and vibration, as well as optimizing injection timing and quantity for variations in fuel quality, cold starting and so on. Some advanced common rail fuel systems perform as many as five injections per stroke.</p> | <p>螺线管或压电阀使得对燃油喷射时间和数量的精细电子控制成为可能，而共轨技术提供的更高压力有助于燃油更好地雾化。为降低发动机噪音，发动机 ECU 可以在主喷射事件（“先导”喷射）前，注入少量柴油，从而减少振动、降低爆炸风险，并优化燃料质量变化、冷启动等条件下的喷射时间与喷射量。一些先进共轨燃油系统的每冲程可进行多达 5 次喷射。</p> |
| <p>Operating Principle</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <p>工作原理</p>                                                                                                                                                                |
| <p>Common rail engines require very short (&lt; 10 second) or no heating-up time at all , dependent on ambient temperature, and produce lower engine noise and emissions than older systems. Diesel engines have historically used various forms of fuel injection. Two common</p>                                                                                                                                                                                                                                                                                                                                                                      | <p>共轨发动机加热时间一般非常短（&lt;10 秒），或根本不需要加热，这取决于环境温度，且与老式系统相比，其发动机噪音更低，排放更少。柴油发动机历来使用各种形式的燃油喷射方式。其中，两种常见的类型是单元喷射系统和分配泵/管</p>                                                      |

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| <p>types include the unit injection system and the distributor/inline pump systems (See diesel engine and unit injector for more information). While these older systems provided accurate fuel quantity and injection timing control, they were limited by several factors:</p>                                                                                                                                                                                                                                                                                                               | <p>道泵系统（详细信息见“柴油发动机与泵喷嘴”一节）。尽管这些老式系统可以提供精确的燃油量和喷射正时控制，但它们还是受多个因素限制：</p>                                                                                                |
| <p>They were cam driven, and injection pressure was proportional to engine speed. This typically meant that the highest injection pressure could only be achieved at the highest engine speed and the maximum achievable injection pressure decreased as engine speed decreased. This relationship is true with all pumps, even those used on common rail systems; with the unit or distributor systems, however, the injection pressure is tied to the instantaneous pressure of a single pumping event with no accumulator, and thus the relationship is more prominent and troublesome.</p> | <p>共轨发动机由凸轮驱动，喷射压力与发动机转速成正比。这意味着，只有发动机转速最高时才能达到最高喷射压力。且随着发动机转速降低，可达到的最大喷射压力也会降低。这种关系适用于所有泵，包括共轨系统中所使用的泵；然而，对于单元泵或分配泵系统来说，由于没有蓄压器，喷射压力与单个泵送事件的瞬时压力密切相关，这种关系更加突出、麻烦。</p> |
| <p>They were limited in the number and timing of injection events that could be commanded during a single combustion event. While multiple injection events are possible with these older systems, it is much more difficult and costly to achieve.</p>                                                                                                                                                                                                                                                                                                                                        | <p>CRDI 可控制的喷射事件在数量和时间上是有限的，不能在单次燃烧事件中单独控制。虽然这些老式系统可实现多次喷射，但实现起来更困难、成本更高。</p>                                                                                          |

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| <p>For the typical distributor/inline system, the start of injection occurred at a pre-determined pressure (often referred to as: pop pressure) and ended at a pre-determined pressure. This characteristic resulted from "dummy" injectors in the cylinder head which opened and closed at pressures determined by the spring preload applied to the plunger in the injector. Once the pressure in the injector reached a pre-determined level, the plunger would lift and injection would start.</p>                                                                                                                                                                      | <p>对于典型的分配泵/管道泵系统，喷射的开始和结束都发生在预定的压力点（通常称为：爆发压力）。这一特点来自其气缸盖中的“假”喷射器。这些喷射器的开启与关闭，由施加在喷射器柱塞中的弹簧预载荷决定。一旦喷射器中的压力达到预定水平，柱塞就会抬起，喷射就会开始。</p>                                                                                                                            |
| <p>In common rail systems, a high-pressure pump stores a reservoir of fuel at high pressure — up to and above 2,000 bars (psi). The term "common rail" refers to the fact that all of the fuel injectors are supplied by a common fuel rail which is nothing more than a pressure accumulator where the fuel is stored at high pressure. This accumulator supplies multiple fuel injectors with high-pressure fuel. This simplifies the purpose of the high-pressure pump in that it only has to maintain a commanded pressure at a target (either mechanically or electronically controlled). The fuel injectors are typically ECU-controlled. When the fuel injectors</p> | <p>在共轨系统中，高压泵在高压下储存燃油，最高压力可达或超过 2,000 巴（磅/平方英寸）。所谓“共轨”，是指所有的燃油喷射器都由一个公共燃油轨道提供，这个燃油轨道只不过是一个蓄压器，将燃油储存在高压下。这个蓄压器为多个燃油喷射器提供高压燃油，它只需将指令压力保持在目标值（由机械或电子控制），简化了高压泵的用途。燃油喷射器通常由 ECU 控制。当电子启动喷射器时，液压阀（由一个喷嘴和柱塞组成）通过机械或液压打开，燃料以所需压力喷洒入气缸。由于燃料压力能量远程存储，且燃油喷射器是电子控制的，因此</p> |

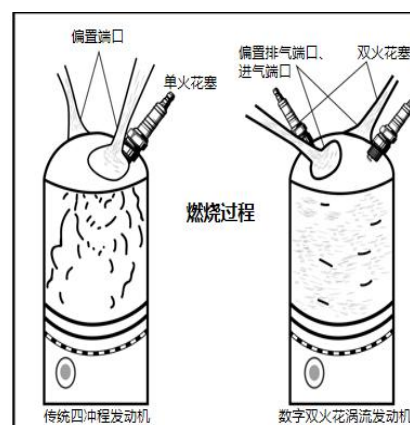
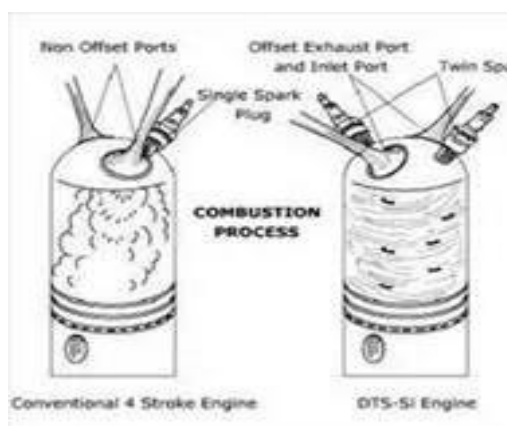
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| are electrically activated, a hydraulic valve (consisting of a nozzle and plunger) is mechanically or hydraulically opened and fuel is sprayed into the cylinders at the desired pressure. Since the fuel pressure energy is stored remotely and the injectors are electrically actuated, the injection pressure at the start and end of injection is very near the pressure in the accumulator (rail), thus producing a square injection rate. If the accumulator, pump and plumbing are sized properly, the injection pressure and rate will be the same for each of the multiple injection events. | 在燃油喷射开始和结束时的喷射压力十分接近蓄压器（燃油轨道）中的压力，从而形成了一个方形喷射率（一种在特定时间段内保持相对稳定或恒定的燃油喷射速率）。如果蓄压器、泵和管道的尺寸合适，那么在多次喷射中，喷射压力和速率也相同。 |
| Advantages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 优点                                                                                                             |
| CRDI engines are advantageous in many ways. Cars fitted with this new engine technology are believed to deliver 25% more power and torque than the normal direct injection engine. It also offers superior pick up, lower levels of noise and vibration, higher mileage, lower emissions, lower fuel consumption, and improved performance.                                                                                                                                                                                                                                                           | CRDI 发动机在很多方面都有优势。装有这种新型发动机技术的汽车，比装有普通直喷发动机的汽车多输出 25% 的功率和力矩。此外，它提速能力卓越、噪音更低、振动更少、里程更远，排放、油耗更低，性能更佳            |
| Disadvantages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 缺点                                                                                                             |
| Like all good things have a negative side, this engine also have few disadvantages. The key disadvantage of the CRDI engine is that it is costly than the                                                                                                                                                                                                                                                                                                                                                                                                                                             | 就像所有好东西都有消极的一面，这款发动机也有缺点。装配 CRDI 发动机的主要缺点是——成本比传统发动机高，还有发动机深                                                   |

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| conventional engine. The list also includes high degree of engine maintenance and costly spare parts. Also this technology can't be employed to ordinary engines.                                                                                               | 层维护费用、备件费用。此外，这个系统不适配普通的发动机。                                            |
| Applications                                                                                                                                                                                                                                                    | 应用                                                                      |
| The most common applications of common rail engines are marine and locomotive applications. Also, in the present day they are widely used in a variety of car models ranging from city cars to premium executive cars.                                          | 共轨发动机最常应用于船舶与机车。如今，它也被广泛用于各类车型，从城市轿车到高级行政轿车等。                           |
| However, most of the car manufacturers have started using the new engine concept and are appreciating the long term benefits of the same. The technology that has revolutionized the diesel engine market is now gaining prominence in the global car industry. | 但大多数汽车制造商已经开始使用新的发动机概念，并开始重视其长期效益。如今，共轨直喷系统彻底改变了柴油发动机市场，并正在全球汽车行业中崭露头角。 |
| CRDI technology revolutionized diesel engines and also petrol engines (by introduction of GDI technology).                                                                                                                                                      | CRDI 技术彻底改变了柴油发动机和汽油发动机（通过引入 GDI 技术）。                                   |

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| <p>By introduction of CRDI a lot of advantages are obtained, some of them are, more power is developed, increased fuel efficiency, reduced noise, more stability, pollutants are reduced, particulates of exhaust are reduced, exhaust gas recirculation is enhanced, precise injection timing is obtained, pilot and post injection increase the combustion quality, more pulverization of fuel is obtained, very high injection pressure can be achieved, the powerful microcomputer make the whole system more perfect, it doubles the torque at lower engine speeds. The main disadvantage is that this technology increase the cost of the engine. Also this technology can't be employed to ordinary engines.</p> | <p>通过引进 CRDI 技术, 发动机性能提升了: 动力更大, 燃油效率更高、噪音更小、稳定性更好、污染物减少、废气颗粒减少、废气再循环能力增强、喷射正时精确。先导和后喷射提高了燃烧质量、燃油的粉碎程度更高、喷射压力更高。的微电脑性能强大, 使整个系统更加完善, 它能在发动机转速较低的情况下, 将力矩提高一倍。这种技术的主要缺陷是增加了发动机的成本, 也不适配普通发动机。</p> |
| <p>DTSI(Digital Twin Spark Ignition System)</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <p>数字式双火花塞点火系统 (DTSI)</p>                                                                                                                                                                        |
| <p><u>It is very interesting to know about complete combustion in automobile engineering, because in actual practice, perfect combustion is not at all possible due to various losses in the combustion chamber as well as design of the internal combustion engine. Moreover the process of burning of the fuel is also not instantaneous. However an alternate</u></p>                                                                                                                                                                                                                                                                                                                                                | <p><u>了解车辆工程中的完全燃烧非常有趣。在实际应用中, 由于燃烧室的各种损失以及内燃机的设计, 无法实现完全燃烧, 且燃料的燃烧过程也不是瞬间发生的。不过, 完全燃烧可以通过尽可能加快燃料燃烧速度来实现——通过使用两个火花塞在一定时间间隔内交替点火, 以增加火焰直径, 使燃料瞬间燃烧。</u></p>                                       |

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| <p><u>solution to it is by making the combustion of fuel as fast as possible. This can be done by using two spark plugs which spark alternatively at a certain time interval so as increase the diameter of the flame &amp; burn the fuel instantaneously. This system is called DTSI (Digital Twin Spark Ignition system). In this system, due to twin sparks, combustion will be complete.</u></p> | <p><u>这个系统被称为 DTSI。该系统中，燃料将在双火花塞的作用下完全燃烧。</u></p>                                                                                             |
| <p>This paper represents the working of digital twin spark ignition system, how twin sparks are produced at 20,000 Volts, their timings, efficiency, advantages &amp; disadvantages, diameter of the flame, how complete combustion is possible &amp; how to decrease smoke &amp; exhausts from the exhaust pipe of the bike using Twin Spark System.</p>                                            | <p>本文介绍了 DTSI 的工作原理——如何在 20000 伏电压下产生双火花，其时序、效率、优缺点、火焰直径、如何实现完全燃烧，以及如何使用双火花系统减少机车排气管中的烟雾和废气。</p>                                              |
| <p>How Does It Works?</p>                                                                                                                                                                                                                                                                                                                                                                            | <p>工作原理</p>                                                                                                                                   |
| <p>Digital Twin Spark ignition engine has two Spark plugs located at opposite ends of the combustion chamber and hence fast and efficient combustion is obtained. The benefits of this efficient combustion process can be felt in terms of better fuel efficiency and lower emissions. The ignition system on the Twin spark is a digital system with static spark advance</p>                      | <p>DTSI 发动机的两个火花塞位于燃烧室两端，使燃烧更快速、高效。这种高效燃烧过程使得燃油燃烧效率更高、排放更低。双火花点火系统是一个数字系统，具有静态点火提前角，没有易损件。它由集成数字电子控制箱进行映射，该控制箱还调节燃油喷射和气门正时。每个气缸都配备有两个火花塞。</p> |

and no moving parts subject to wear. It is mapped by the integrated digital electronic control box which also handles fuel injection and valve timing. It features two plugs per cylinder.



This innovative solution, also entailing a special configuration of the hemispherical combustion chambers and piston heads, ensures a fast, wide flame front when the air-fuel mixture is ignited, and therefore less ignition advance, enabling, moreover, relatively lean mixtures to be used. This technology provides a combination of the light weight and twice the power offered by two-stroke engines with a significant power boost, i.e. a considerable "power-to-weight ratio" compared to quite a few four-stroke engines.

这种创新解决方案还涉及半球形燃烧室和活塞头的特殊配置，确保在空气—燃料混合物被点燃时，产生快速、宽阔的火焰前沿，因此点火提前角更小。此外，还可以使用相对稀薄的混合物。与许多四冲程发动机相比，该技术将二冲程发动机的轻便化与两倍功率相结合，动力得到了明显提升，即具有相当可观的“比功率”（动力与车体重量的比值，比值越大车辆的动力性越好）。

Moreover, such a system can adjust idling speed & even cuts off fuel feed when the accelerator pedal is released, and

此外，这种系统还能调整怠速转速，甚至在松开加速踏板时切断燃料供给，并测量冷启动与加速时

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| <p>meters the enrichment of the air-fuel mixture for cold starting and accelerating purposes; if necessary, it also prevents the upper rev limit from being exceeded. At low revs, the over boost is mostly used when overtaking, and this is why it cuts out automatically. At higher speeds the over boost will enhance full power delivery and will stay on as long as the driver exercises maximum pressure on the accelerator.</p> | <p>的空燃混合物浓度；必要时，它还能防止转速超过上限。低转速时，超增压主要用于超车，因此会自动切断。较高转速时，超增压会增强全功率输出，只要驾驶员对加速踏板施加最大压力，它就会持续工作。</p> |
| <p>Main characteristics</p>                                                                                                                                                                                                                                                                                                                                                                                                             | <p>主要特点</p>                                                                                        |
| <p>Digital electronic ignition with two plugs per cylinder and two ignition distributors.</p>                                                                                                                                                                                                                                                                                                                                           | <p>数字式电子点火系统中，每汽缸配备两个火花塞与两个点火分电器。</p>                                                              |
| <p>Twin overhead cams with camshaft timing variation.</p>                                                                                                                                                                                                                                                                                                                                                                               | <p>双顶置凸轮，凸轮轴正时变化。</p>                                                                              |
| <p>Injection fuel feed with integrated electronic twin spark ignition.</p>                                                                                                                                                                                                                                                                                                                                                              | <p>采用集成电子双火花点火系统的喷射燃料供给。</p>                                                                       |
| <p>A high specific power.</p>                                                                                                                                                                                                                                                                                                                                                                                                           | <p>高比功率。</p>                                                                                       |
| <p>Compact design and Superior balance.</p>                                                                                                                                                                                                                                                                                                                                                                                             | <p>设计紧凑、平衡性佳。</p>                                                                                  |
| <p>Construction</p>                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>结构</p>                                                                                          |
| <p>Digital twin spark ignition technology powered engine has two spark plugs. It is located at opposite sides of combustion chamber. This DTS-I technology will have greater combustion rate because of twin spark plug located around it. The engine</p>                                                                                                                                                                               | <p>数字式双火花点火技术驱动的发动机配备有两个火花塞，位于燃烧室相对两侧。这两个火花塞，使得燃油燃烧效率更高、燃烧速度比正常情况下快了一倍，这既延长了发动机使用寿命，又提高了燃油燃</p>    |

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| combust fuel at double rate than normal. This enhances both engine life and fuel efficiency. It is mapped by the digital electronic control box which also handles fuel ignition and valve timing. | 烧效率。它由数字式电子控制箱映射，该控制箱还用来处理燃油点火和气门正时。                  |
| A microprocessor continuously senses speed and load of the engine and respond by altering the ignition timingm thereby optimizing power and fuel economy.                                          | 微处理器不断感知发动机的转速与负载，并通过改变点火正时来优化功率与燃油经济性。               |
| Advantages                                                                                                                                                                                         | 优势                                                    |
| ● Less vibrations and noise                                                                                                                                                                        | ● 振动更少、噪音更低                                           |
| ● Long life of the engine parts such as piston rings and valve stem.                                                                                                                               | ● 活塞环和阀杆等发动机部件使用寿命更长                                  |
| ● Decrease in the specific fuel consumption                                                                                                                                                        | ● 更低的具体燃油消耗量                                          |
| ● No over heating                                                                                                                                                                                  | ● 无过度加热                                               |
| ● Increase the Thermal Efficiency of the Engine & even bear high loads on it.                                                                                                                      | ● 更高的发动机的热效率，甚至可承受高负载。                                |
| ● Better starting of engine even in winter season & cold climatic conditions or at very low temperatures because of increased Compression ratio.                                                   | ● 由于压缩比增大，即使在冬季、寒冷天气或超低温下，发动机也能更好地启动。                 |
| ● Because of twin Sparks the diameter of the flame increases rapidly that would result in instantaneous burning of fuels. Thus force exerted on the piston would increase leading to better work   | ● 由于双火花的存在，火焰直径迅速增加，导致燃油瞬间燃烧。因此，施加在活塞上的力增加，会产生更高的输出功。 |

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| output.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                        |
| Disadvantages                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 缺点                                                                                                                                                     |
| <ul style="list-style-type: none"> <li>● There is high NOx emission</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>● 氮氧化物排放量高</li> </ul>                                                                                           |
| <ul style="list-style-type: none"> <li>● If one spark plug get damaged then we have to replace both</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>● 如果一个火花塞损坏，另一个也必须更换。</li> </ul>                                                                                |
| <ul style="list-style-type: none"> <li>● The cost is relatively more</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>● 成本相对较高</li> </ul>                                                                                             |
| Electromagnetic Brake                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 电磁制动器                                                                                                                                                  |
| <p>Electromagnetic brakes are the brakes working on the electric power &amp; magnetic power. They works on the principle of electromagnetism. These mare totally friction less. Due to this they are more durable&amp; have longer life span. Less maintenance is there. These brakes are an excellent replacement on the conventional brakes due to their many advantages. The reason for implementing this brake in automobiles is to reduce wear in brakes as it friction less. Therefore there will also be no heat loss. It can be used in heavy vehicles as well as in light vehicles.</p> | <p>电磁制动器是依靠电力、磁力工作的制动器。它根据电磁原理工作，完全无摩擦力，所以更耐用、使用寿命更长、需要维护更少。由于优点颇多，这类制动器是传统制动器的绝佳替代品。在汽车上使用这类制动器，是因其无摩擦，可以减少制动器磨损，也不会产生热损失。电磁制动器既可用于重型车辆，也可用于轻型车辆。</p> |
| <p>The electromagnetic brakes are much effective than conventional brakes &amp; the time taken for application of brakes are also smaller. There is very few need of lubrication. Electromagnetic brakes gives such better performance with less cost which is today's need. There are also many more advantages of Electromagnetic</p>                                                                                                                                                                                                                                                          | <p>电磁制动器相较于传统制动器，不仅更为高效，制动时间更短，而且几乎无需润滑。电磁制动器成本更低，性能却更好，完美契合当今的需求，且它还有许多其他优点。因此，电磁制动器是传统制动器的绝佳替代品。</p>                                                 |

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| brakes. That's why electromagnetic brakes are an excellent replacement on conventional brakes.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                        |
| <p>Electromagnetic brakes are of today's automobiles. An electromagnetic braking system for automobiles like cars, an effective braking system. And, by using this electromagnetic brakes, we can increase the life of the braking unit. The working principle of this system is that when the magnetic flux passes through and perpendicular to the rotating wheel the eddy current flows opposite to the rotating wheel/rotor direction. This eddy current trying to stop the rotating wheel or rotor. This results in the rotating wheel or rotor comes to rest/ neutral.</p> | <p>电磁制动器是当今汽车的主流。对于汽车来说，电磁制动系统是一种有效的制动系统。而且，通过使用这类电磁制动器，可以延长制动单元寿命。此系统工作原理是，当磁通穿过并垂直于旋转的车轮时，涡流流动方向会与车轮/转子的旋转方向相反。该涡流试图阻止车轮旋转，导致车轮或转子静止。</p>                                            |
| HISTORY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 历史                                                                                                                                                                                     |
| <p>It is found that electromagnetic brakes can develop a negative power which represents nearly twice the maximum power output of a typical engine, and at least three times the braking power of an exhaust brake. (Reverdin 1994). These performance of electromagnetic brakes make them much more competitive candidate for alternative retardation equipment's compared with other retarders. By using the</p>                                                                                                                                                               | <p>研究发现，电磁制动器可以产生负功率，其数值接近典型发动机最大功率输出的两倍，并且至少是排气制动器制动功率的三倍（Reverdin 1994）。相较于其他缓速器，电磁制动器在性能上展现出显著优势，从而使其在替代传统缓速器方面更具竞争力。将电磁制动器作为辅助缓速设备，可减少摩擦制动器使用频率，因此其几乎不会出现高温情况。<u>制动闸衬在需要维护</u></p> |

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| <p>electromagnetic brakes are supplementary retardation equipment, the friction brakes can be used less frequently, and therefore practically never reach high temperatures. <u>The brake linings would last considerably longer before requiring maintenance and the potentially "brake fade" problem could be avoided.</u></p>                                                                                                                           | <p><u>之前可使用更久，同时，也可避免潜在的“制动失效”问题。</u></p>                                                                                                                                                             |
| <p>In research conducted by a truck manufacturer, it was proved that the electromagnetic brake assumed 80% of the duty which would otherwise have been demanded of the regular service brake (Reverdin 1974). Furthermore the electromagnetic brakes prevents the danger that can arise from the prolonged use of brake beyond their capability to dissipate heat.</p>                                                                                     | <p>一家卡车制造商进行的研究证明，电磁制动器承担了本应由常规制动器承担的 80% 的工作量 (Reverdin 1974)。不仅如此，电磁制动器还能防止因长时间使用制动器导致超出其散热能力所引发的危险。</p>                                                                                            |
| <p>This is most likely to occur while a vehicle descending a long gradient at high speed. In A study with a vehicle with 5 axles and weighing 40 tons powered by a powered by an engine of 310 b.h.p travelling down a gradient of 6% at a steady speed between 35 and 40 m.h.p, it can be calculated that the braking power necessary to maintain this speed at the order of 450 hp. The brakes, therefore, would have to absorb 300 hp, meaning that</p> | <p>这种情况最可能发生在车辆高速下长坡的过程中。在一项研究中，在一项研究中，一辆拥有 5 轴、重达 40 吨、由 310 匹马力的发动机驱动的卡车，以每小时 35 至 40 英里的稳定速度行驶在 32 度的下坡路上。我们可以计算出，保持这一速度所需的制动功率为 450 匹马力。因此，制动器必须吸收 300 匹马力的功率，这意味着 5 轴中的每个制动器必须吸收 30 匹马力的功率，这</p> |

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| each brake in the 5 axles must absorb 30 hp, that a friction brake can normally absorb with self-destruction.                                                                                                                                                                                                                                                                                                                                                                                          | 是摩擦制动器自毁前所能吸收的正常功率。                                                                                                                   |
| The magnetic brake is well suited to such conditions since it will independently absorb more than 300 hp (Reverdin 1974). It therefore can exceed the requirements of continuous uninterrupted braking, leaving the friction brakes cool and ready for emergency braking in total safety.                                                                                                                                                                                                              | 电磁制动器非常适用于这种情况，因为它可独自吸收超过 300 马力的功率（Reverdin 1974）。因此，它可超出连续、不间断制动的要求，使摩擦制动器保持冷却，并准备好在完全安全的情况下，进行紧急制动。                                |
| The installation of an electromagnetic brake is not very difficulty if there is enough space between the gearbox and the rear axle. It did not need a subsidiary cooling system. It relay on the efficiency of engine components for its use, so do exhaust and hydrokinetic brakes. The exhaust brake is an on/off device and hydrokinetic brakes have very complex control system. The electromagnetic brake control system is an electric switching system which gives it superior controllability. | 如果变速器和后轴之间有足够的空间，安装电磁制动器的难度不大。如果不需要辅助冷却系统。它依赖于发动机部件的效率来运行，排气制动器和液压制动器也是如此。排气制动器是 on/off 设备，而液压制动器则有极其复杂的控制系统。电磁制动器是电子开关系统控制，具有优越的可控性。 |
| CONSTRUCTION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 构造                                                                                                                                    |
| The construction of the electromagnetic braking system is very simple. The parts needed for the construction are electromagnetic, rheostat, sensors and magnetic insulator. A                                                                                                                                                                                                                                                                                                                          | 电磁制动系统的构造非常简单，由电磁铁、变阻器、传感器和磁绝缘体组成。将带绕组的圆柱环形电磁铁和旋转的轮盘/转子平行放置。电磁铁像定子一样固定，线圈                                                             |

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| <p>cylindrical ring shaped electromagnet with winding is placed parallel to rotating wheel disc/rotor. The electro magnet is fixed, like as stator and coils are wounded along the electromagnet. These coils are connected with electrical circuit containing one rheostat which is connected with brake pedal. And the rheostat is used to control the current flowing is used to control the magnetic flux. And also it is used to prevent the magnetization of other parts like axle and it act as a support frame for the electromagnet. The sensor used to indicate the disconnection in the whole circuit. If there is any error it gives an alert, so we can avoid accident.</p> | <p>沿着电磁铁缠绕。这些线圈与电路相连，电路中包含一个与制动踏板相连的变阻器。变阻器用来控制电流、磁通量，还用来防止其他部件磁化，如轴磁化。它还充当一个电磁铁支架。传感器用于显示整个电路断开情况。如有任何错误，它会发出警报，从而避免事故发生。</p> |
| <p>WORKING PRINCIPLE</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <p>工作原理</p>                                                                                                                    |
| <p>The working principle of the electric retarder is based on the creation of eddy currents within a metal discs rotating between two electro magnets, which set up a force opposing the rotation of the discs. If the electromagnet is not energized, the rotation of the disc free and accelerates uniformly under the action of the weight to which its shaft is connected.</p>                                                                                                                                                                                                                                                                                                       | <p>电缓速器的工作原理是——在两个电磁体间旋转的金属盘中产生涡流，从而产生一个与盘旋转相反的力。如果电磁铁没有通电，金属盘会自由旋转，并在其轴连接的重量的作用下均匀加速。</p>                                     |
| <p>When the electromagnet is energized, the rotation of the disc is retarded and the energy absorbed appears as heating of the</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <p>当电磁铁通电时，金属盘的旋转受到阻碍，吸收的能量表现为盘的加热。如果通过电阻器改变激励</p>                                                                             |

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| <p>discs. If the current exciting the electromagnet is varied by a rheostat, the braking force varies indirect proportion of the value of the current. The development of this invention began when the French company Thelma, associated with Raoul Sarasin, developed and marketed several generations of electric brake based on the functioning principle described above. A typical retarder consists of stator and rotor. The stator hold 16 induction coils, energized separately in group of four. The coils are made up of varnished aluminium wire mounted in epoxy resin.</p> | <p>电磁铁的电流，那么制动力会与电流值成反比变化。这项发明始于法国公司 Thelma，基于上述原理，且在与 Raoul Sarasin 公司的合作下，开发和推出了几代电制动器。典型的缓速器通常由定子和转子组成。定子上有 16 个感应线圈，每四个一组，独立通电。线圈由浸渍在环氧树脂中的漆包铝线制成。</p> |
| <p>The stator assembly is supported resiliently through anti-vibration mountings on the chassis frame of the vehicle. The rotor is made up of two discs, which provide the braking force when subjected to the electromagnetic influence when the coil are excited. Carefully design of the fins, which are integral to the disc, permit independent cooling of the arrangement.</p>                                                                                                                                                                                                     | <p>定子组件通过车辆底盘框架上的抗震支架受到弹性支撑。转子由两个圆盘组成，当线圈受激励时受到电磁影响产生制动力。对于与圆盘整体相连的散热片的精心设计，允许独立冷却整个结构。</p>                                                                |
| <p>ADVANTAGES</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <p>优点</p>                                                                                                                                                  |
| <ul style="list-style-type: none"> <li>• Electromagnetic brakes can develop a negative power which represents nearly twice the maximum power output of a typical engine.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• 电磁制动器可以产生一个负功率，几乎是典型发动机最大功率输出的两倍。</li> </ul>                                                                      |

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| <ul style="list-style-type: none"> <li>● Electromagnetic brakes work in a relatively cool condition and satisfy all the energy requirements of braking at high speeds, completely without the use of friction. Due to its specific installation location (transmission line of rigid vehicles), electromagnetic brakes have better heat dissipation capability to avoid problems that friction brakes face times the braking power of an exhaust brake.</li> </ul> | <ul style="list-style-type: none"> <li>● 电磁制动器在相对低温条件下工作，并完全满足高速制动时的所有能量需求，完全无需使用摩擦力。由于安装位置特殊（刚性车辆的传动线），电磁制动器有更好的散热能力，可避免摩擦制动器所面临的问题。其制动功率是排气制动的数倍。</li> </ul> |
| <ul style="list-style-type: none"> <li>● Electromagnetic brakes have been used as supplementary retardation equipment in addition to the regular friction brakes on heavy vehicles.</li> </ul>                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>● 电磁制动器已被用作重型车辆常规摩擦制动器之外的辅助缓速设备。</li> </ul>                                                                             |
| <ul style="list-style-type: none"> <li>● Electromagnetic brakes has great braking efficiency and has the potential to regain energy lost in braking.</li> </ul>                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>● 电磁制动器制动效率很高，并有重新获取制动损失能量的潜力。</li> </ul>                                                                               |
| <ul style="list-style-type: none"> <li>● Its component cost is less.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>● 零部件成本较低。</li> </ul>                                                                                                   |
| DISADVANTAGES                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 缺点                                                                                                                                                             |
| <ul style="list-style-type: none"> <li>● The installation of an electromagnetic brake is very difficult if there is not enough space between the gearbox and the rear axle.</li> </ul>                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>● 如果变速箱和后轴之间无充足空间，则很难安装电磁制动器。</li> </ul>                                                                                |
| <ul style="list-style-type: none"> <li>● Need a separate compressor.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>● 电磁制动器需独立压气机。</li> </ul>                                                                                               |
| <ul style="list-style-type: none"> <li>● Maintenance of the equipment components such as hoses, valves has to be done periodically.</li> </ul>                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>● 须定期维护设备部件，如软管和阀门。</li> </ul>                                                                                          |
| <ul style="list-style-type: none"> <li>● It cannot use grease or oil.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>● 不可使用固态油、液态油。</li> </ul>                                                                                               |

| APPLICATIONS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 应用                                                                                                                             |
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| ● Used in crane control system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | ● 用于起重机控制系统。                                                                                                                   |
| ● Used in winch controlling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ● 用于绞车控制。                                                                                                                      |
| ● Used in lift controlling.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ● 用于升降机控制。                                                                                                                     |
| ● Used in automatic purpose.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | ● 用于自动化。                                                                                                                       |
| The lots of new technologies are arriving in world. They create a lot of effect. Most industries got their new faces due to this arrival of technologies. Automobile industry is also one of them. There is a boom in World's automobile industry. So lots of research is also going here. As an important part of automobile, there are also innovations in brakes. Electromagnetic brake is one of them.                                                                                                                                               | 世界上出现了许多新技术，产生了许多影响。由于这些技术的涌现，大多数行业都焕发出新的面貌，汽车行业也是其中之一。世界汽车工业正蓬勃发展，关于汽车的研究也络绎不绝。作为汽车的重要组成部分，制动装置也在不断创新。电磁制动器就是其中之一。            |
| A electromagnetic braking for automobiles like cars, an effective braking system. And, by using this electromagnetic brakes, we can increase the life of the braking unit. The working principle of this system is that when the electromagnetic flux passes through and perpendicular to the rotating wheel the eddy current is induced in the rotating wheel or rotor. This eddy current flows opposite to the rotating wheel. This eddy current tries to stop the rotating wheel or rotor. This results in the rotating wheel or rotor comes to rest. | 对于汽车来说，电磁制动是一种有效的制动系统。并且，通过使用这种电磁制动，可以延长制动单元的使用寿命。该系统的工作原理是，当电磁通量通过并垂直于转轮时，旋转轮或转子中会产生涡流，涡流的流向与旋转轮相反，它试图阻止旋转轮或转子的运动，导致旋转轮或转子停止。 |

| TURBOCHARGER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 涡轮增压器                                                                                                                                                                                        |
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| <p>A turbocharger or turbo is a forced induction device used to allow more power to be produced for an engine of a given size. <u>A turbocharged engine can be more powerful and efficient than a naturally aspirated engine because the turbine forces more intake air, proportionately more fuel, into the combustion chamber than if atmospheric pressure alone is used.</u> Turbo are commonly used on truck, car, train, and construction equipment engines. Turbo are popularly used with Otto cycle and Diesel cycle internal combustion engines.</p> | <p>涡轮增压器，是一种用于增加特定尺寸发动机功率的迫使进气设备。<u>与自然吸气发动机/不增压发动机相比，涡轮增压发动机更强劲、更高效，因为比起仅使用大气压力，涡轮通过强迫进气，可以将更多的燃料按比例送入燃烧室。</u>涡轮广泛用于卡车、汽车、火车和建筑设备发动机，且通常与奥托循环和狄塞尔循环内燃发动机一起使用。</p>                           |
| <p>There are two ways of increasing the power of an engine. One of them would be to make the fuel-air mixture richer by adding more fuel. This will increase the power but at the cost of fuel efficiency and increase in pollution levels... prohibitive! The other would be to somehow increase the volume of air entering into the cylinder and increasing the fuel intake proportionately, increasing power and fuel efficiency without hurting the environment or efficiency. This is exactly what Turbochargers do, increasing the</p>                 | <p>提高发动机功率有两种方法。其一是通过添加更多的燃料，使燃料与空气混合更充分。这样做的确能提高功率，但代价是降低燃油效率和增加污染…令人望而却步！另一种方法是，在不破坏环境和保持燃油使用效率的情况下，以某种方式增加进入气缸的空气量，并相应增加燃料进气量，从而提高动力和燃油效率，而不会降低效率，也不会对环境造成伤害。这正是涡轮增压器的作用——提高发动机的容积效率。</p> |

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| volumetric efficiency of an engine.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                     |
| <p>In a naturally aspirated engine, the downward stroke of the piston creates an area of low pressure in order to draw more air into the cylinder through the intake valves. Now because of the pressure in the cylinder cannot go below 0 (zero) psi (vacuum) and relatively constant atmospheric pressure (about 15 psi), there will be a limit to the pressure difference across the intake valves and hence the amount of air entering the combustion chamber or the cylinder. The ability to fill the cylinder with air is its volumetric efficiency. Now if we can increase the pressure difference across the intake valves by some way we can make more air enter into the cylinder and hence increasing the volumetric efficiency of the engine.</p> | <p>在自然吸气式发动机中，活塞的下行冲程会在气缸内部产生一个低压区，以通过进气阀吸入更多空气。现在，由于气缸内的压力不能低于 0psi（真空）和相对恒定的大气压（约 15psi），进气阀上的压力差会受到限制，从而限制了进入燃烧室或气缸的空气量。向气缸充满气的的能力就是气缸的容积效率。如果我们能通过某种方式增加进气阀间的压力差，就能使更多的空气进入气缸，从而提高发动机的容积效率。</p> |
| <p>It increases the pressure at the point where air is entering the cylinder, thereby increasing the pressure difference across the intake valves and thus more air enters into the combustion chamber. The additional air makes it possible to add more fuel, increasing the power and torque output of the engine, particularly at higher engine speeds.</p>                                                                                                                                                                                                                                                                                                                                                                                                | <p>涡轮增压器增加了空气进入气缸时的压力，从而增大了进气阀间的压力差，使更多的空气进入燃烧室。有了更多的空气，就可以添加更多的燃料，从而提高发动机的动力和扭矩输出，发动机转速较高的情况下更是如此。</p>                                                                                             |

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| <p>Turbochargers were originally known as Turbo superchargers when all forced induction devices were classified as superchargers; nowadays the term "supercharger" is usually applied to only mechanically-driven forced induction devices. The key difference between a turbocharger and a conventional supercharger is that the latter is mechanically driven from the engine, often from a belt connected to the crankshaft, whereas a turbocharger is driven by the engine's exhaust gas turbine. Compared to a mechanically-driven supercharger, turbochargers tend to be more efficient but less responsive.</p> | <p>涡轮增压器（Turbochargers）最初被称为“Turbo superchargers”，当时所有迫使进气装置都被归类为增压器；如今，“增压器”一词通常仅用于机械驱动的迫使进气设备。涡轮增压器和传统增压器的区别关键在于，传统增压器由发动机机械驱动，通常是通过与曲轴相连的皮带传动，而涡轮增压器是由发动机的排气气体涡轮驱动。与机械驱动的传统增压器相比，涡轮增压器效率更高，但反应却没那么灵敏。</p> |
| HISTORICAL PERSPECTIVE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | 历史视角                                                                                                                                                                                                         |
| <p>The turbocharger was invented by Swiss engineer Alfred Büchi. His patent for a turbocharger was applied for use in 1905. Diesel ships and locomotives with turbochargers began appearing in the 1920s.</p>                                                                                                                                                                                                                                                                                                                                                                                                          | <p>瑞士工程师阿尔弗雷德·比奇（Alfred Büchi）发明了涡轮增压器，并于1905年申请了使用专利。20世纪20年代开始出现配备涡轮增压器的柴油轮船和机车。</p>                                                                                                                       |
| AVIATION:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 航空:                                                                                                                                                                                                          |
| <p><u>During the First World War French engineer Auguste Rateau fitted turbochargers to Renault engines powering various French fighters with some success. In 1918, General Electric engineer Sanford</u></p>                                                                                                                                                                                                                                                                                                                                                                                                         | <p><u>第一次世界大战期间，法国工程师奥古斯都·拉多（Auguste Rateau）在雷诺发动机上安装了涡轮增压器，为各类法国战斗机提供动力，并取得了一定成功。1918年，</u></p>                                                                                                             |

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| <p>Moss attached a turbo to a V12 Liberty aircraft engine. The engine was tested at Pikes Peak in Colorado at 4,300 m to demonstrate that it could eliminate the power losses usually experienced in internal combustion engines as a result of reduced air pressure and density at high altitude.</p>                                                                                   | <p>通用电气工程师桑福德·莫斯（Sanford Moss）在 V12 Liberty 飞机发动机上安装了涡轮增压器。该发动机在科罗拉多州海拔 4300 米的派克峰上进行了测试，证明它可以消除内燃机在高海拔地区由于气压和密度降低而导致的功率损失。</p>                                                      |
| <p>Turbochargers were first used in production aircraft engines in the 1920s, although they were less common than engine-driven centrifugal superchargers. The primary purpose behind most aircraft-based applications was to increase the altitude at which the airplane could fly, by compensating for the lower atmospheric pressure present at high altitude.</p>                    | <p>二十世纪 20 年代，涡轮增压器首次用于飞机发动机的生产，不过当时，它没有发动机驱动的离心式增压器那么普遍。大多数飞机应用中，主要是为了通过补偿高海拔地区较低的大气压力，提高飞机飞行高度。</p>                                                                                |
| <p>PRODUCTION AUTOMOBILES:</p>                                                                                                                                                                                                                                                                                                                                                           | <p>汽车生产</p>                                                                                                                                                                          |
| <p>The first turbocharged diesel truck was produced by Schweizer Maschinenfabrik Saurer (Swiss Machine Works Saurer) in 1938. The first production turbocharged automobile engines came from General Motors in 1962. At the Paris auto show in 1974, during the height of the oil crisis, Porsche introduced the 911 Turbo – the world's first production sports car with an exhaust</p> | <p>1938 年，Saurer（瑞士机械厂索拉）首次生产出在柴油机上装配涡轮增压器的卡车。1962 年，通用汽车公司首次量产涡轮增压发动机。在 1974 年的巴黎车展上，也是石油危机的高峰期，Porsche 推出了 911 Turbo——全球首款配备排气涡轮增压器和压力调节器的量产跑车，其增压器上安装有一个废气旁通阀，能直接将多余的废气从排气涡轮中</p> |

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| <p>turbocharger and pressure regulator. This was made possible by the introduction of a waste gate to direct excess exhaust gasses away from the exhaust turbine. The world's first production turbo diesel automobiles were the Garrett-turbocharged Mercedes 300SD and the Peugeot 604,m both introduced in 1978. Today, most automotive diesels are turbocharged.</p> | <p>排出。全球首款量产涡轮增压柴油车是装有加勒特涡轮增压器的 Mercedes 300SD 和 Peugeot 604，两者均于 1978 年推出。如今，大多数汽车的柴油机都装配了涡轮增压器。</p> |
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