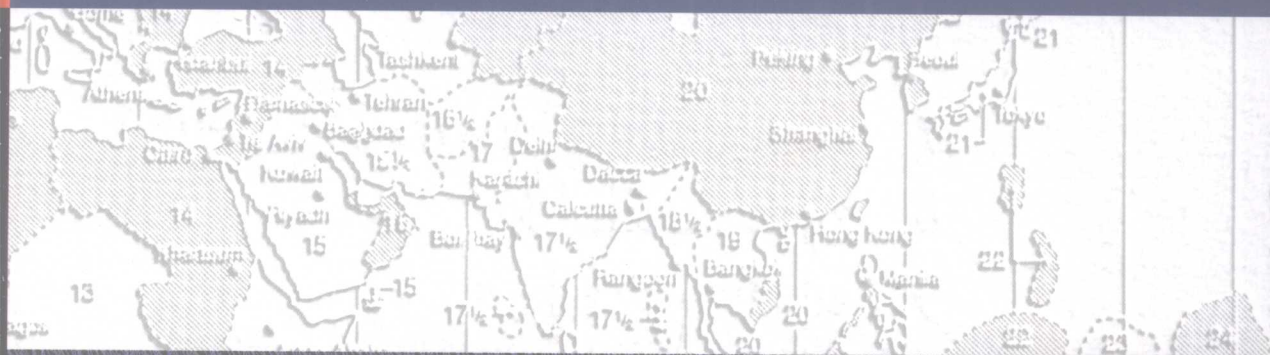




卓越系列·21世纪高职高专精品规划教材



机电一体化专业英语

PROFESSIONAL ENGLISH
ON MECHATRONICS

主 编 刘 宇

 天津大学出版社
TIANJIN UNIVERSITY PRESS

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Professional English on Mechatronics

主 编 刘 宇

副主编 李国昌 谢伟东

参 编 包玉花



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内容提要

本书共分5单元,分别是机械技术,电子技术,控制技术,机电一体化技术,CAD、CAM和CNC技术。每单元包含5课,每一课由课文、单词、注释、练习、课后阅读、科技英语翻译技巧组成。

本书可作为高职院校机电一体化专业学生的专业英语教材,也可以作为相关专业技术人员学习的参考书。

图书在版编目(CIP)数据

机电一体化专业英语/刘宇主编. —天津:天津大学出版社,2008.8

ISBN 978-7-5618-2753-6

I. 机… II. 刘… III. 机电一体化-英语 IV. H31

中国版本图书馆CIP数据核字(2008)第126543号

出版发行 天津大学出版社

出版人 杨 欢

地 址 天津市卫津路92号天津大学内(邮编:300072)

电 话 发行部:022-27403647 邮购部:022-27402742

印 刷 天津泰宇印务有限公司

经 销 全国各地新华书店

开 本 169mm×239mm

印 张 13.75

字 数 337千

版 次 2008年8月第1版

印 次 2008年8月第1次

印 数 1-2000

定 价 25.00元

凡购本书,如有缺页、倒页、脱页等质量问题,请向我社发行部门联系调换

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前 言

随着改革开放和加入 WTO, 中国与国际间的科技、文化、经济交流日趋紧密与频繁。要交流就要有交流的载体, 这个载体就是语言。英语是国际通用的语言, 在与其他国家进行交流时往往使用英语, 各种资料、文献也大多采用英语。科技的发展对高技能人才的知识和能力的要求逐步提高, 为了更好地学习先进的机电一体化技术, 加强交流, 加快发展, 具备较高的专业英语水平显得尤为重要。

本书从高职教育应用性的特点出发, 理论联系实际, 充分体现了专业特色, 兼顾了机电一体化专业的各个层面。每单元既有结合实践、提升学生阅读能力和专业知识的文章, 又有拓展学生知识面的课后阅读, 并且增加了关于专业英语翻译的语法部分, 形成了专业知识、词汇、科技英语语法的有机结合, 使学生得到较为全面的训练和提高。

本书共分 5 单元, 分别是机械技术, 电子技术, 控制技术, 机电一体化技术, CAD、CAM 和 CNC 技术。每单元包含 5 课, 每一课由课文、单词、注释、练习、课后阅读、科技英语翻译技巧组成, 共 25 课。

本书可作为高职院校机电一体化专业学生的专业英语教材, 也可以作为相关专业技术人员学习的参考书。

本书由刘宇、李国昌、谢伟东、包玉花编写, 在编写过程中广泛参考了国内相关专业的英语教材和参考书, 在此谨向这些资料的作者表示衷心的感谢。

由于编者水平有限, 且机电一体化技术发展迅速, 书中难免出现错误和不足之处, 敬请读者批评指正。

编 者

2008 年 5 月

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Unit 1 Mechanical Technology

Lesson 1 Classification of Steels

The Society of Automotive Engineers (SAE) has established standards for specific analysis of steels. In the 10XX series, the first digit indicates a plain carbon steel. The second digit indicates a modification in the alloys. 10XX means that it is a plain carbon steel where the second digit (zero) indicates that there is no modification in the alloys. The last two digits denote the carbon content in points. For example SAE 1040 is a carbon steel where 40 points represent 0.40% Carbon content. Alloy steels are indicated by 2XXX, 3XXX, 4XXX, etc(See Table 1-1). The American Iron and Steel Institute (AISI) in cooperation with the Society of Automotive Engineers (SAE) revised the percentages of the alloys to be used in the making of steel, retained the numbering system, and added letter prefixes to indicate the method used in steel making. The letter prefixes are:

- A = alloy, basic open hearth
- B = carbon, acid Bessemer
- C = carbon, basic open hearth
- D = carbon, acid open hearth
- E = electric furnace

If the prefix is omitted, the steel is assumed to be open hearth. Example: AISI C1050 indicates a plain carbon, basic open hearth steel that has 0.50% Carbon content.

Another letter is the hardenability or H-value. Example: 4340H

General representation of steels:

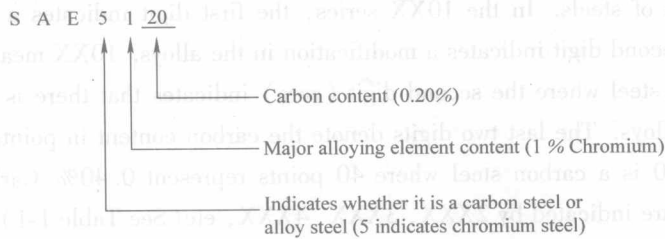
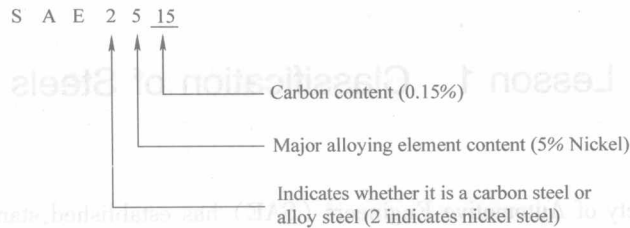
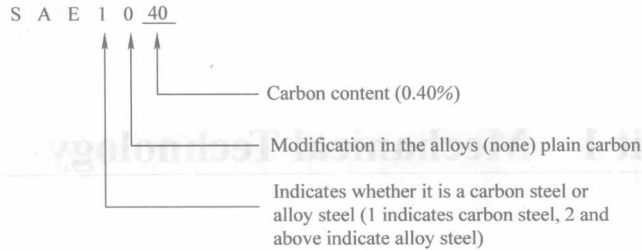


Table 1-1 Classification of Steels

SAE - AISI Number	Classification
1XXX	Carbon steels Low carbon steels; 0 to 0.25% Carbon Medium carbon steels; 0.25% to 0.55% Carbon High carbon steels; Above 0.55% Carbon
2XXX	Nickel steels 5% Nickel increases the tensile strength without reducing ductility 8% to 12% Nickel increases the resistance to low temperature impact 15% to 25% Nickel (along with Al, Cu and Co) develops high magnetic properties (Alnico metals) 25% to 35% Nickel creates resistance to corrosion at elevated temperatures

(Continued)

SAE – AISI Number	Classification
3XXX	Nickel-chromium steels These steels are tough and ductile and exhibit high wear resistance, hardenability and high resistance to corrosion
4XXX	Molybdenum steels Molybdenum is a strong carbide former. It has a strong effect on hardenability and high temperature hardness. Molybdenum also increases the tensile strength of low carbon steels
5XXX	Chromium steels Chromium is a ferrite strengthener in low carbon steels. It increases the core toughness and the wear resistance of the case in carburized steels
86XX 87XX 93XX 94XX 97XX 98XX	Triple Alloy steels which include Nickel (Ni), Chromium (Cr), and Molybdenum (Mo) These steels exhibit high strength and also high strength to weight ratio, good corrosion resistance

Table 1-2 The Effect of Alloying Elements on the Properties of Steel

Element	Effect
Aluminum	Ferrite hardener Graphite former Deoxidizer
Chromium	Mild ferrite hardener Moderate effect on hardenability Graphite former Resists corrosion Resists abrasion
Cobalt	High effect on ferrite as a hardener High red hardness

(Continued)

Element	Effect
Molybdenum	Strong effect on hardenability
	Strong carbide former
	High red hardness *
	Increases abrasion resistance
Manganese	Strong ferrite hardener
Nickel	Ferrite strengthener
	Increases toughness of the hypoeutectoid steel
	With chromium, retains austenite
	Graphite former
Copper	Austenite stabilizer
	Improves resistance to corrosion
Silicon	Ferrite hardener
	Increases magnetic properties in steel
Phosphorus	Ferrite hardener
	Improves machinability
	Increases hardenability

Red Hardness: This property, also called hot-hardness, is related to the resistance of the steel to the softening effect of heat. It is reflected to some extent in the resistance of the material to tempering.

Hardenability: This property determines the depth and distribution of hardness induced by quenching.

Hot-shortness: Brittleness at high temperatures is called hot-shortness which is usually caused by sulfur. When sulfur is present, iron and sulfur form iron sulfide (FeS) that is usually concentrated at the grain boundaries and melts at temperatures below the melting point of steel. Due to the melting of iron sulfide, the cohesion between the grains is destroyed, allowing cracks to develop. This occurs when the steel is forged or rolled at elevated temperatures. In the presence of manganese, sulfur tends to form manganese sulfide (MnS) which prevents hot-shortness.

Cold-shortness: Large quantities of phosphorus (in excess of 0.12% P) reduce the ductility, thereby increasing the tendency of the steel to crack when cold worked. This brittle condition at temperatures below the recrystallization temperature is called

cold-shortness. (See Table 1-2)

New Words and Phrases 1

1. classification [ˌklæsɪfɪˈkeɪʃən]
n. 分类, 分级; 类别(体系)
2. standard [ˈstændəd]
n. 标准, 水平, 规格, 规范
a. 标准的
3. series [ˈsiəriːz]
n. 连续, 系列
4. plain [pleɪn]
a. 简朴的, 朴素的, 不搀杂的, 普通的
5. denote [dɪˈnoʊt]
vt. 表示, 预示, (符号等)代表; 意思是
6. revise [rɪˈvaɪz]
vt. 修订, 校订; 修改, 修正
7. prefix [ˈpriːfiks]
n. 字首, 前缀
8. omit [əʊˈmɪt]
vt. 遗漏, 省略, 删去
9. assume [əˈsjuːm]
vt. 以为, 假定为, (想当然地) 认为
10. modification [ˌmɒdɪfɪˈkeɪʃən]
n. 修改, 改变
11. indicate [ˈɪndɪkeɪt]
vt. 指示, 指出; 表明, 象征, 暗示
12. element [ˈelɪmənt]
n. 元素, 要素, 成分
13. chromium [ˈkrəʊmiəm]
n. 铬
14. nickel [ˈnɪkl]
n. 镍; 五分镍币
15. tensile [ˈtensail]
a. 张力的, 拉力的, 抗张的; 可伸展的, 能拉长的
16. magnetic [mæˈɡnetɪk]
a. 磁铁的, 磁性的, 有磁性的
17. property [ˈprɒpəti]
n. 财产, 资产, 所有物[U]; 特性, 性能, 属性[C]
18. alnico [ˈælnɪkəʊ]
n. 磁性合金
19. corrosion [kəˈrəʊʒən]
n. 腐蚀, 侵入; 渐失, 衰败
20. elevate [ˈelɪveɪt]
vt. 举起, 抬起, 使上升
21. resistance [rɪˈzɪstəns]
n. 抵抗, 反抗; 抵抗力, 抗性, 耐性
22. molybdenum [məˈlɪbdɪnəm]
n. 钼
23. core [kɔː]
n. 果核, 果心; 核心, 精髓, 要义
24. ratio [ˈreɪʃəʊ]
n. 比, 比率
25. exhibit [ɪɡˈzɪbɪt]
vt. 展示, 陈列; 表示, 显出

26. ferrite [ˈfɛraɪt]
n. 亚铁盐
27. graphite [ˈɡræfaɪt]
n. 石墨, 黑铅
28. deoxidizer [diːˈɒksidaɪzə]
n. 还原剂
29. former [ˈfɔːmə]
a. 从前的, 早前的, 旧时的
n. 形成者, 创造者; 模型, 样板
30. hardener [ˈhɑːdəneɪ]
n. 硬化者; 硬化剂
31. mild [maɪld]
a. 温和的, 温柔的; 温暖的, 暖和的; 味淡的, 不浓烈的; (处罚等) 轻微的, 不重的, 宽大的
32. moderate [ˈmɒdəraɪt]
a. 中等的, 适度的
33. hardenability [ˌhɑːdəneɪbələti]
n. 可硬性, 淬透性, 可淬性
34. abrasion [əˈbreɪʒən]
n. 擦伤; 磨损, 磨耗
35. hypoeutectoid [ˌhaɪpəʊjuːˈtektɔɪd]
a. 亚共析的
36. stabilizer [ˈsteɪbalaɪzə]
n. 安定装置, 安定翼; 有安定作用之人(或物); 稳定者
37. concentrate [ˈkɒnsentreɪt]
vt. 集中, 聚集, 集结
38. cohesion [ˌkəʊhɪːʒən]
n. 结合, 凝聚, 团结力, 附着; 内聚力
39. crack [kræk]
vt. 使爆裂, 使破裂
n. 裂缝, 裂痕
40. phosphorus [ˈfɒsfərəs]
n. 磷
41. tendency [ˈtendənsi]
n. 倾向, 天分; 趋势, 潮流; 倾向, 意向
42. brittle [ˈbrɪtl]
a. 脆的, 脆弱的, 易损坏的
43. crystallization [ˌkrɪstəˈlaɪˌzeɪʃən]
n. 结晶化
43. triple [ˈtrɪpl]
a. 三倍的, 三重的

New Words and Phrases 2

1. mechanical [mɪkænikəl]
a. 机械的, 用机械的; 机械学的, 力学的, 物理的
2. steel [stiːl]
n. 钢, 钢铁
a. 钢的, 钢制的
3. SAE
abbr. Society of Automotive Engineers (美国) 汽车工程师学会
4. AISI
abbr. American Iron and Steel Institute 美国钢铁学会

- | | |
|------------------------------------|-----------------------------|
| 5. alloy [ˈælɔɪ] | <i>vt.</i> 渗碳 |
| <i>n.</i> 合金 | 11. hot-shortness 热脆性 |
| 6. ductility [dʌkˈtɪlɪti] | 12. red hardness 红硬性 |
| <i>n.</i> 延展性, 柔软性; 温顺 | 13. tensile strength 抗拉强度 |
| 7. austenite [ˈɔːstəˌnaɪt] | 14. abrasion resistance 耐磨性 |
| <i>n.</i> 奥氏体 | 15. wear resistance 耐磨性 |
| 8. machinability [məˈʃɪːnəˈbɪlɪti] | 16. melt point 熔点 |
| <i>n.</i> 机械加工性; 切削性 | 17. triple alloy steel 三元合金 |
| 9. toughness [ˈtʌfnɪs] | 钢 |
| <i>n.</i> 坚韧, 坚硬, 结实; 韧性 | 18. cold-shortness 低温脆性 |
| 10. carburize [ˈkɑːbjuraɪz] | |

Notes

1. 10XX means that it is a plain carbon steel where the second digit (zero) indicates that there is no modification in the alloys.

10XX 表示是普通碳钢, 第二个数字(零)表明钢里合金含量没有变化。

where 是关系副词, 含义相当于“介词 + which”结构。that 引导的定语从句做 indicate 的宾语。

2. The American Iron and Steel Institute (AISI) in cooperation with the Society of Automotive Engineers (SAE) revised the percentages of the alloys to be used in the making of steel, retained the numbering system, and added letter prefixes to indicate the method used in steel making.

美国钢铁学会与汽车工程师学会合作修订了生产钢时使用合金的百分比, 保留了数字命名系统, 并且(在数字前)增加了字母前缀来表明生产钢所用的方法。

这是一个典型的并列句, 用了连词 and, 因为这里并列成分多于三个, 所以只在最后两个并列成分之间加 and 就可以了。主语是“The American Iron and Steel Institute (AISI)”, “in cooperation with the Society of Automotive Engineers (SAE)”做状语。

3. These steels exhibit high strength and also high strength to weight ratio, good corrosion resistance.

这些钢(Triple Alloy steels)表现出高强度、高比强度和良好的耐腐蚀性。

理解这句话的关键在于“strength to weight ratio”(比强度)。比强度又叫做强度重量比,是材料在断裂点的强度(通用拉伸强度)与其密度之比。

4. This property, also called hot-hardness, is related to the resistance of the steel to the softening effect of heat.

这种性能也叫做热硬度,是钢在高温下的抗软化能力。

“also called hot-hardness”是一个非限定性定语从句,省略了“which is”。“relate to”意思是“涉及、有关”,句中第二个 to 是介词。

5. This brittle condition at temperatures below the recrystallization temperature is called cold-shortness.

这种在重结晶温度以下的不稳定状态叫做低温脆性。

Exercises

I. Fill the blanks according to the text.

The Society of 1 Engineers (SAE) has established 2 for specific analysis of steels. In the 10XX series, the first digit indicates a plain carbon steel. The second digit 3 a modification in the alloys. 10XX means that it is a plain carbon steel where the second digit (zero) indicates that there is 4 modification in the alloys. The last two digits denote the carbon content in points. For example SAE 1040 is a carbon steel where 40 points represent 0.40% Carbon content. Alloy steels are indicated by 2XXX, 3XXX, 4XXX, etc. The American Iron and 5 Institute (AISI) in cooperation with the Society of Automotive Engineers (SAE) revised the percentages of the alloys to be used in the making 6 steel, retained the numbering system, and added letter prefixes to indicate the method 7 in steel making.

Hardenability: This 8 determines the depth and distribution of hardness induced 9 quenching.

Hot-shortness: Brittleness at high temperatures is called hot-shortness which is usually caused by sulfur. When sulfur is present, iron and sulfur form iron sulfide (FeS) that is usually concentrated 10 the grain boundaries and melts at temperatures below the melting point of steel. Due 11 the melting of iron sulfide, the cohesion between the grains is 12, allowing cracks to develop. This occurs when the steel is forged or rolled at elevated temperatures. In the presence of manganese,

sulfur tends to form manganese sulfide (MnS) 13 prevents hot-shortness.

II. Translate the following sentences into Chinese.

1. For example SAE 1040 is a carbon steel where 40 points represent 0.40% Carbon content.
2. If the prefix is omitted, the steel is assumed to be open hearth. Example: AISI C1050 indicates a plain carbon, basic open hearth steel that has 0.50% Carbon content.
3. 5% Nickel increases the tensile strength without reducing ductility.
4. 15% to 25% Nickel (along with Al, Cu and Co) develops high magnetic properties (Alnico metals).
5. These steels are tough and ductile and exhibit high wear resistance, hardenability and high resistance to corrosion.

Extensive Reading

Carbon Steels

The American Iron and Steel Institute (AISI) defines carbon steel as follows:

Steel is considered to be carbon steel when no minimum content is specified or required for chromium, cobalt, columbium (niobium), molybdenum, nickel, titanium, tungsten, vanadium or zirconium, or any other element to be added to obtain a desired alloying effect; when the specified minimum for copper does not exceed 0.40 per cent; or when the maximum content specified for any of the following elements does not exceed the percentages noted: manganese 1.65, silicon 0.60, copper 0.60.

Carbon steel can be classified, according to various deoxidation practices, as rimmed, capped, semi-killed, or killed steel. Deoxidation practice and the steelmaking process will have an effect on the properties of the steel. However, variations in carbon have the greatest effect on mechanical properties, with increasing carbon content leading to increased hardness and strength. As such, carbon steels are generally categorized according to their carbon content. Generally speaking, carbon steels contain up to 2% total alloying elements and can be subdivided into low-carbon steels, medium-carbon steels, high-carbon steels, and ultrahigh-carbon steels; each of these

designations is discussed below.

As a group, carbon steels are by far the most frequently used steels. More than 85% of the steel produced and shipped in the United States is carbon steel.

Low-carbon steels contain up to 0.25% C. The largest category of this class of steel is flat-rolled products (sheet or strip), usually in the cold-rolled and annealed condition. The carbon content for these high-formability steels is very low, less than 0.10% C, with up to 0.4% Mn. Typical uses are in automobile body panels, tin plate, and wire products.

For rolled steel structural plates and sections, the carbon content may be increased to approximately 0.30%, with higher manganese content up to 1.5%. These materials may be used for stampings, forgings, seamless tubes, and boiler plate.

Medium-carbon steels are similar to low-carbon steels except that the carbon ranges from 0.25% to 0.55% and the manganese from 0.60% to 1.65%. Increasing the carbon content to approximately 0.5% with an accompanying increase in manganese allows medium carbon steels to be used in the quenched and tempered condition. The uses of medium carbon-manganese steels include shafts, axles, gears, crankshafts, couplings and forgings. Steels in the 0.40% to 0.55% C range are also used for rails, railway wheels and rail axles.

High-carbon steels contain from 0.55% to 1.00% C with manganese contents ranging from 0.30% to 0.90%. High-carbon steels are used for spring materials and high-strength wires.

Ultrahigh-carbon steels are experimental alloys containing 1.25% to 2.0% C. These steels are thermomechanically processed to produce microstructures that consist of ultrafine, equiaxed grains of spherical, discontinuous proeutectoid carbide particles.

Translating Skills

翻译的标准和对译者的要求

一提到翻译的标准,人们首先想到的就是清末启蒙思想家严复总结《天演论》的翻译经验而提出的“信达雅”三字标准。“信达雅”是翻译标准,也是翻译的基本方法。所谓“信”,是指忠实原文的思想内容,是指译文科学性;这里不