



普通高等教育“十一五”国家级规划教材

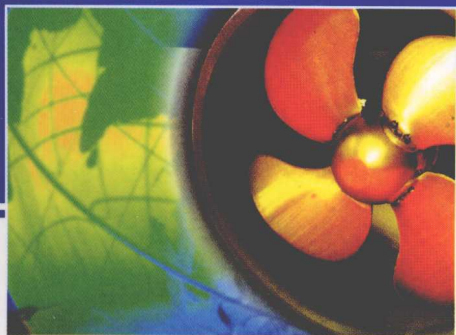
交通职业教育教学指导委员会推荐教材

轮机英语

主编 施祝斌

主审 丁晓梅

MARINE ENGINEERING ENGLISH



大连海事大学出版社

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内容简介

本教材由阅读和书写两部分组成。阅读部分的前 11 课是专业基础知识,主要复习巩固语法及解决公共英语与专业英语衔接的问题,后 44 课为专业知识,包括船舶主推进装置、船舶辅助机械、船舶电气设备、船舶轮机管理、国际公约和规则等;书写部分的主要内容则为轮机日志、修理单、物料单、油类记录簿等。

本教材主要适用于航海类高等职业院校轮机管理专业全日制学生课堂教学,也可作为各类轮机人员工作与考证培训用书,并可供航海企业机务部门、修造船厂技术人员参考。

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前 言

高职高专航海类专业“十一五”规划教材(下称“系列教材”)是交通部科教司为了使高职航海类专业人才培养进一步符合《STCW78/95 公约》和我国海事局颁布的《中华人民共和国海船船员适任考试、评估和发证规则》要求而组织编写的。首批系列教材共 22 种(航海技术专业 11 种,轮机工程技术专业 11 种)。编审人员是由交通职业教育教学指导委员会航海类专业指导委员会在全国航海高职院校范围内组织遴选并聘请的专业教师。参加编审的人员普遍具有较丰富的航海高职教学经验与生产实践经历,其中主编和主审均具有副教授以上专业技术职务。

本系列教材依据 2006 年 3 月新版《高职高专院校海洋船舶驾驶(航海技术)专业教学指导方案》和《高职高专院校轮机工程技术教学指导方案》中相应课程大纲编写,适用于三年制高职高专航海技术和轮机工程技术专业学生使用,也可作为上述专业中等职业教育和船员培训教材或教学参考书。

本系列教材具有如下特点:

1. 较好地体现了《STCW78/95 公约》和《中华人民共和国海船船员适任考试、评估和发证规则》,强调知识更新、突出技能,有利于培养适应现代化船舶的航海技术应用性人才。

2. 紧密结合航海类专业人才培养目标和岗位任职条件,及时充实了新颁布的《中华人民共和国海船船员适任考试大纲》(海船员[2005]412 号)内容,有利于增强高职航海类专业毕业生岗位就业能力。

3. 按照《高职高专院校海洋船舶驾驶(航海技术)专业教学指导方案》、《高职高专院校轮机工程技术教学指导方案》设计,使教材理论教学体系与实践教学体系在知识内容与职业技能之间做到相互交融。

4. 把培养合格海员所需的品格素质、知识素质、能力素质和身心素质贯彻教材当中,强化了高职航海类专业学生素质教育力度。

在本系列教材编写、统稿和审校过程中业经多方把关,力求做得更好。时逢教育部普通高等教育“十一五”国家级规划教材遴选,本系列教材中《船舶操纵》等 12 种教材入选其中。衷心感谢为本系列教材付梓而辛劳的海事局、行业协会、港航企业、航海院校各位专家的帮助和支持。

热切期待教材使用者对本系列教材存在的问题给予指正,欢迎大家积极建言献策,以利交通职业教育教学指导委员会航海类专业指导委员会适时组织人员对本系列教材内容进行修改、调整和充实。

交通职业教育教学指导委员会航海类专业指导委员会

2006 年 12 月

编者的话

本教材按交通职业教育航海类专业指导委员会的布置,专为航海类高等职业技术学院轮机管理专业学生及各类轮机技术人员学习英语而编写的。本教材根据中国海事局 2004 年修订的《中华人民共和国海船船员适任考试、评估和发证规则》、2005 年修订的《中华人民共和国海船船员适任考试大纲》以及专业指导委员会组织制定的课程教学大纲编写,符合《STCW 78 / 95 公约》对航海教育和培训的基本要求,突出我国航海职业教育改革的特色,从适岗要求出发,深广度适中,具有较强的适用性和针对性。

本教材适用于 200 ~ 240 学时的航海院校轮机管理专业全日制班级课堂教学,也适用于轮机员考证培训教学。本教材分两大部分:第一部分是阅读,阅读部分的第 1 ~ 11 课是专业基础知识,主要复习巩固语法及解决公共英语与专业英语衔接的问题,第 12 ~ 55 课为专业知识,包括船舶主推进装置、船舶辅助机械、船舶电气设备、船舶轮机管理、国际公约和规则等;第二部分是书写,内容包括轮机日志、修理单、油类记录簿等。

本书的选材注意跟踪国际航海技术的最新发展,材料大多出自英文原版资料,语言地道流畅,配合插图,直观生动,易于教学。

参加本教材编写的有:郭慧萍老师(阅读第 1 ~ 7 课),印洪浩老师(阅读第 8, 24 ~ 29 课)、马六小老师(阅读第 9, 40 ~ 45 课),刘宏老师(阅读第 10 ~ 13, 30 ~ 32 课)、潘艳萍老师(阅读第 14 ~ 23 课)、蔡冬林老师(阅读第 33 ~ 39 课),施祝斌老师(阅读第 46 ~ 55 课,书写部分)。全书由施祝斌老师统稿,丁晓梅老师主审。在编写过程中,得到了南通航运职业技术学院刘岗、薛丛华、刘芳武、王琪等老师的支持和帮助,在此一并致谢!

由于编者水平有限,不妥和错误之处在所难免,恳请广大同仁和读者批评指正。

编者
2007 年 5 月

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Part One Reading

第一部分 阅读

Lesson One Iron and Steel

The earth contains a large number of metals which are useful to man. One of the most important of these is iron. Modern industry needs considerable quantities of this metal, either in the form of iron or in the form of steel^①. A certain number of non-ferrous metals including aluminium and zinc are also important, but even today the majority of our engineering products are of iron or steel. Moreover, iron possesses magnetic properties, which have made the development of electrical power possible.

The iron ore which we find in the earth is not pure. It contains some impurities which we must remove by smelting. The process of smelting consists of heating the ore in a blast furnace—a cuopla, with coke and limestone, and reducing it to metal^②. Blasts of hot air enter the furnace from the bottom and provide the oxygen which is necessary for the reduction of the ore. The ore becomes molten, and its oxides combine with carbon from the coke. The non-metallic constituents of the ore combine with the limestone to form the liquid slag. It floats on the top of the molten iron, and passes out of the furnace through the tap. The metal which remains is pig-iron.

We can melt this down again in another furnace with more coke and limestone, and tap it out into a ladle or directly into moulds. This is cast-iron. Cast-iron does not have the strength of steel. It is brittle and may fracture under tension. But it possesses certain properties which make it very useful in the manufacture of machinery. It is very fluid in the molten state, and therefore it is easy to cast it into complicated shapes. Also it is easy to machine it. Cast-iron contains small properties of other substances. These non-metallic constituents of cast-iron include carbon, silicon and sulphur, and the presence of these substances affects the behavior of the metal. Iron which contains a small quantity of carbon, for example wrought-iron, behaves differently from iron which contains a lot of carbon.

The carbon in cast-iron is present partly as free graphite and partly as a chemical combination of iron and carbon which we call cementite. This is a very hard substance, and it makes the iron hard too. However, iron can only hold about 1.5% of cementite. Any carbon content above that percentage is in present in the form of graphite. Steel contains no free graphite, and its carbon ranges from almost nothing to 1.5%. We make wire and tubing from mild steel with a very low content, and drills and cutting tools from high carbon steel.

New Words and Expressions

- | | | |
|--------------|-----------------|------------|
| 1. aluminium | [ˌæljuːˈmɪnjəm] | n. 铝 |
| 2. zinc | [zɪŋk] | n. 锌 |
| 3. magnetic | [mæɡˈnetɪk] | a. 磁的, 磁性的 |

4. impurity	[im'pjʊərɪti]	n.	杂质,混合物
5. smelt	[smelt]	v.	熔炼,精炼
6. ore	[ɔ:(r)]	n.	矿石,矿砂
7. blast	[blɑ:st]	n.	鼓风
8. furnace	[ˈfə:nɪs]	n.	炉,炉渣,炉膛
9. coke	[kəʊk]	n.	焦炭
10. limestone	[ˈlaɪmstəʊn]	n.	石灰石
11. molten	[ˈmɒltən]	a.	熔化了的
12. oxide	[ˈɒksaɪd]	n.	氧化物
13. carbon	[ˈkɑ:bən]	n.	碳
14. metallic	[miˈtælik]	a.	金属的
non-metallic		a.	非金属的
15. slag	[slæg]	n.	溶渣
16. cupola	[ˈkju:pələ]	n.	化铁炉,冲天炉
17. ladle	[ˈleɪdl]	n.	铸勺,钢水包
18. mould	[məʊld]	n.	模子
19. brittle	[ˈbrɪtl]	a.	脆的
20. fracture	[ˈfræktʃə]	n.	断裂,破裂,裂缝;v. (使)断裂
21. cast	[kɑ:st]	v.	铸造
22. silicon	[ˈsɪlɪkən]	n.	硅
23. sulphur	[ˈsʌlfə]	n.	硫,硫黄
24. graphite	[ˈgræfəɪt]	n.	石墨
25. cementite	[siˈmentɪt]	n.	渗碳体,碳化铁体
26. considerable quantities of			大量的
27. non-ferrous metal			有色金属
28. iron ore			铁矿石
29. combine with			与……化合
30. pig-iron			生铁
31. cast-iron			铸铁
32. the presence of			存在,存在的人(或物)
33. wrought-iron			熟铁,锻铁
34. free graphite			游离石墨
35. cutting tool			切割工具,刀具

Notes

1. Modern industry needs considerable quantities of this metal, either in the form of iron or in the form of steel.

considerable: 大量的; in the form of: 以……的形式。

全句译为：现代工业需要大量这种金属，或是钢，或是铁。

2. The process of smelting consists of heating the ore in a blast furnace—a cuopla, with coke and limestone, and reducing it to metal.

全句译为：熔炼过程是这样的，矿石在带有焦炭和石灰石的鼓风炉里加热，并冶炼成金属。

Reading Material

Metal Terminology

Age hardening

The term as applied to soft or low carbon steels, relates to slow, gradual changes that takes place in properties of steels after the final treatment. These changes, which bring about a condition of increased hardness, elastic limit, and tensile strength with a consequent loss in ductility, occur during the period in which the steel is at normal temperatures.

Aging

Spontaneous change in the physical properties of some metals, which occurs on standing, at atmospheric temperatures after final cold working or after a final heat treatment. Frequently synonymous with the term “Age hardening”.

Air cooling

Cooling of the heated metal, intermediate in rapidity between slow furnace cooling and quenching, in which the metal is permitted to stand in the open air.

Air hardening steel

Alloy steel which may be hardened by cooling in air from a temperature above the transformation range. Such steels attain their martensitic structure without going through the quenching process. Additions of chromium, nickel, molybdenum and manganese are effective toward this end.

Alclad

The common name for a type of clad wrought aluminum products, such as sheet and wire, with coatings of high-purity aluminum or aluminum alloy different from the core alloy in composition. The coatings are anodic to the core so they protect exposed areas on the core electrolytic during exposure to corrosive environment.

Alloy

Metal prepared by adding other metals or non-metals to a basic metal to secure desirable properties.

Alloy steel

Steel containing substantial quantities of elements other than carbon and the commonly accepted limited amounts of manganese, sulphur, silicon, and phosphorous. Addition of such alloying elements is usually for the purpose of increased hardness, strength or chemical resistance. The metals

most commonly used for forming alloy steels are: nickel, chromium, silicon, manganese, tungsten, molybdenum and vanadium. "Low Alloy" steels are usually considered to be those containing a total of less than 5% of such added constituents.

Annealing

A heating and cooling operation implying usually a relatively slow cooling. Annealing is a comprehensive term. The process of such a heat treatment may be: to remove stresses; to induce softness; to alter ductility; toughness; electrical magnetic, or other physical properties; to refine the crystal structure; to remove gases; to produce a definite micro-structure. In annealing the temperature of the operation and the rate of cooling depend upon the material being heat treated and of the treatment.

Austenite

Phase in certain steels, characterized as a solid solution, usually of carbon or iron carbide in the gamma form of iron. Such steels are known as "austenitic". Austenite is stable only above 1,333 degrees in a plain carbon steel, but the presence of certain alloying elements, such as nickel and manganese, stabilizes the austenitic form, even at normal temperatures.

Austenitic steel

Steel which, because of the presence of alloying elements, such as manganese, nickel, chromium, etc., shows stability of Austenite at normal temperatures.

New Words and Expressions

- | | | | |
|-------------------|---------------------------|----|---------------------|
| 1. tensile | [ˈtensail] | a. | 拉(张)力的 |
| 2. ductility | [dʌkˈtɪlɪti] | n. | 展延性, 可锻性 |
| 3. spontaneous | [spɒnˈteɪnjəs, -niəs] | a. | 自发的, 天然的 |
| 4. synonymous | [siˈnɒnɪməs] | a. | 同意义的 |
| 5. intermediate | [ɪntəˈmi:djət] | n. | 中间体, 媒介物 |
| 6. transformation | [trænsfɔˈmeɪʃən] | n. | 变化, 改变 |
| 7. martensitic | [ˌmɑ:tinˈzɪtɪk] | a. | 马氏体的 |
| 8. chromium | [ˈkræʊmjəm] | n. | 铬 |
| 9. molybdenum | [məˈlɪbdɪnəm] | n. | 钼 |
| 10. manganese | [ˌmæŋɡəˈni:z, ˌmæŋɡəni:z] | n. | 锰 |
| 11. alclad | | a. | 镀铝的 |
| 12. clad | [klæd] | v. | 在金属外覆以另一种金属; a. 穿衣的 |
| 13. core | [kɔ:] | n. | 核心, 中心部分 |
| 14. composition | [kɒmpəˈzɪʃən] | n. | 合成, 组成 |
| 15. anodic | [əˈnɒdɪk] | a. | 正极的, 阳极的 |
| 16. electrolytic | [ɪˌlektroʊˈlɪtɪk] | a. | 电解的 |
| 17. substantial | [səbˈstænjəl] | a. | 许多的, 相当的 |
| 18. phosphorous | [ˈfɒsfərəs] | a. | 磷的 |

19. tungsten	[ˈtʌŋstən]	<i>n.</i>	钨
20. vanadium	[vəˈneidiəm, -djəm]	<i>n.</i>	钒
21. austenite	[ˈɔːstənaɪt]	<i>n.</i>	奥氏体
22. carbide	[ˈkɑːbaɪd]	<i>n.</i>	碳化物
23. gamma	[ˈgæmə]	<i>n.</i>	微克

Lesson Two Heat Treatment of Steel

Heat treating refers to the heating and cooling operations performed on a metal for the purpose of altering such characteristics as hardness, strength, or ductility^①. A tool steel intended to be machined into a punch may first be softened so that it can be machined. After being machined to shape, it must be hardened so that it can sustain the punishment that punches receive^②. Most heating operations for hardening leave a scale on the surface, or contribute other surface defects. The final operation must, therefore, be grinding to remove surface defects and provide a suitable surface finish. When a steel part is to be either hardened or softened, its temperature must be taken above the critical temperature line; that is, the steel must be austenitized. Usually a temperature of 50 to 100 degrees above the critical temperature is selected, to ensure that the steel part reaches a high enough temperature to be completely austenitized, and also because furnace temperature control is always a little uncertain.

The steel must be held at furnace temperature for sufficient time to dissolve the carbides in the austenite, after which the steel can be cooled. How much residence time in the furnace is required is to some degree a matter of experience with any particular steel^③. Usually, for a 3/4 in. bar, 20 minutes or slightly more will do. Double the time for twice the diameter. Alloy steel may require a longer furnace time, many of these steels are best preheated in a low-temperature furnace before being charged into the hardening furnace.

When the heating time is completed, the steel must be cooled down to room temperature. The cooling method determines whether the steel will be hardened or softened. If the steel is quickly removed from the furnace and quenched into cold water, it will be hardened. If it is left in the furnace to cool slowly with the heat turned off, or cooled in air (small pieces of plain carbon steel cannot be air-softened, however), it will be softened^④. High-alloy steels may be hardened by air-cooling, but plain carbon steels must have a more severe quench, almost always water^⑤.

There are several softening methods for steels, and the word softening therefore does not indicate what softening process or purpose was used. The method of softening by slow cooling from austenite is called annealing, not softening. Annealing leaves the steel in the softest possible condition (dead soft).

To conclude, the differences between hardening and annealing is not in the heating process, but in the cooling process.

New Words and Expressions

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|--------------|--------------|-----------|----------|
| 1. treatment | [ˈtri:tmənt] | <i>n.</i> | 处理,加工,对待 |
| 2. alter | [ˈɔ:lteɪ] | <i>v.</i> | 改变,变更 |