专业英语系列教材

English for Environmental Science & Technology

环境工程专业英语

English for Environmental Science & Technology

蒋东云 李学军 编

华中科技大学出版社
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内 容 提 要

《环境工程专业英语》是供普通高校环境工程专业本科生使用的专业英语教材，也可供对环境工程技术有兴趣的人士阅读。本书分 6 个模块(Module)共 27 课，另附加一篇介绍技术报告写作要点的文章。所有的课文和附录均选自原版的英文技术文献，既涉及基础理论，也介绍先进的专业技术方法。所选文章大都行文流畅，深入浅出。书中提供部分专业词汇的注解和一些长句的翻译，并配有相应的练习。

本书第 1 模块介绍水力学基本概念及污水处理技术；第 2 模块介绍大气污染及其全球性的影响；第 3 模块介绍固体废弃物和危险废物处理技术；第 4 模块介绍生态学的相关知识；第 5 模块介绍环境可持续性概念和清洁能源；第 6 模块介绍环境影响评价的核心宗旨和基本要素。

前　言

近20年来，全球的环境工程技术发展迅速，我国的环境工程技术虽然起步较晚，但是近年得到了长足的发展和可喜的进步，而且随着环境意识的深入，人们对环境问题越来越重视，因此环境工程与环境技术的高等教育达到了一个新的平台。在这一背景下编写适应环境工程专业本科生的专业英语教材就很有必要了。同时，从事技术工作的人常常需要学他人之所长，借他山之石以攻玉。英语，这一全球工程技术界通用的语言可帮助我们了解国外同行的研究状态和技术水平，也有助于同行间的沟通与合作。

在接触本书之前，相信你已经对英语有了一定程度的认识，而且你也已经是环境工程的(准)专业人士。专业英语这门课程是在专业知识背景下，学习一些用英语写成的技术文章。当然，这些文章的语言难度、技术深度、具体研究领域和写作风格各不相同。希望你能享受阅读和学习的过程：将新学习的英语专业词汇和技术原理与你原有的专业知识一一印证。也许你还会发现一些新的技术方案，让你觉得有必要再查找一些中文或者英文的技术资料进行深入的了解。

本教材包含6个模块和附录中一篇关于技术报告写作的文章。

1. MODULE 1 Water Treatment 水处理

2. MODULE 2 Air Pollution 大气污染

3. MODULE 3 Municipal Solid Wastes and Hazardous Wastes Management 固体废弃物和危险废物管理

4. MODULE 4 Ecology 生态学

5. MODULE 5 Sustainability 可持续性发展

6. MODULE 6 Environmental Impact Assessment 环境影响评价

7. Appendix Technical Writing: The Importance of Organizing Information 技术报告写作：组织信息的重要性

本书的第1、2、5模块以及附录由蒋东云选摘和编注；第4、6模块由李学军选摘和编注；第3模块由蒋东云和李学军共同选摘和编注。本书在编写过程中得到了华中科技大学出版社的大力支持，编者在此深表感谢。

在选材和编写中注重材料的新颖与实用性统一，尽可能考虑实际教学中的课时安排与教学要求、学生需求等诸方面情况，力图在宏观上介绍当前环境工程领域的发展趋势以及该课程的基本内容。在编排形式上便于教学和学生自学的需要。

由于本书涉猎的具体领域广泛，在编注的过程中可能出现错漏，敬请读者不吝指正。

编　者

2008年3月

References

1. Bureau of reclamation. Water measurement manual: A water resources technical publication [M].3rd ed. Washington, D.C.: US Department of the Interior, 1997.
2. G. Srikanth. Membrane Separation Processes—Technology and Business Opportunities [J]. Chemical engineering World, 1999, 34(5): 55-66.
3. Syed Ali, Paul Boblak, Efrem Capili, et al. Membrane Separation and Ultrafiltration [J] Membrane Separation, 1999.
4. YS Polyakov, DA Kazenin. Membrane Filtration with Reversible Adsorption: Hollow fiber membranes as collectors of colloidal particles [J]. Theoretical Foundations of Chemica Engineering, 2005, 39 (2): 118-128.
5. Jon Gibbins. Power from coal with responsibility [C/OL]. [2006-09-13]. http: //www chinadialogue .net/ article /show/single/en/371-Power-from-coal-with-responsibility.
6. US EPA &US CPSC. The Inside Story: A Guide to Indoor Air Quality [R]. US Environmental Protection Agency, 2001-2005.
7. Stephan Harrison. Global Warming and Chinese Glacier Melting [C/OL]. [2006-08-04]. http: //www.chinadialogue.net/article/show/single/en/252-Global-warming-and-Chinese-glacier-melting.
8. Yushi Mao. Thinking Rationally About Global Warming [C/OL]. [2006-07-07]. http: //www. chinadialogue.net/article/ show/single/en/176-Thinking-rationally-about-global-warming.
9. David H. F. Liu, Béla G. Lipták. Hazardous Waste and Solid Waste [M]. Boca Raton: CRC Press, 2000.
10. Goodland R.J..The tropical origin of ecology: Eugen Warming's jubilee[J]. Oikos, 1975, 26: 240-245.
11. Robert E.Ulanowicz. Ecology, The Ascendent Perspective [M]. New York: Columbia University Press, 1997.
12. Edward O.Wilson, Frances M. Peter. Biodiversity [M]. Washington, D.C.: National Academy Press, 1988.
13. Kejia Zhang. Poyang Lake: saving the finless porpoise [C/OL]. [2007-03-09]. http: //www. chinadialogue.net/ article /show/single/en/839-Poyang-Lake-saving-the-finless-porpoise.
14. J. Ashe, B. Sadler. Report of the EIA Process Strengthening Workshop [C]. Canberra: Environment Protection Agency, 1997.
15. Pfeiffer, William S. Technical Communication: A practical Approach [M]. 6th ed. Beijing: Publishing house of electronics industry, 2006.
16. http: //unesco-chair.nankai.edu.cn/script/unesco-chair. 2007.
17. http: //www.gdrc.org/uem/eia/impactassess.html. 2007.
18. http: //www.thefreedictionary.com.2007.
19. http: //eia.unu.edu/course.2007.

CONTENTS

MODULE 1

Water Treatment

UNIT 1

Basic Concepts Related to Flowing Water and Measurements

本文简介

本文介绍水力学基本概念和模型。

1. Introduction

Experiences with the Bureau of Reclamation's Water Management *Workshops*, held each year in Denver, Colorado, have indicated a need to explain fundamental concepts of flowing water and its measurement. The workshops have also demonstrated the need to present concepts in simple terms using *step-by-step development* (Schuster, 1970). Because of more recent water measurement developments and the new chapters and sections added to this edition, this chapter has expanded the previous edition's appendix material into a more complete form. Thus, many more equations are included to maintain step-by-step development of the new material. Readers who have difficulties with *algebra* or the technical writing should skim the text to provide exposure to concepts and terminology related to water measurement. More experienced water *providers* and users can use this chapter as a quick review of hydraulic principles related to water measurement.

Eventually, operators may wish to further investigate and seek more advanced references in *hydraulics* and *fluid mechanics*. Streeter (1951) has a chapter on flow measurement that covers tube-type flow meters. Bean (1971) has full information on fluid meter theory and provides detailed material for determining *coefficients* for tube-type meters. King and Brater (1963) have a thorough discussion of general *critical depth relations* and detailed relationships for most common hydraulic flow section shapes. Bos (1989) covers the entire field of open channel water measurement devices.

workshop 在此应作"协会、工作组"的意思

step-by-step development 逐步推导法

algebra *n* 代数学

provider *n* 供应商

hydraulics *n* 水力学

fluid mechanics 流体力学

coefficient *n* [数]系数，因数

critical depth relations 临界水深关系式

2. Kinds of Flow

Flow is classified into *open channel flow* and *closed conduit flow*. Open channel flow conditions occur whenever the flowing stream has a free or *unconstrained* surface that is open to the atmosphere. Flows in canals or in vented pipelines which are not flowing full are typical examples. The presence of the free water surface prevents transmission of pressure from one end of the conveyance channel to another as in fully flowing pipelines. Thus, in open channels, the only force that can cause flow is the force of gravity on the fluid. As a result, with *steady uniform flow* under free discharge conditions, a progressive fall or decrease in the water surface elevation always occurs as the flow moves downstream.

In hydraulics, a pipe is any closed conduit that carries water under pressure. The filled conduit may be square, rectangular, or any other shape, but is usually round. If flow is occurring in a conduit but does not completely fill it, the flow is not considered pipe or closed conduit flow, but is classified as open channel flow.①

Flow occurs in a pipeline when a *pressure or head difference* exists between ends. The rate or discharge that occurs depends mainly upon: (1) the amount of pressure or head difference that exists from the inlet to the outlet; (2) the friction or resistance to flow caused by pipe length, pipe *roughness*, bends, restrictions, changes in conduit shape and size, and the nature of the fluid flowing; (3) the *cross-sectional area* of the pipe.

3. Basic Principles of Water Measurement

Most devices measure flow indirectly. Flow measuring devices are commonly classified into those that sense or measure velocity and those that measure pressure or head. The head or velocity is measured, and then charts, tables, or equations are used to obtain the discharge. Some water measuring devices that use measurement of head, h, or pressure, p, to determine discharge, Q.

(1) *Weirs*

(2) *Flumes*

(3) *Orifices*

(4) *Venturi meters*

(5) Runup measurement on a flat "weir stick"

Head, h, or depth commonly is used for the open channel devices such as flumes and weirs. Either pressure, p, or head, h, is used with tube-type flowmeter such as venturi meter

open channel flow 明渠流
closed conduit flow 闭管流
unconstrained *adj* 不受拘束的
steady uniform flow 稳定均匀流
pressure or head difference 压力差或水头差
roughness *n* 粗糙度
cross-sectional area 截面积
weir *n* 堰
flume *n* 水槽
orifice *n* 孔，口
venturi meter 文丘里流量计

Pressure, p, is the force per unit area as shown on Fig 1 1 that acts in every direction *normal* to containing or submerged object boundaries. If an open vertical tube is inserted through and flush with the wall of a pipe under pressure, water will rise to a height, h, until the weight, W, of water in the tube balances the pressure force, F_p, on the wall opening area, a, at the wall connection These tubes are called *piezometer*. The volume of water in the piezometer tube is designated ha. The volume times the unit weight of water, $\gamma\ ha$, is the weight, W.

normal *n* [数]法向,垂直于

piezometer *n* 压力计,压强计

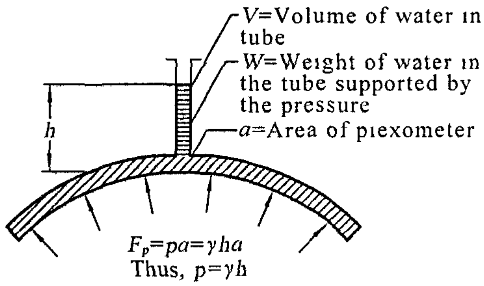

Fig. 1.1 Pressure definition

The pressure force, F_p, on the tap connection area is designated pa. The weight and pressure force are equal, and dividing both by the area, a, gives the unit pressure on the wall of the pipe in terms of head, h, written as:

$$p=\gamma\ h$$

or

$$h=p/\gamma$$

Thus, head is pressure, p, divided by *unit weight of water* or γ. When the head principle is used, the discharge, Q, is computed from an equation such as the one used for a sharp-crested rectangular weir of length, L:

unit weight of water 水的单位重量

$$Q=CLh^{3/2}$$

A coefficient, C, is included that accounts for simplifying *assumptions* and other *deficiencies* in deriving the equation The coefficient can vary widely in nonstandard installations, but is well defined for standard installations or is constant over a specified range of discharge.②

assumption *n* 假定

deficiency *n* 缺乏. 不足

The flow cross-sectional area, A, does not appear directly in the equation, but an area can be extracted by rewriting this equation:

$$Q=CLhh^{1/2}$$

in which·

$$A=Lh$$

In this form, C also contains a hidden *square root* of $2g$, which, when multiplied by $h^{1/2}$, is the *theoretical velocity*. This velocity does not need to be directly measured or sensed. Because the weir equation computes velocity from a measuring head, a weir is classified as a head measuring device

Some devices that actually sample or sense velocities, v.

(1) *Float and stopwatch*

(2) *Current* and *propeller* meters.

(3) Vane *deflection* meters.

These devices generally do not measure the average velocity, V, for an entire flow cross section. Thus, the relationship between sampled velocities, v, and the *mean velocity*, V, must be known as well as the flow section area, A, to which the mean velocity applies. Then, the discharge, Q, sometimes called *the flow rate*, is the *product*, AV

Discharge or rate of flow has units of volume divided by unit time. Thus, discharge can be accurately determined by measuring the time, t, to fill a known volume, $V_0$③:

$$Q = V_0 / t$$

Water measurement devices can be *calibrated* using very accurate volumetric tanks and clocks More commonly, weight of water in the tanks is used by converting the weight of water per unit volume.

square root 平方根

theoretical velocity 理论速率

float and stopwatch 浮标和秒表

current *n* 水流

propeller *n* 推进器

deflection *n* 偏转

mean velocity 平均流速

the flow rate 流量

product *n* 乘积

calibrate *v* 校准

Notes

① If flow is occurring in a conduit but does not completely fill it, the flow is not considered pipe or closed conduit flow, but is classified as open channel flow 如果管道未充满，则闭管流模型不适用，归为明渠流。

② The coefficient can vary widely in nonstandard installations, but is well defined for standard installations or is constant over a specified range of discharge 在非标准的结构中，系数 C 的值变动的范围很大，但是在标准结构中 C 值很容易定义，且在一定的流量范围内是恒定的。

③ a known volume, V_0 V_0是一个已知的体积量，而非流速的符号。

Practices

1. Translate the following terms into English.

水力学 流体力学 明渠流 截面积 水压差 堰

文丘里流量计 假定 平均流速 平方根 校准

2. Describe the basic principles of water measurement briefly.

3. Translate the following paragraph into Chinese.

Public concepts of how to share and manage the finite supplies of water are changing. Increasing competition exists between power, irrigation, municipal, industrial, recreation, aesthetic, and fish and wildlife uses. Within the United States, critical examinations of water use will be based on consumption, perceived waste, population density, and impact on ecological systems and endangered species. Water districts will need to seek ways to extend the use of their shares of water by the best available technologies. Best management measures and practices without exception depend upon conservation of water. The key to conservation is good water measurement practices.

UNIT 2

Wastewater Treatment

本文简介

本文介绍污水处理技术和主要术语。

Waste water is not just *sewage*. All the water used in the home that goes down the drains or into the *sewage collection system* is wastewater This includes water from baths, showers, sinks, dishwashers, washing machines, and toilets. Small businesses and industries often contribute large amounts of wastewater to sewage collection systems; others operate their own wastewater treatment systems. In combined municipal sewage systems, water from storm drains is also added to the *municipal wastewater* stream. The average American contributes 265～568 liters (66～192 gallons) of wastewater each day. Wastewater is about 99 percent water by weight and is generally referred to as *influent* as it enters the wastewater treatment facility. "*Domestic wastewater*" is wastewater that comes primarily from individuals, and does not generally include industrial or agricultural wastewater.

sewage *n* 下水道，污水

sewage collection system 污水收集系统

municipal wastewater 市政污水

influent *adj* 流入的；*n* 进水

domestic wastewater 生活污水

At wastewater treatment plants, this flow is treated before it is allowed to be returned to the environment, lakes, or streams There are no holidays for wastewater treatment, and most plants operate 24 hours per day every day of the week.① Wastewater treatment plants operate at a critical point of the water cycle, helping nature defend water from excessive pollution. Most treatment plants have primary treatment (physical removal of floatable and settleable solids) and secondary treatment (the biological removal of dissolved solids).

Primary treatment involves the following steps.

(1) Screening to remove large objects, such as stones or sticks, that could plug lines or block tank inlets

(2) *Grit chamber* slows down the flow to allow grit to fall out.

(3) Sedimentation tank (settling tank or clarifier) settleable solids settle out and are pumped away, while oils float to the top and are *skimmed* off

grit chamber 沉砂池

skim *v* 撇去

Secondary treatment typically utilizes biological treatment processes, in which microorganisms convert nonsettleable solids to settleable solids. Sedimentation typically follows, allowing the settleable solids to settle out. There are three options.

(1) Activated Sludge. The most common option uses microorganisms in the treatment process to break down organic material with aeration and *agitation*, then allows solids to settle out. Bacteria-containing "activated sludge" is continually *recirculated* back to the aeration basin to increase the rate of organic decomposition.

(2) *Trickling Filters* These are beds of coarse media (often stones or plastic) 3～10 ft deep. Wastewater is sprayed into the air (aeration), and then allowed to trickle through the media Microorganisms attached to and growing on the media, *break down* organic material in the wastewater. Trickling filters drain at the bottom, the wastewater is collected and then undergoes sedimentation

(3) *Lagoons* These are slow, cheap, and relatively inefficient, but can be used for various types of wastewater They rely on the *interaction* of sunlight, *algae*, microorganisms, and oxygen (sometimes aerated).

After primary and secondary treatment, municipal wastewater is usually *disinfected* using chlorine (or other disinfecting compounds, or occasionally ozone or ultraviolet light) An increasing number of wastewater facilities also employ *tertiary treatment*, often using *advanced treatment* methods. Tertiary treatment may include processes to remove nutrients such as nitrogen and phosphorus, and carbon adsorption to remove chemicals. These processes can be physical, biological, or chemical

Settled solids (sludge) from primary treatment and secondary treatment settling tanks are given further treatment and undergo several options for disposal.

Terms

(1) Activated sludge. Sludge particles produced by the growth of microorganisms in aerated tanks as a part of the activated sludge process to treat wastewater.

(2) *Aeration*. Exposing to *circulating air*, adds oxygen to the wastewater and allows other gases trapped in the wastewater to escape (the first step in secondary treatment via activated sludge process)

(3) Biochemical oxygen demand (BOD). A laboratory measurement of wastewater that is one of the main indicators of the quantity of pollutants present; a parameter used to measure the amount of oxygen that will be consumed by microorganisms during the biological reaction

agitation *n* 搅动

recirculate *v* 再通行、再流通

trickling filter 滴滤池

break down 分解

lagoon *n* 氧化塘

interaction *n* 相互作用

algae *n* 藻类，海藻

disinfect *vt* 消毒

tertiary treatment 三级处理

advanced treatment 高级处理

aeration *n* 通风、曝气

circulating air 循环空气

of oxygen with organic material.

(4) Biosolids. Sludge that is intended for beneficial use. Biosolids must meet certain government-specified criteria depending on its use (e.g., fertilizer or soil amendment).

(5) Decomposition. The process of breaking down into constituent parts or elements.

(6) Domestic wastewater. Wastewater that comes primarily from individuals, and does not generally include industrial or agricultural wastewater.

(7) Effluent. Treated wastewater, flowing from a lagoon, tank, treatment process, or treatment plant.

(8) Grit chamber. A chamber or tank used in primary treatment where wastewater slows down and heavy, large solids (grit) settle out and are removed.

(9) Influent Wastewater flowing into a treatment plant.

(10) Lagoons (oxidation ponds or stabilization ponds). A wastewater treatment method that uses ponds to treat wastewater. Algae grow within the lagoons and utilize sunlight to produce oxygen, which is in turn used by microorganisms in the lagoon to break down organic material in the wastewater.② Wastewater solids settle in the lagoon, resulting in effluent that is relatively well treated, although it does contain algae.

(11) Municipal. Municipal wastewater, which relating to a municipality (city, town, etc.), is primarily domestic wastewater.

(12) Primary treatment. The first stage of wastewater treatment that removes settleable or floating solids only; generally removes 40% of the suspended solids and 30%～40% of the BOD in the wastewater.

(13) Secondary treatment A type of wastewater treatment used to convert dissolved and suspended pollutants into a form that can be removed, producing a relatively highly treated effluent. Secondary treatment normally utilizes biological treatment processes (activated sludge, trickling filters, etc) followed by settling tanks and will remove approximately 85% of the BOD and *TSS* in wastewater. Secondary treatment for municipal wastewater is the minimum level of treatment required by the Clean Water Act.

TSS 总固体悬浮物

(14) Sedimentation. The process used in both primary and secondary wastewater treatment, that takes place when gravity pulls particles to the bottom of a tank (also called settling).

(15) Settling tank (sedimentation tank or clarifier). A vessel in

which solids settle out of water by gravity during wastewater or drinking water treatment processes.

(16) Sludge Any solid, semisolid, or liquid waste that settles to the bottom of sedimentation tanks (in wastewater treatment plants or drinking water treatment plants) or *septic tanks*.

septic tank 化粪池

(17) Tertiary treatment. Any level of treatment beyond secondary treatment, which could include *filtration*, nutrient removal (removal of nitrogen and phosphorus) and removal of toxic chemicals or metals, also called "advanced treatment" when nutrient removal is included.

filtration *n* 过滤，筛选

(18) Total suspended solids (TSS). A laboratory measurement of the quantity of suspended solids present in wastewater that is one of the main indicators of the quantity of pollutants present.

(19) Trickling filter process A biological treatment process that uses coarse media (usually rock or plastic) contained in a tank that serves as a surface on which microbiological growth occurs. Wastewater trickles over the media and microorganisms remove the pollutants (BOD and TSS) Trickling filters are followed by settling tanks to remove microorganisms that wash off or pass through the trickling filter media.③

(20) *Turbidity*. The cloudy or muddy appearance of a naturally clear liquid caused by the suspension of particulate matter

turbidity *n* 浊度

Notes

① There are no holidays for wastewater treatment, and most plants operate 24 hours per day every day of the week 污水处理时刻进行着，大多数污水处理厂24小时运行，每周运行七天。

② Algae grow within the lagoons and utilize sunlight to produce oxygen, which is in turn used by microorganisms in the lagoon to break down organic material in the wastewater 氧化塘中藻类利用太阳光能生长并制造氧气，氧气又被塘中的微生物用来分解废水中的有机物。

③ Trickling filters are followed by settling tanks to remove microorganisms that wash off or pass through the trickling filter media. 滴滤池之后有沉淀池，脱落的或通过了滴滤池的微生物会在沉淀池中沉淀下来。

Practices

1. Translate the following terms into English.

二氧化碳　氮　磷　氧　微生物　滴滤池