矿井通风与安全专业外语

第一册

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中国矿业大学通风安全教研室

一九九一年十月

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前　言

本教材是以新的教学大纲为依据，在原有专业外语教材基础上，为了满足当前对大学本科生的新的要求，而进行重新编写的。

本教材分为三册，分别满足三个学期的教学需要。第一册包括矿井通风与空调的内容；第二册包括瓦斯控制、瓦斯预测预报、瓦斯突出和矿井火灾等内容；第三册包括矿井防尘、文摘翻译和专业常用术语等内容。全书所选文章涉及到通风与安全的主要内容，具有一定的典型性，语法文体比较规范，词汇较为全面，共40课，32篇文章。为了便于自学，对课文中比较疑难的句子作了注释。

由于编者的专业水平和外语水平有限，书中一定存在许多错误或不妥之处，欢迎读者批评指正。

编　者

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LESSON ONE

Nature and Properties of Air

The substance of chief attention in the mine environment is air. Air is a gaseous mixture, existing as a vapor, that Constitutes the natural atmosphere at the surface of the earth, Thermodynamically, it may be thought as a mechanical mixture of dry air and water vapor, whose behavior is complicated by changes of state in the water vapor. Chemically, the composition of so-called dry air ~~at sea level~~ is as follow (Bolz and Tuve, 1973)

Gas	% by Volume	% by weight
Nitrogen	78.09	75.55
Oxygen	20.95	23.13
Carbon dioxide	0.03	0.05
Argon, other rare gases	0.93	1.25

For calculations involving quality control, it is customary to assume dry air and compute problems on a volume basis, taking the composition approximately as, (The various rare gases are grouped with nitrogen)

oxygen 21%

Nitrogen and "inert" gases 79%

because they are chemically and physically inert

insofar as air conditioning is concerned. For problem involving carbon dioxide, use 0.03% or the actual content by volume.

It must be borne in mind, however that dry air does not exist in normal atmospheres. It is a hypothetical term, one we assume in quality control or use as a convince in psychrometric calculations Saturated air, which is air containing all the water vapor possible at the existing conditions of temperature and pressure, is more than occasionally encountered; and even supersaturated air (fog) is not uncommon. The usuall situation confronted in mine air conditioning is moist air, or normal air, which is a mixture of dry air and water vapor, varying from 0.1 to 4% by volume (usually well over 1% in mines). This is a "normal" atmosphere, the basis for ventilation and air-conditioning calculations. So-called "standard air is a misconception; generally normal air is meant. (On the other hand, the terms enviromental standard or standard conditions are properly sued.)

With regard to chemical properties, air is colorless, odorless, and tasteless, and supports combustion and life. These are important in quality control. Its other properties may be classified as

physical or psychrometric. Physical properties consist of those of the fluid, both at rest or in motion: quantity control (ventilation) is concerned principally with the dynamic properties. Psychrometric properties relate to the thermodynamic behavior of air and water-vapor mixture and are of particular importance in temperature-humidity control.

NEW WORDS AND PHRAES

hief [tʃi:f] a. 主要. 首先

vironment [invaiərənment] n. 环境. 外界

por [vɛrpə] n. 蒸汽. 水汽

ermodynumically [θ'əmoudainæ'mikəli] ad. 热力地. 热力学地

behavior [biheiˈvjə] n. 行为. 举止

complicate [kəˈmplikeit] vt. 复杂化. 使…错综

nitrogen [naˈitrədʒən] n. 氮. 氮气

oxygen [oˈksidʒən] n. 氧. 氧气

arbondioxide [kaːˈbəndaioksaid] n. 二氧化碳

rgon [ɔːgɔn] n. 氩

ustomary [kʌˈstəmərɪ] a. 通常的. 惯例的

ssume [əsjuːm] vt. 采取. 假定

omposition [kɔˈmpəziˈʃən] n. 成分. 组成

pproximately [əprɔˈksimitli] ad. 大约

nert [inˈəːt] a. 惰性的. 不活泼的

ypothetical [ˈhaipouθeˈtikəl] a. 假定的

insofar [insouˈfaː] ad. 在…的范围内

convince [kənˈvins] vt. 使信服

psychrometric [saiˈkrɔmitrik] a. 湿度测定的

aturate [ˈsætʃəreit] vt. 使饱和

occasionally [ə'keiʒənli] ad. 偶然地

encounter [in'kauntə] v. & n. 遇到

supersaturated [sju:pə'sætʃəreitid] a. 过饱和的

confront [kən'frʌn] vt. 使面对，比较

ventilation [venti'leiʃən] n. 通风

standard ['stændəd] n. 标准

a. 标准的

misconception ['miskən'sepʃən] n. 误解

properly ['prɔpəli] ad. 适当的

colorless ['kʌləlis] a. 无色的

odorless ['oudəles] a. 无气味的，无臭气的

tasteless ['teistlis] a. 无味的

combustion [kəm'bʌstʃən] n. 燃烧

classify ['klæsifai] vt. 把…分类

principally ['principli] ad. 原则上，根本地

dynamic [dai'næmik] a. 动力的，动力学的

humidity [hju'miditi] n. 湿度，湿气

exist as 以…（状态）存在

so-called 所谓的

bear in mind 牢记在心

with regard to 关于，对于

classify ... as 把…归类为

relate to 与…有关系，论及

air-conditioning 空调

Notes

1. Air is a gaseous mixture, existing as a vapor, that constitutes the natural atmosphere at the surface of the earth.

以气相状态存在的空气是不同气体的混合物，地球表面的天然大气层就是由空气组成的。

这里 existing as a vapor 作状语，表示空气存在的状态。

that 引导的是定语从句，修饰 a gaseous mixture.

2. ..., whose behavior is complicated by changes of state in the water vapor.

..., 由于水蒸汽状态的经常变化，使这种混合气体的特性被复杂化了。

3. ..., it is customary to assume dry air and compute problems on a volume basis, ...

... 习惯上假定是干空气并按体积进行计算。...

这里 to assume, (to) compute 作为该句子的两个并列的实际主语。

4. It mast be borne in mind, ...

必须记住 ..... 这里 borne 是 bear 的过去分词

5. ... (usually well over 1% in mines).

... (通常在许多矿井都超过了1%)

这里 well 是付词，作"完全地"，"都"解。

LESSON TWO

Energy Changes in Fluid Flow

Mine ventilation is normally an example of a steady flow process, that is, one in which none of the variables of flow changes with time. Transition and loss in energy are involved in such a process, and it is important to understand their nature and to be able to express them mathematically. Energy changes are basic to the calculation of the mine quantity and head, the of the ultimate objectives of mine-ventilation engineering. An expression relating the energy variables may be developed as follows.

The total energy at any section in a moving fluid consits of the sum of the internal static velocity, potential, and heat energies at that section. Assume a real fluid moving in a conduit, and consider the energy changes that occur between any two sections in the system. The heat change is genrally negligible compared to the other terms, except in deep mines or ones naturally ventilated, and the addition of mechanical energy is usually considered separately. Omitting these terms for now, the total energy at section 1 equals the total energy at section 2, plus the flo

energy losses occurring between 1 and 2, or

Total energy1= (total energy)2+(flow energy losses)-2-

substituting expressions for the various energy terms and disregarding the minor change in internal energy. the following general energy equation for fluid flow results:

$$\frac{P1}{w} + \frac{V1^2}{2g} + Z1 = \frac{P2}{} + \frac{V2^2}{} + Z2 + H1 \qquad (2)$$

where $\frac{P}{W}$ is static energy, $\frac{V2^2}{2g}$ is velocity energy, z is potential energy, ant H is flow energy loss.

Equation 2 is recognized as the familar Bernoulli equation, applicable to all fluid-flow processes. In this form , it applies only to an incompressible fluid, which air is assumed to be in nearly all mine ventilation because of minor changes in air density.

Each term in the equation is actually a specific energy, in unit of m.kg/kg, or m. Since m is a measure of fluid, head these terms can also be referred to as pressure heads or simply heads. In dealing with air, it is customary to employ mm of water rather-than m of a air as the unit of head.

Accepting the equivalency of specific energy and head, the general energy equation as writtem in Eq. 1 can also be expressed

$$H_{t1} = H_{t2} + H_1 \qquad (3)$$

where H_t total bead; and Eg. 2 can be expressed

$$H_{s1}+H_{v1}+H_{z1}=H_{s2}+H_{v2}+H_{z2}+H_l \qquad (4)$$

where Hs is static head, H_v is velocity head, and H_z is elevation or potential head, All heads have the unit of mm water.

These versions of the Bernoulli energy equation (Egs. 3 and 4) are both basic and general and the most useful to employ in mine ventilation. In relating the static velocity, potential, and total heads plus the losses in flow, the energy equation permits writing of an expression encompassing all flow variables between any two points in the ventilation system. These points may be selected at the beginning and end of the system (the entrance and discharge of the mine for the air circuit), enabling the calculation of the characteristics for the entire system (the mine heads).

NEW WORDS AND PHRASES

fluid [ˈfluid] a. 流动的

steady [ˈstedi] a. 稳定的

transition [trænˈsiʒən] n. 过渡，转变

involve [inˈvɔlv] vt. 包含

mathematically [mæθiˈmætikəli] ad. 数学上地

calculation [kælkjuˈleiʃən] n. 计算

quantity [ˈkwɔntiti] n. 数量

ultimate [ˈʌltimit] a. 最终的，最远的

objective [ɔbˈdʒektiv] a. 客观的，真实的

expression [iksˈpreʃən] n. 表达，表示

internal [inˈtə:nl] a. 内的，固有的

potential [pəˈtenʃəl] a. 潜在的

conduit [ˈkɔndit] n. 管道

negligible [ˈneglidʒəbl] a. 可以忽略的

mechanical [miˈkænikəl] a. 机械的

separately [ˈsepəritli] ad. 分离的

omit [ouˈmit] vt. 省略，删去

occur [əˈkə:] v. 发生，出现

substitute [ˈsʌbstitju:t] n.& v. 代替

disregard [ˈdisrigˈa:d] vt. 不顾

Bernoulli （人名）伯诺里

incompressible [inkəmˈpresəbl] a. 不可压缩的

density ['densiti] n. 密度

specific [spi'sifik] a. 特有的

measure ['meʒə] n. & v. 测量

equivalency [i'kwivələnsi] n. 相当，相等

version ['vəːʃən] n. 表述，说法

selecte [si'lekt] vt. 选择

characteristic [kæriktə'ristik] a. 特有的

refer to 关于，说到，涉及

deal with 处理，论述

rather than 宁愿…（而不…），（与其…）不如…

Notes

1. ..., that is, one in which none of the variables of folw changes with time.

... 即在该过程中流体的流动不随时间而变化

这里 that is 作"也就是"，"即"解。作插入语用 one 代替上文刚提过的 process, in which引导的定语从句修饰 one

2. ... except in deep mines or ones naturally ventilated,

…除了深井或自然通风的矿井。……

这里 ones 代替刚出现的 mines, 为了避免重复

ventilated 是过去分词。修饰 ones.

LESSON THREE

Natural Ventilation

Airflow through mine openings could not exist unless pressure gains occurred in the circuit to overcome the pressure losses. Flow is induced by a pressure difference, and this can only be supplied by some energy source.

There are two forces that may be used to generate pressure difference: natural and mechanical. (Mechanical ventilation is considered in the next chapter). The only natural force that can create and maintain a substantial airflow is, basically, thermal energy due to a temperature difference. Normal heating of the air in the mine as it passes through working faces and mine opening adds thermal energy; this is sufficient to over-come the head losses, and flow results. The Bernoulli equation states that the thermal energy added to the system is converted into a pressure head capable of producing airflow.

The common chimney effect is known to all. Warm air rises and displaces colder air above, producing circulation. A similar phenomenon occurs in mines, where due to difference in elevation and difference in temperature of the workings, warm air displaces cold