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多级A/O 工艺理论的探讨

——A/O 工艺、非稳态理论与多级A/O 理论之间的关系

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摘要: 分别介绍了A/O 工艺、非稳态理论与多级A/O 理论的概要; 着重阐述了三者之间的关系, 以及建立在A/O 理论和非稳态理论基础之上的多级A/O 理论实现的可能性和可行性, 最后提出了多级A/O 理论尚存的问题。

关键词: A/O 工艺; 非稳态理论; 多级A/O; 脱氮; 除P; 硝化; 反硝化

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随着水污染状况的日益严重和污水深度处理要求的不断提高, 国内外污水处理工艺方面的学者和技术人员都在不断进醒着越来越深入的探索和研究。A/O 工艺作为污水深度处理工艺的代表, 被广泛应用到污水处理行业的各个方面。A/O 工艺的不断变型发展和非稳态理论的提出, 为多级A/O 工艺理论的建立提供了较成熟的理论依据。多级A/O 工艺理论是建立在新型移动曝气设备的基础之上的全新的污水处理工艺理论。

1 A/O 工艺

1.1 A/O 工艺理论

缺氧—好氧(anoxic- oxic)生物处理系统简

称为A/O 系统, 这套工艺被称为A/O 工艺。它是随着废水深度处理, 尤其是脱氮要求的提高而出现的。其所完成的生物脱氮在机制上主要由硝化和反硝化 2 个生物过程构成。废水在好氧条件下使含氮有机物被细菌分解为氨, 然后在好氧自养型亚硝化细菌的作用下进一步转化为亚硝酸盐, 再经好氧自养型硝化细菌作用而转化为硝酸盐, 至此完成了硝化反应; 硝酸盐进入到缺氧条件下, 在兼性异氧细菌的作用下, 利用或部分利用废水中原有的有机物碳源为电子供体, 以硝酸盐替代分子氧作电子受体, 进行无氧呼吸, 分解有机质, 同时, 将硝酸盐中氮还原成气态氮, 至此完成了反硝化反应。A/O 工艺不但能取得比较满意的脱氮效果, 而且通过上述缺氧—好氧循环操作, 同样可取得高的COD 和BOD 的去除率。

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(2) 疲劳断口上源区附近的特征形貌可以定性或定量判断疲劳起始时的应力幅大小(或疲劳过载情况); 而采用疲劳扩展过程中的断口特征形貌则只能判断疲劳扩展时的应力幅大小。

(3) 根据应力—强度干涉模型的原理, 可以采用疲劳源的多少或疲劳沟线的有无作为判断疲劳起始应力幅的大小(或疲劳过载的程度)。

(4) 根据断裂力学的理论, 宏观疲劳裂纹临界扩展距离可以判断疲劳扩展寿命和扩展应力幅的断口特征形貌。

(5) 鉴于微观疲劳条带间隔(宽度)是宏观疲劳裂纹扩展速率的度量, 因此, 微观疲劳间隔是衡量疲劳扩展应力幅大小和是否属于应力(应变)疲劳的依据之一。

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1.2 A/O 工艺的发展形式

随着对 A/O 工艺研究的不断深入, 出现了许多 A/O 工艺的变型, 以下介绍其中有代表性的几种:

(1) A - A/O 工艺 即厌氧—缺氧—好氧组合工艺。与 A/O 工艺不同之处在于前段设置一厌氧反应器, 旨在通过厌氧过程使废水中部分难降解有机物得以去除, 进而改善废水的可生化性, 并为后续的缺氧段提供适合于反硝化过程的碳源, 最终达到去除 COD、BOD、N、P 的目的。

(2) O/A 工艺 即单级好氧—缺氧工艺。它与 A/O 工艺的不同之处在于, 直接将含有各种形态氮的废水通过好氧过程使其充分硝化, 转变成硝酸盐氮后再进入缺氧反应器, 经过反硝化过程达到脱氮目的, 整个工艺不需要回流。由于首先进行的好氧过程使大部分 BOD 物质被去除, 为反硝化过程添加碳源成为必要, 因此该工艺适用于处理碳源不足而以生物脱氮为主要目的的废水。

(3) O - A/O 工艺 即好氧—缺氧—好氧组合工艺。它与 A/O 工艺的不同之处在于, 在单级 A/O 工艺前面增加一好氧反应器, 用于将废水中的有机氮和各种形态的无机氮完全转化为硝酸盐氮, 从而为反硝化菌提供合适的基质。

(4) A₁ - A₂/O₁ - O₂ 工艺 也就是采用 2 级厌氧滤池加 2 级好氧滤池组合而成。该工艺是吸收日本小型生活污水处理技术发展而成。

2 非稳态理论

非稳态理论认为, 非稳态条件对生物处理系统的影响应归结到对系统中微生物的影响, 包括微生物活性、适应不断变化的外界环境的能力、具有特殊功能的微生物的形成等方面, 而系统的处理效果在很大程度上取决于这些因素。如 Stefan 提出, 几小时的“饥饿”状态并不会导致微生物活性的降低, 反而会刺激微生物产生更多的与基质摄取相关的酶, 从而在“饱食”状态下吸收, 亦即从水中去除数量更多、范围更广的污染物; 荷兰学者 Loosdrecht 的研究也证明, 微生物体内贮存多聚物是一种普遍现象, 只不过条件不同其作用显示程度不同, 它是微生物固有的能力, “饥饿—饱食”状态是激发并强化这一能力的重要影响因素, 揭示和利用其中的规律就有可能优化现有生物处理技术或设计出新的工艺^[1]。

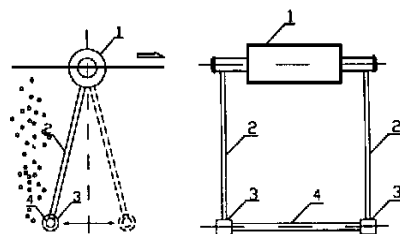
3 多级 A/O 理论

3.1 多级 A/O 工艺的概念

多级 A/O 工艺理论在国外的一些新工艺中已

经有所体现, 但作为单独的理论体系还未见到。我们通过对非稳态理论、A/O 工艺、SBR 工艺以及 Bio-lak 工艺的研究, 结合我国一些专家学者的有关观点, 提出多级 A/O 工艺概念: 把多级 A/O 理论分为 狭义多级 A/O 理论, 即严格按照 A/O 理论, 保证严格的 A/O 周期, 也就是多次硝化反应与反硝化反应的叠加。广义多级 A/O 理论, 即简单造成的缺氧—好氧—缺氧—……—好氧条件, 无需严格的 A/O 周期, 主要的理论基础是非稳态理论与硝化—反硝化反应机理。本文主要是指广义多级 A/O 理论。

多级 A/O 工艺的实现主要依靠悬浮式移动曝气器(国外称之为 Bio-lac 曝气器或 Bio-lak 曝气器^[2])的不规则运动曝气, 以及曝气链的启闭来完成的。为便于理解, 先简要介绍一下悬浮式移动曝气器及其特点: 悬浮式移动曝气器是由气路控制阀门、布气软管、浮筒、布气支管、曝气器(可单联或多联)以及配重组成(见图 1)^[3]。布气软管和浮筒漂浮在水面上, 布气支管悬挂着曝气头, 在配重的作用下悬浮在水中。当气路控制阀门打开后, 空气通过布气软管、布气支管传到曝气器, 曝气器将空气释放到水中, 气泡升到水面爆裂, 推动浮筒向一个方向运动, 当浮筒到达极限位置时停止运动, 而曝气器和配重在惯性作用下继续运动, 当气泡在浮筒另一面爆裂时, 推动其向另一个方向运动, 周而复始。当气路阀门闭合时, 整链曝气器停止曝气。



1. 浮筒 2. 曝气支管 3. 配重 4. 曝气器
图 1 悬浮式移动曝气器正/侧视图

由于悬浮式移动曝气器的不规则运动以及曝气链的启闭, 造成了构筑物内的曝气区域与不曝气区域间隔存在, 而在处理构筑物 DO 值较低的情况下, 造成了好氧区与缺氧区间隔存在, 即多组 A/O 段。一般情况下缺氧区和好氧区是不固定的, 即同一区域此时是缺氧区, 过一段时间, 就可能处于好氧区(见图 2)。

宏观上每经过一组停气—曝气区域, 也就是经历了一个 A/O 工艺周期, 完成了一次 A/O 工艺处理, 处理效率是依次累加的。污染物的处理效率

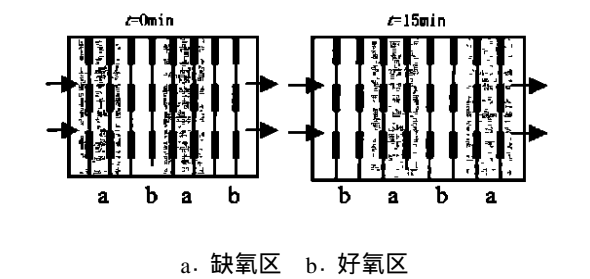


图2 多级A/O 工艺运行示意图

$$E_n = 1 - (1 - E)^n \tag{1}$$

式中, E_n 为污染物总处理效率; E 为每个A/O 周期污染物处理效率; n 为A/O 工艺周期的个数。

3.2 多级A/O 工艺实现的可行性研究

本研究旨在以非稳态理论研究为基础, 结合A/O 机理, 设计出以多级A/O 为基本运行方式的新工艺, 使处于可控非稳态环境下的微生物接受足够强度的刺激, 继而产生适应, 实现缺氧—好氧—缺氧—……—好氧条件下的快速吸收, 使出水达标或接近达标, 并通过污泥的缺氧—好氧饥饿来提高系统的长期处理能力和稳定性。

我们进行了多级A/O 实现硝化—反硝化反应可能性的研究。一般认为, 发生脱氮反应必须具备以下条件: 硝酸盐(亚硝酸盐)的存在; 合适的溶解氧水平; 兼性菌团; 合适的电子供体(能源)的存在。 、 条件属于废水本身的因素, 可以认为具备。主要是应具有合适的 、 。

由于硝化菌的自养特性, 其增长速率比异氧菌小1个数量级左右, 因此, 在整个系统中, 如何维持足够数量的硝化菌, 将成为该工艺成败的关键。系统中硝化菌的增殖与硝化菌固有的比增长速率(μ)和所控制的细胞平均停留时间(θ)有关。反应处于稳态时

$$\mu = 1/\theta \tag{2}$$

如果 $\mu < 1/\theta$ 系统中增殖的硝化菌小于流失的硝化菌。此时, 系统中硝化菌的数量将越来越少, 直至完全消失。也就是说, 系统中的硝化处于非稳态(注意: 此处的非稳态与非稳态理论并非同一概念), 硝化能力越来越差, 直至完全丧失。所以, 我们必须保证 $\mu \geq 1/\theta$ 才能使A/O 工艺顺利实现。

多级A/O 工艺采用低污泥负荷, 水利停留时间较长, 污泥龄达到20天以上, 所以细菌的平均停留时间相应较长; 适宜条件下, 硝化菌的最小世代时间为3天左右, 所以, 该工艺能完全满足 $\mu \geq 1/\theta$

此外, 兼性菌团的增殖也是依靠合适的溶解氧条件来完成的。因此反应器内进行同时硝化/反

硝化的必要条件是好氧和缺氧环境同时存在, 此时控制溶解氧的水平至关重要, 既要满足碳化和硝化反应的需要, 又要为保证局部缺氧环境的形成使DO 控制在较低的水平。不同的反应器类型和反应条件, DO 的控制范围亦不同, 一般为0.5 ~ 1.5mg/L。进行同时硝化/反硝化的其它条件有污泥负荷小于0.1~0.15kgBOD/kgMLSS, 以满足硝化的要求, C/N 比满足反硝化过程对碳源的要求以及碱度等。

国内一些学者曾进行过低氧曝气在SBR 工艺中脱氮的效果, 通过控制曝气量使SBR 反应器内的DO 控制在0.5~1mg/L, 在反应器内形成厌氧(缺氧)和好氧并存的环境, 实现了同时硝化/反硝化的过程。其试验参数如下: 污水间歇进水, 运行周期为12h, 反应(曝气)时间为8h, MLSS 为7589mg/L, 泥龄为25d, 水温为21℃。试验结果见图3^[4]。

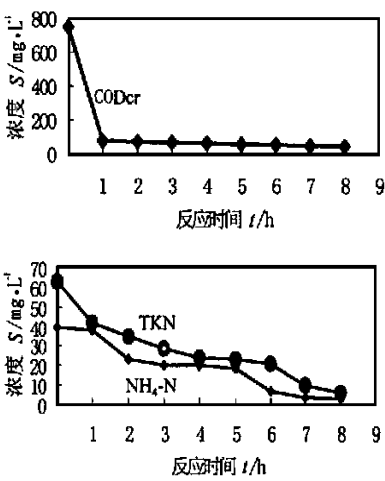


图3

在利用悬浮微生物进行污水处理的过程中, 对于缺氧区污泥沉降是一个敏感问题, 一般采用加设推流搅拌装置来解决。而对于多级A/O 工艺, 不存在这个问题。污水在若干开启的曝气链的作用下, 始终处于运动状态, 即使在停气曝气链所处缺氧区, 由于相对停留时间较短, 造成污泥运动速度降低的水力损失相对较小, 污泥仍能保持悬浮状态。

此外, 多级A/O 工艺理论上可以有效避免在活性污泥法处理废水中经常遇到的污泥膨胀问题, 这也是该工艺理论的主要特点之一。

3.3 多级A/O 工艺的部分参数

多级A/O 理论仍属于活性污泥理论范畴, 在运行方式上采用“整体推流, 局部混合”。在工艺计算中按照完全混合方式处理。一般认为完全混

合条件下多组分基质被去除的氧化动力学公式^[1]为

$$(S_0 - S)/X_v t = K (S/S_0) \tag{3}$$

式中, S 为基质浓度; S_0 为基质起始浓度; X_v 为挥发性悬浮固体; K 为反应速率系数。

根据目前我们掌握的技术, 多级 A/O 工艺的实现还需依靠长的污泥龄(一般大于 15 天)和低污泥负荷(0.03~ 0.2dkgBOD/kgMLSS)来完成。主要工艺参数与传统工艺有所不同, 见表 1。

表 1 多级 A/O 工艺与其他工艺部分参数对比

运行方式	N_s	X	R	t_m
传统曝气工艺	0.2~ 0.5	1.0~ 2.5	20~ 50	6~ 8
完全混合工艺	0.3~ 0.6	2.5~ 4.5	100~ 500	3~ 5
生物吸附工艺	0.2~ 0.6	1~ 3* 3~ 7**	50~ 100	1~ 2* 2~ 5**
延时曝气工艺	< 0.2	1.5~ 3.5	30~ 100	10~ 36
多级 A/O 工艺	0.03~ 0.2	1.5~ 5.0	50~ 150	10~ 36

表中, N_s 为污泥负荷, kgBOD5/kgMLSS · d; X 为污泥浓度, kg/m³; R 为污泥回流比, %; t_m 为曝气时间, h。* 为吸附段; ** 为再生段。

多级 A/O 工艺的核心是缺氧区与好氧区的大小和疏密, 对其控制主要是对 DO 与 ORP 的控制。由于该工艺属于低污泥负荷, 停留时间长, 因此控制难度大大降低。具体的控制数值由进水的的水质和现场的条件决定, 在此不再累述。

4 多级 A/O 工艺理论待确定的关键问题

4.1 溶解氧问题

多级 A/O 工艺的关键之一在于在低好氧状态下同时进行硝化和反硝化反应。尽管国内曾进行过在同一反应器内形成厌氧(缺氧)和好氧并存的环境, 实现同时硝化、反硝化过程的试验, 但首先该试验是针对 SBR 工艺进行的, 与多级 A/O 工艺相比还有一定出入, 某些试验条件如 DO 的控制范围为 0.5 mg/L ~ 1.5 mg/L 在多级 A/O 工艺情况下实现的可行性; 其次对于在多级 A/O 工艺低污泥负荷条件下, 污水由好氧区进入缺氧区后溶解氧的衰减速率 v 与缺氧区停留时间的关系尚需进一步研究。理论上 v 只与水中好氧菌和兼氧菌浓度 S 有关: 在以好氧菌为主构筑物中, v 和 S 基本成正比例关系, 然而在多级 A/O 工艺条件下水中微生物兼性菌所占比例较大, v - S 曲线还需试验确定。而只有 v - S 曲线确定后, 才能确定缺氧区停留时间, 进而确定好氧区停留时间以及启停曝气链的条数、时间等工程应用的实际问

题。

4.2 除磷问题

目前许多污水处理厂, 尤其是地处南方的污水处理厂都加强除 P 的要求。多级 A/O 工艺在正常情况下, 污水中的 P 按照 1 : 100 的比例与 BOD 一同被去除掉。在 P 含量较高的情况下, 一般加设单独的除 P 构筑物, 也可采用除 P 区, 即在多级 A/O 前分隔出一定区域, 除 P 区内氧含量很低, 相当于 A²/O 工艺中的 Anaerobic 段, 除 P 原理也与之相似。但经过多级 A/O, P 会部分地反复地被释放出来, 而且多级 A/O 属于低污泥负荷范畴, 排泥量较之传统工艺要小, P 的去除也将受影响。因此确定 A/O 级数和相关参数与除 P 效果之间的关系是确定什么情况下必须采用单独地除 P 构筑物的关键, 也是确定整个工艺流程的关键。此外, 对除 P 区加药除 P 的可行性以及效果也应作进一步研究。

5 结语

综上所述, 多级 A/O 理论是结合 A/O 工艺理论和非稳态理论的机理和特点提出并发展起来的。在脱 N 和去除一般污染物方面与传统工艺相比体现了优势, 尤其利用了悬挂链移动曝气设备自身的特点, 作出了多级 A/O 理论广义和狭义的划分, 但仍需在 DO 控制方面进一步加强, 并且对除 P 方面暴露出的不足应加以重视。

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ples for explaining the problems occurred in GT implementation in Chinese manufacturing industry in the 60~70s of the 20th century. It is pointed out that these problems will be solved by the mass- customization production. In addition, the paper also proposes that the mass- customization production model should be consisted of modularization of product design, specialization of manufacturing, netshaped production organization and management, and finally the companies will move toward to be virtual corporations for agile manufacturing.

Key words: group technology mass- customization production agile manufacturing virtual corporation

Job Shop Management System Based on Cost Control

SUN Shudong (Northwestern Polytechnical University, Xi'an, China) DENG Wein XIE Guiliang p 322-323, 345

Abstract: Cost control system has become one of the most important systems in the management information system of a Chinese enterprise because of the market economy growth so rapidly in China. As part of the CMS project of Xi'an Aero-Engine Corporation (XAE-CMS), the paper developed an integrated cost control system for a job shop of XAE. Based on the analysis of the existing cost control method in the job shop, the authors designed the function and information model of the cost control system. Great efforts have been put on the information integration of the cost control system with the other part of management system of the job shop. Such as, it can share information with the planning subsystem, tool management subsystem, inventory control subsystem, and equipment management subsystem of the job shop management system. The cost control system is developed on C/S mode. The authors use Delphi 4.0 as the desktop developing tool and SQL Server 7.0 as the database management system. The OS of the server and clients are Windows NT 4.0 and Windows 98, respectively. Running results show that the system can meet the requirements of cost control of the job shop.

Key words: CMS cost control production planning

Transforming Traditional Materials by Means of High and Advanced Technology

MA Mingtu (Chongqing Automobile Research Institute, Chongqing, China) p 324-327

Abstract: Main progresses in transforming traditional materials by means of high and advanced technology in the past twenty years are reviewed in this paper. The progresses include the increasing in productivity and performance of the materials industry, the improving in quality and the decreasing in price of materials. The new properties and applications of traditional materials and automobile parts endowed with the high and new technology are explained by some typical examples. New business opportunities, a bright future of application, great progresses and benefiting of the world's population society created by the triumphs of materials processing are revealed too.

Key words: high and advanced technology traditional material manufacturing technology automobile industry

Microstructure Simulation of Al Alloy with Cellular Automaton Method

XU Qingyan (Tsinghua University, Beijing, China) LI Baicheng p 328-331

Abstract: Microstructure simulation of aluminum alloy casting was carried out by Cellular Automaton model.

Continuous nucleation model was used to describe heterogeneous nucleation of the liquid metal. Gauss distribution function was employed to describe the relation between the density of nucleation sites and the temperature and was integrated to get the grain density at a given undercooling. Dendrite tip growth kinetics and preferential 100 crystallographic orientation were also taken into account. Therefore not only the stochastic nature of nucleation process but also the deterministic of dendrite growth was considered in the calculation. Simulation results showed that the obtained grain size increases with the increasing of average nucleate undercooling ΔT_N . The modeling results were analyzed mathematically.

Key words: Al alloy microstructure simulation cellular automaton model nucleation and growth

Study on Microstructures and Properties of Aluminum Alloy Microarc Oxidation Coating

JIANG Bailong (Xi'an University of Technology, Xi'an, China) BAILI Jing JIANG Yongfeng p 331-333

Abstract: Through the XRD, SEM and TEM etc, the microstructures of ceramic coating on aluminum alloy by microarc oxidation in different kinds of electrolytes and in different condition of electric parameters were studied. The results indicate that properties, chemical composition and phase contents of ceramic coating was influenced by the kind of electrolytes and electric parameters respectively.

Key words: aluminum alloy microarc oxidation ceramic coating microstructure property

The Application of Crystal Orientation Map in Electron Backscatter Diffraction

CHEN Jianguang (Testing Center of Shanghai Baosteel Research Institute, Shanghai, China) LI Zhong p 334-337

Abstract: The paper introduced a new technology in electron backscatter diffraction (EBSD)- crystal orientation mapping (COM) and its applications in the research on iron and steel.

Key words: electron backscatter diffraction (EBSD) crystal orientation mapping (COM) microtexture IF steel

The Estimation of Stress Amplitude from the Fatigue Fracture Surface Feature of Blade

ZHANG Zheng (Beijing University of Aeronautics and Astronautics, Beijing, China) ZHANG Haiying TIAN Yongjiang ZHONG Qunpeng p 337-339

Abstract: The fatigue fracture surface features of blade are summarized firstly. The macro- features of fatigue fracture surface mainly include macro fatigue origin or striation, distance of fatigue crack propagation, roughness of fatigue fractography. The micro- features of fatigue fracture surface mainly include interval of micro fatigue striations, secondary fatigue crack, dimple and so on. The possibility and the related problems of the qualitative or quantitative determination of fatigue stress amplitude from the characteristics of fracture surface of blade were inquired in this paper. The paper is valuable for the references to fracture failure analysis and diagnosis.

Key words: fatigue stress amplitude fractography feature criterion

Discussion about the Theory of Multistage A/O Technology—The Relation of A/O Technology Unstable State

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Theory & the Theory of Multistage A/O Technology

WANG Tao (Academy of Machinery Science and Technology, Beijing, China) LOU Shangyou p 339-342

Abstract: The paper introduces a summary of A/O technology, the theory of unstable state & the theory of multistage A/O technology. It describes the relationship of them, possibility and feasibility of actualizing multistage A/O theory with emphasis. By the end of all, the problems still in existence are pointed out. The paper explores and explains the theory of multistage A/O technology as a new idea on wastewater treatment technology.

Key words: A/O technology unstable state theory multistage A/O dephosphorylation nitrification denitrification

Control Countermeasures of Municipal Refuse in Beijing

RU Yihong (Northern Jiaotong University, Beijing, China) LU Wei SHI Yang XU Bo p 343-346

Abstract: With the development of urban economy and growth of population, the volume of municipal refuse is rising, the composition is varying and the disposal cost is going up. These factors aggravate the difficulty of solving these problems. In this paper, waste source management theory and sampling investigation are used to analyze the waste column and characteristics of compositions on the basis of spot investigation. Some conclusions are drawn as follows: municipal residents are the most important producers of refuses, emphasis should be put on educational industry, the volume of municipal refuse varied little among seasons, Chaoyang District and Haidian District are the main districts that should strengthen the management, garbage is the main component of municipal refuse. At last, source management countermeasures in Beijing are put forward.

Key words: municipal refuse waste source characteristic analysis

The Study of the Ultrasonic Sludge Density Monitor

WANG Zhaoyang (Academy of Machinery Science and Technology, Beijing, China) MA Dianqi p 346-348

Abstract: Sludge density is an important control parameter in the sewage plant and the feedwater plant. A new ultrasonic sludge density monitor is introduced, which is suitable for monitoring the sludge density of the sewage plant and the feedwater plant and so on. Some new patent technology has been adopted in the ultrasonic sludge density monitor. It has some important advantages, such as, operating simply and conveniently and great capacity of anti-jamming and high precision, high stability and high adaptability to on-line monitoring. It also outputs the measured results to be used for auto-control. The monitor achieves the international advanced performance and fills up the domestic blank in this field.

Key words: sludge density monitor intelligent instrument ultrasonic

Hot Topics in Study and Application of Steel Line Pipe for Natural Gas Transportation

LI Helin (The Key Laboratory for Mechanical and Environment Behavior of Oil Tubular Goods, CNPC, Xi'an, China) p 349-352

Abstract: Several hot topics in study and application of steel line pipe for natural gas transportation are introduced including transportation under high pressure, research and development of high grade steel line pipe, line pipe with high HIC (Hydrogen Induced Cracking) resistant and its technical requirements, rich gas transporta-

tion and technical requirements of steel pipe, comparison and selection between longitudinally submerged arc welded pipe and spirally submerged arc welded pipe, ductile fracture arrest of steel pipe for gas transportation, SCC (Stress Corrosion Cracking) of pipeline in soil environment with approximately neutral pH value, residual stress and its control of line pipe, the ratio of yield to tensile strength of high strength steel line pipe, fitness-for-purpose assessment and risk management of pipeline in service, etc.

Key words: natural gas transportation pipeline welded steel pipe hot topics

Hydraulic Free Piston Engine (HFPE)—Is it the Power Star in the Future

YANG Huayong (Zhejiang University, Hangzhou, China) XIA Bizhong FU Xin p 353-357

Abstract: This paper introduces the typical designs and recent achievements as well as operation features of HFPE, then analyzes the key realization problems and potential applications, finally presents the countermeasures for the further development in China.

Key words: internal combustion engine new type power hydraulic free piston engine

The Forty Years' Retrospection and Vista of Group Technology in China

WANG Zhibo (Beijing Institute of Technology, Beijing, China) SUN Houfang LIU Jiangnan LI Mengqun p 357-361

Abstract: After describing the Group Technology's origin and recent development and its phylogeny in China, this paper expatiates the developing achievement of domestic group technology within latest 20 years. Briefly analyzing the existing problems, this paper narrates the connotation, mechanism and feature of the Similarity Manufacture Engineering, which is the advanced way to practise new technology based on Group Technology and Similarity Theory.

Key words: group technology theory of similarity similarity manufacturing engineering advanced manufacturing technology

Condition Monitoring and Fault Diagnosis Technique (MDT) Are the More Active High Technique for the Plant Maintenance Engineering (PME)

HUANG Zhaoyi (Equipment Maintenance Institution of CMES, Beijing, China) p 361-364

Abstract: This paper discussed 4 subjects and explained with some case studies. (1) Under the direction of CMES, the MDT in China obtained more developments both in the theoretical research and practical application, gained more profits, and approached the advanced level of the world. (2) The derivation and erection of MDT are under the effect and foster of the system theory, information theory, cybernetics, reliability engineering and computer technique of the fore period of the 20th century. (3) The development and promotion of MDT are under the support and promotion of higher and newer techniques such as information technique (IT), artificial intelligence (AI) and the non-linear theory of the latter period of the 20th century. (4) To popularize the MDT is the important link of the realization of modern management, also the promotion of the technical level. So we wish more support and pay more attention to this topic.

Key words: condition monitoring fault diagnosis technique plant maintenance engineering