

Technic Improvement of External Circular Anaerobic Reactor and Testing Research of Treatment Effect

HAN Hong-jin GAO Fei

(School of Municipal and Environmental Engineering, Harbin Institute of Technology, Harbin 150090)

Abstract The external circular anaerobic reactors are innovative and improved of UASB reactors. With the use the cyclone flow distribution water device and short distance tilted-plate three-phase separator, high rate anaerobic reactors are space saving and low cost, and have a high popularization value and broad prospects. The parameters are satisfied and supply reliable theory gist, technic and methods for anaerobic treatment application. It can also be direction and demonstrate for high concentrate wastewater treatment.

Key words beer wastewater; external circular anaerobic processes; cyclone flow distribution water device; short distance tilted-plate three-phase separator

CLC number: X797 Document code: A Article ID: 0529-6579 (2007) S1-0225-02

1 Test Flow and Equipment

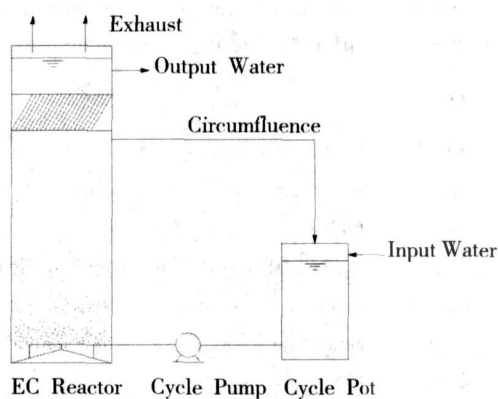


Fig 1 The flow chart of external circular anaerobic processes

1.1 Primary parameters of testing equipment

The recycling cans for testing were plastic box, dimensions of 250 mm × 200 mm × 750 mm, 0.03 m³ of effective cubage. The external circular anaerobic reactor was made of perspex with diameter of 0.3 m and height of 2.30 m. Total volume is 0.17 m³ and effective volume is 0.09 m³.

2 Test Result and Analyses

The test result is shown in figure 2. We can see that in the condition of cyclone flow distribution water device, the expand effect of granular sludge bed is better than vertical distribution mode. The backflow a-

mount of the former one is less than the latter, therefore the energy consumption is less correspondingly.

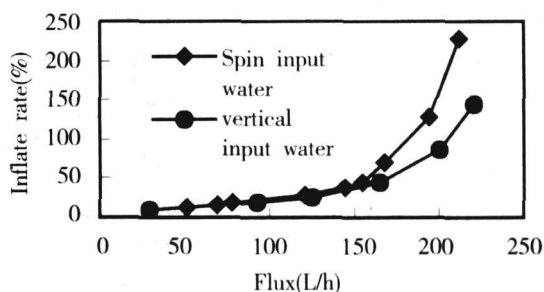


Fig 2 Relation curve of input water flux and sludge bed inflate rate

2.1 Research of distribution condition of sludge in the reactor

Figure 3 is the distribution curve of sludge thickness by height of reactor by the up flow speed of 8 m/h of two input water mode. As shown in the chart, the distribution curve of cyclone flow input water mode is steep, the sludge is distribute evenly in the height, large sludge bed inflate rate without evidently sludge-water interface.

2.2 Clean section height test of three-phase separator

The clean water separated from three-phase separator overflow through the top of separating section, the height of clean section in the upper of three-phase separator will affect the uniformity of water gathering and

①收稿日期: 2007-01-10

基金项目: 国家重点基础研究发展计划基金资助项目 (973计划 2004CB4185)

作者简介: 韩洪军 (1955年生), 男, 教授/博士生导师, E-mail: hhj@hit.edu.cn

outwater quality. Different clean section heights were used in the tests, and the results are shown in figure 4.

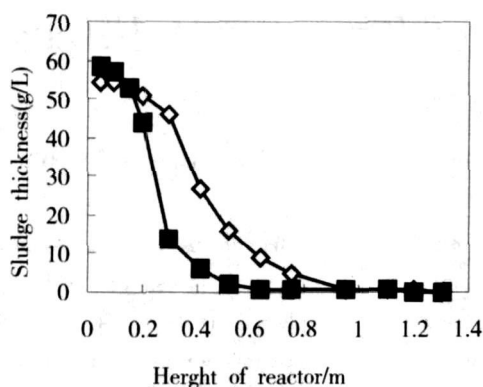


Fig. 3 Distributing curve of sludge thickness by height of reactor

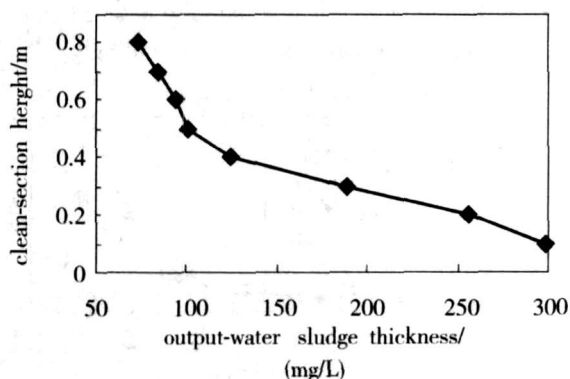


Fig. 4 Relation curve of clean-section height and output-water sludge thickness

The height of clean section will affect the amount of granular sludge in output water; if the height of clean section is too small, the water gathering may not

be even, resulting the over speed of up flow water and the overflow of some granular sludge. When the height of clean section is more than 0.4 m, the quality of output water is good and stable.

3 Conclusions

(1) The situation of energy consumption is studied in the modes of cyclone flow and vertical flow; the results prove that the former is better than the latter. That is, on the equal condition of expended rate, the backflow of the former is less, thus consume less energy.

(2) the cyclone flow in put mode can heighten the height of activated sludge region, enlarge the space for water mixture and dilutedness; provided the reactor with perfect biology condition and hydraulic condition.

(3) The small space of short distance tilted plate three phase separator making granular sludge flow up to the top of the tilted plate, air bubbles will separate from the granular sludge by the slight collision and overflow from the surface along the tilted plate.

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外循环厌氧反应器的技术改进及处理效果的试验研究

韩洪军, 高 飞

(哈尔滨工业大学 市政环境工程学院, 黑龙江 哈尔滨 150090)

摘 要: 对啤酒废水采用外循环厌氧工艺与好氧工艺联合的处理工艺的可行性进行了中试研究。外循环厌氧反应器的各项参数能够满足生产的需要, 为厌氧技术在实际工程的应用提供了可靠的理论依据, 技术方法和解决途径, 对啤酒废水厌氧处理的发展和实践起到重要的理论指导作用, 对相关的高浓度废水处理起到很好的示范作用和指导意义。

关键词: 啤酒废水; 外循环厌氧反应器; 旋流配水装置; 小间距斜板三相分离器

中图分类号: X797