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污泥龄对低氧丝状菌活性污泥微膨胀系统的影响

## Impacts of sludge retention time on low oxygen limited filamentous sludge bulking system

关键词: [污泥龄](#) [丝状菌污泥微膨胀](#) [脱氮除磷](#) [污泥沉降性](#) [低溶解氧](#)基金项目: ["十二五"国家水体污染控制与治理科技重大专项\(No.2012ZX07204-001-02\)](#)

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**摘要:** 为了研究污泥龄(SRT)对低氧丝状菌活性污泥微膨胀系统的影响,采用序批式间歇反应器(SBR)进行试验,分别按照厌氧/好氧和单级好氧的方式运行,考察了不同SRT下丝状菌污泥微膨胀系统的沉降性、脱氮除磷过程以及污泥特性的变化.结果表明,在好氧水力停留时间充分的条件下,低氧环境不但不会影响丝状菌微膨胀污泥的硝化进程,而且还有助于同步硝化反硝化(SND)、单级好氧除磷的发生.厌氧/好氧运行时,SRT与活性污泥的比硝化速率、比释磷速率和比吸磷速率成反比,与SND率和污泥的含磷量成正比.单级好氧运行时,减小SRT对硝化过程影响不大,但是有助于改善除磷效果.活性污泥的比耗氧速率(SOUR)、胞外聚合物(EPS)中多糖与蛋白质含量的比值、以及粘度都与SRT成反比.适当地减小SRT可以改善丝状菌微膨胀污泥的沉降性.厌氧/好氧运行时,厌氧段微氧环境易引发过度丝状菌污泥膨胀;单级好氧运行时,SRT过低会造成污泥黏性骤增而引发黏性污泥膨胀.

**Abstract:** The impacts of sludge retention time (SRT) on low oxygen limited filamentous sludge bulking system were investigated based on sequencing batch reactors (SBR). The SBRs were operated at both anaerobic/aerobic and purely aerobic patterns. Under limited filamentous bulking condition, variations of sludge settleability, nitrogen and phosphorus removal process and sludge characteristics were analyzed at different SRTs. Generally, with sufficient aerobic hydraulic retention time, low ambient oxygen did not deteriorate nitrification process of limited filamentous bulking sludge. In contrast, it contributed to the occurrence of simultaneous nitrification denitrification (SND) and single aerobic phosphorus removal. Operated at anaerobic/aerobic pattern, SRT was inversely proportional to the specific nitrification rate, specific phosphorus releasing rate and phosphorus uptaking rate while in directly proportional to SND ratio and sludge phosphorus content. Decrease of SRT at single aerobic pattern did not weaken the influence on the nitrification process but strengthen the phosphorus removal effect. The specific oxygen utilizing rate, carbohydrate to protein ratio in extracellular polymeric substances (EPS) and viscosity of the activated sludge were all inversely proportional to SRT. Slight decrease of SRT improved sludge settleability. At anaerobic/aerobic pattern, micro-oxygen in anaerobic period easily induced to excessive filamentous sludge bulking. At purely aerobic pattern, extreme small SRT tended to cause severe increase of sludge viscosity hence viscous sludge bulking bursts out.

**Key words:** [sludge retention time](#) [limited filamentous sludge bulking](#) [nitrogen and phosphorus removal](#) [sludge settleability](#) [low dissolved oxygen](#)

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