TYPE 021N AND SLUDGE BULKING

Sludge bulking is one of a range of process issues that can be encountered at a WWTP. This month’s issue examines this phenomenon of filamentous sludge bulking and in particular, the role of Type 021N as an indicator organism of this condition.

This has the effect of increasing floc surface area, slowing settling, and stopping the liquor from separating in the time available in the clarifier; i.e. bulking.

Type 021N is one of the most common causes of filamentous sludge bulking particularly in industrial wastewater treatment processes or domestic plants receiving industrial waste.

Type 021N thrives in low F:M (high SRT) environments, low DO or septic conditions - particularly where high concentrations of volatile fatty acids (VFAs) are high.

Type 021N also has a particular physiological quirk that allows it to out-compete floc forming bacteria in plants treating variable flow or variable strength wastewater where ammonia dosing is applied at a constant rate. This is because large swings between ammonia deficiency and excess trigger Type 021N to assimilate and store ammonia at rapid rate, allowing it to out-compete floc forming bacteria and form large networks of filamentous growth. An ammonia deficiency of as little as an hour followed by large periods of ammonia excess can simulate the perfect conditions for the rapid growth of Type 021N.

Control strategies for Type 021N growth include:

- Controlling for septicity by ensuring adequate DO and the reduction of VFA concentrations - see our ‘Septicity’ issue for more information.

- Pacing ammonia load/dosing with respect to the BOD load at all times. Shock doses of nitrogen will not necessarily immediately relieve sludge bulking issues as Type 021N thrives on shock ammonia loading.

- Increasing sludge wasting or introducing a high F:M zone especially where selector and aeration basin are compartmentalised and when the selector is anoxic or anaerobic (unless cause of bulking is pH, septicity and/or nutrient deficiency).

- Intermittent influent feeding, especially where initial zone is unaerated.

- Chlorination (worst case scenario).

Have you got interesting bugs? Send us a photo. Find out what is growing in your treatment plant…

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Why did the bacteria cross the microscope? To get to the other slide. Just when you thought we had already scraped the bottom, they just keep coming…

Figure 1: Filamentous and non-filamentous sludge bulking (left to right)

Figure 2: Type 021N in rapid growth stage growing in rosettes.