

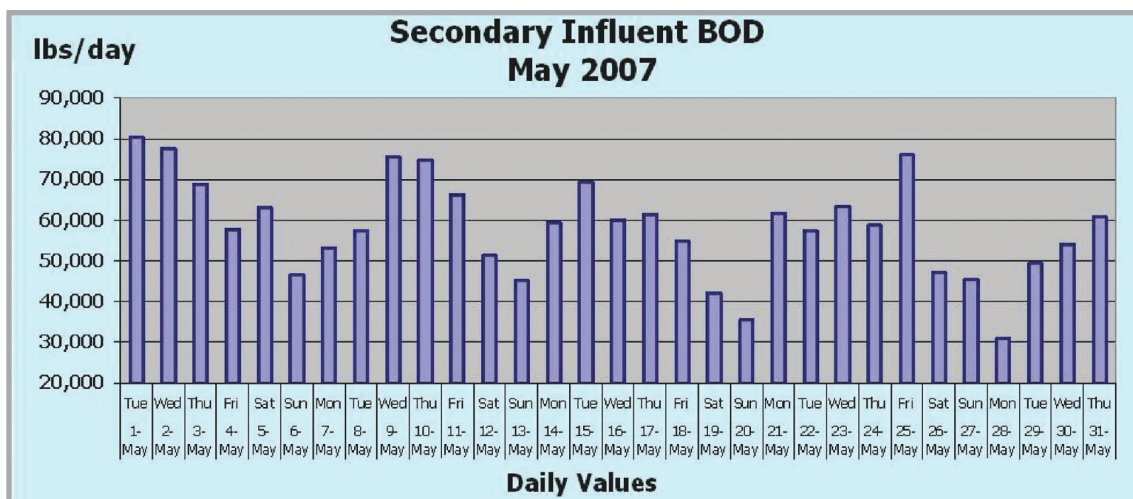
Controlling Influent BOD with the UVAS sc

Dosing fermented sludge to maintain Bio-P

PROBLEM: Low influent BOD loadings on the weekends would upset the biological phosphorous removal process (Bio-P), resulting in costly chemical addition to meet permit requirements.

SOLUTION: Use UVAS sc to control addition of fermented primary sludge to the secondary influent, leveling the BOD loadings and maintaining Bio-P.

With effluent limits of 1.0mg/L total phosphorus and tight budget constraints, a large city in Michigan decided to enhance the biological phosphorus removal conditions that are present naturally during the winter months, after a successful pilot study of the Bio-P process. During the pilot study they discovered problems occurring over the weekends which caused the Bio-P system to decrease in performance, but which would repair itself on Tuesday of the following week. Understanding the importance of nutrient ratios, they began to correlate the secondary influent BOD loading with the decreased Bio-P performance. The BOD loading would drop significantly during the weekend, and not recover until Tuesday.



To overcome this problem, the operations staff decided to supplement the low BOD loadings on the weekends with fermented primary sludge. Fermented primary sludge is an excellent source of volatile fatty acids, the main food source of PAOs under anaerobic conditions. However, one of the consequences of overfeeding volatile fatty acids is the growth of competitive organisms known as glycogen accumulating organisms, or GAOs. GAOs consume the volatile fatty acids and do not perform any significant phosphorus removal. Another consequence of overfeeding primary fermented sludge is an increased oxygen demand in the aeration system, leading to increased aeration costs. The staff balanced the supplemental BOD loading in order to preserve or reduce aeration costs while maintaining nutrient balances, which had the additional beneficial result of keeping the GAOs from proliferating.

Having successful results with the Hach Wastewater Trailer during the pilot study, the staff decided to try the UVAS sc organics sensor to control the BOD loading. Using the UV-254 method to detect dissolved organics, the UVAS sc also employs a 550nm measurement to compensate for solids in the sample, which would otherwise interfere with the UV measurement. The UVAS sc was installed in the secondary influent, after primary clarification. To have the sensor display the measurement as BOD, the staff had to enter two data point pairs into the SC100 controller: a high BOD grab sample and a low BOD grab sample both with the related UV absorbance values measured with the sensor at the sampling time. Based on these measurements, the sensor created its own correlation curve to allow the SC100 to display as mg/L BOD. The correlation in the UVAS sc is checked weekly as a best practice to ensure the correlation has not changed significantly.

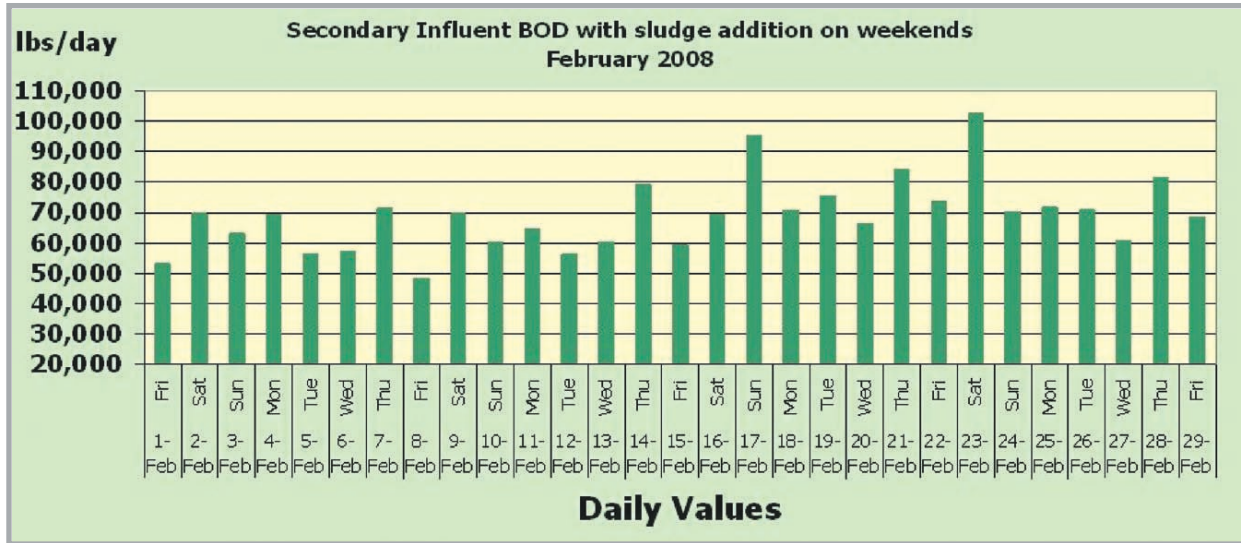
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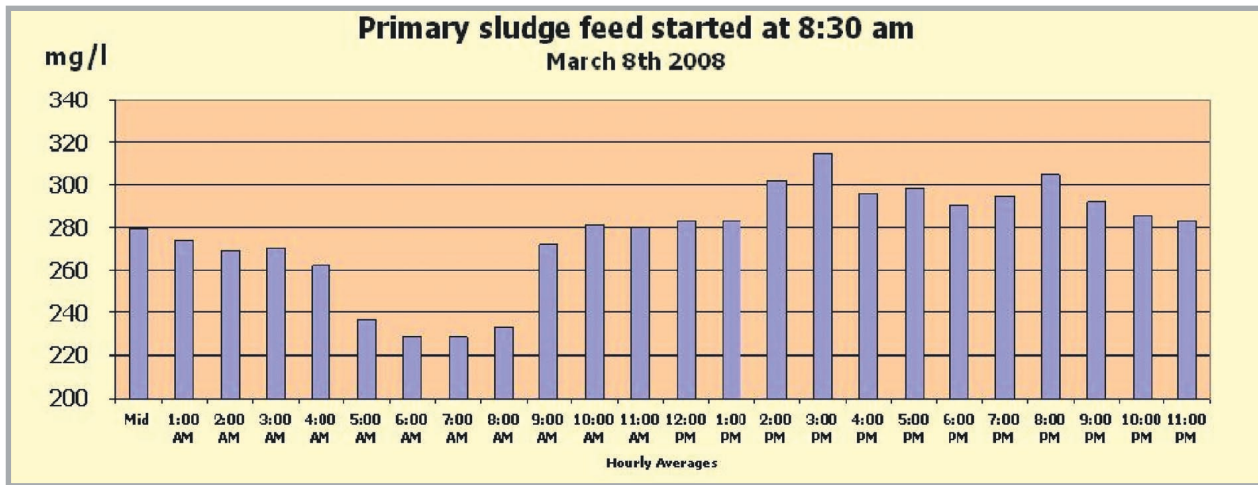


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After the correlation was successfully created, the staff measured the BOD concentration of the fermented primary sludge, and determined appropriate dosing rates based on historical trends. There was a short learning curve to understand the data the sensor was displaying, which was quickly overcome, and now provides important level BOD loading and transparency to the process.



The staff begins dosing fermented primary sludge at 8:30am on Saturday, and trims the dose to maintain level loading as necessary. The UVAS sc sensor responds quickly to the increase in secondary influent BOD as evidenced in the chart below, allowing for precise control of the added BOD while not overloading the secondary treatment system.



Conclusion

Real-time control of fermented primary sludge dosing with the UVAS sc sensor has allowed this facility to sustain their Bio-P process regardless of influent BOD loading. Not only have they been able to reduce chemicals used during Bio-P upset conditions, but have also been able to avoid growing competitive GAOs. Additionally, by not exceeding a maximum dose threshold, they have been able to keep aeration costs down by not overloading the secondary treatment system with too much BOD to achieve the desired phosphorus removal. This has resulted in a much more reliable and forgiving system able to achieve effluent phosphorus targets with significant reduction in ferric chloride addition.

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