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ENERGY EFFICIENT SYSTEM DESIGN FOR WASTEWATER TREATMENT PLANTS:

A System Splitting Approach

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Abstract

Energy is the single highest operating cost in a wastewater treatment plant. More specifically, the energy to operate blowers for aeration is the single highest energy consumer. Fortunately, blowers and blower systems are becoming more energy efficient as system engineers pay more attention to this critical cost factor. It is no longer enough to only consider the individual equipment's efficiency. With energy costs on the rise, it is now more important than ever to carefully examine the entire system's efficiency and understand how each piece of equipment works with one another and how this interaction impacts the overall plant energy efficiency. This paper will outline the traditional approach to wastewater treatment plant design, the efficiency problems associated with this approach, and explain system splitting, an alternate design approach with key efficiency gains. The paper will include guidance on how to calculate specific power for an individual unit as well as an entire system and provide calculation examples for comparing system specific power between traditional and system splitting design approaches.

Nature of WWTP Planning

Unlike commercial systems, municipal wastewater treatment plants are often designed and built based on projected populations and demand 10, 20, and even 30 years in the future. Because project funding is available now and may not be available later on, system engineers are tasked with building a system that will continue to serve the community's growing needs, and in the most cost-effective, energy-efficient way possible. This is no simple task. Although the volume of air needed changes seasonally, day to day, even hour to hour, the general practice is to design the plant's capacity for the worst case/maximum load. This results in oversizing the blowers. Because the blowers are oversized, they do not operate at their most efficient design point, spending as much as 90% of their operating time wasting costly energy.

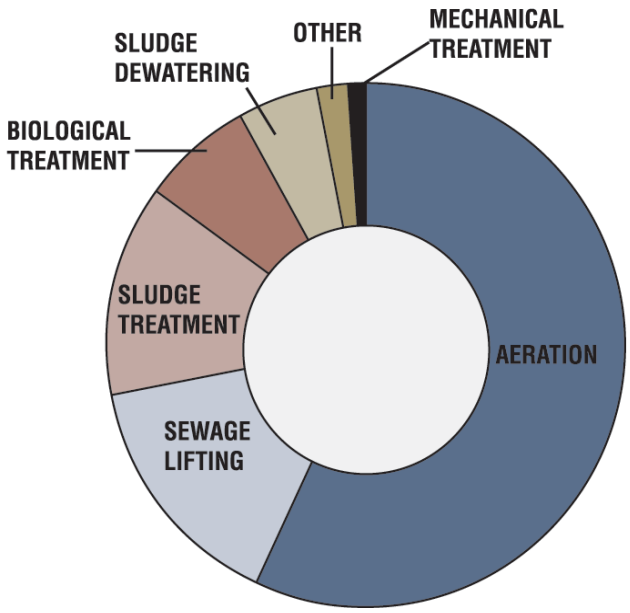

FIGURE 1: OF ALL THE ENERGY COSTS AT A WASTEWATER TREATMENT PLANT, ENERGY FOR AERATION IS BY FAR THE HIGHEST.