

Energy conservation at Sjölunda wastewater treatment plant

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In a world with an ever increasing electrical energy consumption it is important to evaluate the energy usage, especially that of large consumers. Wastewater treatment is one excellent example of a large energy consumer. In Sweden the WWTPs (wastewater treatment plants), represent roughly one percent of the total electrical energy consumption.

Up till recent years focus have not been put on energy efficiency when building and expanding wastewater treatment facilities. This means there is a promising potential for decreasing the consumption. Studies from German WWTPs show a saving potential of up to 30 %. These studies also show that much can be done using existing equipment or by just small investments. With increasing demands and new legislatives on both energy consumption and emittance of carbon

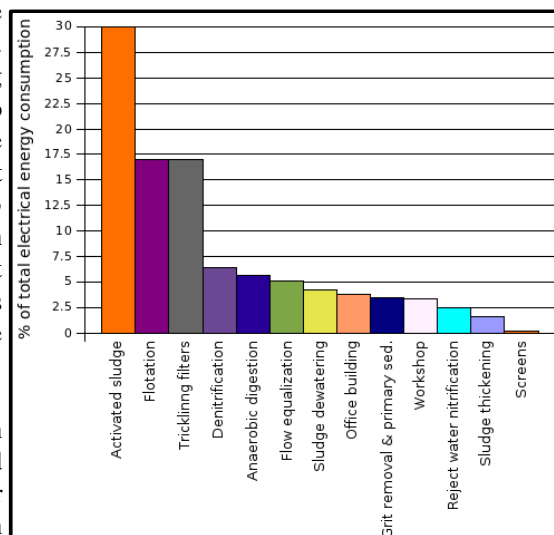
dioxide, it is becoming more and more of a pressing issue to decrease the electrical energy consumption.

When evaluating a WWTP from an energy perspective the first thing to do is to study the existing process. When this is done the processes with the largest saving potential should be evaluated. The process that consumes the most electrical energy is likely to have the greatest saving potential. One way of choosing which processes to analyze, is to separate the largest processes that together represent 80 % of the total consumption and then look deeper at these for potential ways of making them more energy efficient.

Sjölunda WWTP in Malmö is the third largest wastewater treatment facility in

Sweden. Each day 100 000 m³ of wastewater is treated to remove particles, organic matter, nitrogen, phosphorus and other substances before the water is let back to the environment. Each year Sjölunda WWTP uses about 19 GWh of electrical energy. At a rate of 0.80 SEK / kWh this means a yearly electricity bill of about 15 million SEK if all of it is bought from at third party. This is not the case though, since the extraction of biogas during the sludge treatment allows Sjölunda to produce part of the needed electrical energy and all energy used for heating, on site. Anyhow, this shows that much money could be saved with just a small decrease in the electrical energy consumption.

A key to decreasing the electrical energy consumption is knowing where the energy is actually consumed. The easiest and most reliable way is to have power meters installed at strategic points in the electrical system. When that is not the case, as at Sjölunda, different



Energy usage at Sjölunda wastewater treatment plant.

ways to obtain the electrical energy consumption of each process have to be used. A simple way is to use run-times multiplied by rated power.

As seen in the diagram, the main part of the energy is used in the activated sludge process. This is the process where the main part of the organic matter is removed from the wastewater. This is done by mixing the water with a sludge with a high concentration of micro organisms. These micro organisms consume the organic matter. The activated sludge process is a large energy consumer at most WWTPs. At Sjölanda it represents about 30 percent of the total electrical energy consumption, which is roughly the same as the Swedish average. The reason for the activated sludge process being such a large energy user, is that the micro organisms need a lot of oxygen. The process is therefore aerated by large blowers with heavy energy usage as a result. Since the activated sludge process represents such a large percent of the total consumption this is a good place to start when investigating energy saving possibilities.

“Energy thinking”

There is no doubt that much can be achieved from studying existing processes, looking for ways to decrease the energy usage. Another thing that is important to make wastewater treatment efficient is to introduce “energy thinking” to the people working with it. Energy conservation is, today, not a natural part of wastewater treatment in Sweden. To simplify this it is of vital importance that there is a platform for evaluating energy efficiency. First and foremost there has got to be simple ways to obtain the necessary data. The energy usage of the processes should be monitored and the run-times measured. Energy conservation must be a natural part of the planning when installing or managing a process. Last

but not least there has got to be simple ways to measure and evaluate the results. One way to do this is the use of performance indicators. These indicators are values that are used for evaluating the results. In this case it could be a value that indicates the effect of a new control algorithm or a way to study a trend.

For Sjölanda it is likely that much can be done to improve the energy efficiency. Today, data of the electrical energy consumption is hard to obtain and much of the data that do exist is uncertain. This is a large obstacle on the road to a more energy efficient treatment process. A natural step would be to start designing a good foundation for energy conservation with easy accessible data and a well defined set of performance indicators to measure the effect of each potential action.



Activated sludge process at Sjölanda.