



In the pulper the organic waste is dissolved into a substrate, and in the reject separator it is fine screened from plastics and metals.

More gas with a cleaner substrate

NEW PULPER PLANT IN OPERATION AT SKELLEFTEÅ BIOGAS

The municipality of Skellefteå, Sweden, has run a biogas plant since 2007. Incoming material comes from organic household waste and slaughterhouse remains. This year a new pre-treatment plant has been built, with a process based on Cellwood's high consistency pulper. It has recently been taken into operation and the performance tests show a substrate of very high quality.

Project manager at the municipality is Joaquim Holmberg. "The old plant had big operating problems. It didn't live up to promised capacity, and it required a lot of maintenance. The working environment for our operators was far from ideal, they often had to enter the machines to clean them manually."

The new plant has been projected and built in a cooperative project between Skellefteå municipality and Cellwood Machinery.

"The first phase of the project was a thorough pre-study where we compared different technologies," Joaquim says. "We considered two alternative concepts: wet hammer mill or pulper. One criterion was a capacity of 14 tonnes per hour. With the hammer mill that would have required a setup of two parallel machines. But as Cellwood customize the pulper dimensions we could reach the capacity with one single line – therefore the pulper meant a lower investment cost. And we had already seen the pulper concept in other plants, so we knew that it was a robust and reliable process with low maintenance costs."

The new plant is built in the existing premises. The receiving unit, tanks and digester are kept from before. In available space, Cellwood's engineers have made a customized layout for pulper, reject separator, and a system for reject handling. Two machines are being reused: a hydrocyclone and a disperser that were both delivered by Cellwood as upgrades to the previous plant.

A cleaner substrate

"Cleaner substrate, increased gas exchange, and less maintenance. Those have been our three main targets with our project", Joaquim says. "With the pulper we get an industrialized process which is easy to operate and always gives us a high quality substrate."

Analysis from the trials confirm that the substrate is very clean. The Swedish standards specify limit values for visible contaminants >2 mm. The measured value is 0,03%, which corresponds to 6,6 cm²/kg.

"That is an incredibly low value. With a clean substrate we get a better bacterial culture in the digester, and that means more gas from the same material."

The cleanness is to be compared with the Swedish law



“With the pulper we get an industrialized process which is easy to operate and always gives us a high quality substrate,” says project manager Joaquim Holmberg.

requirements of maximum 0,5% – the pulper process is almost twenty times better. The values are similar also in other Cellwood plants where high consistency pulpers are installed. Apart from the increased yield there are several other advantages with a clean substrate – such as optimized use of space in digesters, and less wear.

“Our expectations have been met, and we are very satisfied,” Joaquim concludes.

The pre-treatment process

Cellwood has built the plant on a turn-key contract. Apart from delivery of own machines, that includes dimensioning of conveyors, pipes and pumps, as well as electrical installations with sensors and control system.

The pre-treatment process includes several steps. Incoming household waste is delivered into two receiving units. The first processing step is a shredder that helps opening bags and making the material easier to dissolve.

Next step is the pulper. The material is dissolved in water to a consistency of 20 % DS, and processed in a

“With our new plant we have ensured a production of 17,000 tonnes per year.”

batch cycle of 36 minutes. The pulper rotor sets the material in motion, letting it be treated by its own friction. This means a gentle treatment where the organic content is dissolved, while plastic contaminants remain intact.

This principle is important for the following step. In the reject separator, the substrate is screened through a plate with 6-millimeter holes. Plastics and metals are efficiently separated and dumped into a reject handling system, where the reject is dewatered and transported to a container.

Equipment from Cellwood

- High consistency pulper for dissolving of organic waste
- Reject separator for fine screening of plastics and metal
- Hydrocyclone for removal of grit
- Disperser for grinding of slaughterhouse waste

Capacity: 14 tonnes per hour

Yearly production: 17,000 tonnes



There are many advantages with a clean substrate: increased gas exchange, optimized use of space in digesters, and less wear on the machinery.

Case Study / Skellefteå Biogas, Sweden

The cleaned substrate is pumped to a tank for hygienization. Connected to the tank is a hydrocyclone, that is constantly cleaning the substrate from sand and glass, preventing it from sedimenting in the digester.

There is also a separate receiving unit for slaughterhouse waste, which is processed in a disperser.

Focus on environment

“Our operators are very satisfied,” Joaquim says. “They have run the new plant for a couple of months now, and they are relieved to be working in a well-functioning process. The working environment has improved dramatically.”

Since the first run, the process has been optimized with fine-tuned batch times and recipe. Machinery has been trimmed for increased energy efficiency.

“By now, we’ve run more than 200 batches through the plant, so we are getting to know the process more and more. The plant is operating very well.”

The new pre-treatment plant enables an increased

focus on bioenergy in Skellefteå.

“With our new plant we have ensured a production of 17,000 tonnes per year. That is more than twice as much as before. Now we need to collect more organic material to increase the production of biogas. We want to reach out to more households and recycle even more food waste. We also want to collect more material from supermarkets and neighboring municipalities. When more gas is produced, it will enable even more fossil-free city buses.”

With the pre-treatment plant in place, the next project is already about to start.

“We will build a new plant for upgrading of the biogas into fuel. A new pipeline is being built as well as a new gas station. It will be located close to where we have the garage for public buses and fire department, so it will facilitate the fueling up of those vehicles. The location is also easily accessible for private cars. The new pre-treatment plant therefore enables a chain of other investments with focus on the environment.”