



The equipment supplied by Cellwood Machinery is installed in a separate hall at Frevar KF Biogas Anlegg in Gamle Fredrikstad. The premises are neat and clean with hardly any odours. To the right of the picture: Separation of heavier particles such as glass, gravel, and metal. To the left of the picture: Separation of plastics.

An upgrade that introduced a whole new world

Thanks to its cooperation with Cellwood Machinery, Norwegian municipal biogas plant, Frevar KF Biogas Anlegg in Gamle Fredrikstad, has set out on a completely new era. After installing the HDC25 cyclone unit and a GRS1000 reject separator unit, the amount of undesired particles such as glass, gravel, metal and plastic has been minimised – and machine breakdowns have all but disappeared.

“Previously, we would experience problems on a daily basis. Now, breakdowns are completely gone. This is a whole new world,” says Raymond Jörgensen, process specialist at the plant.

The Frevar biogas plant in Fredrikstad was commissioned in 2013. Here, the municipal company receives approximately 100 tonnes of nutritional waste every day, both packed food waste from wholesalers and liquid substrates in the form of food waste, fat, glycols as well as chicken sludge from slaughterhouses. The end product is biogas supplied to AGA and mainly used as fuel for buses. The sludge is turned into biofertilizer for Norwegian farmers.

Already in 2015, a need to upgrade the plant’s pre-processing facility was identified.

–“Initially, we only had a wet hammer mill for crushing and coarse screening the slurry. This meant that we had large amounts of plastic, metal, gravel and glass in the system causing extreme wear on the equipment and resulting in frequent breakdowns. The rejected material produced sedimentation build-up at the tank bottoms that lead to severe breakdowns of the agitators. These breakdowns would cost us close to NOK one million per year,” recalls Torbjörn Bakke Henriksen, the project leader of the upgrade.

The ultimate solution

He says the company at an early stage had noted that Cellwood Machinery looked for the best solution to meet the needs of Frevar.

“We signed a contract with Peter Ek, and our first impressions were reassured by visits to reference facilities in Växjö, Sweden, and to waste disposal plants belonging to HRA, Hadeland og Ringerike Avfallsselskap. This combination of fine straining and screening was exactly what we were looking for.

By reviewing the entire plant setup, taking advantage of the existing tank volumes and by removing old equipment no longer in use, it was possible to create new space at the existing premises thereby considerably reducing the investment cost.

Smoother flow

Following a public tender, Cellwood Machinery was awarded the tender involving a high-density cleaner unit, type HDC25, and a Grubbens GRS1000 reject separator unit. The equipment was installed in a separate hall downstream from a new receiving unit where vehicles today enter a covered pier. With the aid of an onboard air compressor, the liquid substrate is emptied into a 180 m³ receptacle, shortening the discharge time from one hour to 15 minutes. Packed food waste is dumped into a hatch

“Today, there are hardly any line-ups. Deliveries take place in the daytime when the plant is manned and it is easier to check the items received,” says Torbjörn.



The process operator Henriette Dahl now enjoys calmer workdays and can track the process on the monitors in the Control Room.

The process

According to Cellwood's proposals, the cyclone unit was placed at the beginning of the process line. This is to remove heavier particles, such as gravel, glass, sand, and egg shells from the substrate, after which it is dewatered using a grit separator. The substrate is then returned and purified again before being passed on to the reject separator. In this unit, the substrate is then fine screened in a process where all particles larger than six millimeters in size are separated and dewatered in a buffer screw for transport to a reject container.

Successful commissioning

"We knew that we had lots of heavy particles in the substrate. Previously, there was always clattering noise in the pipes, but this is something that has almost disappeared now. All operators have been pleasantly surprised. Our days are completely different now with less problems and definitely fewer warnings," says Torbjörn, whilst mentioning a heat exchanger that used to clog up at regular intervals. Since the upgrade, even this unit has not caused any trouble.

–At the time, we were guardedly optimistic, however, we would never have imagined that the implementation would be this good right from the start. Everything simply worked from day one," says Raymond Jörgensen.

The biggest surprise was the large amount of plastic.

"Our days are completely different now with less problems and definitely fewer warnings."

"It is a lot more than what we had expected! We are shocked over the amount of plastic that had previously been passed on to the digester. The 2 m³ container, where the rejects are collected, is emptied several times a day. We never had substrate as clean as this!"

Environmental benefits

The new plant has been designed to receive up to 200 tonnes of liquid substrate per day.

"For now, we are receiving the same volumes as before, but because the current process flow is a lot smoother we have basically increased the production capacity of marketable biogas," continues Torbjörn whilst adding

FACT

Receiving capacity:
 30,000 tonnes of substrate/year of which
 6,000 tonnes of packed food waste
 24,000 tonnes to receiving tanks

Pre-treatment capacity:
 Daily: 200 m³/day
 Hourly: 30 m³/hour

Digester:
 3 units with a total capacity
 of 7,400 m³



Project engineer Jani Juntunen (Cellwood), process specialist Raymond Jörgensen and project leader Torbjörn Bakke Henriksen all agree that plastic separation in the Grubbens reject separator is extremely efficient.



Anything bigger than six millimeters in size is separated from the substrate. The container fills up much more quickly than anyone could have imagined, and the substrate has never been this clean!

that thanks to the higher capacity, there is now also time to cleanse the substrate in the hygienisation and take out even more reject.

A clean substrate translates into fewer problems and a more efficient retting process, and of course cleaner sludge with much higher demand.

–“Research has shown that sludge from food waste especially is one of the most nutritious soil conditioners with very positive effects on vegetation. Sludge turnover is high with considerable benefits for both farmers and the environment!”

At Frevar, pre-treatment is a continuous process and this is one of only a few retting plants in Norway that relies on thermophilic retting, i.e. with higher process temperatures than with the more common mesophilic process. The whole process takes place in a closed system. Very few operating problems also means that the equipment rarely needs to be opened, which in turn leads to less offensive odours.

Good cooperation

“Cellwood Machinery distinguished themselves early on, and references confirm its reputation. Following our

positive cooperation and three months of operation thus far, we are nothing short of optimistic. Besides, this is not standard delivery. We had our own opinions regarding the design of the facility, and Cellwood has certainly contributed with sensible input. We are very satisfied with Cellwood and our cooperation with Jani,” says Torbjörn.

The project engineer Jani Juntunen, confirms this positive cooperation and how the two companies together arrived at an optimum solution for Frevar. Three months following the completed installation, Jani made a follow-up visit and concluded that wear on the equipment so far has been minimal.

“We will inspect the systems again in about six months’ time, but so far it looks really good,” says Jani.

However, already, Frevar is looking into the possibility to lease and evaluate the cyclone unit for cleansing the substrate in the digester where the plant has experienced significant problems with sedimentation.