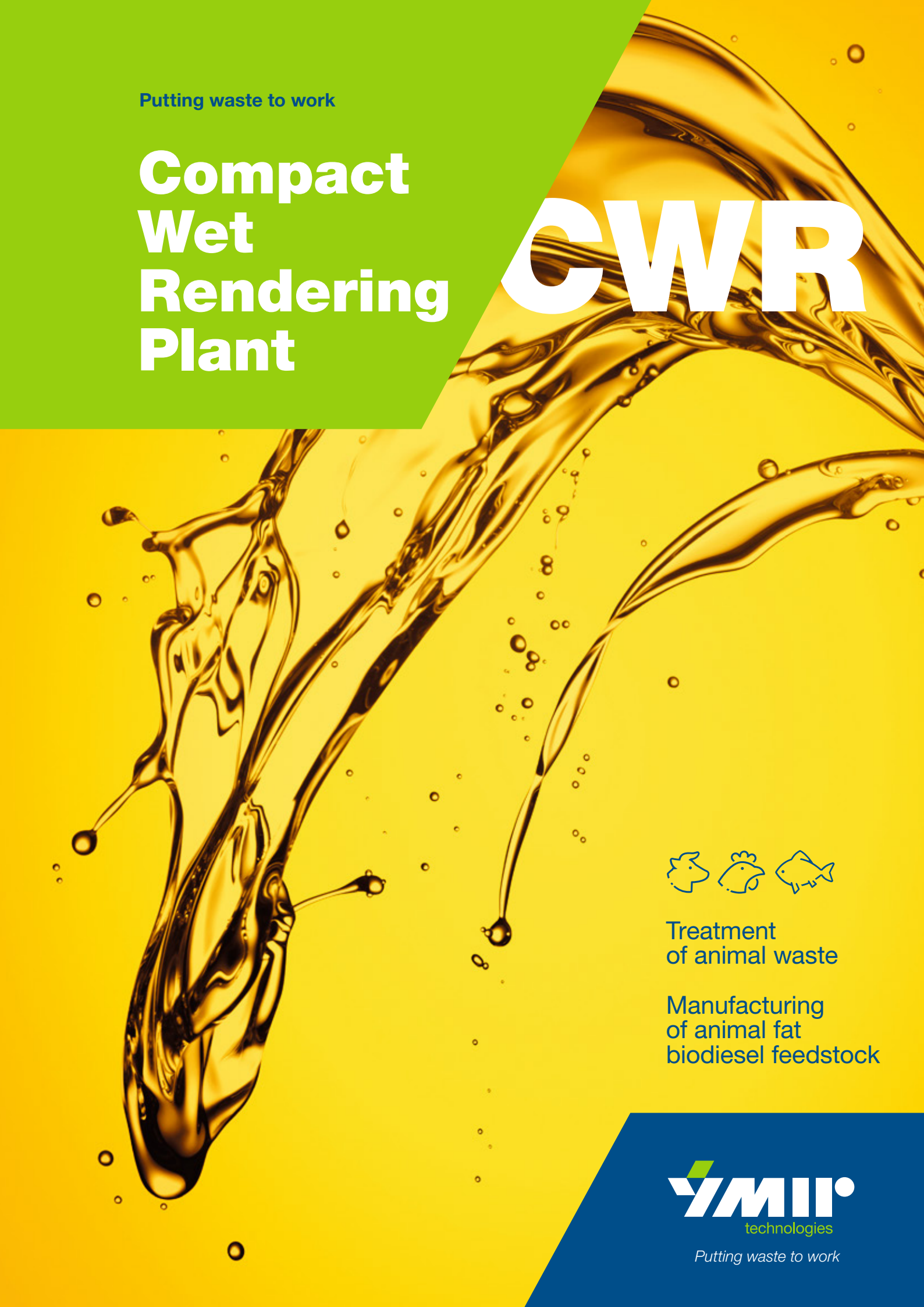
Putting waste to work

Compact Wet Rendering Plant

CWR



Treatment of animal waste

Manufacturing of animal fat biodiesel feedstock

YMII technologies

Putting waste to work

Background

The purpose of the ÝMIR Compact Wet Rendering Plant (CWR) module is to separate the valuable fat fraction out of biological waste, while substantially decreasing its weight and volume by removing water content. This treatment can create value and save money on disposal costs for a range of animal by-products (ABP), as well as many other types of agricultural waste and even food waste from distributors and retailers.

In the CWR module, the waste material is separated into three components: water, a protein-rich wet solids component, and the fat fraction. Typically, the initial water reduction will account for 50%, the fat fraction will represent some 10-15%, depending on input composition, and the remaining 35-40% will be a slurry rich in nitrogen, calcium and phosphates. For food-grade inputs, both the latter components may be further processed into food or fodder. In the case of waste material, however, the fat component can still be quite valuable as feedstock for biodiesel, while the protein-rich component may be used to produce bio-gas and compost, leaving zero-waste and contributing to a circular economy. In this way, the cost of bio-waste disposal can be turned into savings and profit by using the outputs for on-site energy or selling up to 100% carbon-neutral biofuel feedstock to third parties.

The CWR module may either be located at the point of origin of the waste (e.g., slaughterhouse or fish farm) or at its destination (e.g., landfill or a dedicated ABP processing site). If the module is installed at the site of origin, the waste holder can save up to 100% of transportation costs and gate fees, while generating significant additional revenue through the sale of feedstock or even produce its own biodiesel on site and save significantly on fuel costs, as well as achieving sustainability targets (additional module needed). If the CWR module is located at a landfill site, the waste management company can respond to increasing regulatory demands for reducing reliance on landfill for this waste category, while also generating revenue or savings on the fuel side in the same way as above. An EU-compliant end-of-waste (EOW) certification has already been issued for an existing ÝMIR reference plant, so regulation is unlikely to stand in the way of harnessing fuel or feedstock of this type.

Business Model and Delivery

Conditions will vary across sites, but the ÝMIR CWR module can be adapted to a wide range of throughput requirements and input materials. A standard implementation is designed for a processing capacity of 7 MT/h, yielding 1 MT of fat feedstock. In the absence of a convenient source of bio-energy on site, part of the fat may be used to generate most of the 0.9-1 mW of heat energy needed for the process by powering a steam boiler, leaving a net fat yield in excess of 0.9 MT/h. Other energy requirements include up to 120 kW of electricity and approximately 1 MT/h of water and pneumatic air for control purposes.

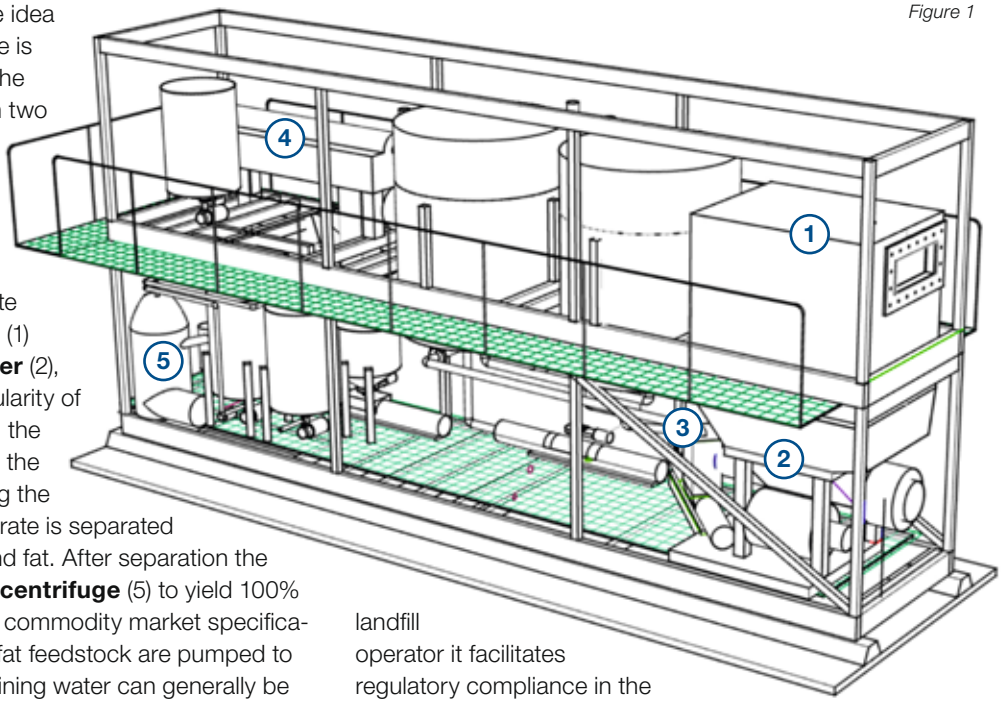
The business case for such an installation will depend on conditions specific to each location. However, a rough outline can be reached using generic assumptions for the central parameters. Assuming gate fees of EUR 100/MT and operating the plant for a modest 140 days per year to process roughly 7,800 MT/year, these parameters will yield EUR 780,000 in gate fee savings and 1,000 MT of biodiesel feedstock. Based on the average market price (as of January 2020 FOB ARA), sale of the feedstock yields another EUR 495,000 in revenue, totalling EUR 1,275,000 per annum. Operating expenses will vary depending on the local cost of labor and electricity, as well as the specific opportunities for synergies inherent in the setup of each operator.

An ÝMIR CWR Module is delivered and implemented with due consideration of the customer's needs. Sales contract terms cover on-site implementation, with a training and commissioning period following the last payment installment. An ÝMIR CWR reference solution has been installed at the landfill site of the Reykjavik area municipal waste management company SORPA.

Details of the ÝMIR CWR Module

Figure 1 gives an approximate idea of how the ÝMIR CWR module is laid out. The configuration in the illustration is skid-mounted on two 40' container bases, designed to be stacked on top of each other.

Figure 1

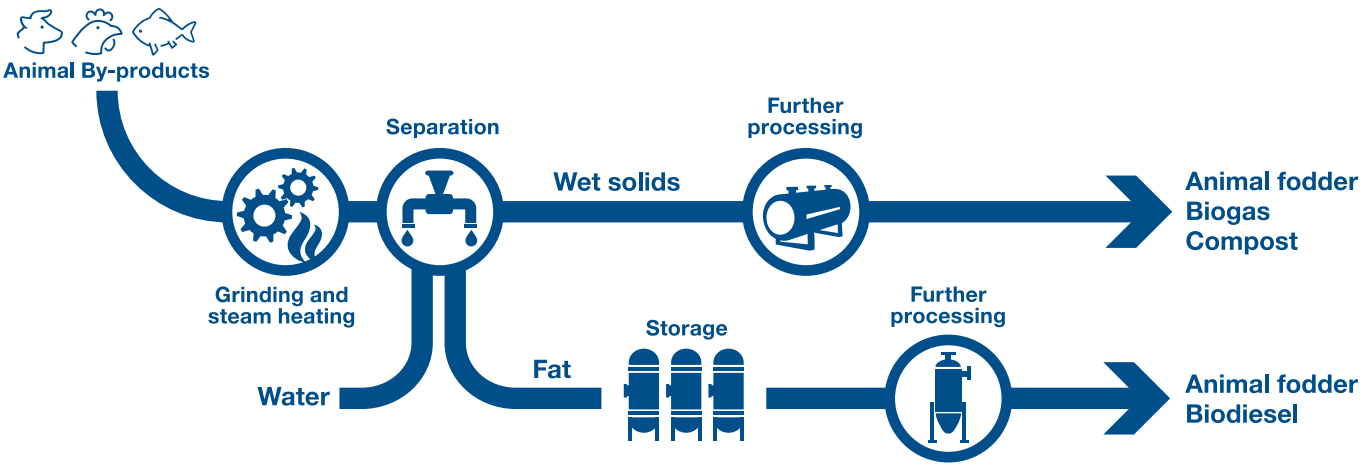


Vehicles transporting the waste material offload it into the **silo** (1) located above the **fine-grinder** (2), shredding the input to a granularity of 13x13 mm. Following grinding the material is heated by steam in the **pre-heater** (3) before entering the **decanter** (4) where the substrate is separated into water, wet solid matter and fat. After separation the fat component is purified in a **centrifuge** (5) to yield 100% fat feedstock compatible with commodity market specifications. The wet solids and the fat feedstock are pumped to storage tanks, while the remaining water can generally be drained into the local sewage in compliance with local regulations. A typical upper bound for sewage water impurities is 1% biological material, although this can be further purified where necessary. The wet solids component can be further processed depending on what best suits each local case, yielding bio-gas for sale or local consumption and organic fertilizer or soil conditioner when animal fodder is not an option.

Even in a scenario where there is no viable alternative to sending the wet solids to landfill, the ÝMIR CWR module still serves to reduce the landfilled amount of bio-waste by more than 60% by removing fat and water. For the waste holder, this saves gate-fees and transportation and for the landfill operator it facilitates regulatory compliance in the same proportion. The CWR module is simple to operate and operating expenses and maintenance costs are low, while revenue from the sale of feedstock can be significant. With the addition of the ÝMIR CFR continuous flow biodiesel reactor module, biodiesel can be produced from the feedstock on site, resulting in an even more lucrative business model. In this case the fuel can be either used power the client's own fleet or sold on the market as TME RED waste-based biodiesel (average price as of January 2020: EUR 1105 FOB ARA)

A schematic overview of the ÝMIR CWR process is shown in Figure 2.

Figure 2



Site Requirements

On site, in addition to a solid concrete foundation, the installation of an ÝMIR CWR module requires access to electricity, sewage and water supply for steam, as well as access to a steam boiler.

The steam boiler, corresponding to 90% of the total energy demand for the whole process, can be powered either by a portion of the fat produced in the system (<10%) or by excess bio-gas or methane where available or made available from the wet solids component as part of the CWR solution. Other local infrastructure necessary for the operation of the ÝMIR CWR module are storage tanks for the fat and wet solids.

For ease of daily operation, the module comes equipped with a Cleaning-In-Place (CIP) system and a fully automated process dashboard, making it possible to run the module with a single operator. The ÝMIR CWR module has closed circuit ventilation to ensure odor-free operation in the presence of a bio-filter (not included).

A schematic overview of the inputs and outputs of a typical installation is shown in Figure 3.

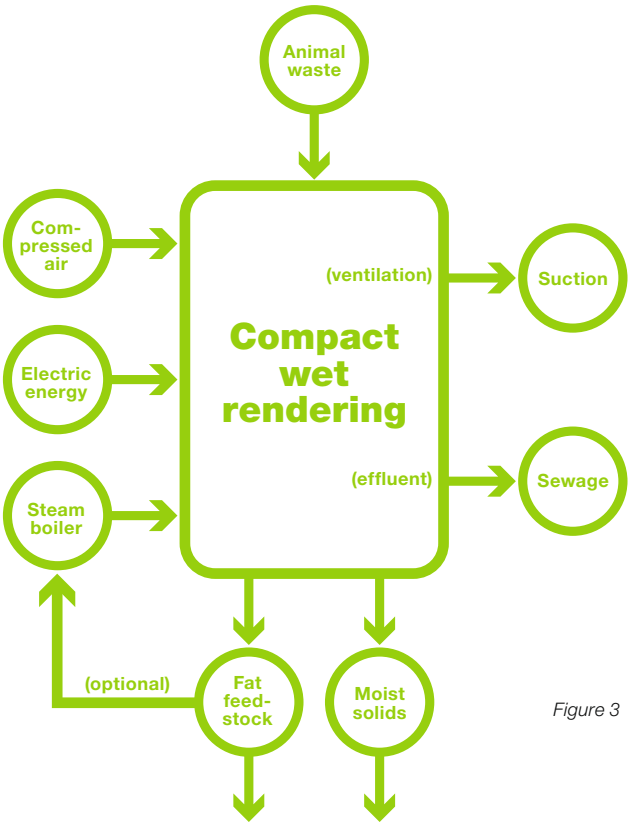


Figure 3

ÝMIR technologies is a pioneer in fuel production from waste and a long-term collaborator with Reykjavik municipal waste management company SORPA in the field of R&D and process development. The company was founded in 2008 and operates a small-scale biodiesel plant in Reykjavik. Using feedstock from SORPA's reference ÝMIR CWR plant to produce biodiesel with a 97% emission savings rating for admixture into consumer market transportation fuel.