

Each type of waste is different from others – special separation technology for the separation of disturbing material from biowaste

A substantial part of industrial and domestic waste consists of organic substances. These organic fraction contains an enormous energetic potential, the 'organic energy', which has already been utilised in the field of waste treatment for many years but in most cases extensive prior treatment is required. Different countries use different collection systems with more or less differentiated systems for the separation of waste. Accordingly, differentiated processes are required for the treatment of collected (bio-, kitchen) waste, out of date food, etc. to meet the specific requirements of each country and type of waste. Moreover, the scope of treatment steps required differs for continuous dry or wet fermentation. Both processes have one thing in common: separation of disturbing coarse material prior to actual biogas production. The treatment techniques described in the following refer to wet fermentation. Requirements are very specific when it comes to selecting the plant technology for the separation of organics and removal of disturbing material. Making the right choice is crucial for the economic efficiency of the system for energy recovery from waste and for the reusability of the generated residues.

The process

The utilisable part of the waste, after primary crushing and pre-sorting, is treated hydromechanically. Different pulper technologies and crusher techniques transform the fermentable organics into an organic suspension for biogas production. The suspension with a solids content of 5 - 15 % is homogenous and pumpable. Rejects such as oversized floating and settling material can be separated from this liquid suspension. This is necessary in order not to impair the actual fermentation process, prevent disruptions of the course of the process and minimise wear. Irrespective of whether the treatment process is continuous or discontinuous, up to 95 % (depending on separation degree) of the following disturbing materials can efficiently be separated by means of a specially developed HUBER Complete Plant for the removal of coarse, settling and floating matter.

- ▶ Coarse material > 6 mm (application-dependent) or > 15 (- 30 mm): stones, plastics, foams, films, textiles, fabrics, wood (branches), etc.
- ▶ Settling material: small stones, grit, glass, bones,



HUBER ROTAMAT® Complete Plant Ro 5 Bio

sometimes metal residues, etc.

- Floating matter: smaller plastic articles, styrofoam, films, wood, etc.

The suspension produced in the pulpers, including the coarse material, flows by gravity through the Complete Plant. The plant automatically and continuously separates the three above-mentioned material flows so that downstream conveyors and other wear-susceptible process technologies only have contact with media that are free of disturbing coarse material. This efficiently minimises sediments and wear.

The individual components

Screening plant with subsequent screenings treatment

Removal of non-decomposable and non-usable material after treatment in the pulpers is perfectly achieved by a fine screen especially developed by HUBER. The screen actually comes from the sewage treatment sector and has proven its efficiency for such applications over many years. Reinforcement of all its essential components makes the screen suitable for continuous operation, i.e. automatic and continuous coarse material removal from (bio-)waste suspensions. The screen is available with bar spacings from 6 to 30 mm (depending on the type of waste to be treated). In this process step, approximately 5 - 15 % of the solids are removed that are contained in the organic suspension produced in the pulpers. The screen offers the advantage of several functions combined in one compact unit: coarse material removal, screenings transport, separation of utilisable organics by means of a modified integrated screenings washing system (IRGA), and pre-dewatering. For additional weight reduction, the screenings are discharged to a screenings press that is designed to perfectly suit the discharged coarse material flow and operates fully automatically. The screenings are additionally dewatered up to 40 % DR. Additional washing of the screenings and removal of still adhering and therefore fermentable substances is possible to a degree that permits to return them to the process. As an option, it can be provided for screenings washing with warm or hot water to achieve an optimal return of organics. The amount / weight of washed out and up to approximately 40 - 50 % DR dewatered screenings in this way is reduced by approximately 20 - 30 %. This offers a potential of saving costs for the disposal of the virtually inert screenings, particularly with regard to ever increasing disposal costs.

Combi grit trap for settling and floating material separation

The grit and glass contained within the waste represent a problem throughout the entire course of the process. If this settling material is not or insufficiently removed, it will settle on the fermenters and in the pipelines and as a result lead to increased wear of pipelines, pumps and stirrers. Even the best stirrer then is unable to loosen such sediments as they bake together solidly and can only be removed with heavy equipment. Efficient grit and settling material separation therefore is applied after coarse material removal and treatment to avoid such sedimentation problems. The aerated longitudinal grit trap especially dimensioned for this process step removes up to 95 % settling material > 2 mm. Separation of the settling material from the viscous organic suspension is achieved through sedimentation. The installed aeration technology control ensures both continuous and discontinuous but always efficient settling material separation even with varying throughputs. The separated settled material is removed by a horizontal screw conveyor installed in the bottom of the trough and transported to the inclined screw conveyor which statically dewateres the settled material while removing them from the system. The organics still attached to the settled material can be removed in a grit washer. The wash water containing the organics is returned to the



In the fine screening plant undissolved solids are removed from the organic suspension (approximately 5 - 15 % of the inflow)

organic suspension or process water storage tank. Washing of settled material, like washing of screenings, reduces disposal costs. Under favourable conditions (e.g. use of warm wash water / suitable input material / grit removal system design) the separated grit / gravel portion can be reused, e.g. as building material. In the same tank, and depending on the input material, aeration may lead to the flotation of smaller, not yet separated light substances. This floating material layer is removed by a screw especially developed by HUBER for this application purpose. This separated floating material can be washed together with the screenings from the preceding screening plant to again reduce disposal costs. Substances that do not float up in this stage of the process will not cause any remarkable problems in the later course of the process. Every day operation of fermentation plants as well as examinations on the occasion of routine inspection of upstream fermentation tanks show that our Complete Plant reliably ensures the effective separation of disturbing material. The screen and grit trap combined in the compact unit are optionally available as individual units.

Removal of disturbing material from organic suspensions without preceding HUBER machines

The different treatment technologies applied to remove disturbing material are not always able to ensure optimal material. Floating layers mainly consisting of light particles (films, fibres, etc.) may form due to flotation effects in the fermenter and cause considerable problems in the fermentation process. If the fermentation residues are dewatered in a decanter, the light particles not separated in the wet-mechanical treatment system, such as foil scraps or other plastics, pass into the centrate and contaminate the process water. If efficient removal of the light materials cannot be ensured by preceding treatment units, they can be separated later in the process. A suspension or fermentation residue screen that can be installed also in a pressure line (approx. 1 bar maximum counter pressure, maximum 1.5 bar process pressure in the pressure line) offers the flexibility of installation at different places. In the same unit the material separated by the screen can be dewatered to up to 35 - 50 %, depending on the type of material. Especially with already existing plants, pump circulation and screening of a partial flow is particularly suitable. Such a screen can be used also in the fermenter outlet, e.g. in the feed line to the decanter or fermentation residue storage. With other dewatering systems, e.g. screw presses, pre-screening is applied to separate films and similar material. Two-stage fermentation systems offer the possibility to remove disturbing material in the organic suspension already after hydrolysis, for example in the overflow from the hydrolysis plant to the fermenter (even without the need

for pumps!). Depending on the screen perforation used, inert fibres non-utilisable in the fermentation process and other lignin containing materials are removed. Such screening increases fermenter efficiency or reduces the fermenter volume.

Stainless steel plants for a long product life

Due to different input materials the organic suspension produced is not easy to specify. The use of stainless steel for the above-mentioned plants eliminates corrosion problems. Dead zones in the plants, which would be susceptible to corrosion, are avoided or equipped with washing systems. Plant parts naturally exposed to wear can fast and easily be replaced without hindering the overall process. The use of adapted, flexible systems for the removal of disturbing materials ensures the safe and reliable automatic and continuous operation of (bio-)waste fermentation plants. All essential plant parts are self-cleaning during operation or cleaned by automatically operating washing systems. The manual work required is limited to maintenance and general cleaning work. The right choice of input materials and treatment technology ensures the stable operation of the fermentation process and peripheral equipment.

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Removal of dewatered disturbing matter from the material separator