PUTTART®
VERTICAL DRYER-GRANULATOR

SLUDGE DRYING AND GRANULATING IN ONE
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Sludge, the by-product of wastewater treatment, consists of a concentrated mix of solids in liquid which is biologically unstable and needs further treatment before it can be used as a product or it can be disposed of. Besides incineration or stabilisation, thermal drying is a solution leaving open other disposal options: use as fertilizer or as fuel.

The Waterleau PUTTART® sludge drying technology is an efficient, safe and economical solution for integrating thermal sludge drying in large waste water treatment plants. The unique drying-granulating combination results in a valuable pathogen-free, easy storage fertilizer end-product.

VERTICAL SLUDGE DRYER-GRANULATOR

Waterleau's PUTTART® vertical sludge dryer granulator is a high-capacity plant with the unique capability of simultaneous drying and granulating.

Mechanically dewatered sludge is extracted from the reception bunker and pumped to the coater. The coater puts a fresh layer of wet sludge around dry recycled granules. The coated granules enter the dryer from the top and fall onto the first tray. The tray is a double steel plate, internally heated with thermal oil. This means that drying is done in an indirect way (no contact between heating medium and product to be dried) and this is inherently much safer (no explosion risks) than direct drying.

The granules are transported from the inner to the outer circumference of the tray by raking arms which are mounted on a slowly rotating central shaft. On the arms ploughs are mounted in such a way that the granules are pushed spirally away from the centre. The granules roll on the trays and thus friction is minimal.

At the outer side of the tray, the granules fall on the tray below, which is slightly larger in diameter than the one above. The granules are now transported back to the centre. This movement is repeated on the trays below. At the bottom of the dryer the granules are collected and transported by a screw system and a bucket elevator to a screen. The screen separates the larger granules from the smaller ones. The small granules are recycled to the coater, the large granules are cooled and evacuated to storage.
CONTINUOUS IMPROVEMENTS

Sludge drying is in principle a heat exchange problem and thus for a large part determined by the heat exchanging surface. This is expressed by the key design parameter called ‘specific evaporation rate’ or SER. It is easy to understand that for a given heat exchanging surface, the smaller the discs, the more discs one needs. And as the surface is proportional to the second power of the diameter, a limitation in the diameter very quickly leads to an increase in the number of discs. For constructive reasons and for ease of maintenance a certain minimum distance between the discs is required and thus the dryer quickly becomes very tall for large capacities. In addition, large diameters mean that the transport costs of the discs are high.

SMART DESIGN

With the patented PUTTART® design Waterleau has overcome these drawbacks. The PUTTART® makes large (up to 11 m) disc construction possible, by making two seemingly evident but technically challenging design decisions:

- The discs are split in 6 or 8 identical segments.
- The heat exchanging function is separated from its support function: each disc is resting on a support structure that allows free thermal expansion of the disc, without deformation.

The technical challenge is to keep the disc surface flat within a narrow tolerance, no matter what the temperature of the disc.

FROM DESK TO FULL SCALE

As one can easily understand, the PUTTART® disc design is ‘by nature’ a large scale concept, so that a small-scale pilot – typical for new developments – was simply not possible. As a result the PUTTART® vertical sludge dryer granulator had to be built immediately at full scale.
ADVANTAGES PUTTART®

| SAFETY                        | • Indirect drying: no contact between hot gases and dry dust  
|                              | • Low level of O2: operation well below lower explosion limit  
|                              | • Dust content inside < 0.5g/m³  
|                              | • Continuous temperature control  

| EFFICIENCY                   | • High evaporation rate: high heating surface in small volume  
|                              | • High thermal efficiency: efficient heat transfer  
|                              | • High electrical efficiency: no need for additional pelletizer  

| EASY OPERATION               | • Low maintenance  
|                              | • Robust & proven design  

| FLEXIBILITY                  | • Wide range of capacities  
|                              | • Wide range of heat transfer media  

| SAVINGS                      | • Energy recovery from condensers  
|                              | • No need for complex air/gas treatment  
|                              | • Small footprint  
|                              | • Low maintenance costs: few moving parts, no erosion or corrosion  
|                              | • Low operating costs  

GRANULATING

As each granule rolls at least 5 times gently through the dryer, the wet sludge sticks to the dry core and the granules become larger and harder, eventually achieving a spherical shape and hardness similar to those of chemical fertilizers. Since the dust fraction is less than 0.25%, and hygroscopicity very low, granules can be stored safe even for a longer time. The PUTTART® granules can be used as a high value pathogen free fertilizer and soil conditioner in agriculture or landscaping. Alternatively PUTTART® granules can be used as renewable green fuel in coal fired or biomass fired power plants.
CASE: GRANULES FROM POLAND

Poznan, Poland’s fifth largest city is a vibrant centre of trade, industry, and education in west-central Poland, on the Warta river. Aquanet, the authority responsible for water in Poznan launched a project called “Sewage treatment and the supply of water for the city of Poznan” implemented with the financial participation of the European Union. One of the contracts, “Management of biogas and the thermic drying of sludge within the area of the Central Sewage Treatment Plant”, was awarded to a Spanish-Polish consortium called BudCad (Budimex-Cadagua). Waterleau with its PUTTART® vertical sludge dryer granulator was selected as subcontractor to the consortium for supply of all electromechanical equipment.

The Central Sewage Treatment plant of Poznan is a mechanical-biological plant with additional nutrients removal. The treated wastewater is discharged into the Warta River. The sludge is digested before it is thermally dried. The biogas from the digesters is converted by gas engines to green electricity and heat. Part of the biogas is also used to dry the sludge in the PUTTART® vertical sludge dryer granulators. The heat energy of the drying process is recovered as much as possible in the first of the two condenser stages. The hot water is used to heat up the digester, thereby closing the energy cycle (biogas from the digesters to the dryer, heat from the dryers to the digesters). The three lines were started up successfully and very quickly.

**KEY DATA POZNAN**

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<th>Parameter</th>
<th>Value</th>
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<td>Dry solids</td>
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<tr>
<td>Wet cake</td>
<td>260 000 kg/day</td>
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<tr>
<td>Water evaporation</td>
<td>9 300 kg/h</td>
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<td>People equivalent</td>
<td>1 500 000</td>
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<td>Number of lines</td>
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</tbody>
</table>

**WET SLUDGE DATA**

- Digested, municipal sludge
- Dry solids: 25 - 30 %

**DRY SLUDGE DATA**

- Hard, dust-free, spherical granules
- Dry solids: > 90 %
PUTTART®: THE SAFEST WAY TO TURN SLUDGE INTO VALUABLE GRANULES

We all have the responsibility to handle our natural resources in a careful and sustainable way. Waterleau develops environmental technologies and offers sustainable solutions for water, air and waste treatment, as well as for energy recovery. As an EPC contractor and operator, Waterleau counts more than 1000 references for municipal and industrial clients around the world.