



HYDROGONE® HORIZONTAL DISC DRYER

A ROBUST AND PROVEN DESIGN FOR
HIGH CAPACITY SLUDGE DRYING



WATERLEAU

protecting the 4 elements

A ROBUST AND PROVEN DESIGN FOR HIGH CAPACITY SLUDGE DRYING

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 HYDROGONE® sludge drying technology is an efficient, safe and economical solution for integrating thermal sludge drying in large waste water treatment plants. The dried sludge can be pelletized or used as fuel in an incinerator for green energy production.

HORIZONTAL SLUDGE DRYER

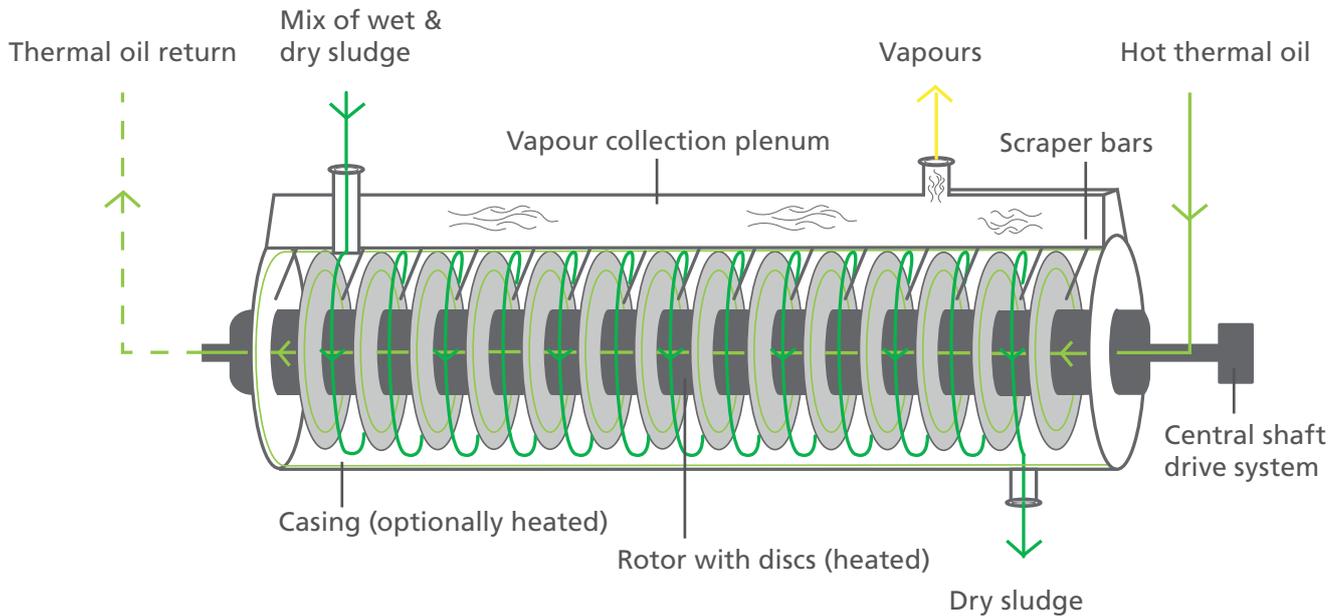
Waterleau's solution for sludge drying works as follows: Mechanically dewatered sludge is extracted from the reception bunker and pumped to the feed screw where it is mixed with recycled dry sludge. The mixture is fed to the HYDROGONE®

The HYDROGONE® consists of a heated rotor that is turning in a stator. The rotor has a series of heated discs placed on a central shaft. The stator is a cylindrical vessel that can be equipped with a heated jacket. The discs (and stator) are heated with steam, hot water or thermal oil.

The combined action of the turning discs, the swords between the disks and the agitator blades on the perimeter of the discs ensures optimal heat transfer and slowly moves the product through the equipment. The dry product is continuously discharged through a frequency controlled discharge screw, placed at the bottom at the opposite end of the dryer. Dry product is partially recycled to the inlet in order to avoid the "glue phase" in the drier (a range of DS in which the product shows extremely sticky or glue-like behaviour).



HYDROGONE®



THERMAL OIL, STEAM OR HOT WATER?

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 temperature the design evaporation capacity is directly proportional to the disc surface and thus to the number of discs.

The heat transfer fluid in the HYDROGONE® can be thermal oil, steam or hot water. Each has its advantages and drawbacks. The choice of heat transfer fluid is project dependent. Waterleau has experience with all options:

Hot water

- Readily available from cooling of industrial processes
- Need for large heat exchanging surface due to limited temperature
- High flow of hot water needed
- Heat exchange takes place over a temperature range of 20°C

Steam

- Often available for cogeneration purposes
- High temperature heat transfer potential by using latent heat of evaporation
- Reduced steam mass flow compared to hot water alternative
- Reduced losses of transport energy and pressure
- Fixed operation temperature
- Construction constraints due to high working pressure

Thermal oil (mineral or synthetic)

- High temperature heat transfer at relatively low pressure
- Reduced heat exchanging surface needed
- Operating temperature over a range of 20°C, similar as water alternative
- Higher mass flow compared to steam
- Higher operating temperatures requires **special attention for safety**

ADVANTAGES HYDROGONE®

SAFETY

- Indirect drying : no contact between hot gases and dry dust
- Low level of O₂ : operation well below lower explosion limit
- Inert atmosphere in air-tight dryer
- Safe for operators: CO alarm and insulated parts

EFFICIENCY

- High evaporation rate : high heating surface in small volume
- High thermal efficiency: minimal heat consumption
- High electrical efficiency : low absorption of power per ton DS

EASY OPERATION

- Low maintenance
- Robust & proven design

FLEXIBILITY

- Final product in any form: powder - granules - pellets
- Wide range of capacities, feeds and heat transfer media
- Fully automated plant
- Use as pre dryer (45% DS) or as full dryer (95% DS)

SAVINGS

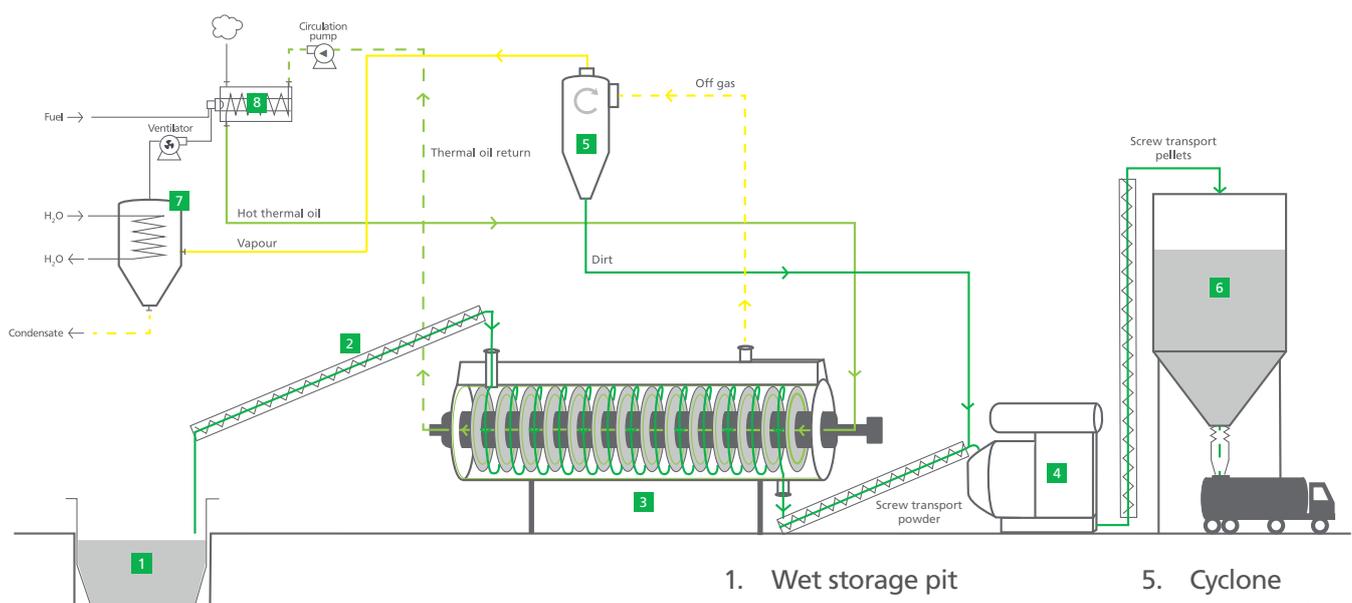
- Minimal energy consumption : energy recovery from condensers
- Low maintenance costs : few moving parts, no erosion or corrosion
- Low operating costs

ROBUST AND PROVEN DESIGN

- Over 200 references world-wide on large range of products

PELLETISING

The dry sludge produced by the HYDROGONE® is a powder. For transport and long term storage this creates some potential risks that can be overcome by turning the powder into pellets in a pellet mill. Compared to direct granulation this has the advantage that certain additional compounds can be added to the dry sludge, for example to optimise the KPN-ratios (use as a fertiliser). On the other hand, pelletizing requires dedicated equipment, which can be avoided by direct granulation (which is possible using Waterleau's PUTTART® technology).



1. Wet storage pit
2. Feed screw
3. HYDROGONE® disc dryer
4. Pelletiser

5. Cyclone
6. Storage silo
7. Condenser
8. Boiler

CASE: DRYING IN THE DESERT

Makkah (or Mecca) is an Islamic holy city (it was the birthplace of the Prophet Muhammad) in Saudi Arabia and has a population of 1,700,000. The city is revered by Muslims for containing the holiest site of Islam, the Grand Mosque of Mecca. A pilgrimage to Mecca during the season of the Hajj is one of the Five Pillars of Islam, a sacred duty that is required of all able-bodied Muslims who can afford to go, at least once in their lifetime. People of other faiths are officially forbidden from entering the city.

The Ministry of Water of the Kingdom of Saudi Arabia (KSA) launched a public tender for the wastewater treatment plant including a sludge drying plant. This main contract was won by the company Bin Jarallah Ltd.

Waterleau with its HYDROGONE® horizontal sludge dryer was selected as subcontractor to the main contractor for supply of the total electro-mechanical equipment of the sludge drying plant. The Sewage Treatment plant of Makkah is a mechanical-biological plant. In the past, the sewage of Mekkah was discharged into the desert, without treatment. The new wastewater treatment plant cleans the water before discharge. Part of the water is re-used after a more advanced treatment.



The Makkah sludge drying plant consists of two completely independent lines, each with an input of 8 150 kg/h of wet sludge and an output of 1 650 kg/h. The evaporation capacity is thus 6 500 kg/h per line. The thermal energy is supplied by two independent boilers, one per line. The heat carrier is thermal oil. In many other projects the HYDROGONE® uses steam as heat carrying fluid, but in this case the boilers heat up thermal oil using fossil fuel, which is abundantly available in KSA. In most other projects of sludge drying, the heat is recovered from other processes (e.g. a CHP-unit) or is made from biogas, which is often available from digestion of the sludge prior to drying

KEY DATA MECCA		WET SLUDGE DATA	
Dry solids	24 000 kg/day	Digested, municipal sludge	
Wet cake	130 000 kg/day	Dry solids	18 - 25 %
Water evaporation	13 000 kg/h	DRY SLUDGE DATA	
People equivalent	2 500 000	Hard, dust-free pellets	
Number of lines	2	Dry solids	> 90 %

HYDROGONE®: A HIGH-EFFICIENCY, FLEXIBLE AND RISK-FREE SOLUTION FOR DRYING SLUDGE

DESIGN
ENGINEERING
CONSTRUCTION
OPERATION
MAINTENANCE

PROTECTING THE 4 ELEMENTS



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.



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