Improved treatment, handling and use of sewage sludge from wastewater treatment plants

Dr.-Ing. Paul Engelke

KLEINE Solutions GmbH

Improved treatment, handling and use of sewage sludge from wastewater treatment plants

- How we can improve and optimise the sludge treatment processes?
- What is the essential adjusting screw?
- What are the benefits?

First of all

We are corporate group of 3 companies:

- KLEINE Solutions GmbH
- SPILLING Technologies GmbH
- Jos. Hansen & Söhne

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The Treatment Plant Optimizers

www.kleine.de

SPILLING Technologies
The Steam Specialists

www.spilling.de

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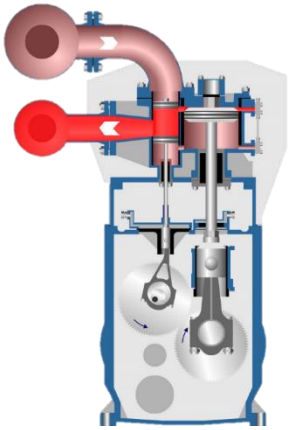
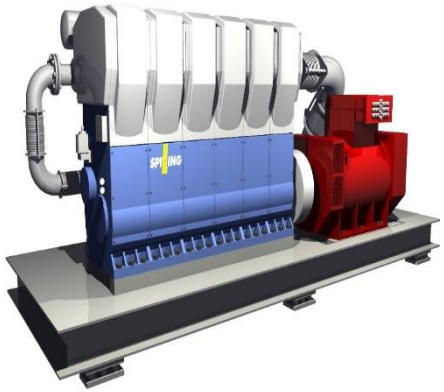
The Product Line



Steam Compressor



Steam Engine

Steam Turbine

Gasexpansion Engine

- Specialised in the unique niche of energy recovery
- Remaining steam from production processes can be reused
- Compressors transfer captured steam to a higher energy level
- Afterwards it can be given back to the production process or converted into electricity, e.g. via a steam turbine

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JOS·HANSEN
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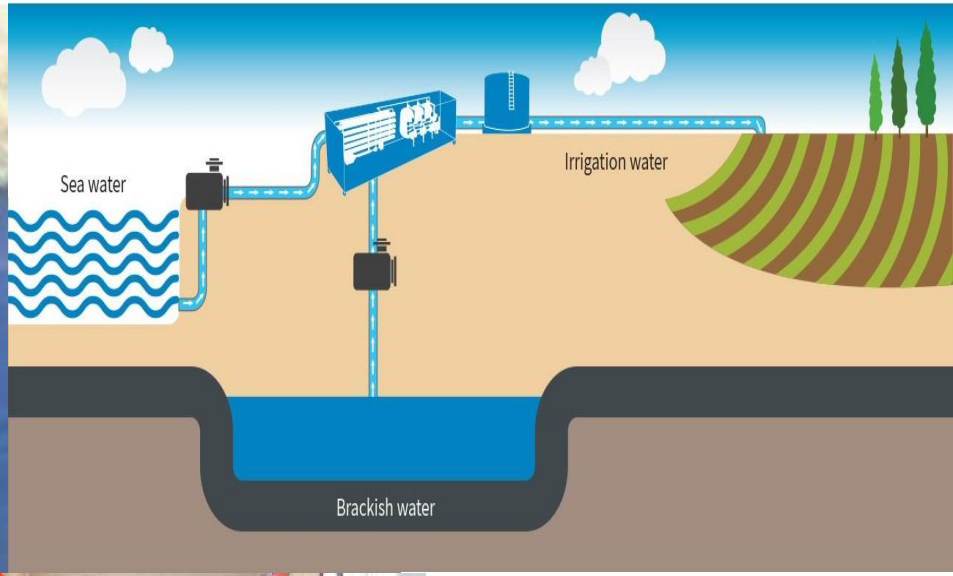
- Trading House for technical goods,
- Engineering Company and Turnkey Contructor in Water Management, Irrigation and Agriculture in Africa



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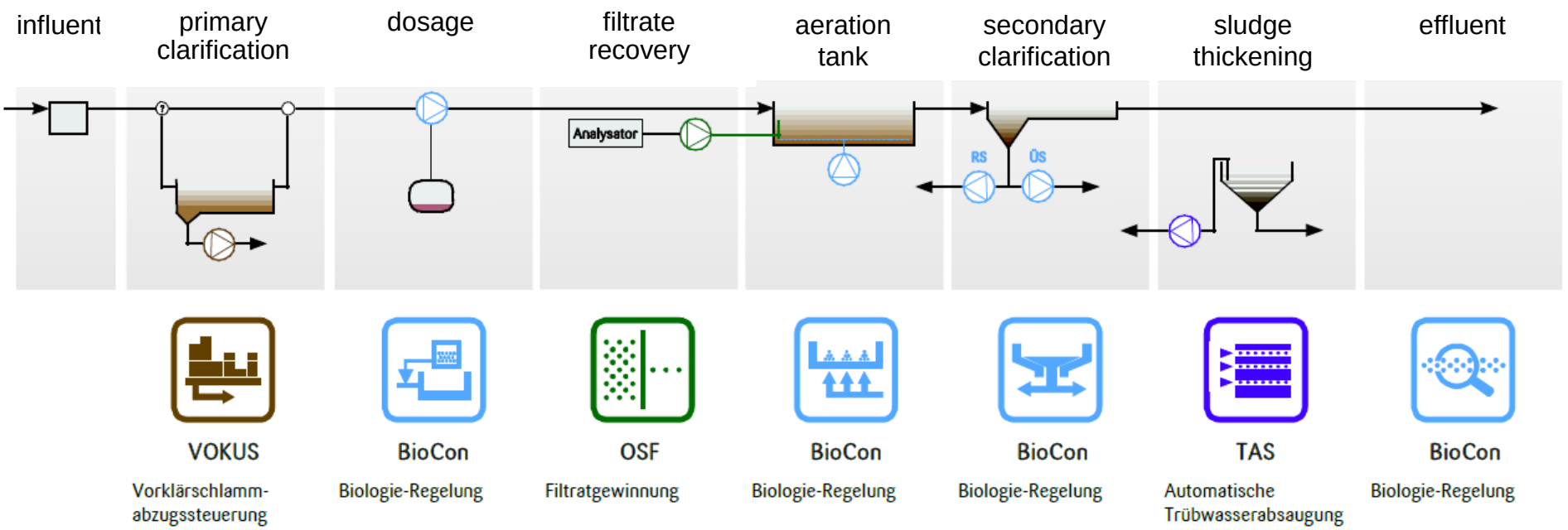
KLEINE
The Treatment Plant Optimizers

- More than 40 years of experience in the optimisation of processes along all stages of wastewater treatment plant
- Manufacturer of machines and software-based control systems
- Engineering in the field of Water Supply and Waste Water Treatment



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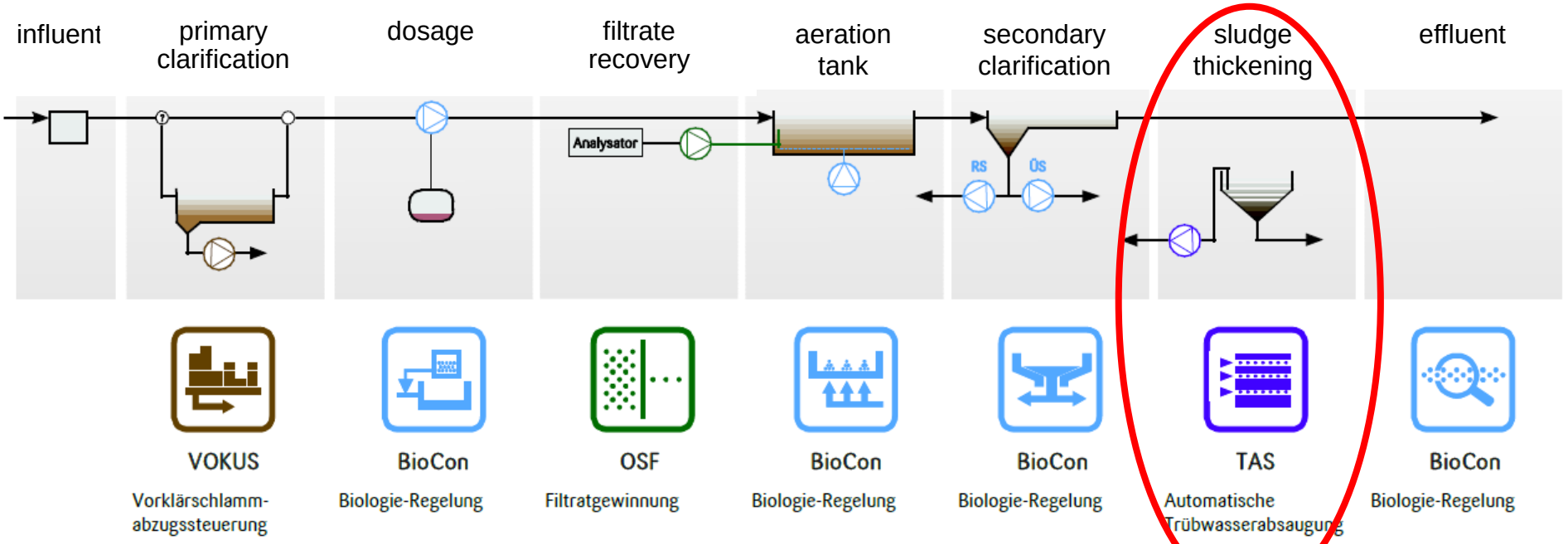

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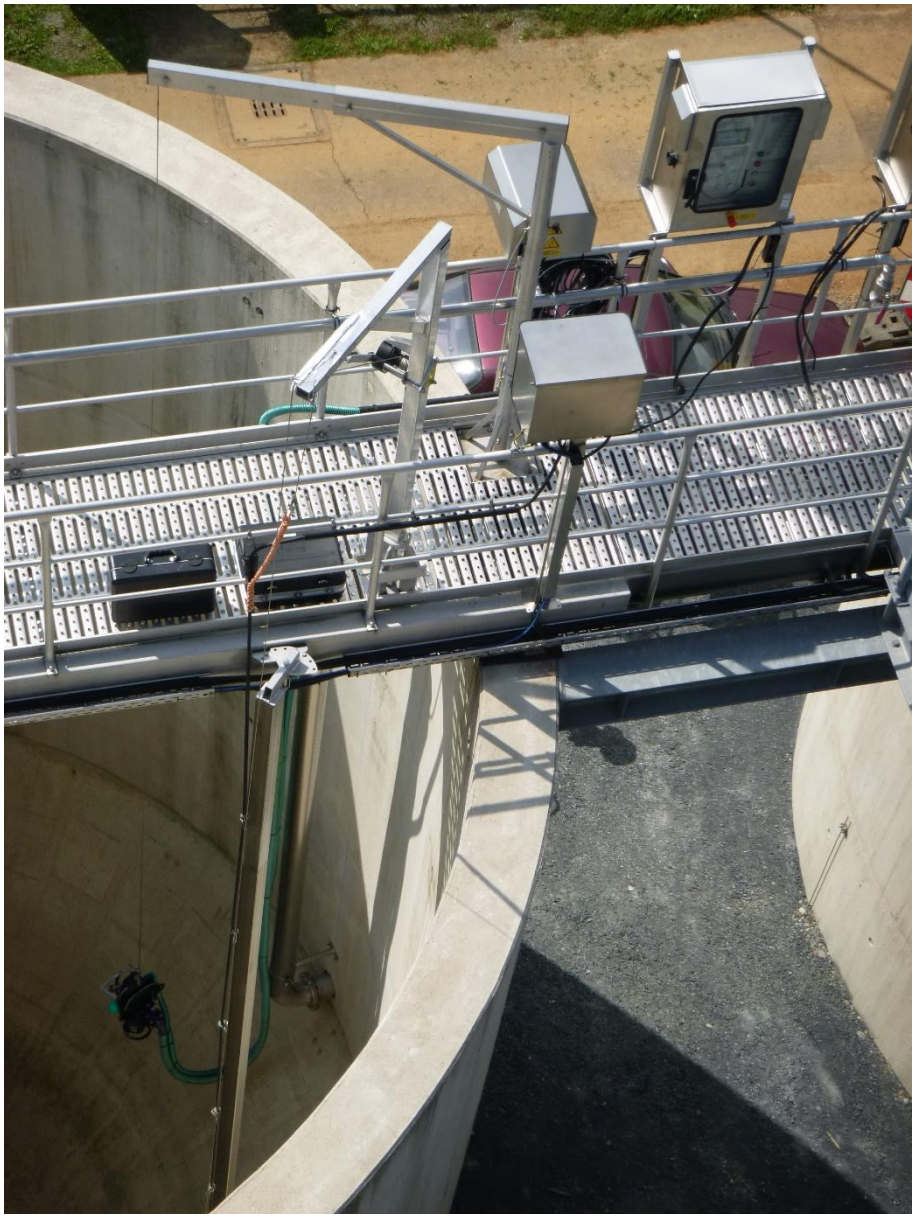
TAS

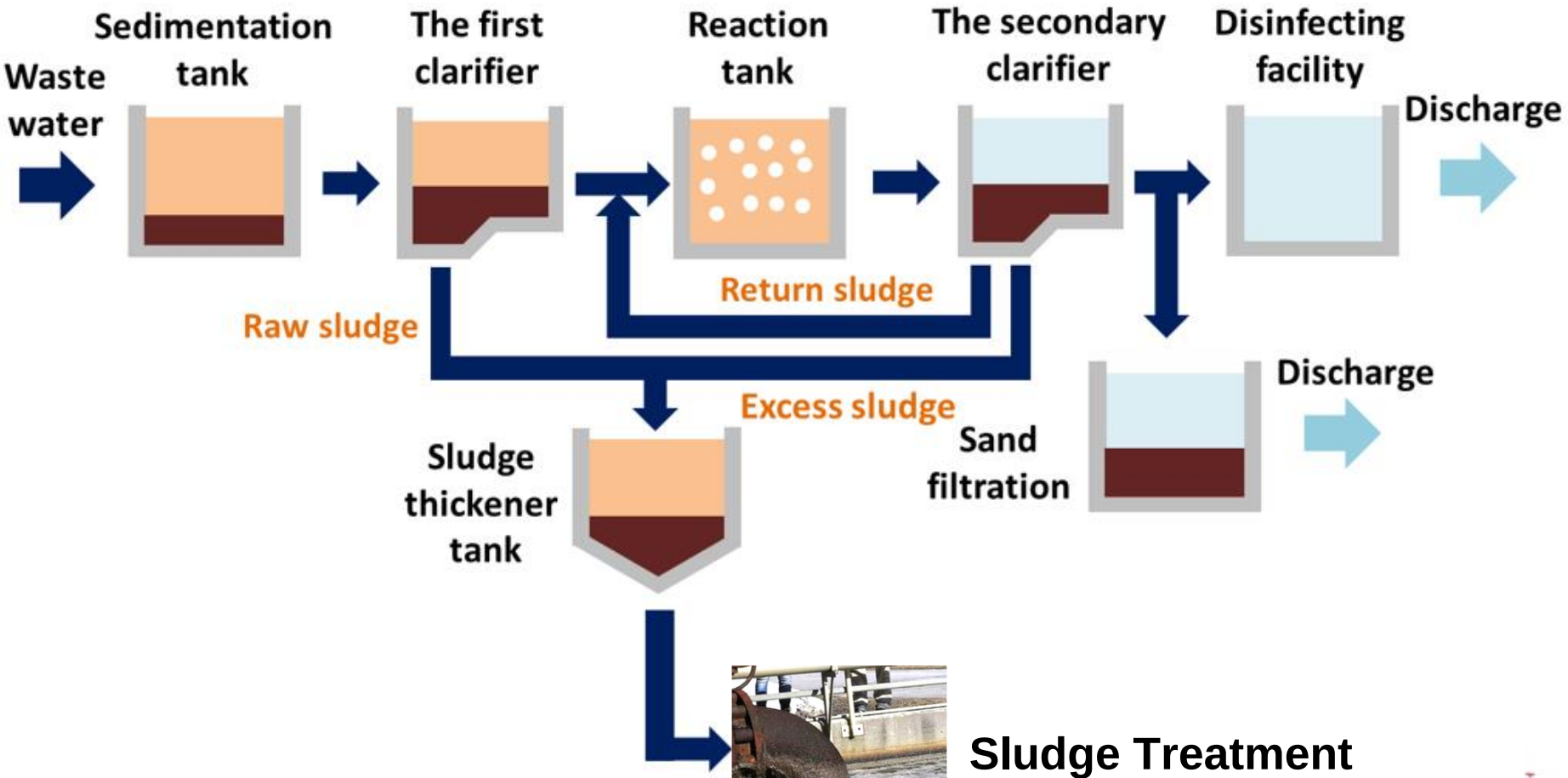
Trübwasserabsaugung

in English:

Turbid Water Discharge System



Sludge on the Waste Water Treatment Plant



Sludge Treatment

https://kenkidryer.com/2020/03/14/about-conventional-activate

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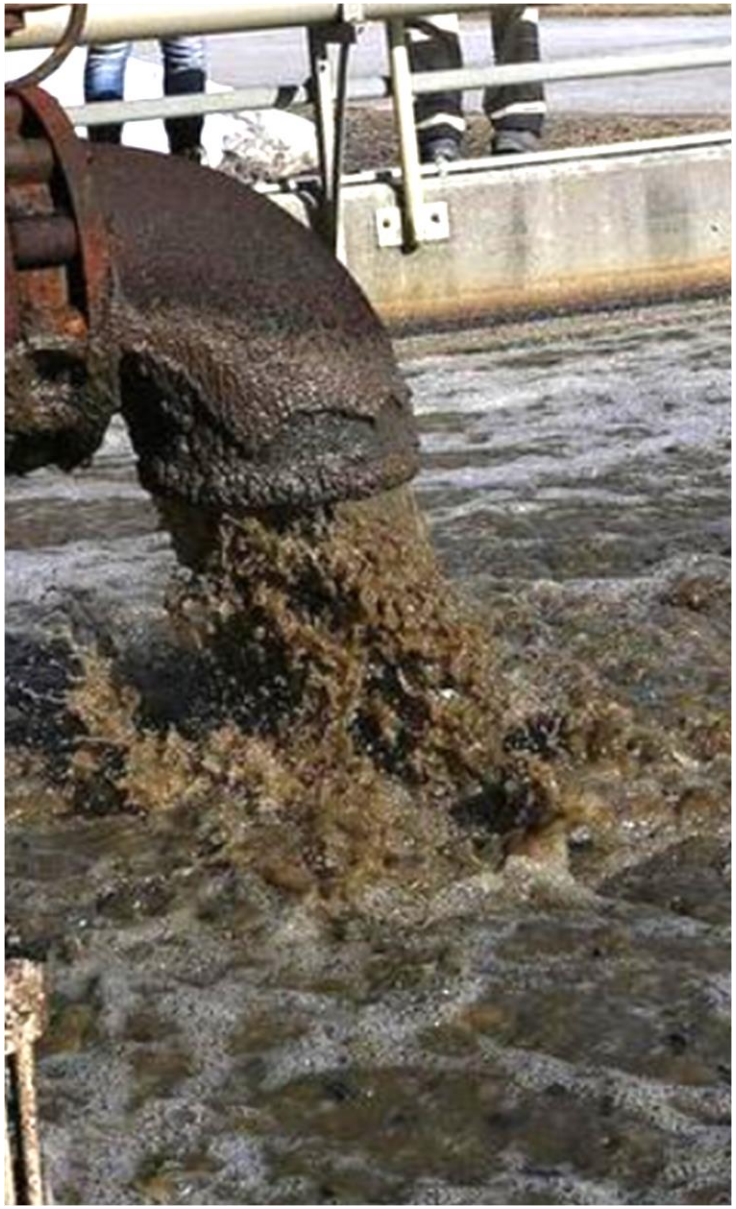
Sludge Characteristics

- Usually in form of a liquid
- Contains more than 97% water, mostly 99%
- Largest of the removed ingredients in volume



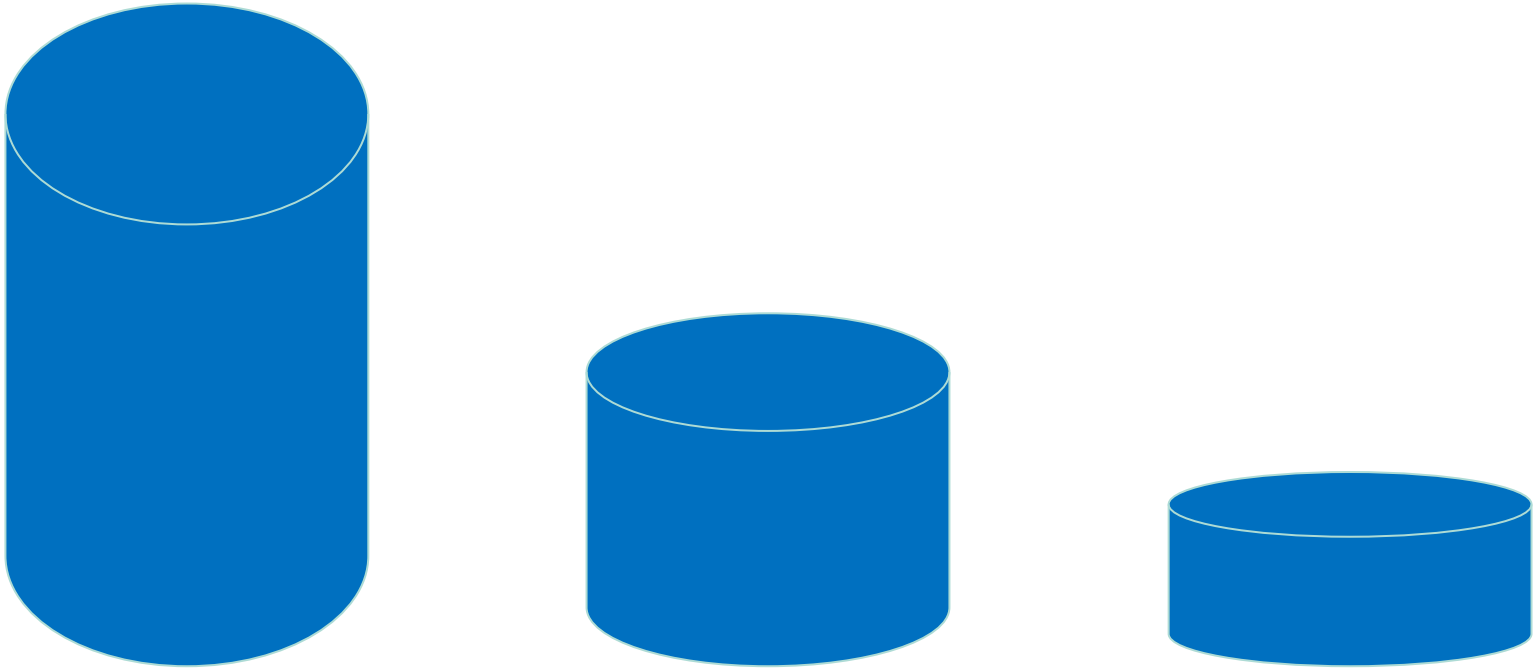
Goals of Sludge Treatment

- Volume reduction
- Elimination of pathogenic germs
- Stabilisation of organic substances
- Recycling of substances

https://www.sludgeprocessing.com/sludge-stabilisation/

Sludge Characteristics => Dry Matter Content (DMC)

Example: same sludge mass of 10 kg in different volumes

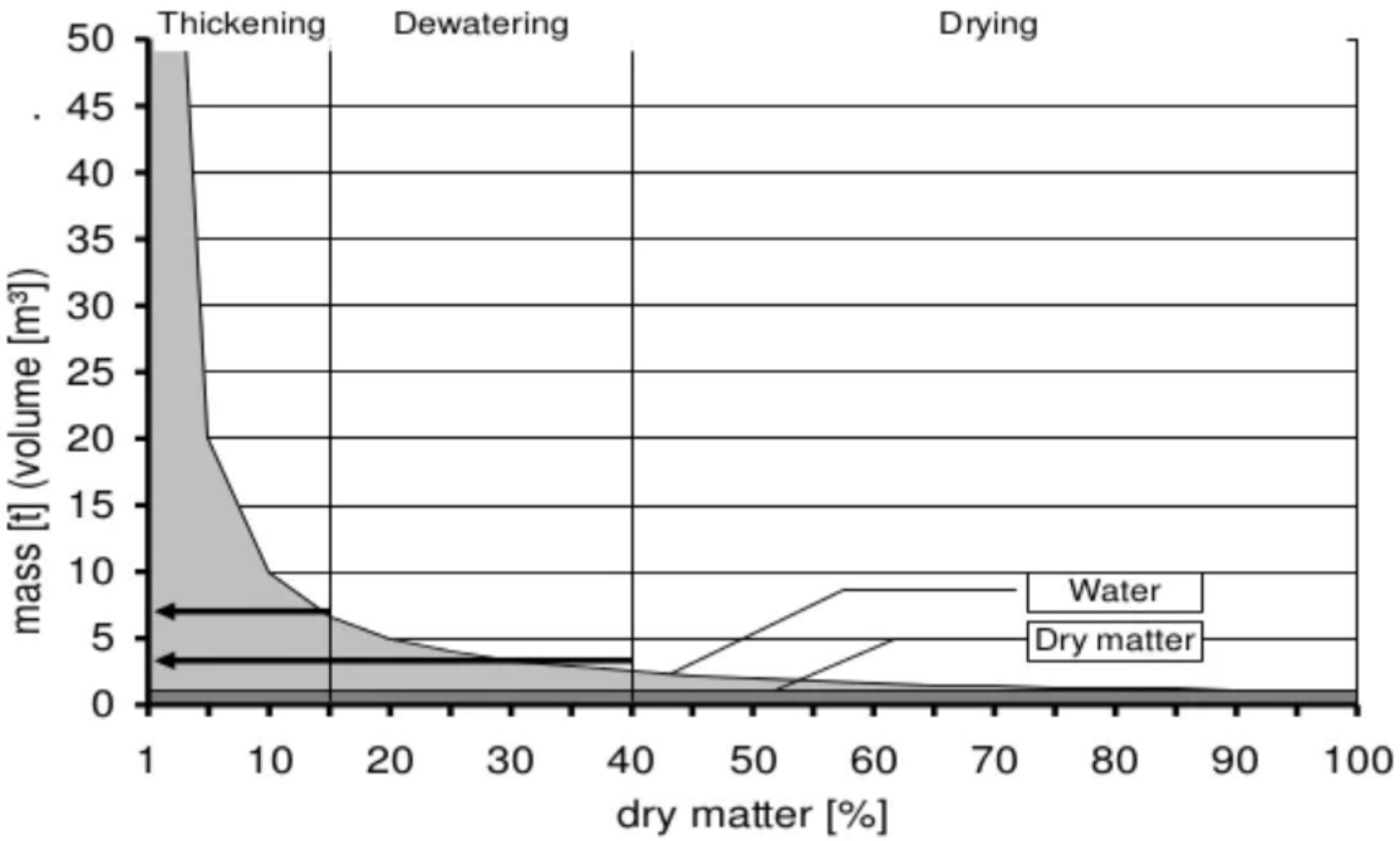


1,000 l with 10 kg DM
=> 1 % DMC

500 l with 10 kg DM
=> 2 % DMC

250 l with 10 kg DM
=> 4 % DMC

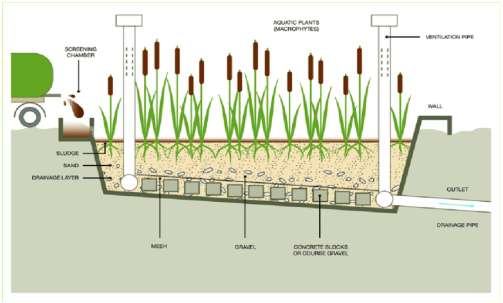
Sludge Characteristics => Dry Matter Content (DM)



Thickening process can be massively supported by TAS

Steps of Sewage Sludge Processing and Usage

Storage



Drying Bed (Composting)

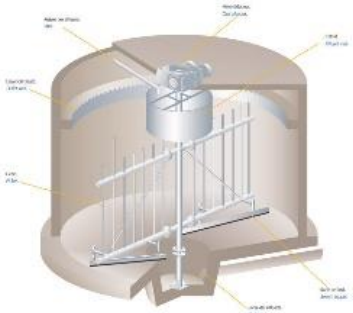
Fertilizer

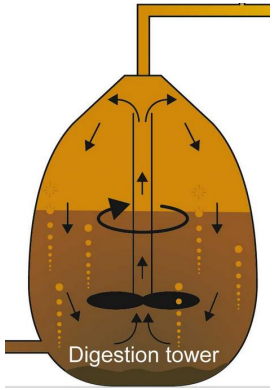
Thickening

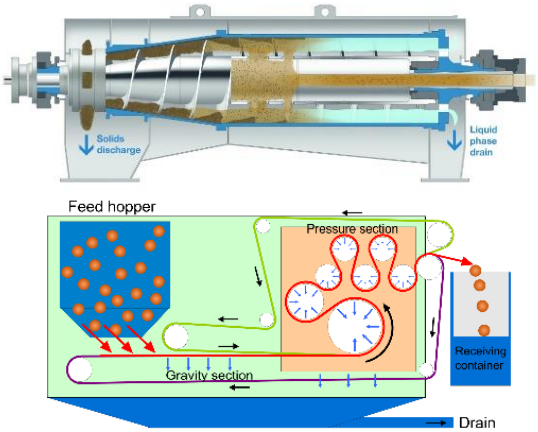
Digestion
(anaerob/aerob)

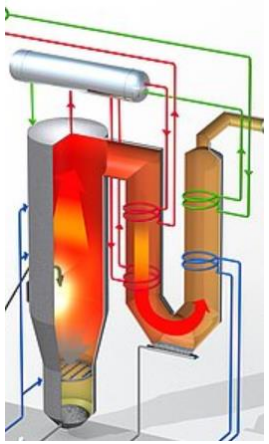
Dewatering

Incineration









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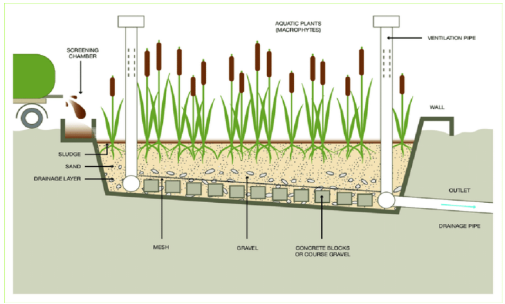
Steps of Sewage Sludge Processing and Usage

Storage

TAS

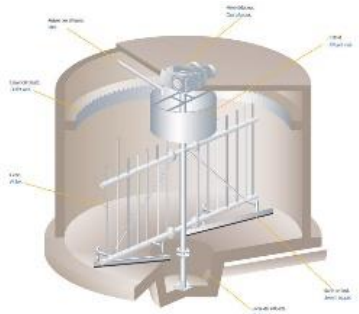


Drying Bed (Composting)

Fertilizer

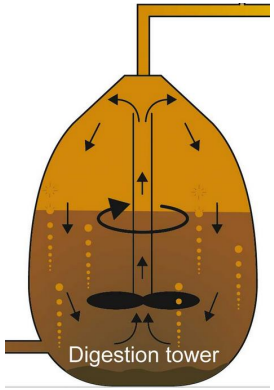
TAS

Thickening



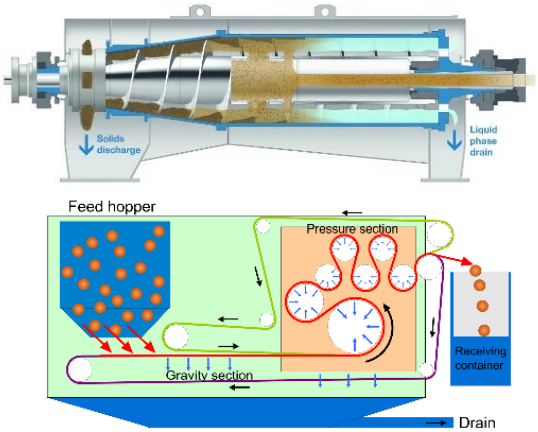
TAS

Digestion (anaerob/aerob)

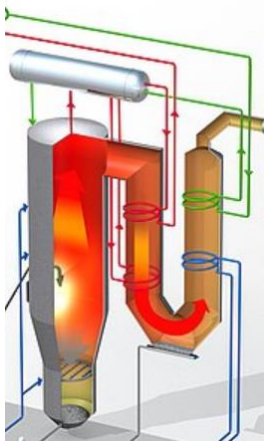


TAS

Dewatering



Incineration



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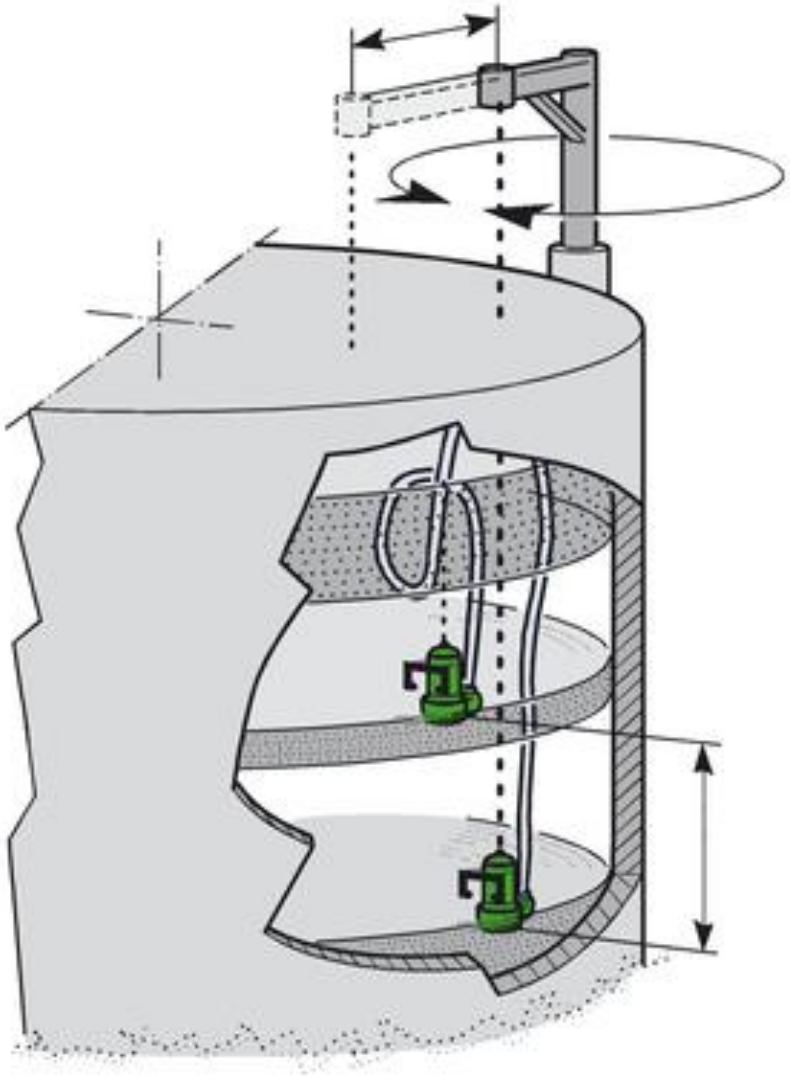
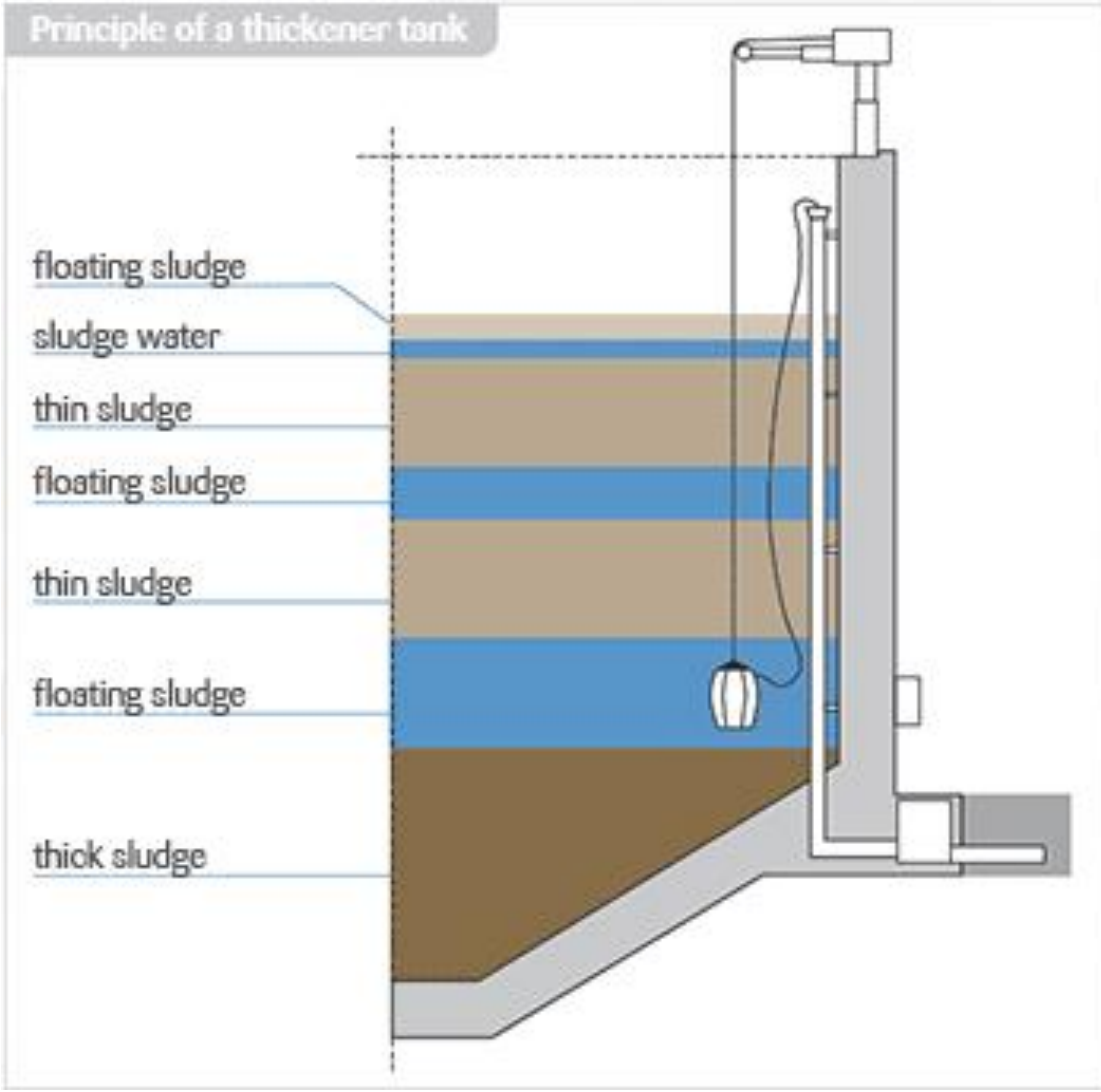
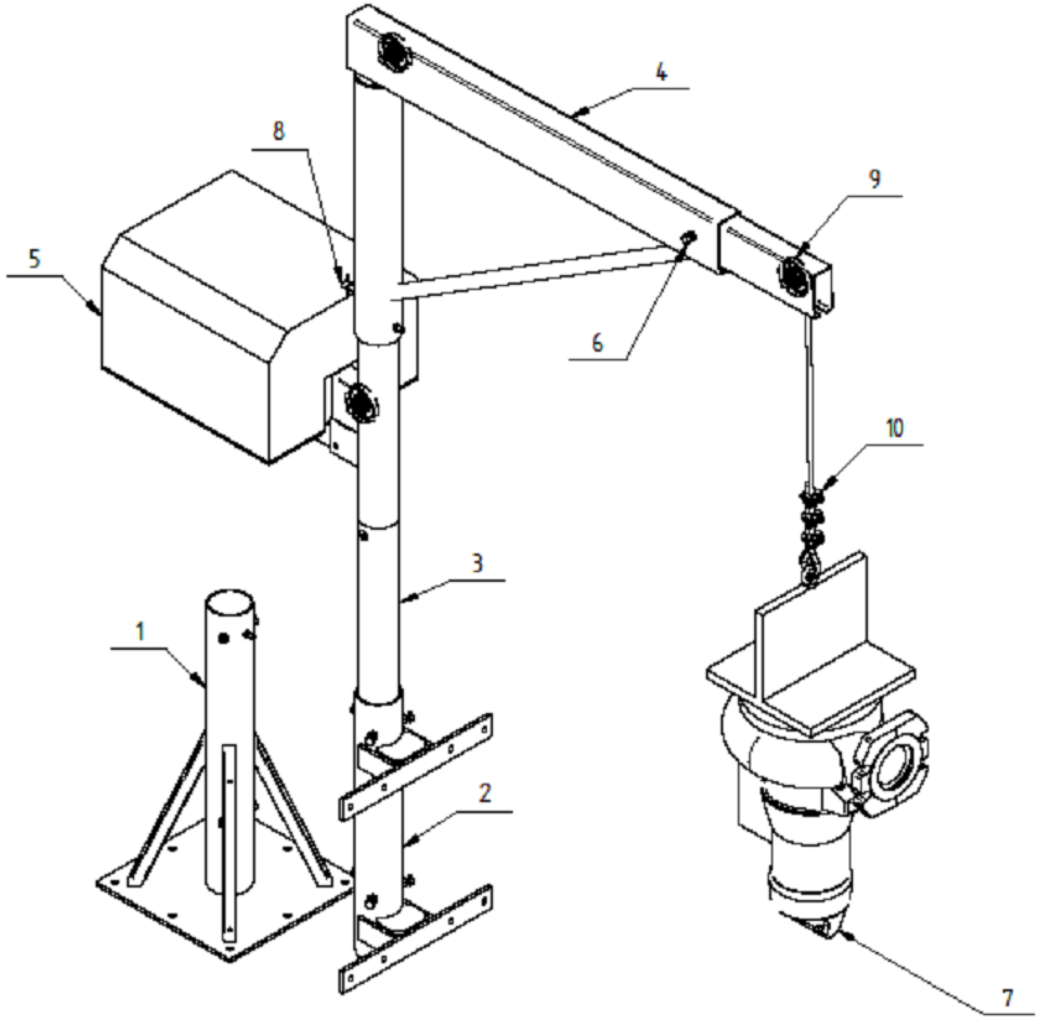
Principle of TAS

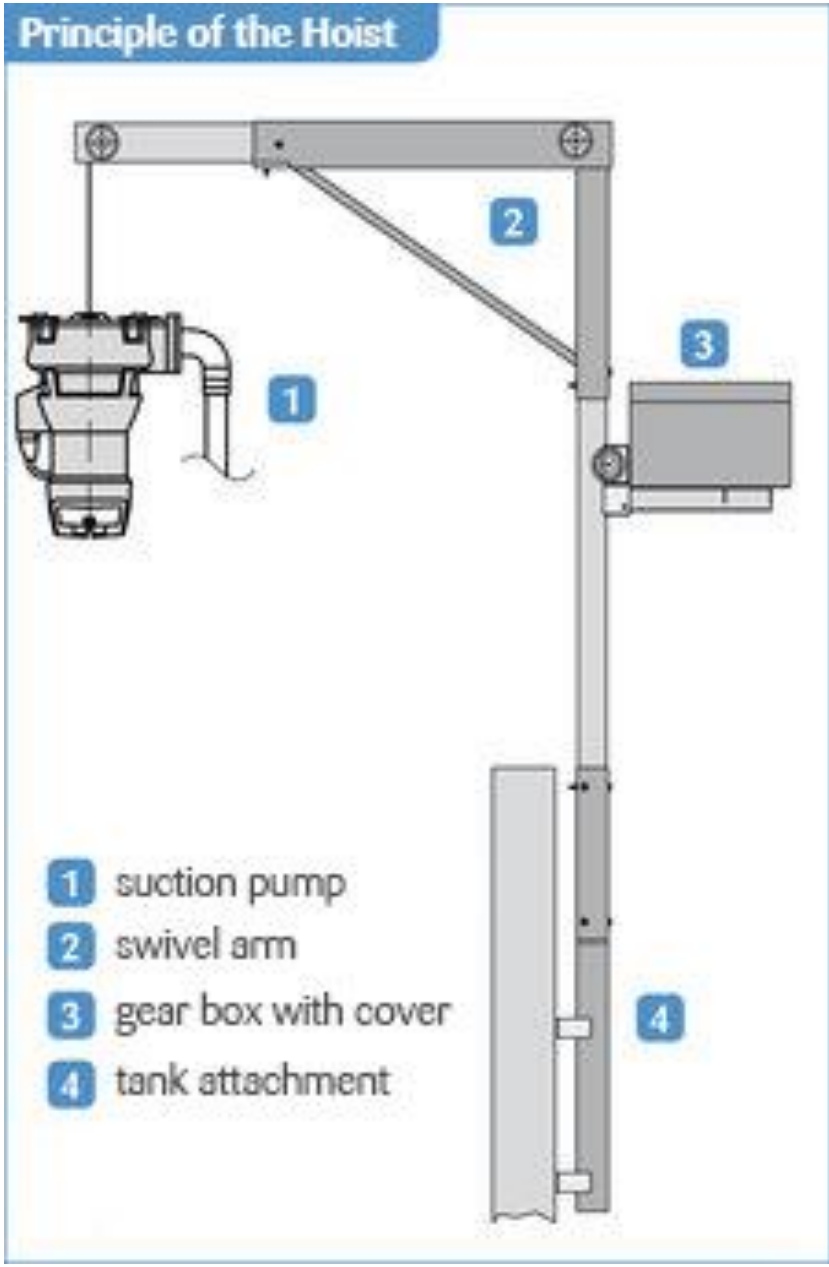
Layers with different densities are formed



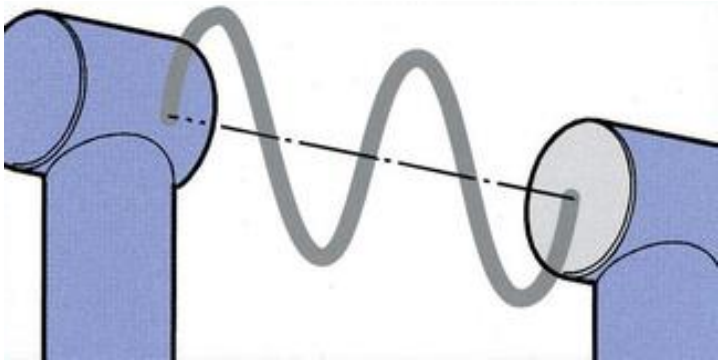


Components of the TAS





Suction Unit with Ultrasonic-Sensor



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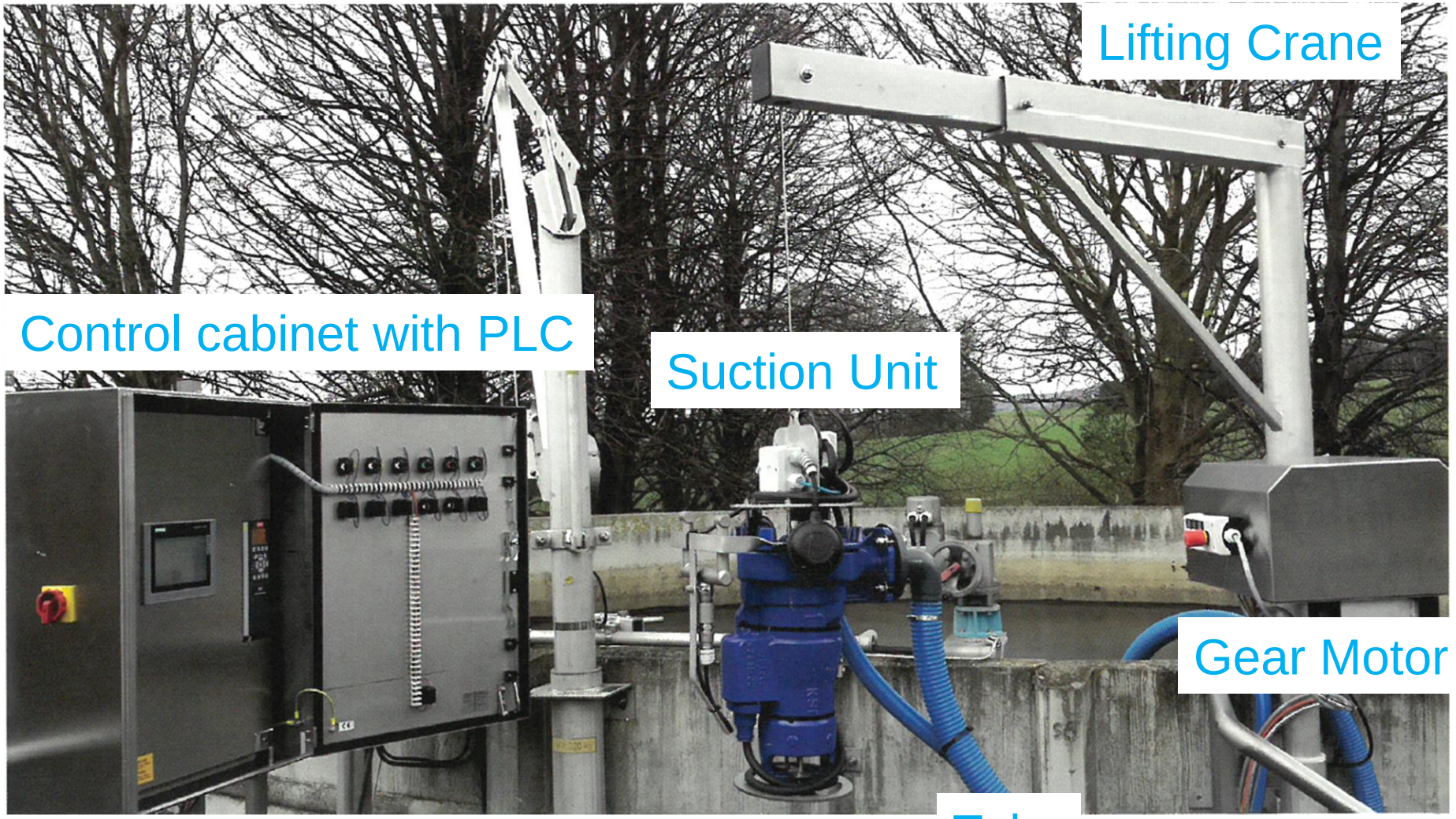
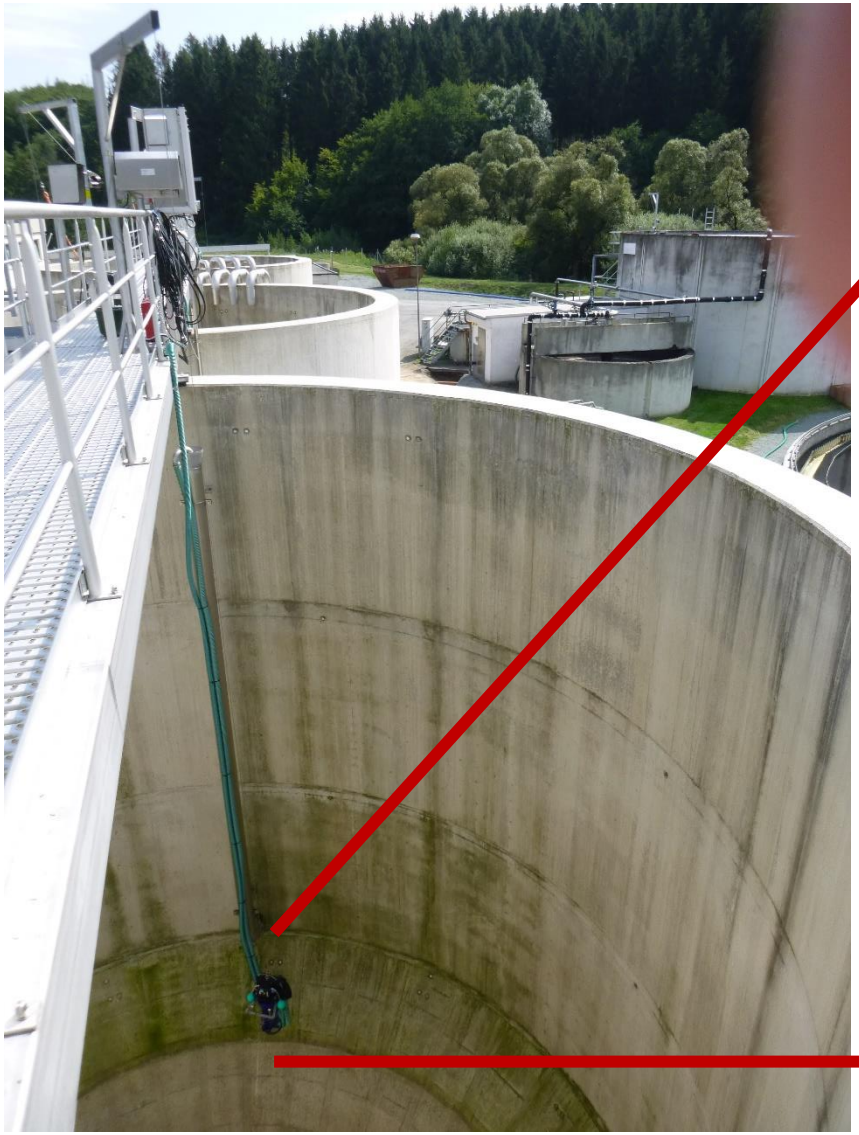
TAS


Lifting Crane
Control cabinet with PLC
Suction Unit
Gear Motor
Tube

TAS

TAS

TAS



Dry Matter Content influences all Steps of Processing Showing Benefits with TAS

Storing Volume

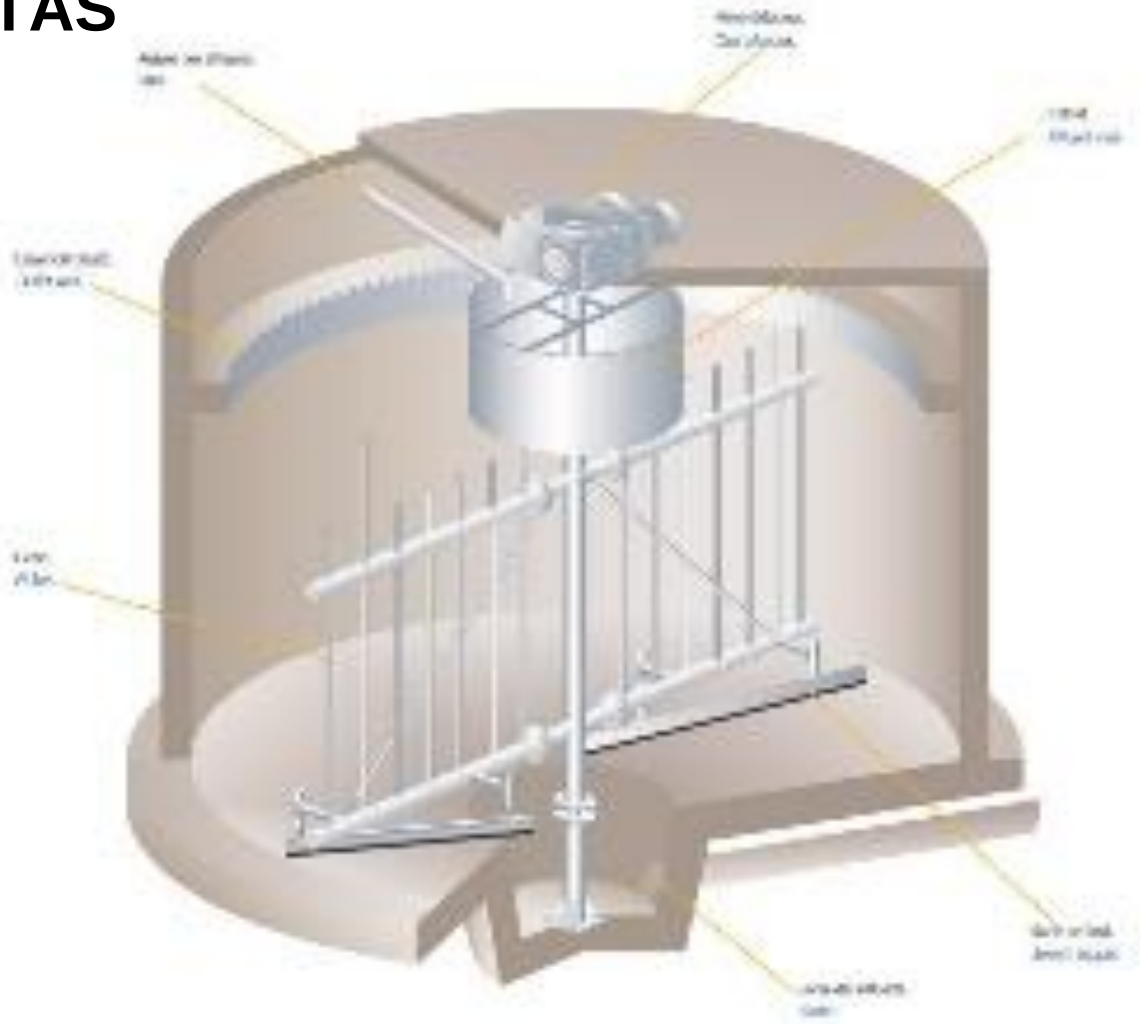
=> can be reduced up to 20 %

Dry Matter Content influences all Steps of Processing Showing Benefits with TAS

Thickening

=> DM-Values can be increased from 3.5 % up to 10 %

Classical Gravity Thickener with Fence Raker



https://img.directindustry.de/images_di/photo-g/131647-7975701.jpg

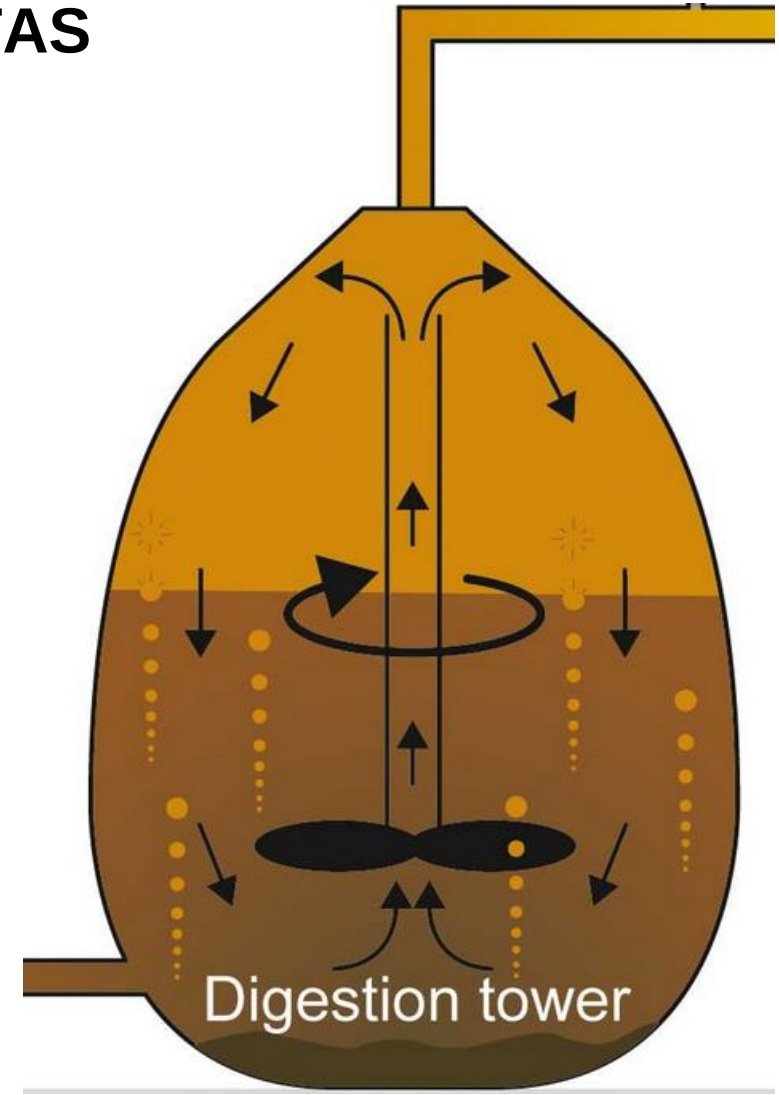
Dry Matter Content influences all Steps of Processing Showing Benefits with TAS

Digestion

=> more optimsed biological process with higher gas rates of up to 10%

Classical Digestion Tank

anaerob or aerob



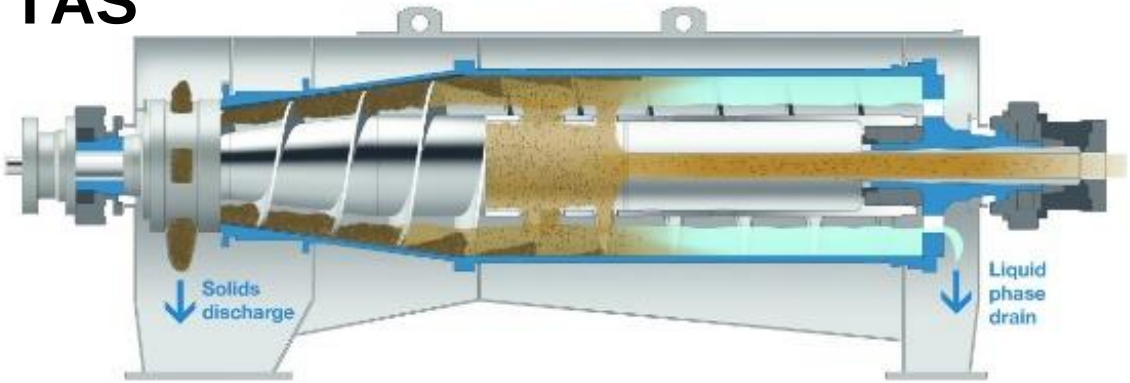
https://www.hoentzsch.com/fileadmin/media/graphics/content_images/Branchen/Illustrationen/Sewage_gas__biogas_quantity_measurement_in_wastewater_treatment.jpg

Dry Matter Content influences all Steps of Processing Showing Benefits with TAS

Centrifuge

Dewatering

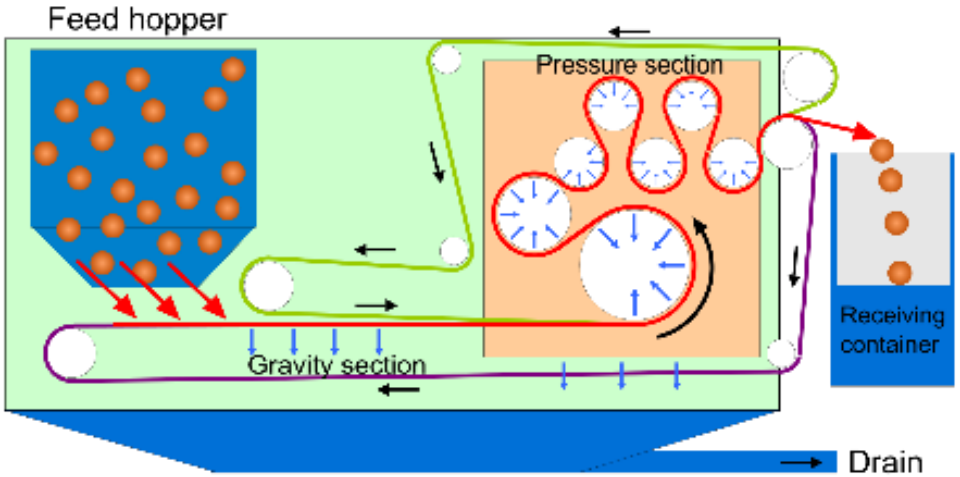
=> less running time, higher DM-values from 16-18% to 20-24%



=> Reduction of the running time to a quarter

https://www.at-minerals.com/imgs/1/5/7/1/7/6/6/02_sectional_drawing_ZXE_X5X_labelled__1_-e340f1b637bcafe8.jpeg

Belt Press



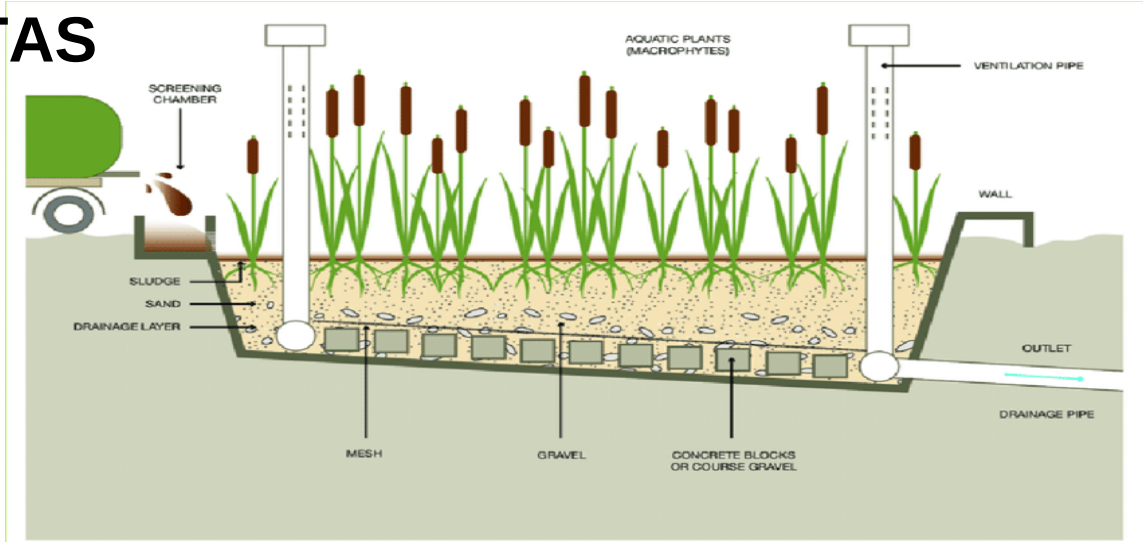
https://en.wikipedia.org/wiki/Sewage_sludge_treatment#/media/File:BeltPress.svg

Dry Matter Content influences all Steps of Processing Showing Benefits with TAS

Planted Drying Bed

Dewatering and Composting
=> less space necessary

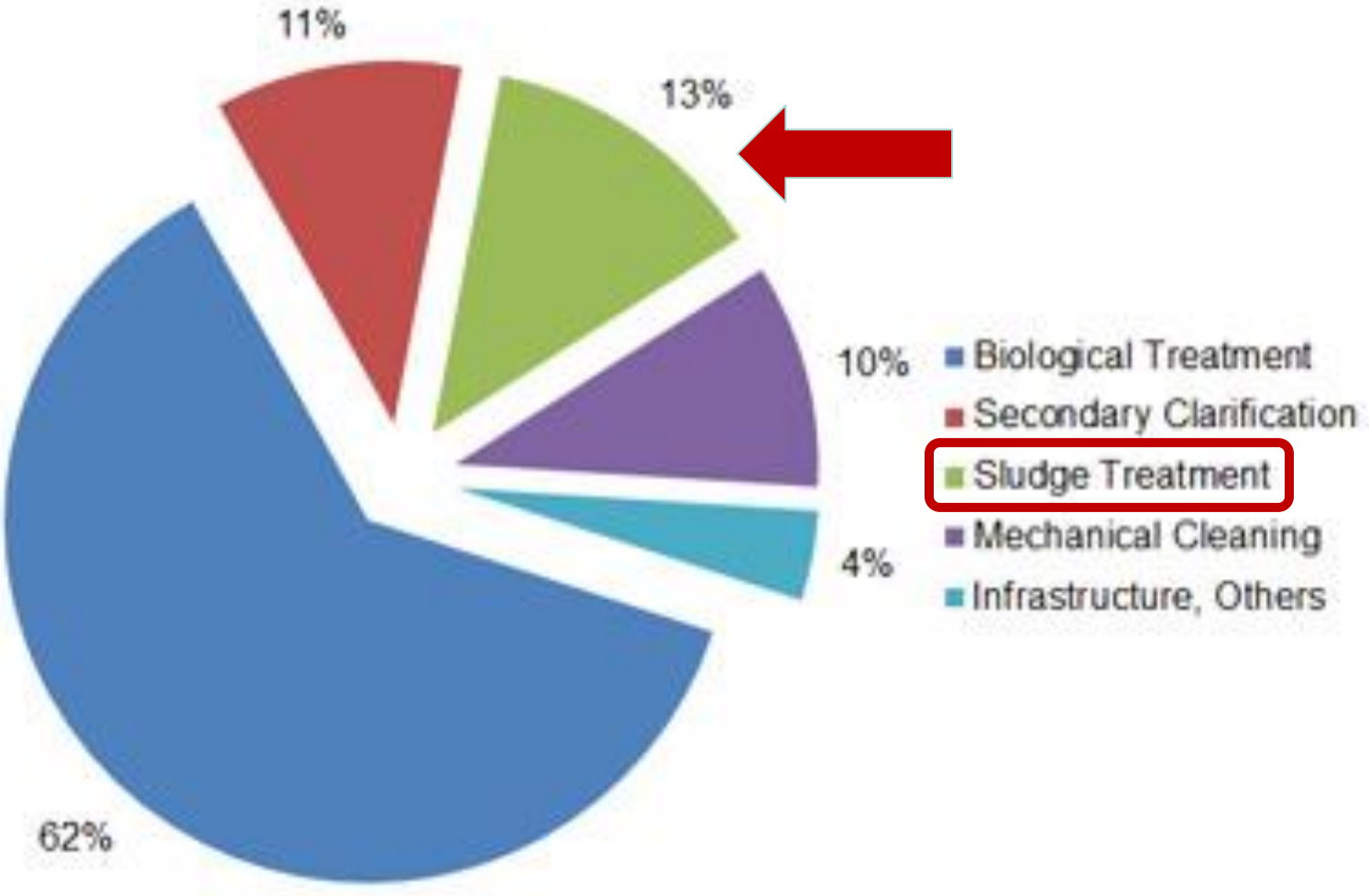
Drying Bed



https://www.researchgate.net/figure/Schematic-of-a-planted-drying-bed-13_fig2_341486153

https://www.researchgate.net/figure/Drying-beds-at-Niayes-faecal-sludge-treatment-plant-Dakar-Senegal-photo-Linda_fig1_269037413

Operation Costs of Wastewater Treatment Plant



https://www.rmu.de/energy-efficiency.html

Benefits of TAS

- Reduction of the sludge volume in the thickening process up to 20%
- Increasing of dry matter content values by 3 to 6 %
- Increased dry matter content have an enormous influence on the downstream dewatering processes
  - ➢ less running time of aggregates
  - ➢ generates longer operating life of aggregates
  - ➢ saving energy
  - ➢ saving operating, investment + maintenance costs
- Reduction of the dewatered sewage sludge volume by 20 %
- Reduction of sludge disposal costs

TAS in general

- Inventor of the turbid water discharge as the first stage in the sludge dewatering process to reduce the sludge volume enormously
- Use as round-the-clock operation
- Installed and proven on every second waste water treatment plant in Germany, others in many European countries, in Asia and Australia
- As well proven in oil industry, mining and food production industry

Thank you!