



SEVAR – Sludge Treatment

SLUDGE DRYING SYSTEM

SEVAReco:

- Single Belt Dryer
- Double Belt Dryer
- Multi-Stage Dryer
- Tube bundle heat exchanger
- Burner chamber
- Odour control system

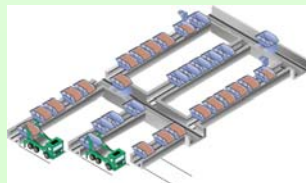


Components



Conveying systems

- Container/ skip terminals
- Chain conveyors
- Screw conveyors



SEVAR

Anlagentechnik GmbH

Hardeckstrasse 3
76185 Karlsruhe
Germany

Tel. +49 - 721 5001-0
Fax. +49 - 721 5001-368
email: info@sevar.de

Advantages of the Belt Dryer

SEVAR



Optimum drying - closed drying air loop

The process is specially developed for drying sewage sludge – the drying air is recirculated in a closed loop, i.e. no odourous drying air is released to ambient

Convective drying = dust free drying system

The belt dryer is a convective dryer and is very safe: drying air is slowly removing the moisture from the sludge particles and there is no mechanical treatment of the sludge – it is therefore a dust free method of drying

High Product Quality

Uniform and dust free final product
No Pelletising equipment needed for the final product

Low maintenance expenses

The equipment is easy accessible – doors allow access to the dryer internal elements, due to slow moving parts there is no wear of the dryer parts

Low vapour condensate load

due to low drying temperature (120 - 130°C)

Pasteurisation of product

due to retention time of approximately 30 to 40 minutes and drying temperature of 120 to 140° C

High degree of flexibility

The dryer is heated indirect! In this case the combustion gases of the burner heater are not in contact with the dryer and the sludge.

Final dry solids content easily adjustable

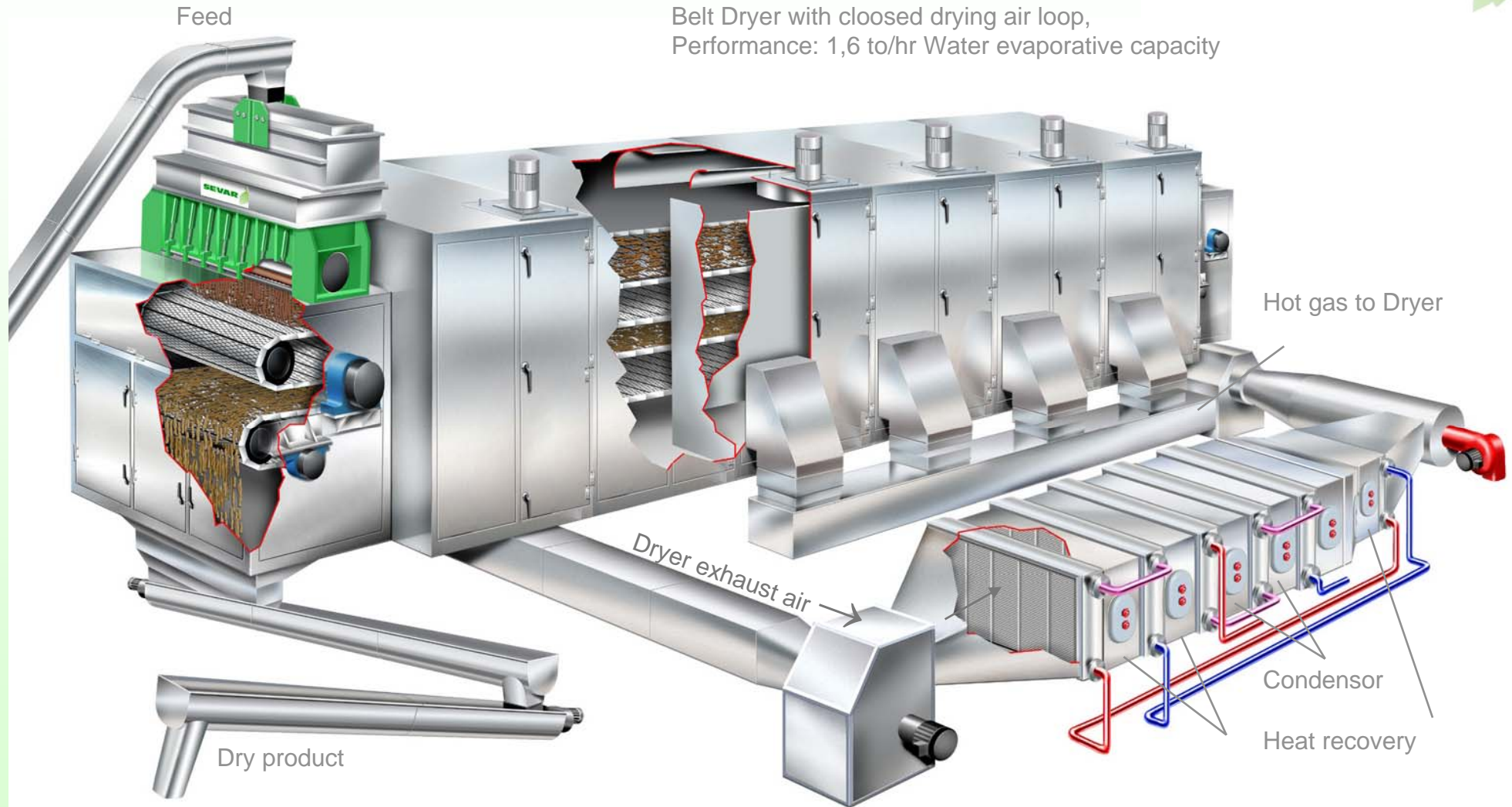
The final dry solids content is easily adjustable between 50 to 90%, the sludge can be utilized directly in agriculture, composted, landfilled or incinerated. This adjustment of output DS can be made at any time.

Dryer extension

An extension of the dryer is easy possible. Just by adding additional dryer modules the throughput can be increased.

BELT DRYER

SEVAR

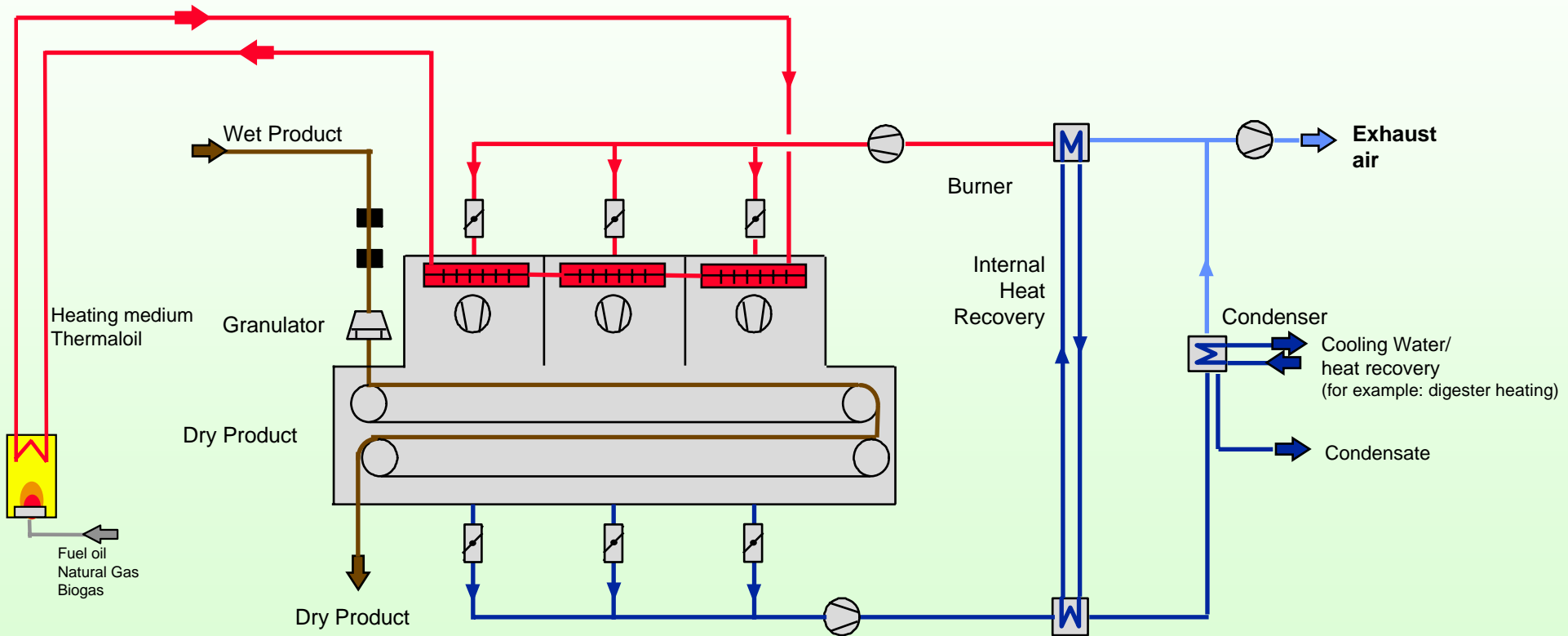


INDIRECT HEATING

Flow sheet with closed gas loop

SEVAR

The Sevar Dryer is an indirect fired, double-pass belt drier. The feed product is fed into the drier continuously to a distribution hopper providing even distribution across the belt. Pasty products like sludge need to be extruded to a "spaghetti-like" shape by a roller or extruder press and drop down onto the top belt of the drier in a uniform pile.



A stainless steel plate belt with slot holes is used for the transport belt in the drier. Due to smooth transportation, dust production is prevented by avoiding any mechanical treatment of the material against itself or against parts of the drier.

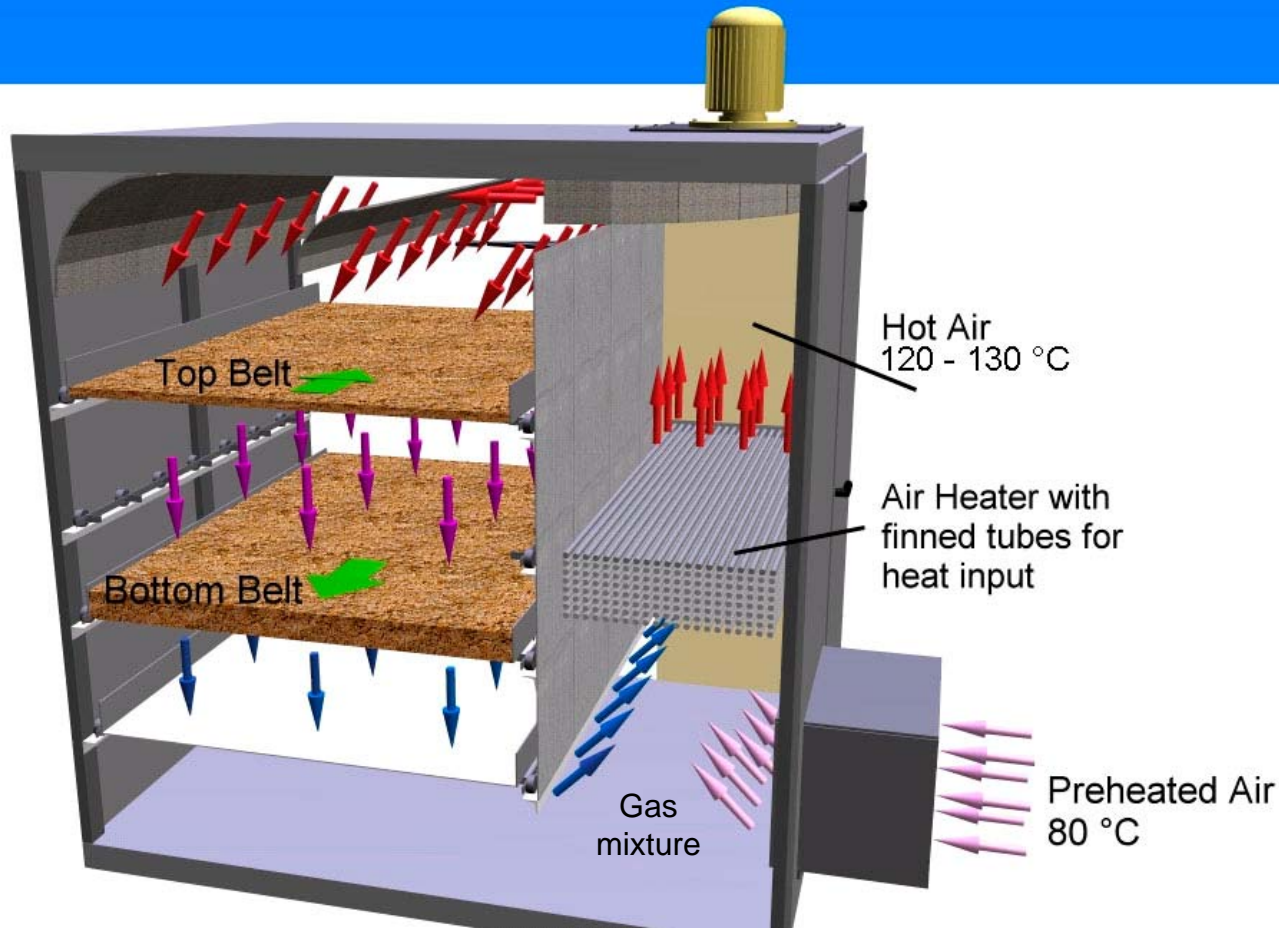
As the sludge passes through successive chambers, the gas temperature progressively increases (130°C), heating up the sludge to the desired temperature (appr. 80°C) and driving the evaporation process.

INDIRECT HEATING

with exhaust gas from CHP

SEVAR

The temperatures within the drier chambers are controlled automatically by PLC.
Also manual visualisation of thermometers, flow gauges and pressure gauges are installed for observation of the process parameters.
The residence time of the material inside the dryer is typically 50-70 min.



The drier is designed as a mechanical assembly unit. The drying zone is divided into several drying chambers each with a length of approx. 2 m, the width of the drier belt is 1,5 or 3,0 m. These drying chambers are further subdivided into a product zone, where the belts with the sludge pile travels and an air circulation zone, in which heat transfer resp. air mixing occurs.

Belt Dryer - Safety Control

SEVAR



RISK OF DUST EXPLOSION:

There is no risk of an explosion inside the dryer as due the prevention of a flammable atmosphere.

A steel plate transport belt with slot holes is used for the sludge transport in the drier.

Slow transport of the material through the dryer prevents any mechanical treatment of the material against itself or against parts of the drier.

The measured dust content inside the dryer atmosphere is below 3 mg/m^3 at all likely operating scenarios, i.e. start up, shut down, emergency shut down, restart, etc.

Due to this low concentration it is impossible to operate the dryer with a dangerous atmosphere. (the minimum explosible concentration for sludge is 60000 mg/m^3).

RISK OF FIRE:

Due to the dryer operating temperatures of up to only $140 \text{ }^\circ\text{C}$ the risk of product smoldering is minimised.

This smoldering would start when dry product is exposed to temperatures above $170 \text{ }^\circ\text{C}$.

Mitigations against smoldering:

- temperature monitoring of each dryer chamber module,
- thermocouples will stop the heat input via PLC at temperatures above $155 \text{ }^\circ\text{C}$
- Overtemperature switches TZA installed in the dryer are hardwired to a deluge system.
- These sensors would detect a critical temperature - when the temperature inside the dryer reaches $170 \text{ }^\circ\text{C}$, the safety temperature switches cease the heat input and operate a solenoid valve and cooling water is sprayed into the dryer.
- the numerous temperature instruments provide a high degree of reliability.
- the dryer deluge system is designed to fail to safety.
- regular testing of the system is part of the maintenance schedules.
- the product outlet temperature of the dryer is monitored by thermocouples in the discharge conveyors – see below

Dust accumulation respectively the liberation of dust accumulation has not caused problems on operating belt dryer plants.

Any dust/particle settlement in the dryer could start smoldering at temperatures above $160 \text{ }^\circ\text{C}$ (= layer ignition temperatures).

The temperature in the lower parts of the Belt dryer where accumulations could take place will not exceed $140 \text{ }^\circ\text{C}$.

During maintenance shutdowns the particles shall be removed from the bottom part of the dryer in intervals of 4 weeks.

Extruder

For extrusion of pasty materials

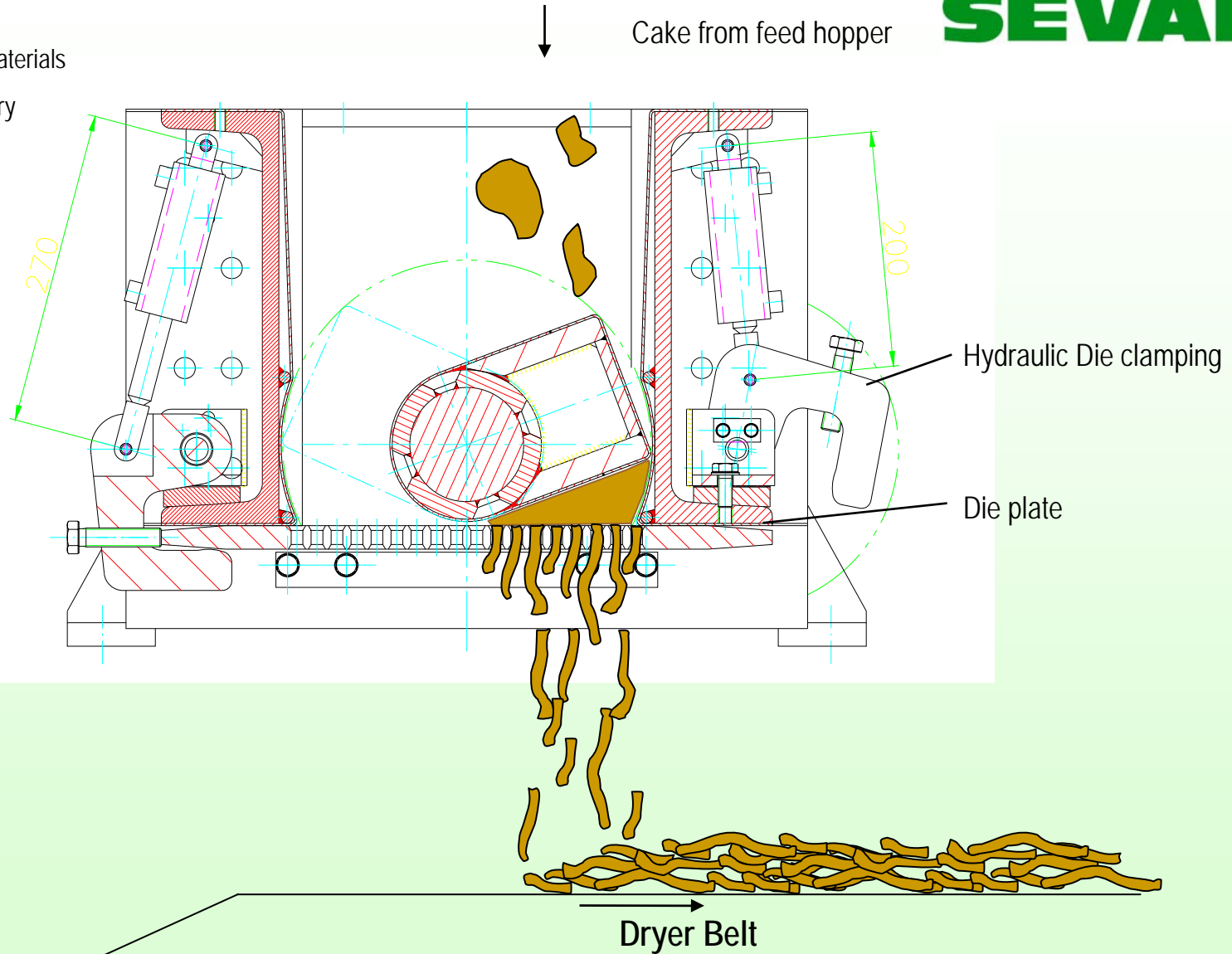
sludge from 16 - 35 % Dry solids content

Size:

Width 1500 mm
Throughput up to
max. 4 to/h

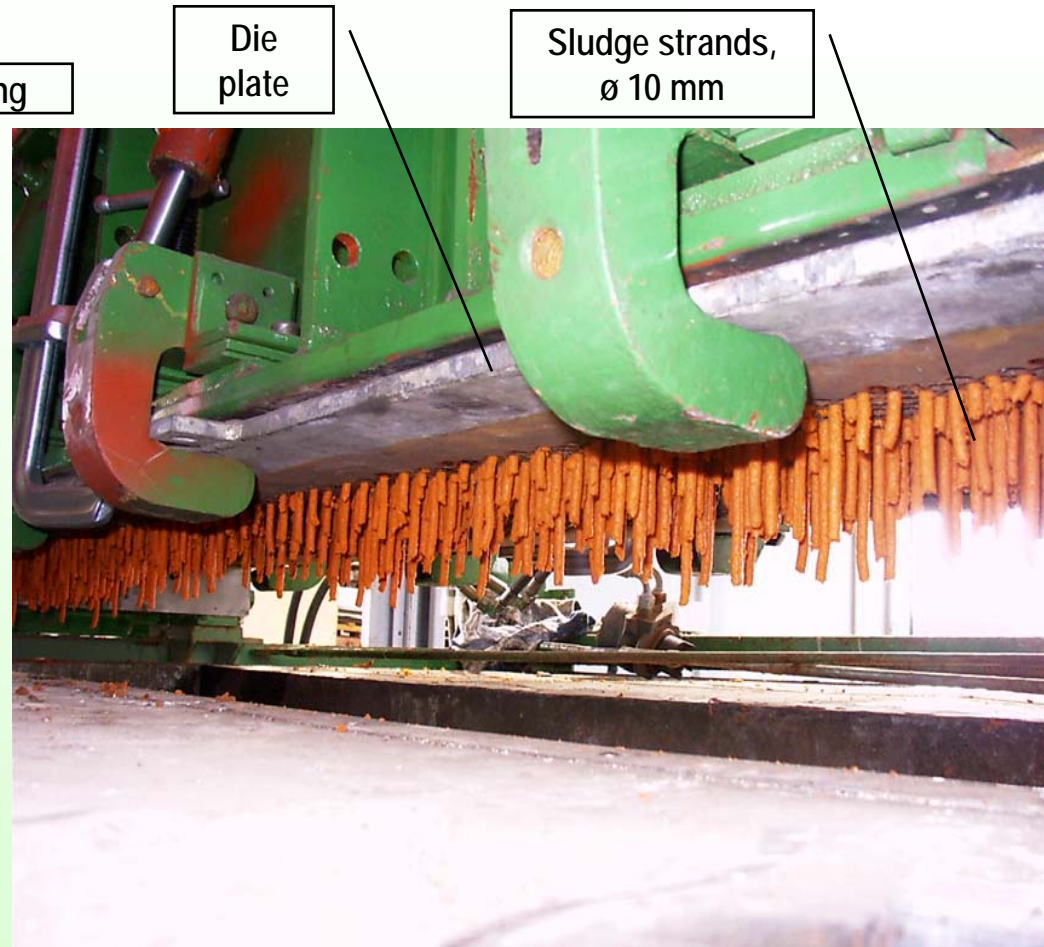
Width 3000 mm
Throughput up to
max. 8 to/h

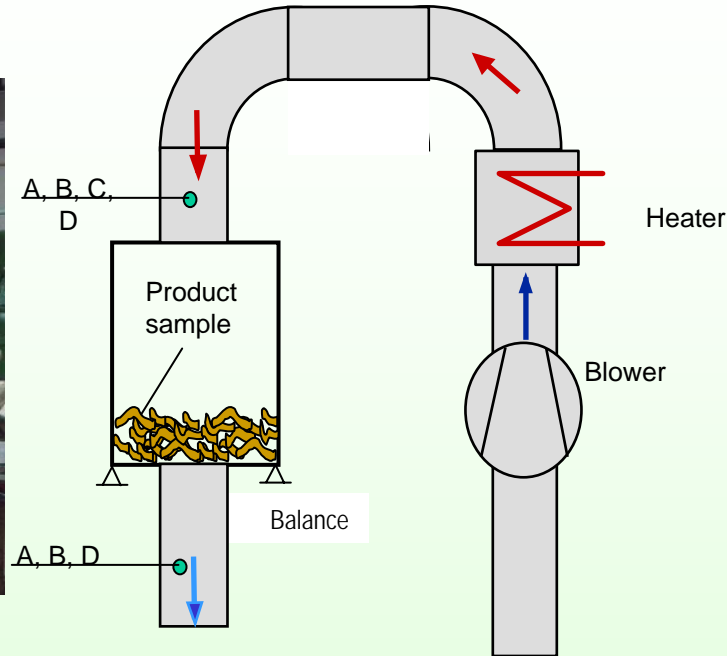
SEVAR



Extruder

SEVAR





Laboratory Dryer

The laboratory dryer simulates the convective drying process in a belt dryer.

It allows quick determination of the main drying parameters: temperatures, pressure loss of the drying air and the water content of the sludge sample during the drying process = drying speed.



Mobile Dryer

Package Unit on two 40' trailers:

Dryer Type: BT 1500/4

Heating: Fuel oil and/or
Exhaust gas from CHP

Water evaporation: max 550 kg/h

Throughput: max. 1,2 to/hr

Product: Bulk products or fibrous/pasty
products

References

Sewage Treatment Plant Mainz

SEVAR



Client:	Tiefbau GmbH
Location:	Mainz, Germany
Dryer Type:	BT 2500/9
Heating:	Biogas/ Natural gas and Exhaust gas from CHP
Water evaporation:	2000 kg/h
Throughput:	3,5 to/hr
Product:	Sewage sludge (centrifuge)



References

Sewage Treatment Plant Uttigen

SEVAR



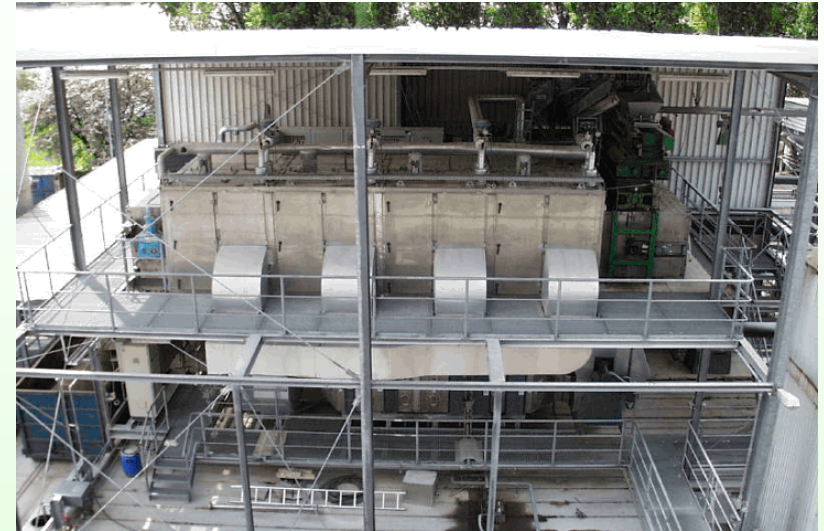
Client:	AVAG AG
Location:	Uttigen, Switzerland
Plant size:	3 to/hr sludge cake, 22 - 25 % DS
Dryer Type:	BT 2500/9
Heating:	Indirect heating,
Water evaporation:	2100 kg/h
Sludge:	Digested sewage sludge

References

Sewage Treatment Zschimmer+Schwarz

SEVAR

Client:	Chemische Fabriken Zschimmer und Schwarz
Location:	Lahnstein, Germany
Dryer typ:	BT 2500/4
Heating:	Indirect, steam heated (6 bar)
Water evaporation	900 kg/h
Sludge:	Industrial sludge (Belt filter press)
Sludge input:	18 - 20 % DS-Content
Sludge Output:	90 % DS-Content
Use of endproduct:	Incineration



References

Sewage Treatment Plant Wellingborough

SEVAR



Client:	Anglian Water
Location:	Wellingborough, UK
Dryer type:	BT 1500/4
Heating:	Direct, with producer gas from gasifier
Throughput:	0,8 to/hr
Water Evaporation:	470 kg/h
Product	Sewage sludge (belt filter press)



References

Sewage Treatment Plant Wellingborough

SEVAR



Burner

Heating and
ventilation
system

Exhaust air
ventilator



Product inlet
Extruder unit

References

STW Colchester

SEVAR



Client:	Anglian Water
Location:	Colchester, UK
Dryer type:	BT 3000/6
Heating:	Direct, Dual Fuel Burner Biogas/ Diesel
Throughput	2,2 to/hr
Water evaporation:	1500 kg/h
Product:	Digested Sludge dewatered with Centrifuge (23 %DS)

References

SEVAR



BRS Bioenergie GmbH

Client:	BRS Bioenergie GmbH
Location:	Deißlingen, Germany (Villingen-Schwenningen)
Dryer type:	BT 3000/4
Heating:	Exhaust gas from CHP
Throughput:	1,0 to/hr
Water evaporation:	650 kg/h
Product:	Digested Sludge, dewatered with Centrifuge (23-25 %DS)



References

SEVAR



Dryer for Digester Residue
MBA Südniedersachsen



Client: AMB/ Abfallzweckverband
Südniedersachsen

Location: Göttingen/ Friedland

Dryer type: BT 3000/9

Heating: Exhaust gas from CHP,
Energy backup by Biogas-Burners

Throughput: 4,5 to/hr

Water evaporation: 2,2 to//hr

Product: Digester residue