Solar supported

sewage sludge drying plant

Reference plant Alexander Buhl – Bioenergiezentrum

Year of construction: 2010

Location

This solar supported drying plant is near Horb a.N. in Baden-Württemberg and the owner and operator is a farmer who is one of the first biogas plant farmers since the middle 90s.

Sludge input

The sewage sludge arrives with a dry solid content of ca. 20 to 35% out of four different waste water treatment plants (ca. 50.000 population equivalent) from nearby municipalities: Horb, Oberndorf, Glatt and Dettingen.

Drying and sludge output

The drying process is inside a foiled greenhouse and happens by solar radiation and a floor heating system. Inside the hall the sewage sludge dry solid content reaches ≥ 90% DS. The thermal energy which is needed for the floor heating system is delivered by the biogas plant. The averaged daily drying process manages about 11 tons per day.
The gained sewage sludge granulate gets stored in an underunable silo until the collection by a cement plant. The biogenic granulate as an alternative fuel replaces brown coal.

Plant data

Drying space	1050 m²
Independent lines	2 pieces
Input bunker	140 m³
Dry sludge silo	60 m³
Energy value dry sludge	ca. 2.5 Mio. kWh
Thermal energy biogas plant	300- 500 kW

Sludge data

Sludge delivery	Container
Sludge pickup	Truck–Silo
Dewatered sludge flow	4000 m³/a
Sludge input	ca. 25 % DS
Sludge output	≥ 90 % DS
Evaporation	2890 t H_2O/a

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Solar supported

sewage sludge drying plant

Reference plant Abwasser Zweckverband Oberes Mühlbachtal

Year of construction: 2006

Location

On the downhill side of the Birkhof / Sulz a.N. farm this solar supported drying plant was built in 2006. The association for sewage treatment and the farmer signed an agreement that the association can use the thermal energy for the floor heating drying system.

Sludge input

Two waste water treatment plants deliver the sludge with ca. 25% DS: The waste water treatment plant of the nearby city Sulz and the waste water treatment plant Bergfelden of the association for sewage sludge treatment Oberes Mühlbachtal with a population equivalent of about 20.000.

Drying and sludge output

This plant is the first plant that was built in this way. The drying process takes place inside a glass greenhouse by the incoming solar radiation and the surplus of thermal energy out of the farmer's biogas plant. Depending on the whole energy supply the drying flowing rate of the sewage sludge is about 15 days. As an intermediate storage an underrunable silo was positioned beside the hall. Therefore a bucket conveyor transports the sludge ≥ 90% out of the hall and inside the silo – a closed system.
The collection is done by a cement plant which uses this dried sludge energetically as secondary fuel.

Plant data

Drying space	570 m²
Independent lines	1 pieces
Input bunker	ca. 72 m³
Dry sludge silo	60 m³
Energy value dry sludge	ca. 736.000 kWh
Thermal energy biogas plant	120 kW

Sludge data

Sludge delivery	Container
Sludge pickup	Truck–Silo
Dewatered sludge flow	1.880 m³/a
Sludge input	ca. 25 % DS
Sludge output	≥ 90 % DS
Evaporation	1.200 t H_2O/a

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Solar supported

sewage sludge drying plant

Reference plant Verwaltungsverband Langenau

Year of construction: 2011

Location

As communally employer the topic energy efficiency is as important as never before. So the administrative cooperation Verwaltungsverband Langenau near Ulm decided itself for a solar supported sewage sludge plant on the area of its waste water treatment plant.

Sludge input

The dewatered sewage sludge (20 - 30% DS) gets transported out of an adjoining building via a push floor and transport system. Inside the drying hall made of glass a spiral conveyor is responsible for spread the sludge across the width of the hall.

Drying and sludge output

The decision was made for a Venlo designed toughened safety glass greenhouse on a space of ca. 480m². The greenhouse consists of roof and side openings and the aeration system is supported with ventilators that enlarge the circulation above the sludge. Beside the solar energy and the aeration effect a block heat and power plant was connected. The necessary gas for the block heat and power plant is covered out of the digester on the waste water treatment plant.
So the administrative cooperation uses free and unused energy effectively.
At the end of the drying area a high quality bucket conveyor takes the sludge out of the hall and into a silo. This silo is also part of the adjoining building. Regarding the energy shortage the power and cement industry need more and more homogenous fuel qualities with a density <8mm and <90% DS. Because of this IM developed a special crusher that consist of a magnetic separator additionally.

Plant data

Drying space	370 m²
Independent lines	2 pieces
Input bunker	45 m³
Dry sludge silo	50 m³

Sludge data

Sludge delivery	Chamber filter press
Sludge pickup	Truck–Silo
Sludge input	ca. 25 % DS
Sludge output	≥ 90 % DS
Population	ca. 14.500 p

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Solar supported

sewage sludge drying plant

Reference plant Gemeinde Zwiefalten

Year of construction: 2011-2012

Location

This is a very special sewage sludge drying plant of the municipality Zwiefalten county Reutlingen and is located uphill the waste water treatment plant.

Sludge input

Feature number one is the sludge input:
The fluid sludge (ca. 2-3% DS) gets pumped from the downhill waste water treatment plant on a belt press. From this belt press the sludge falls down and gets delivered across the width with a spiral conveyor.

Drying and sludge output

Like many municipalities also Zwiefalten came to a decision for a glass greenhouse (ca. 325m²). In this case there is just one drying line. The thermal heat for the floor heating system is covered by the biogas plant of a near farmer. Additionally thermal heat can be used out of the waste water treatment plant's digester.
Beside the input with the belt press also the output is a feature that hasn't been there before:
The dried sludge doesn't get transported out of the hall. It just falls down into a deep sludge shelter at the end of the hall. At the time when the sludge was collected, the dried material is pulled out of the shelter by a chain conveyor.

Plant data

Drying space	230 m²
Independent lines	1 pieces
Input	Belt press
Sludge shelter	ca. 35m³

Sludge data

Sludge delivery	Direct
Sludge pickup	Truck–Silo
Sludge input	ca. 2% resp. 25 % DS
Sludge output	≥ 90 % DS
Population equivalent	ca. 19.300 PE

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Solar supported

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Solar supported

sewage sludge drying plant

Reference plant – Turkey
REMONDIS Su ve Atık Su Tek. San. ve Tic. A.Ş

Year of construction: 2012

Location

In the southwest of Turkey the operator Remondis decided to built a pure solar sewage sludge drying plant. The drying plant is now part of the waste water treatment plant.

Sludge input

The input happens typically with a pre-located bunker which is equipped with a push floor to transport the dewatered sludge (ca. 25% DS) inside the hall. The hall consists of a double foiled cover with roof and side openings for fresh air inlet and roof ventilation for the air circulation above the sludge. Regarding the fact that the southwest of Turkey is a popular holiday destination in summer the sludge amount is different from the amount in winter. In summer it's about three to four times higher than in the cold season.

Drying and sludge output

This foiled greenhouse is more than 150m long and consists also of a floor heating system although the sludge gets dried pure solar at the moment. This foresight offers the possibility to add an external heat source in future to optimize the drying result regarding the dry solid content and the seasonal variation. Based on the different dry solid contents during the year the output is organized with belt conveyors. Two of them transport the sludge from the outer edges to the central where a third one collects the sludge and dumps it inside a container.

Plant data

Drying space	1350 m²
Independent lines	2 pieces
Input bunker	140m³

Sludge data

Sludge delivery	Container
Sludge pickup	Container
Sludge input	ca. 25 % DS
Sludge output	Seasonal different

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Solar supported

sewage sludge drying plant

Reference plant Gemeinde Kißlegg/Allgäu

Year of construction: 2012

Location

The sixth solar supported sewage sludge drying plant of I+M got realized embedded into the beautiful countryside of the Allgäu near Kißlegg.

Sludge input

Like the plant in Zwiefalten this plant was also constructed with and directly and immediately sludge input by using a pump unit and a belt press. That means that the sewage sludge gets dewatered inside the drying hall and the press drops it down on the drying field.
Two sewage sludge treatment plants are drying their sludge in this plant: The municipality of Kißlegg and the smaller plant Dürren.

Drying and sludge output

The required area for the greenhouse which is made of toughened safety glass is about 400m². This area contains as well the unit for the press and electronic cabinets as the bucket conveyor for the material's output. The storage of the dried sludge happens by an underrunable silo. The thermal energy for the floor heating system comes from the digester on site.

Plant data		Sludge data	
Drying space	377 m²	Sludge delivery	Direct
Independent lines	1 pieces	Sludge pickup	Truck–Silo
Input	Filter press	Sludge input	ca. 2% bzw. 25 % DS
Output / Silo	ca. 35m³	Sludge output	≥ 90 % DS

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Solar supported

sewage sludge drying plant

Reference plant Gemeinde Gärtringen

Year of construction: 2014

Location

It is seen even you are on the A81 between Stuttgart and the Lake Constance: A huge glass greenhouse that rises up beside the road on the site of the sewage sludge treating plant of Gärtringen.

Sludge input

Two independent pre-located bunker units offer the possibility to receive sludge from the 9 other members of the sludge treatment association as well as the local sludge of the WWTP Gärtringen that gets transported automatically by a spiral conveyor after passing the dewatering unit. This collecting point offers a good plant utilization rate and is a real solution for all members.

Drying and sludge output

On a space of about 1400m² the different types of the association's sludge get dried until ≥ 90 % TS automatically from the input until the pick up: electrical and electronic engineering, bunker with pushfloor, greenhouse, air management and output system.
To prevent the dried sludge from moisture and other weather influences the sludge is kept safe inside an underrunable silo.
The heat for the floor heating system comes from the electricity generation of a nearby deep-freeze warehouse.

Plant data

Drying space	1040 m²
Independent lines	2 pieces
Input bunker	ca. 150m³
Input	Spiral conv., bunker
Output / Silo	ca. 60m³
Heat source	Industrial district heat

Sludge data

Sludge delivery	Direct, Truck-Container
Sludge flow (plan)	3200 - 4000to
Sludge pickup	Truck–Silo
Sludge input	20 - 25 % DS
Sludge output	≥ 90 % DS

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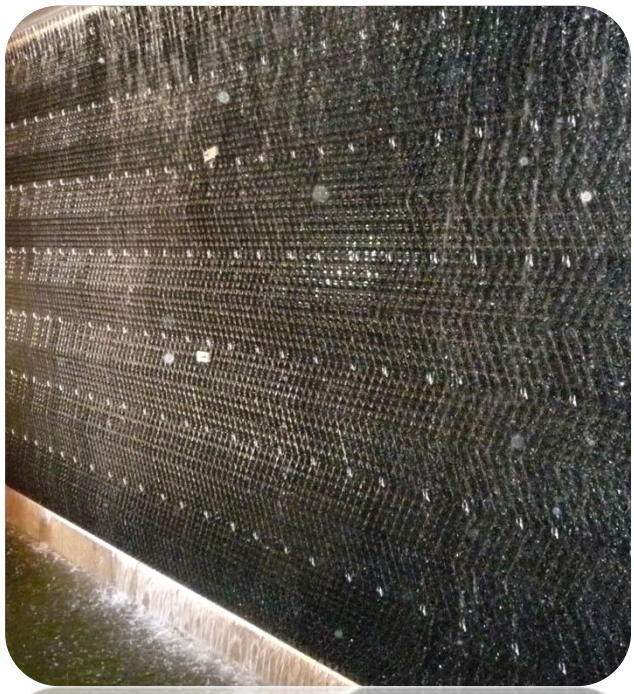
Solar supported

sewage sludge drying plant



Reference plant Alerheim

Year of construction: 2012

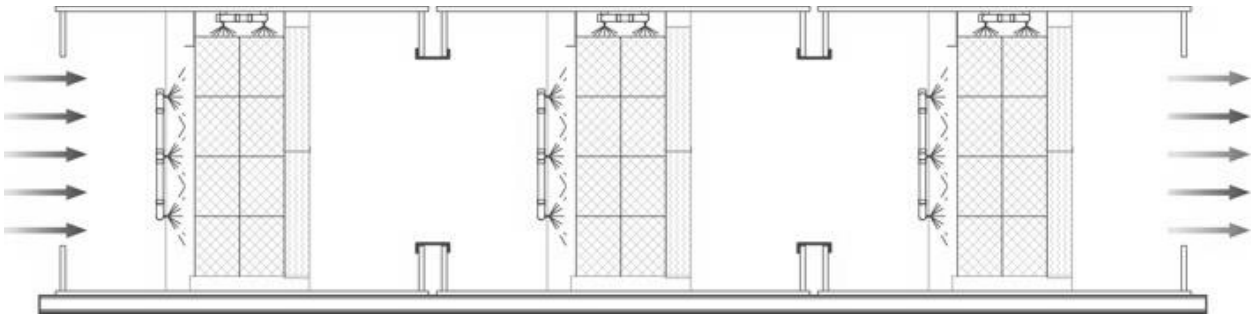
Location

Alerheim is located in a meteor crater called „Nördlinger Ries“. Because of this special topographical situation often inversion occurs. This means that exhaust air from the greenhouse stays close above the ground without mixing or rising up to higher atmospheric shifts.

Enhancement

The plant got equipped with an acid-base-washer for smelling exhaust air on the one hand and enlarged chimneys on the other hand to push the air in upper areas.
Additionally the plant got optimized regarding sludge flow rate in 2014.

Draft air scrubber



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Solar supported

sewage sludge drying plant

Reference plant Oswald

Year of construction: 2017

Location

Beside the EDZ drying plant from 2006 owned by the waste water association AZW Oberes Mühlbachtal a new i+M-Zizmann plant was constructed in 2017 on the same site.
Performance differences and technical developments of 10 years can be shown here perfectly.

Sludge input

As constructed previously also the new plant is equipped with the pre-located hydraulic bunker units for safe and independent sludge feeding. Sludge delivery from more than five surrounding sludge treatment plants happens by container or any other dumping vehicle.

Drying and sludge output

The drying area was chosen with ca. 1.200m². The floor is constructed as heating plate with stainless steel pipes that allow water inlet temperatures until 105°C.
This offers water evaporation performances up to 8ton per square meter per year.
Drying result is fixed on 90% DS for industrial utilization or as RDF in mono-incineration plant.

Plant data

Drying area	1,200 m²
Independent lines	2
Bunker vol.	ca. 170m³
Feeding	Bunker
Output / Silo	ca. 60m³
Heat source	Biogas plant

Technical data sludge

Sludge feeding	Truck, Container
Design sludge flow	3,500-8,000to
Sludge discharge	LKW–Silo
DS Input	22 - 25 % TS
DS Output	≥ 90 % TS

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Solar supported

sewage sludge drying plant

Reference plant Narol, Indien

Year of construction: 2018

Location

Together with our local Indian partner company now the world's largest drying plant for apparel textile sludge according to the i+M-Zizmann was constructed in 2018 in the northwest of India, in Gujarat state. Usually the area of 9,600m² was designed just as sludge storing halls after dewatering.
By using i+M technology the sludge gets desiccated professionally on a granulate type product structure with industrial application

Sludge feeding

The primary concept of the owner was just feeding by tractor/wheel loader after mono-belt dewatering. To optimize the drying process now the new concept shall include automatic feeding, either by relocate the dewatering machines to the feeding sections or dosed feeding adjustments of the feeding sections.

Drying and sludge output

The drying area is ca. 9,600m². On this area the sludge gets dried on 90%DS the whole year.
Only during monsoon times the incoming air gets optimized to generate warm air inside the hall to guarantee the drying process during the monsoon. Preparations for hot floor operations were considered during the design and can be installed easily in case of higher sludge flow rates in future.

Plant data

Drying area	9,600m²
Independent lines	11
Feeding 2018	Manual
Future feeding	Dosed
Output	Belt conveyor, Elevator, Silo
Sludge output	≥ 90% DS

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Solar supported

sewage sludge drying plant

Reference plant Vishaghapatnam

Year of construction: 2019

Location

The coast city Vishaghapatnam (Vizag) is located in India's east in the state Andhra Pradesh. Vizag is one of the prosper regions of India. The plant is part of the production area of Brandix Apparel India Pvt. Ltd., one of the world largest producers and exporters of apparel.

Sludge feeding

Two separated bunker units with hydraulic walking floor allow the independent sludge feeding in each hall of this drying plant. The sludge dumping happens with any usual dumping vehicles from the dewatering building beside the drying plant.

Drying and sludge output

The area for drying is ca. 1,200m² and is operated solar on ca. 8 months. During monsoon times and in case of increased apparel production waste heat from the nearby incineration process is used for guarantee the drying results.

Plant data

Drying area	1,200 m²
Independent lines	2
Feeding bunker	ca. 170m³
Feeding	Bunker, Hydr. Walking floor
Output silo	ca. 60m³
Heat source	Incineration

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