



Solar Sludge Drying System

After mechanical dewatering, sludge contains 20 % dry solids

www.argesconcept.com

HIGH DRYING EFFICIENCY





12+ years

**Arges Concept has more than 12 years
of experience on sludge dewatering and
sludge drying technology.**

**Our technology
and experience in
the operation of
Solar Sludge
Drying Systems
recommend us.**



Several units have been successfully installed and operated within **Europe and Asia countries**

THE SLUDGE

Low Operation Cost

Sewage sludge is a byproduct of wastewater treatment. Depending on the applied process, the produced sludge usually contains 15–28% dry solid content.

Dried sludge can be added to landfill, applied to agricultural cropland as fertilizer, or bagged with other materials and marketed as “biosolid compost” for use in agriculture and landscaping.

Our Solar drying System has the following basic parts.



GENERAL DESCRIPTION

The operation is fully automatic

Our Solar Sludge Drying System uses the greenhouse effect. It significantly reduces the volume and weight of the sludge faster and more effective than conventional drying, so that it is easier to recover.

With this process, Arges Concept is promoting the use of clean and renewable energy sources to dry sludge. It uses the same principle as horticultural greenhouses, completed by a ventilation system and a sludge mixer. The operation is fully automatic and can be monitored from a remote location.



1 Sludge Loading

There are alternative ways of sludge transport to greenhouse.

A Pumping

The wet sludge can be transported to the greenhouse by means of special pumps and a pipe system. If this alternative is used preventive measures should be taken against clogging of the pipework.

B Transport by Truck or by a loader

If the dewatering building location is not suitable to convey the sludge, damper trucks or loaders can be used to transfer the sludge.

Our system is so designed that the sludge entry is always outside the greenhouse. The confined area should not be opened to ambient climate conditions as the system will lose heat and negatively impact the process.

cUsing Conveyors

If the location of the dewatering building is suitable to convey the dewatered sludge from dewatering building to feed conveyor of the system, screw conveyor may be used for transportation. Alternative conveying systems such as belt conveyor can also be used for the sludge transport.

Sludge will be conveyed to ARROBOT 2000 system feed conveyor's bunker outside the green house.



^aFeed Conveyor

A screw conveyor may be used for transport of the dewatered sludge if the dewatering building is in a suitable location. Alternatively, conveying systems such as a belt conveyor can also be used for the sludge transport.

^bDistribution Conveyor

As soon as the feed conveyor begins operating, the distribution conveyor operates. Depending on the number of lines in the system, the distribution conveyor will have 2 openings controlled by flaps. Each flap is controlled by a timer and will be open to discharge the sludge into the greenhouse until it reaches 1.2 to 1.5 meter height, depending on the Dry Solid content of the incoming sludge. When the set height of the pile is reached, the flap will automatically close. The next time it will open and operate in the same logic. The distribution conveyor stops in a few minutes after the feed conveyor stops, depending on the number of lines.



2Green House

The greenhouse system is always designed based on the needs and options of the customer. We provide flexibility and support from design to commissioning.

A The Base

The base of the green house may be constructed as RCC or it may be asphalt pavement. The floor needs to be as flat as possible for the proper operation of the whole system. In between the lines, a wall of 0.85 meters has to be built. It may be as a brick wall or any other material which will withstand the load of the sludge and be resistant to humid conditions.

The column bases will be placed flat on the base of the greenhouse

B Steel Construction

The steel construction is designed taking in consideration the location conditions. It will be a light duty steel construction with a railing system attached to it. The construction is made out of Hot-Dip Galvanized Steel. No welding will be allowed during installation after galvanizing.



c Cover

The cover may be selected by the customer as Polycarbonate plates with a light emission factor of 0.8, or tempered glass with a light emission factor of 0.9. Both alternatives have some advantages and disadvantages. Glass gives higher static load to the steel construction, whereas the polycarbonate plates have lower light emission factor.

We are at your service for the full design of a Solar Sludge Drying System suitable to your needs.



3Arrobot® 2000

ARROBOT 2000 is a mixer with a 6 axis control, which moves on a travelling bridge.

Arges Concept ARROBOT® 2000 has the following benefits:

- Sludge can be supplied at any time inside the Greenhouse
- Sludge will be spread in transversal or longitudinally direction
- No wheels or tires. Good mixing of sludge combined with recirculation and supply of air will maintain an odourless environment.
- It will reach to every part of the greenhouse with no difficulties.
- It has the buffering ability for wet and dried sludge inside the greenhouse.
- Optimal sludge height can be maintained at any time.
- Turning speed and movement speed can be set automatically for an optimal result
- ARGES @ARROBOT 2000 can be taken out from the green house in a short time to repair.
- Simple Maintenance
- All sludge touching parts are SS 304 as standard or SS 316 as per request.

► **Right + Left**

► **Back + Forward**

► **Up and Down +
Rotates on its axis**



Operation

Operation of the Arges Concept ARROBOT® 2000 is fully automatic and can easily be adapted to customer requirements. The machine has the following main operation sequences.

01 Load

The sludge is taken into the greenhouse by the distribution conveyor.

02 Spread

The sludge is spread uniformly on the whole area of the greenhouse. The height of the sludge is controlled automatically.

03 Mix and Dry

Once the sludge is spread, the mixer ARROBOT 2000 begins mixing the sludge. The recirculation fans begin operating. Each volume of sludge is mixed 9 times per day.

04 Unload

Once the drying sequence is completed, a pre-determined quantity of sludge is conveyed to the unloading conveyor. If the dried sludge needs to be kept inside the greenhouse, a pre-determined area near the discharge conveyor can be used for this purpose.



4 Inlet/Exhaust & Recirculation Fans

The greenhouse is designed with inlet/exhaust and recirculation fans. Inlet fans controls the air temperature and pressure inside the greenhouse. The maximum temperature inside the green house will not exceed 76°C. Above this temperature, inlet fans operate and take the cool air from outside to inside. There is always a positive pressure inside the greenhouse so that no ambient air will flow into the greenhouse. Consequently, if there is any leak from the positively pressured system it will egress into the surrounding environment. Furthermore, under these conditions, outside contaminants (particles, viruses, bacteria) are kept out and the odour gradually dissipates.

Inside the greenhouse the drying process is not only dependent on solar radiation, but the wind effect as well, which is maintained inside the greenhouse through the several recirculating fans. When there is an excess wind velocity, the exhaust fans operate and regulate the inner pressure so that the ceiling will not be affected.

Recirculation fans operate based on the humidity measured inside as well. When it reaches a pre-determined level the exhaust fans together with the inlet fans operate and regulate the humidity inside.



5 Sludge Unloading

There are alternative ways for the sludge to be discharged from the greenhouse.

A Unloading Conveyors

The dried sludge in the greenhouse will be transported automatically to the discharge conveyor. Discharge conveyor will convey the dried sludge on to the truck loading conveyor. The sludge can also be collected in a container.

If the transportation is delayed, the dried sludge will be buffered up to a height of 90 cm close to the discharge conveyor.

B By a Loader

For specific projects, a loader may also be used to unload the dried sludge. However, if it is done so, all confined area will be opened to ambient climate conditions and there will be a lot of heat loss from the system.



6 Exhaust Air Treatment

If the odour is an essential issue, then the Odour Treatment Unit can be connected to exhaust fans to treat the bed smells that may result during operation.

Arges Concept can help you find the best solutions to your project.

Technical Description

ARROBOT consists of the following mechanical components:

- Gantry crane
- Turning Device
- Angular /up-down movement

Gantry Bridge

The Gantry Bridge is manufactured as a welded construction.

The Gantry Bridge is re-positioning itself automatically to cover the entire length of the greenhouse.

Drive speed	-1,0 to +1,0 m/s, continuously adjustable
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Frequency converter controlled

Bracing of the bridge	4 guiding rolls
Drive performance carriage motors	2 x 0,75kW
Power Transmission	2 Driven, 2 idle Steel Wheel
Axle distance of propelled rolls	1500 mm minimum (Counter weighted)

Rails

The rails for the bridge can either be mounted the concrete wall or can be hanged on the green house steel columns.

The rails are fixed with a removable screw connection. All rail parts are hot-dipped galvanized.

Turning Device

The complete turning device is made of stainless steel as standard SS 1.4301. Other type of material may be used on demand.

Drive speed of turning axle	from -30 to + 30 rev/min
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Frequency converter controlled

Diameter of the turning tools	800 mm
Working width of turning device	2 000 mm
Drive performance motor turning tools	5,5 kW, chain drive
Material of complete turning device	Stainless steel (1.4301)
Angular movement of the turning device	-35° to + 35°

The turning tools can be adapted to suit the sludge properties even if it has a DS content as low as 15%. The transversal movement of the sludge is done by the movement of the turning device using an integrated side shield.

Transversal Trolley

Continuous positioning of the trolley over the complete drying chamber width.

Driving speed of transversal trolley	from -0,2 to +0,2 m/s
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Frequency converter controlled

Drive performance motor	1,1 kW, gear drive
Drive Unit	Through 4 rollers 2 driven, 2 idle

Angular/Up and Down Movement

Continuous height adjustment of the turning device

Height of turning device over ground	800 to 1170 mm
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Frequency converter controlled

Drive performance of lifting motor	1,1 kW
Power transmission	gear drive
Guidance	2 Heavy duty Bearings

Height measurement

An ultrasonic sensor is measuring the sludge height continuously and produces a floor level map of the whole drying area. This ensures that the turning device is adjusting its working level to the specific sludge surface and height, so that the sludge is always mixed and there are no untreated layers left.

The filling height of sludge is measured and mapped over the whole drying area continuously with 2 ultrasonic sensors.



Materials

Gantry Bridge and carriage	S 235 JR, painted
Turning device with axle and tools	Stainless steel (1.4301)
Transversal trolley	S 235 JR, painted
Running surface of Bridge	S 355 JR, painted
Rails	S 235 JR

Electrical Components

Power supply and data transmission:

System operates automatically via SCADA system. It has 4 main selection step

- 1. Loading
- 2. Spreading in the chamber
- 3. Mixing
- 4. Unloading

Each step could be operated separately or in sequence as planned. A touch panel control inside the drying chamber is located for manual operation of the system.

The system can also be operated manually from the main control panel.

All drive groups are supplied with motor protection switches and each motor can be operated manually.

Connection to central drying plant control is achieved via Profibus DP.

Switch Board is located outside the drying chamber in a container. The container is equipped with CCTV.



Inlet, Exhaust and Recirculation Fans

Each Drying chamber is equipped with inlet, exhaust and ventilation fans. Fans are designed as to give maximum speed and air circulation efficiency.

Fans are equipped with VFC and operated depending on the data collected by the Meteorological unit.

Fan Technical Data

Powerconsumption	0,75 Kw
Capacity	20.000m ³ /h

Meteorological Station

The exhaust fans inside the drying chamber are controlled from a central meteorological control unit.

The Meteorological Station continuously measures;

Air temperature inside and outside

Air Relative Humidity inside and outside

Solar Radiation

Wind speed

In order to keep operating at maximum efficiency, all fans are controlled according to the climatic conditions and adjusted accordingly.

An integrated security system ensures the stop of the whole system as soon as one of the doors is opened.

A confirmation is required to re operate the system.



Always a clean environment and a sustainable life...

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