

## Sludge Treatment System Proposal

Project Entity	Fort Bragg
Project Description	Domestic Wastewater Sludge Drying
Project System	Low Temp Dehumidification Solids Treatment System
System Sludge Inlet	28,600 Gallons a day at 1.5% solids dewatered to 15% solids.
System Outlet Sludge	Approximately 2.3 Tons of dried solids per 24 hour day.
Project Designer	USA Sludge
Date	12/28/2020



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USA Sludge is a High-Tech Enterprise devoted to dehumidification heat pump sludge drying.

This new line of dehumidification heat pump sludge dryers are the most advance sludge drying machines in the world.

USA Sludge has broken through the difficulties and the high costs associated with traditional gas drying equipment by implementation of a fin-type regenerative cycle with advance slitting, combined with double and triple effect heat pump cycling which dramatically lowers the cost of sludge drying by reusing the heat that would normally be discarded in a traditional sludge drying system.

This high-tech drying system has a small foot print, effectively treats many different kinds of sludge, requires no odor control equipment and doesn't require an fossil fuel emissions permit.



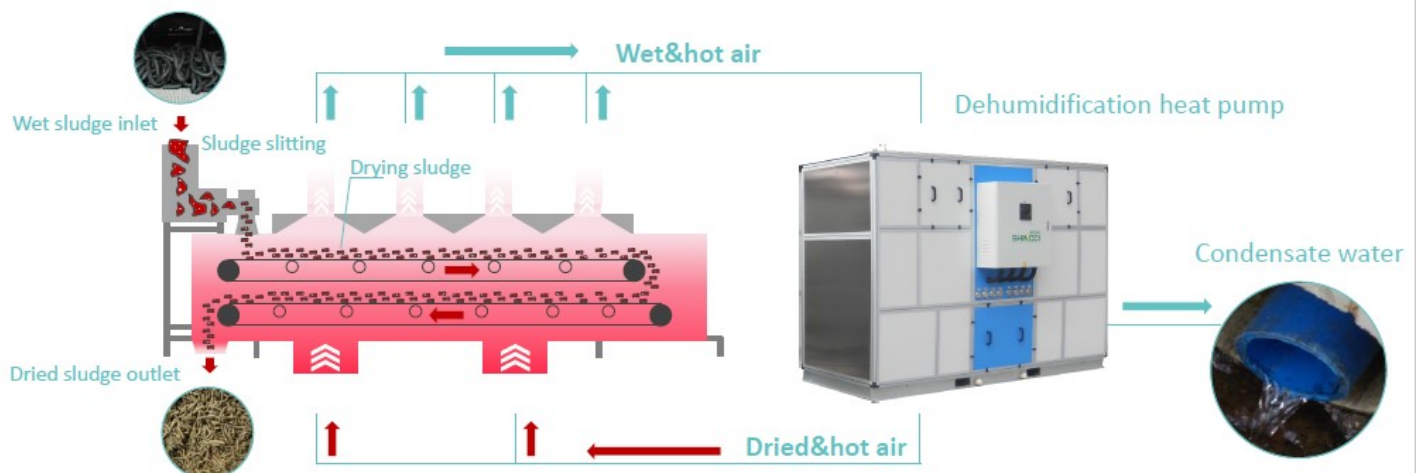
## Dryer Overview

Below is a schematic of the USA Sludge Dryer. The dehumidification heat pump dries the wet sludge to dried Class A Fertilizer. The hot air and the condensate water are captured within the system.

There are no odor issues when using this closed cabinet drying system. The heat transferred from the compressor and fan motor is dissipated using a fan coil unit. The condensate water is captured and can be reused or recycled to the headworks of the treatment facility.

The dehumidification heat pump used in the proposed USA Sludge dryer utilizes the refrigeration principal to cool and dehumidify hot wet air. Through the heat pump principal, the heat pump recycles the latent heat released from steam congealing to water liquid. A dehumidification heat pump is equal to the dehumidification process (moisture removal or moisture dehumidifying) plus a heat pump process (energy recycling). A dehumidification heat pump can internally collect all the latent heat and sensible heat during air exhaust, bringing no waste heat to the outside.

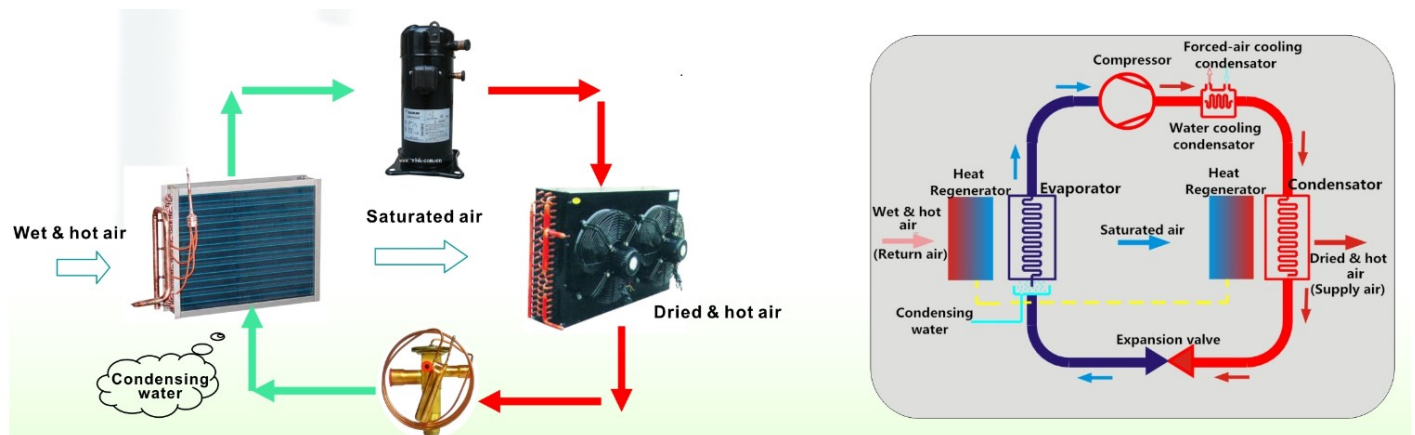
The evaporation of sludge moisture absorbs latent heat; and the condensation of the generated vapor on the heat pump cycle releases latent heat. The evaporation process absorbs the same quantity of latent heat that the condensation process produces, according to the laws of thermodynamics and the law of conservation of energy. As a result, the drying process does not require additional heat capacity, resulting in the reduction of energy costs. The energy consumed during the process is only the electricity needed to operate the compressors and the air handlers.



Material used in construction is anti-corrosive 304 stainless steel while the heat exchanger surface is specifically electroplated with an anti-corrosion material which extends the service life. The service life of the dryer is 20 years since there's no mechanical wear and tear during operation.

Triple effect and quadruple effect patented dehumidification technology can effectively maintain the air humidity lower than 10% which enables high drying efficiency and saves electrical consumption. The Independent layered blower system can satisfy the requirement of high-speed dehydration which shortens the period of low temperature drying. Modularized structure design enables high regulating capacity and easy installation. Conveyance motors and outlet conveyor have a frequency converter and infinitely variable speed enables regulated dried sludge moisture of between 10 and 50%

This heat pump system is designed to recycle the heat and reuse it in a closed cabinet dryer. One kilowatt hour is capable of drying 4 kg of H<sub>2</sub>O. With a quadruple affect heat pump, electricity consumption of the dryer for 1 metric ton of sludge from 80% moisture to 10% moisture is 180 kilowatt hours . Electricity consumption of drying one metric ton of sludge from 80% moisture to 60% moisture is 118 kilowatt hours





## Product Specification

Model USA TSD 400E Sludge Drying System

Model	USA TSD 400E
Dehumidification Capacity Kg/Hr	400
Max Dehumidification Capacity T/24	9.6
Electric Consumed	104 kWh
Length	36feet (Required 46ft) Does Not included Conveyor
Width	8.5 feet (Required 20ft) Does Not include Conveyor
Height	9.1 feet (Required 16ft)
Weight (Full)	24,000 lbs.
Dehumidification Heat Pump Module	2 sets
Number of Compressors	16
Cooling Method	Forced Air
Refrigerant	R-134a
Power Supply	480 Volt 3PH 60Hz
Drying Temperature	118 - 132F (Recycle Air) / 148 - 176F (Supply Air)
Control System	Touch Screen + PLC Programmable Control System
Outlet Sludge	75% Solids

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## Operating Cost Heat Pump

Electrical consumption to dry to 75% solids

Energy consumption of low temperature heat pump drying system  
(dry from 15% to 75% solids)

1. Per hour electricity consumption: 104 kWhs
2. Daily electricity consumption: 2496 kWhs

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## Water

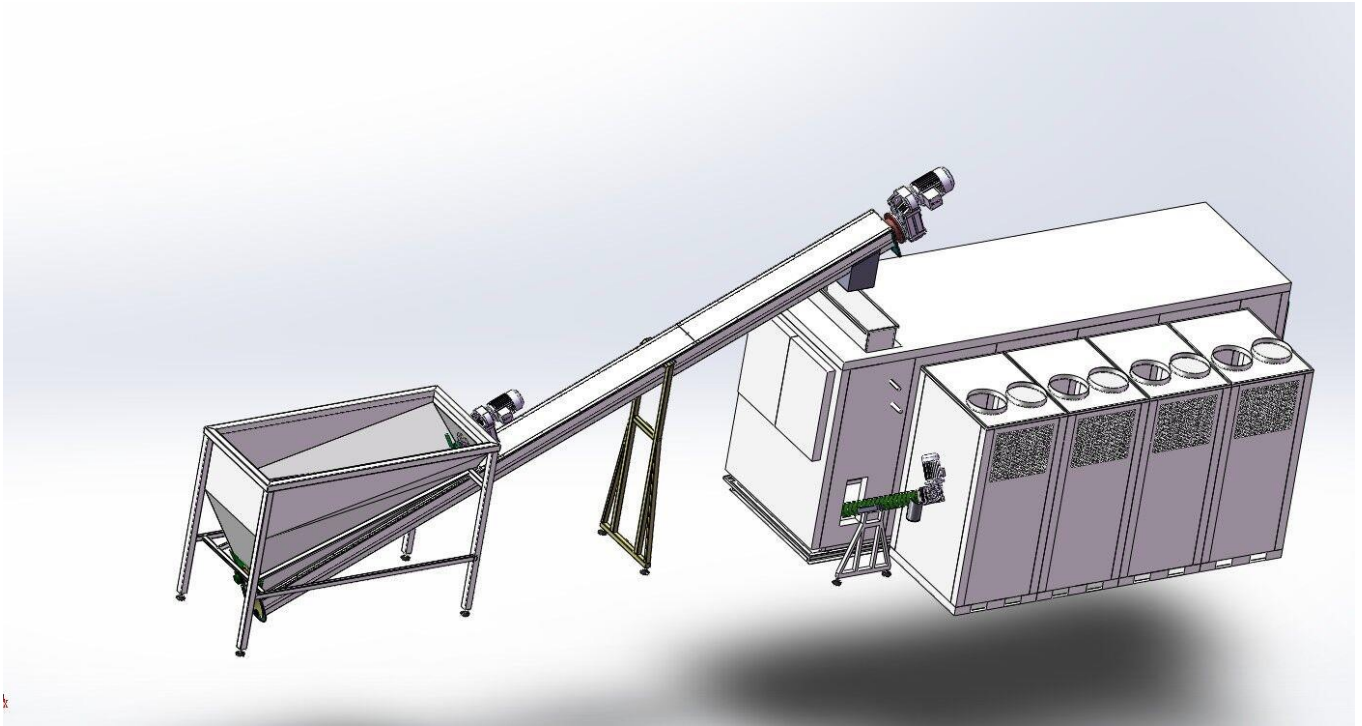
System will condensate 105 gallons of water an hour or 2,520 Gallons a day.

## Labor

The machine can operate unattended but pellet storage needs to be managed and the machine should be checked every hour. Filters need to be cleaned once a week and replaced every 90 days. Condensing coils need to be cleaned every 6 months and overall inspection once a year. Slitter combs need to be replaced once a year.

System Cost Heat Pump Dryer	\$499,800.
Inlet Conveyor 304 SS	\$40,000.
<b>Total Project Cost</b>	<b>\$539,800.</b>

## Feed Hopper Inlet Conveyor





Belt Conveyor Pulled from Container



Second Forklift placed underneath Belt Conveyor



Truck drives away and Belt Conveyor transferred to forklift



Heat Pump Unit removed from Container



Belt Conveyor placed in Building





Compressors



Evaporators



Belt Section



## Touch Screen



Sludge From  
Centrifuge

Sludge After  
Drying





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### **Delivery:**

The unit will take 140 days from date of order to be delivered to your facility...Hopefully earlier.

### **Warranty:**

5-year guarantee. USA Sludge Guarantee's Class A quality dried biosolids per the EPA 503 standards provided the sludge does not have "forever chemicals in the sludge.

### **Installation:**

USA Sludge will have one engineer to help commission the unit. Commissioning will last no longer than 30 days. A Rigging company must be supplied to help install the unit.

#### Connections:

Plumbing connects 1" from the machine need to be completed by outside plumbing contractor.

Electrical connects to the machine need to be performed by outside electrical contractor.

A 200 Amp 480 3 Phase Disconnect.

A slab will need to be poured for the unit.