

Instructions for Demonstration Equipment

Please read thoroughly and understand the instructions below and explain to the customers of operating principles of the demonstration equipment. This will prevent any misunderstanding on the customers' part and make them realize importance of the demonstration equipment.

FIVE (5) MUST in operation of the demonstration equipment.

1. The demo equipment can run most of organic sludge. However the following rules must be observed.

| Good sludge | Possible sludge | Very difficult sludge | Sludge to be avoided at all cost |
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| <ul style="list-style-type: none"> ① Less than 80% organic content ② Electrical conductivity between 3,000 and 8,000μs ③ Low to medium viscosity ④ Less than 80% moisture content ⑤ With good cohesion and flock formation after first-stage dewatering | <ul style="list-style-type: none"> ① More than 20% organic content ② Electrical conductivity between 8,000 and 12,000μs ③ Mid to high viscosity ④ Less than 85% moisture content ⑤ With some of the cell membranes destroyed after being cured by time lapse following first-stage dewatering | <ul style="list-style-type: none"> ① Less than 10% organic content with no conductivity ② Inorganic sludge such as stones, calcium, soil and dirt ③ Super pure water purification plant sludge ④ Electrical conductivity over 12,000μs ⑤ Ocean or seafood sludge with high salt content ⑥ Super high viscosity or super fine sludge ⑦ Over 90% moisture content | <ul style="list-style-type: none"> ① Metal sludge ② Metallic sludge containing copper, lead or iron ③ Electrical conductivity over 15,000μs ④ Food sludge containing animal some bones (of chicken, pig, cow, goat, lamb, etc.) |

※ NEVER use sludge containing metal, stone power, cement, soil, steel, copper, flammable material, kerosene, explosive chemical, high oil content or food (various animal, fish bones and lumpy leftovers).

2. The demo equipment is intended to prove relationship between sludge moisture content (dryness), throughput, electrical power consumption and weight reduction by inputting the sludge manually, and thus should not be run with automatic input. Automation can be achieved by designing such auxiliary devices as sludge feed device, sludge distribution device, sludge thickness controller, filter cloth, scraper, etc. according to

the result of thorough analysis of quality of the sludge.

3.Restrictions on throughput and electrical power consumption of demo equipment must be observed. Otherwise serious damage to the unit may occur due to overload.

4.First thoroughly check power input unit, washing water supply unit, air supply unit, discharge plumbing, fume extraction hood, conveyor belt, SFD (Sludge Feeding Distributor) and SSD (Sludge Supply Device) before running the demo unit. Warm up the unit for at least 30 minutes. The main drum and all other internal components must be thoroughly wet through washing. The filter cloth must be clean.

5.Thoroughly clean inside and outside of the demo unit before finishing the demo operation so that there is no leftover sludge in the unit. Any leftover sludge will solidify into sludge cake and can cause serious damage to the unit at the next operation. **Please thoroughly clean always the unit after work.**

Basic knowledge of DEMO unit operation: SFD(Sludge Feeding Distributor) and SSD (Sludge supply Device)



- SLUDGE:** There are over 30,000 different types of sludge characteristic in the world. Among them, 80% are Organic characteristics, **ELODE can take most of the organic sludge** - the better sludge quality the higher dewatering rate and the less electrical energy consumption. The best sludge is from right after first stage dewatering with cell water formation. However it is not uncommon to notice there is no conductivity due to natural curing through time lapse after the first stage dewatering or destruction of cell water. In such case you will need to raise dewatering rate thru other appropriate process after analyzing quality of the sludge.



High Organic & Viscosity sludge

- SSD (Sludge Supply Device):** The conveyor type SSD supplied by ELODE is for general organic sludge with low viscosity and above medium density. This is intended to automatically feed organic sludge with no viscosity that does not stick to the screw. If you use highly organic or sticky sludge, you will notice that the sludge sticks to the screw and does not feed at all. If you would like to opt for automatic sludge supply device, you will need to decide what type of supply device to use after studying stickiness and organic content of the sludge..



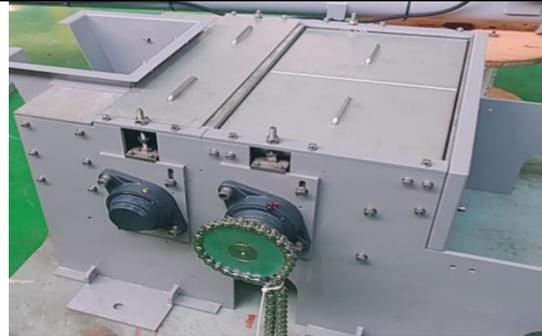
Feed small amount of sludge by manually

- If the sludge is not in a good shape or difficult to feed with automatic supply device, climb on to top of the unit and feed small amount of sludge at the center line manually by watching the sludge and gradually increasing the feed depending on the result. Never feed large amount of sludge or violate the prescribed throughput as it may cause serious damage to the unit. Use care in handling the unit and wash it thoroughly with water inside and out after use to prevent any problem in subsequent operations.



<https://pumps.netzsch.com/zh/>

Mono pump automatic sludge supply device: If you would like to automatically feed highly organic or sticky sludge, Netzsch sludge pump from Germany is recommended. You can find distributors close to you by clicking the homepage. They will select and install appropriate mono pump if you show quality of your sludge.



LO-SFD (Low Organic/Viscosity Sludge Feeding Distributor): ELODE supplies two types of sludge feeding distributors. The one on the left is low viscosity distributor. This device is being used in most of normal waste water sludge application.



HO-SFD (High Organic/Viscosity Sludge Feeding Distributor): This device is being used for high viscosity or fine sludge. Built-in inverter controls speed of rotor depending on viscosity and fineness of the sludge. Min. 0 to max. 60 cycles can be controlled on the PLC panel. Please check if direction of the rotor is correct.

※ **If there is a customer requesting sludge testing:** Be sure to review the RFQ written in advance beforehand. Customers who did not submit the RFQ will not be allowed to test sludge under any circumstances.

※ **When the sludge is delivered and tested at the self-operating site:** Slurry is fast to decay. When corruption begins, the FLOC formed will be destroyed, resulting in a large difference in dehydration rate. Thus, should be packaged well with ICE-Packing to avoid corruption as

much as possible and should be tested within 24 hours.

※ **When you receive sludge**, Before receiving the sludge, it is necessary to grasp the sludge property in advance by receiving the faithfully prepared RFQ. **Do not test in any case if not suitable sludge for ELODE.**

■ Instruments and tools need for demo unit operation

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|--|---|--|--|
|  |  |  |  <ul style="list-style-type: none">• Infrared thermometer: Measures temperature of drum, CAKE being discharged and the PLC. |
| <p>Conductivity meter: Measure conductivity after putting polymer in the sludge before first stage dewatering. Measure and compare with conductivity of liquid collected at discharge plumbing from second stage dewatering by ELODE.</p> | <p>Moisture content meter: Measure at least five times moisture content of samples collected from the bottom and deep in the middle of sludge before putting in ELODE. Measure the same way and compare with after dewatering by ELODE</p> | <p>Scale: Measure 10kg on the scale before dewatering and measure the same after dewatering by ELODE.</p> | <ul style="list-style-type: none">• Disposable vinyl gloves: Useful in handling sludge.• Trowel: Useful in feeding sludge manually.• Camera: Record dewatering process for report to the customer |

■ Formula

1. Dewatering ratio formula:

First measure moisture content of input and output.

Q: If moisture content of the input before ELODE is 80% (=20% DS) and the same after dewatering by ELODE is 60% (=40% DS), and throughput is 300kg/hour how much dewatering has been made?

A: Dewatering = DS before input / DS after output. $300\text{kg} \times 20/40 = 150\text{kg}$. Therefore, 50% weight reduction has been achieved and 150 liters of water has been extracted.

2. Electrical power consumption:

Calculate dewatered amount first and check average power consumption at the PLC panel. If 60kW has been consumed, $60\text{kW}/150$ liters = 0.4kW/liter extracted. In other words, only 0.40kW of energy has been used to remove (dewater) 1 liter of water.

Important note: Typical drier consumes 0.98 - 1.1kW/liter. ELODE is very economical as it dewateres with only 1/3 of the energy.

3. Speed of Drum and throughput:

1) Average speed of drum is 1.2 meter per minute and diameter of the drum is 752mm. Circumference of the drum is 2,361mm. Contact area where sludge touches the drum is $\frac{3}{4}$ or 75% of the circumference and therefore is 1,770mm. Speed of the belt is 200mm/sec and thus it takes 1 minute and 28 seconds from the time electro osmosis dewatering of sludge starts at the drum and until it comes out.

2) Time it takes from initiation of electro osmosis to complete energization is only 45 to 60 seconds. Optimal thickness of sludge is min.

4mm to max. 8mm depending on the quality of the sludge. Even 4mm can be too thick for sludge with worst quality while sludge with best quality can be fed with 8mm thickness. All the data has been prepared based on the case of using general organic wastewater sludge with good quality and feeding it as 8mm thickness. Throughput of each model is as below.

| MODEL | Max. throughput (min. throughput is with 4mm-thick input)/time | Min. throughput | <p>When moisture content of input sludge is increased by 1%, throughput decreases by average of 3%. Please consult with the customer with result obtained from thorough testing on the demo unit as there are great variations in organic content, conductivity, sludge particle and viscosity.</p> <p>The reason utilizing the DEMO unit is to prove and guarantee what ELODE can do for the customer. It was never meant to run any type of sludge!</p> |
|-----------|--|-----------------|---|
| EOD-500S | 8mmT*1.2*60*450mmW(Max.Belt width) = About 260kg | About 130kg | |
| EOD-1000S | 8mmT*1.2*60*900mmW(Max.Belt width) = About 518kg | About 259kg | |
| EOD-2000S | 8mmT*1.2*60*1800mmW(Max.Belt width) = About 1036kg | About 518kg | |
| EOD-3000S | 8mmT*1.2*60*2800mmW(Max.Belt width) = About 1612kg | About 806kg | |

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