Electro-Osmotic Dehydrator

ELODE®

Electro-Osmosis Dehydrator ELODE®

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ELODE® Phase Electro-Osmosis Dehydration Equipment

Question & Answer

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1. ELODE & WORKING PRINCIPLE

1.1. What is ELODE and how does ELODE perform the dewatering process?

Ans. ELDOE is highly efficient sludge dehydration equipment using the principle of electrophoresis and electro-osmosis. ELODE consists of three basic components, they are sludge conveying belt, anode drum and cathode caterpillar.

[First, the sludge cake generated from mechanical dehydration process, such as belt press, filter press etc is loaded onto the sludge-conveying belt of ELODE. The electro-osmosis dehydration process begin when the sludge pass through the electrodes (anode drum and cathode caterpillar). The electric field between the electrodes pushes the moisture out from the cathode caterpillar by means of the process of electrophoresis, electro-osmosis, and capillary pressure and finally destroys the cell membranes of the bonded moisture of sludge.]

1.2. What is the minimum ratio of moisture level (dehydration ratio) and the percentage of reduction in cake weight can be achieved by ELODE?

Ans. The minimum ratio of moisture can be achieved by ELODE depends on characteristic of sludge. For example, minimum moisture ratio for Industrial wastewater sludge is 70~40ds% and municipal wastewater is 60~40 ds%. The reduction in cake weight is at least 50%.

1.3. What average temperature of the final Cake and Temperature is different depends on sludge property?

Ans. Dehydration of ELODE is available by Electro-osmosis. Electricity comes into sludge and the heat comes out of it. The temperature will be 40℃~60℃ and No big difference dehydrated temperature in any sludge property. The reason of Sludge heats that Sludge resists electricity because the electricity is conveyed through anode and cathode in ELODE. So, the heat emits and the temperature of drum rise between 60℃ to 80℃ at same time, the heat helps the very small amount of dehydration.

1.4. What's the dehydrating ratio by mechanical pressure?

Ans. Dewatering of ELODE is not attained dehydration by mechanical method. If input sludge without electrical energy, Cake is discharged without dehydration made.

1.5. Does ELODE encounters any problem during the dehydration process with high sludge property such as steel or other magnetic material, which has property of high conductivity and resistance to magnetic field?

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Ans. when the electric transmits 2000~6000 ㎲ of Organic or Inorganic Sludge, the work is done very smoothly as a result of experiment. **But New ELODE can be guaranteed over 6000 ㎲ or less 15,000 ㎲, (Old model ELODE could not withstand over 7,000 ㎲ that gave serious damage to Main Drum and Belt filter cloth)**

1.6. Why the dehydration ratio has no much improvement when the treated sludge cake from first stage (mechanical) dehydration machine is further dehydrated again by another mechanical dehydration machine?

Ans. The mechanical dehydrating methods by applying high pressure and using large amounts of coagulation and flocculation polymers, can only extract the free water contained in the liquid sludge, it can not extracts the water which is physically and chemically firmly bound to the solid molecules. Therefore, the dehydration ratio will not have significant improvement regardless of multiple dehydration process by the conventional mechanical dehydration machine.

1.7. Does the electro-osmosis process cause odor?

Ans. Yes, depending on the sludge nature, there would be some occasion of heavy smell. The odor comes from steam generated during the dehydration process. There is hood facilities option to pipe out to concentration tank.

1.8. What is the material and painting specification of the ELODE machine?

Ans. All metal parts of main Body are made of stainless steel 304/316 and some other parts are made of carbon steel with double epoxy coated with urethane paint for long durability and high protection against corrosion. The machine frame is also coated with high corrosion resistance urethane paint. Some special frame option is also available.

1.9. What are the differences between SELO & BELO ?

Ans. SELO (Single ELODE)

An electro-osmosis dehydrator specially designed for second stage of dehydration. Generally, SELO is installed after the mechanical dewatering machine such as belt press, gravity press, decanter etc. The input sludge must pre-dewater to or below 95wt%(=5%ss) by other method of dehydration first before loading to SELO for second stage dehydration.

BELO (Belt-Press Built-in ELODE)

A COMPLETE dehydrator combines mechanical 4~6 stage Roller belt-press dehydrator for first stage of dehydration and SELO for the second stage of dehydration using highly efficient electro-osmosis dehydration to reduce the moisture level to or below 60wt%.

1.10. What condition of sludge cake will give best electro-osmosis dehydration result?

Ans. The following condition will give best electro-osmosis dehydration result,

- Conductive of sludge cake at approximate 2000 ㎲ - 6000 ㎲.
- Dry Solid % from 1st Dewatered Cake of Conventional Machine Less 30%DS(Over 70%wt)

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- Solid Suspended % of 1st Input Sludge after polymer mixing Less 5%SS
- Organic Sludge should be mixed 50% Over.(As well as High %)

1.11. What are the safety features of ELODE?

Ans. ELODE come with the following standard safety features?

- Motor overload detector.
- Water level sensor.
- Conveyor overload detector
- Sludge capacity overload detector
- LCD PLC Auto control system
- Over-current device
- Emergency stop
- No spark, No static electricity
- Designed by CE, ISO certificate

1.12. Does ELODE come with AUTO mode?

Ans. Yes. AUTO mode is a standard feature of ELODE. In the even of emergency occurred during the AUTO mode, the machine will stop automatically and the emergency alarm will activate.

1.13. Does ELODE come with REMOTE control mode, such as control from the central control room?

Ans. Yes. ELODE is controlled by Programmable Logic Controller (PLC-Standard program is "Schneider or LG", "Siemens is Option") and this will enable ELODE to integrate or handshake with external controller easily.

1.14. What is the life span of ELODE machine?

Ans. Basically, The life span of ELODE machine is 5 years (20,000hours) at minimum, based on 12 hours per day. But each parts of life span and warranty time is different. Please refer to "Warranty time for replacement" section.

1.15. We have an Old dehydration equipment such as Belt Press, Decanter, Filter Press, Screw Press, Gravity dehydrator or Vacuum press that become moisture content 90% higher at this moment. In this case, Can we use with ELODE without remove away the existing equipment?

Ans. Please do not remove away your existing dehydrators, any kinds of equipments. Single-ELODE (Model SELO) establishes coupling on back side of all dehydration equipments such as Filter Press, Decanter, Belt Press or others. Of course high dehydration is possible..

1.16. What is the average sludge dewatering cost in term of weight? What are the electrical consumption and the capacity of cake treatment?

Ans. Take an example based on dewatering of municipal sludge in Korea, the average unit cost required for sludge dewatering by ELODE is less than USD8.00/MT and electricity consumption of 50~90V DC, 300~3000A depending on the type and treat capacity of sludge.

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The following table shows the electric consumption and capacity of cake treatment by ELODE.

MODEL	Electric consumption (kW.h)	Capacity of Cake treatment (MT/hr)	
*SELO-500 is Pilot Only		In case 98% Moisture contents(BELO only)	In case 85% Moisture contents (SELO)
ELODE-500	30~60	1.80	0.25
ELODE-1000	50~100	3.90	0.52
ELODE-2000	80~150	7.80	1.04
ELODE-3000	130~220	11.70	1.56

1.17. Circumstances of voltage and current are different for each country. Isn't there any problem about electric power error extent that can coincide to all conditions in this case?

Ans. Basically, there is no problem if Electricity of that problem is not happened running motor.

1.18. Can ELODE integrated into the existing mechanical dewatering machine such as belt press, screw press, gravity dehydrator or vacuum press, which have final cake of approximate more than 80 wt%?

Ans. Yes. The Single-ELODE (Model : SELO) is specially designed to reduce the sludge cake to as low as 50 wt% - 65%. It can be easily install at the unloading site of the first mechanical dewatering machine.

1.19. Is it necessary to add polymer to sludge before the dehydration with ELODE?

Ans. Adding of polymer depends on which stage of dehydration is to be carried out.

Case 1 - The sludge has never been dewatered before. Generally, the moisture level is above 95wt%, thus adding of polymer is necessary.

Case 2 - The sludge cake has gone through the first stage of dewatering process, therefore no adding of polymer is required.

By rule of thumb, adding of polymer is required before the sludge loading to the BELO, but not for the SELO.

1.20. Does ELODE equipped with safety devices to prevent any electrical incident?

Ans. All electrical components are properly housed under an isolated control panel or safely enclosed by cover to prevent accident. Special devices are also installed to detect and stop high current and possible occurrence of spark. Such electrical incident will only be possible during the setting up of machine for very high conductivity or very oily sludge.

1.21. Is it suitable for ELODE to operate in tropical and severe winter regions?

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Ans. The operating temperature range is 4~30℃ in the outdoors. Adequate considerations have been taken during the designing stage of ELODE. Please refer to manufacturer for operating of ELODE in the severe winter region.

1.22. Whatever dry again the Cake that is dried once, but dehydration ratio is not much difference. What is reason?

Ans. Reason of not difference moisture content that chemistry, biological or Bio-chemistry's sludge are passed cell membrane because electricity does not charged well whatever do re-dehydrates this.

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2. TERMS AND CONDITIONS

2.1. What is the delivery time of ELODE?

Ans. In general, the delivery time of ELODE is 10~12 weeks ex-works at Busan Korea factory, from receipt of official purchase order.

2.2. What is the guarantee period for ELODE machine?

Ans. The guarantee period of ELODE's representative Parts as follows. (Please refer to the 'Warranty Time for Replacement' on the catalogues for detail parts and each time)

* MAIN BODY	20,000	HOURS
1) DRUM	10,000	HOURS
2) CARBON	10,000	HOURS
3) FILTER	4,000	HOURS
4) SCRAPER	4,000	HOURS

2.3. What is the recommended model for promotion and demonstration?

Ans. We recommend DEMO, ELODE-500 models such as BELO-500 or SELO-500.

2.4. What is the special price for the above demo set?

Ans. Distributors and agents are entitled to purchase 1 set of demo equipment (SELO-500 or BELO-500) at manufacturing special price without profit, please note that it is only applicable to the above-mentioned models.

2.5. What are the inclusions and exclusions of supply for a complete set of ELODE?

Ans. ELODE comes fully assembled with functional dehydration equipment comprising the following breakdown components,

- Electrodes - 1 set of drum and 1 set of caterpillar.
- Sludge conveying system - 1 set of filter-belt, tension rollers and belt tensioning device, chain and sprocket, frame and protective covers.
- Control – control panel and wiring within the equipment.
- Washing Ass'y – filter washing system and drum cooling system.

The exclusions are site installation, running start and commissioning, engineering fee, exhaust hood, fume remover, loading and unloading conveyers, lifting equipment, ACB panel and other indirectly related items. The cost of a completed system may vary in accordance to the plant or site conditions.

2.6. Does Seller provide 'maintenance and repair' training program?

Ans. Yes. Seller provides training program in Korea for all distributors and agents only and also Duration is approximately 1 week after training is awarded a certificate. The training program includes installation, maintenance, repair and trouble-shooting.

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3. OPERATING AND MAINTENANCE

3.1. Which parts of the machine required most attention and maintenance?

Ans. Periodic preventive maintenance according to the "Operating and Maintenance" is required. Especially the carbon and caterpillar, drum and belt filter cloth require frequent checking and maintenance. Besides the periodic maintenance, keeping the ELODE clean is recommended.

3.2. What are the main consumable parts, consumables material type and estimated life cycle?

Ans. The main consumable parts are as follows:

Description	Materials	Life cycle(24hrs works)
Drum	Ti, Ir(Stainless steel+Ti)	10,000 hrs Over
Filter-Cloth	PPS	4,000 hrs Over

3.3. What is the estimate washing water required for each model of ELODE and what is recommended grade of the washing water?

Ans. General industrial water is recommended for use as the washing water. Refer to the following table for the estimated amount of washing water required for each model.

MODEL	Estimated amount washing water	
	SELO	BELO
ELODE-1000	20 ℓ/min	208 ℓ/min
ELODE-2000	32 ℓ/min	407 ℓ/min
ELODE-3000	44 ℓ/min	594 ℓ/min

3.4. What is the recommended procedure in the event of machine breakdown?

Ans. In the event of machine breakdown, refer to the trouble-shooting table of the ELODE "operating and Instruction" manual.

3.5. Please provide the periodic maintenance checklist.

Ans. The periodic checklist of ELODE as follow,

Daily Check	
Item No	Check point
1	ACB panel
2	Main control panel
3	Air pressure (5kg/cm^3)
4	Washing water pressure
5	Tension cylinder
6	High pressure washing pump
7	Cleaning Filter-cloth
8	Output water
9	Crusher
10	Conveyor driving
11	Conveyor cylinder

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Weekly Check	
Item No	Check point
1	Emergency switch
2	Meandering adjustment switch
3	Overrun Switch of Filter-cloth
4	Cover Switch
5	Meandering adjustment cylinder
6	Drum scraper
7	Filter-Cloth scraper
8	Joint-Point of Filter-Cloth
9	Joint Point of Caterpillar + Carbon
10	Tension strength of Filter-Cloth

Monthly Check	
Item No	Check point
1	Hole, Scratch or damages of Filter-Cloth
2	Carbon-damages
3	Carbon's Lead-wire
4	Carbon's Spring
5	Booth-Bar (Bus-bar)
6	Wire connection R.S.T.+,-
7	Sprocket Washing
8	Drum Water-cooling
9	Insulator of Drum Teflon

3.6. What is the machine start-up operating procedure?

Ans. The machine start-up operating procedure as follow,

1) Warming-Up (Quick Start)

a. Turn on the main air valve.

b. Check the pressure of the incoming air supply and cleaning nozzle, ~5 bar and 2 bar respectively.

Pressure Gauge	Pressure
Main(Tension)	5K(0.5K ~ 3K: Depend on sludge Character)
Cleaning Nozzle (Meandering Adjustment)	2K(3K ~ 4K)

c. Turn on the main incoming water valve, washing filter-cloth valve, drum-cooling valve, chain washing valve and CRS valve.

d. Turn on main switch at the control panel.

e. Turn on the "Power" switch at the control panel.

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f. Turn on the cam motor and the washing nozzle of filter-cloth will reciprocate from left to right.

g. Turn on the high pressure-washing pump, water will supply to the Filter-cloth washing nozzle.

h. Turn on the drive unit "SW" to start the caterpillar, drum and filter-cloth conveyor.

i. Let the machine to warm-up for 5 minute. Carry out the daily check and wash the filter-cloth at the same time

2) Drive

a. Check and ensure that the conveying belt is running within the "normal" position. In case of Single ELODE (SELO), ensure that the dehydrated cake from the existing mechanical dehydrators is ready.

b. Turn on the DC power and begin to load the sludge cake. The DC power supply will increase gradually and it takes several seconds to reach its full power.
- "Trans Power" ON – "DC supply" ON – "Conveyor" ON -

c. In case of optional Crusher-motor is installed, turn it on. Check and ensure that the treated sludge cake is within the acceptable result.

d. In case of optional odor hood is installed, turn on the blower of the odor hood to remove the steam and smell generated during the dehydration. The blower is normally installed at the outdoor. Open the damper slowly to prevent overheating and damaging of blower-motor.

3.7. Does the drum and caterpillar of ELODE need to replace periodically, and does ELODE come with the pre-alert system?

Ans. Drum (Anode) is a consumable part and it should be replaced periodically in order to maintain the high efficient dehydration. No periodically change of caterpillar (Cathode) is required, however keeping it clean is important, so that the electricity can be easily transmitted.
* A timer is installed to keep track of the drum operating time.

3.8. What is the delivery time of the Drum-Plate?

Ans. The delivery time of Drum-Plate is within 40 days from receipt of official purchase order. We recommended user to keep at least 1 set of Drum-Plate and 2 sets of filter-cloth.

3.9. Please list the special jig/tools and general tools required for repair work?

Ans. No special tools required. The following general tools are required for repair work,

- 1 set of "metric" hex wrenches.
- 1 pc of monkey / adjustable spanner.
- 1 set of straight (-) head and 1 set of phillip (+) head screwdriver.
- 1 set of "metric" combination wrench.
- 1 pc of tool box
- 1 pc of 6" nipper
- 1 pc of 6''Pincher(Side cutting plier)

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- 1 pc of Long Lose (Long nose plier)
- Spanner : 8, 21, 24, 27, 32
- Snap ring plier : Outer
- 3 jaw-bearing puller
- Lever block

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