BLUEWIN Co., Ltd.

a Family Group, EPC Turnkey company for
Sludge Dewatering, Reduction, Recycling,
Water, Wastewater, Algae Treatment,
Utility, Devices, Equipment, System.

Electro-Osmotic Dehydrator

ELODE

Electro-Osmosis Sludge Dehydrator

Advanced Solution for Sludge Treatment
35 years Field Know-how

Version 2021/Jan

ELODE : 5 Key Point

BLUEWIN Co., Ltd.
a Family Group, EPC Turnkey company for Sludge Dewatering, Reduction, Recycling, Water, Wastewater, Algae Treatment, Utility, Devices, Equipment, System.

ELODE

Remarkable Sludge Dehydrator

- **NO Competitor in the World!**

- ***10%wt (90%ds) Guarantee*** *(For most of WWTP Sludge)*
- ***0.45kWh/liter water removed*** *(Lowest Energy Consumption)*
- ***12months Recovery of Investment (Faster ROI)***
- ***World Lowest Operating Expenditure***
- ***World Lowest Capital Expenditure***

Operating Video

Click to watch ▶
"2021 ELODE Promotion Video"

FINE (주)화인 FINE Inc.
Electro-Osmotic Dehydrator
ELODE®

◀ Click to watch
"Full Operation of
BELTPRESS + FINE-ELODE"
(Old version)

What is FINE-ELODE ?

BLUEWIN Co., Ltd.
a Family Group, EPC Turnkey company for Sludge Dewatering, Reduction, Recycling, Water, Wastewater, Algae Treatment, Utility, Devices, Equipment, System.

Remarkable Dewatering system
90% Volume Cut-Down
Reborn to Renewable Energy

35 years Know-How for Sludge Dewatering

<1st Stage Dewatering>

Belt press, Centrifuge, Filter press,
Screw press, Volute press,
Other mechanical dewatering M/C

<2nd Stage Dewatering>

FINE-ELODE

What is FINE-ELODE ?

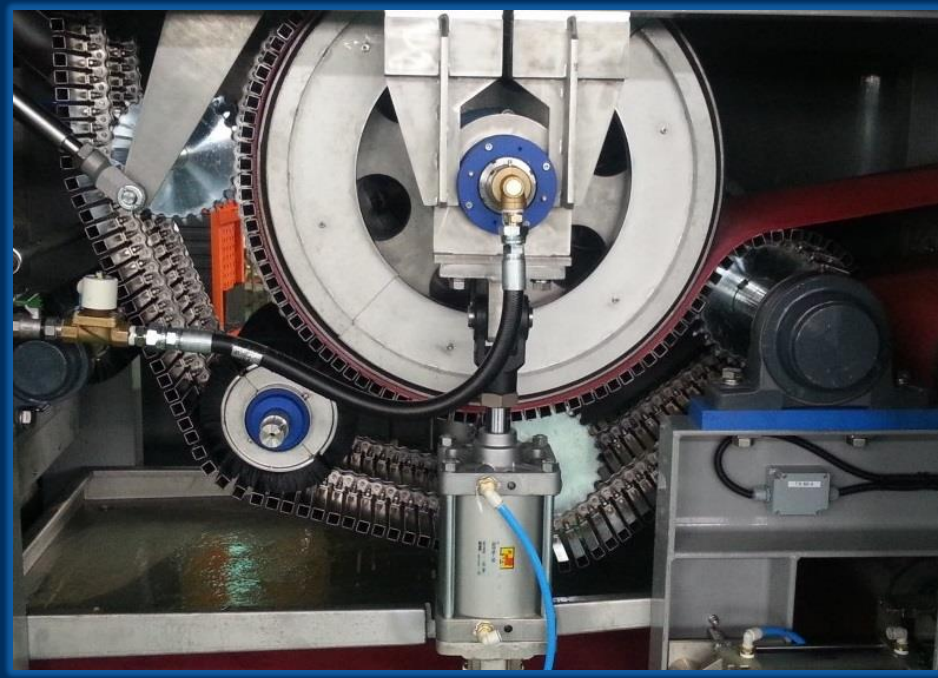
▶ FINE-ELODE = Electro Osmosis Dewatering Equipment

: The world first "Field Proven" commercialized electro-osmosis dewatering machine which treat almost all types of Organic wastewater.

▶ Sludge Types

All kinds of Organic Sludge

- Municipal Sewage
- Food & beverage
- Livestock
- Dyeing & painting
- Chemical
- Fishery
- Etc.



Why ELODE ?

ELODE provides Total solution for the deficiency of current treatment.

1. Mechanical Dewatering machine

- Only extract the free water contained in the sludge.
- Dehydration limited to Avg. 25%DS of sludge.
- Cannot extract the remaining of absorbed water.

2. Thermal Dryers

- High capital
- High energy consumption
- Lots of Utilities

ELODE

1. Extract Both Free & Absorbed water

- **90%DS** Guarantee
- Reduce Sludge weight in half

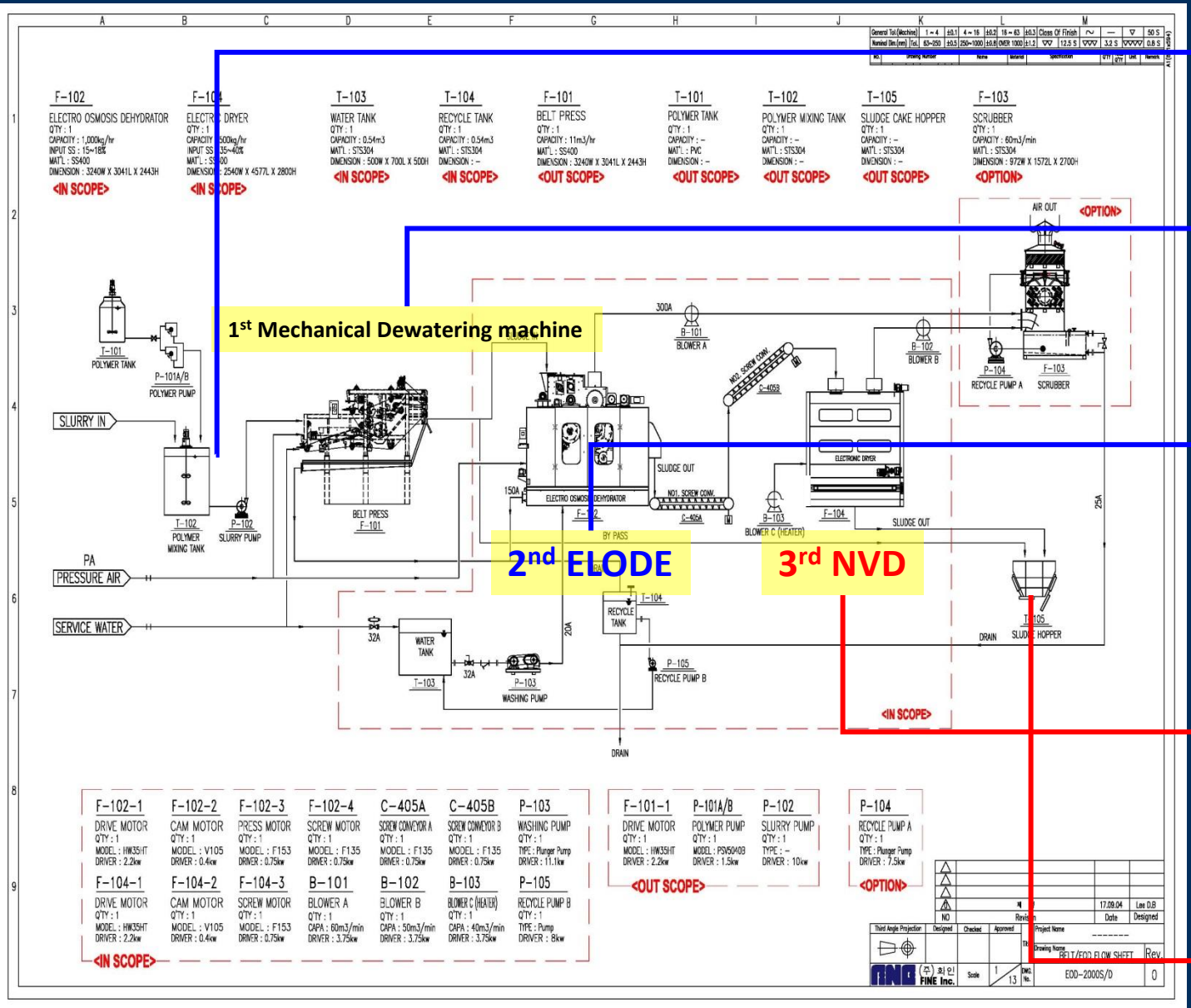
2. Low Footprint & Energy consumption

- Small Space for Full Operating Process
- **0.45kWh** removing 1L water
- Simplification of Utilities

-> **12months** ROI recovery (South Korea)

FLOW SHEET :How to get 90%ds

BLUEWIN Co., Ltd.
a Family Group, EPC Turnkey company for
Sludge Dewatering, Reduction, Recycling,
Water, Wastewater, Algae Treatment,
Utility, Devices, Equipment, System.



Input 1-5%ds

1st Dewatered by Mechanical Machine as Beltpress, Decanter, Filterpress, Screwpress

Input 15~20%ds 2nd Dewatered by ELODE

Input 40~50%ds 3rd by NVD (Natural Ventilation Dryer)

Final Output 90%ds

How ELODE works?

▶ **Combinated dehydration of ELODE + NVD achieves 20% ▶ 90%ds with only 0.45kWh.**

2nd Stage : ELODE : 20%ds ▶ 40%ds

- Electro-phoresis, osmosis and dialysis are applied to inlet sludge.
- By Electric potential difference, Cell membrane is destructed.
  ▶ In the process, 60~80°C heat is generated inside sludge.
- Absorbed water is discharged.

* Details on the next page

3rd Stage : NVD : 40%ds ▶ 90%ds

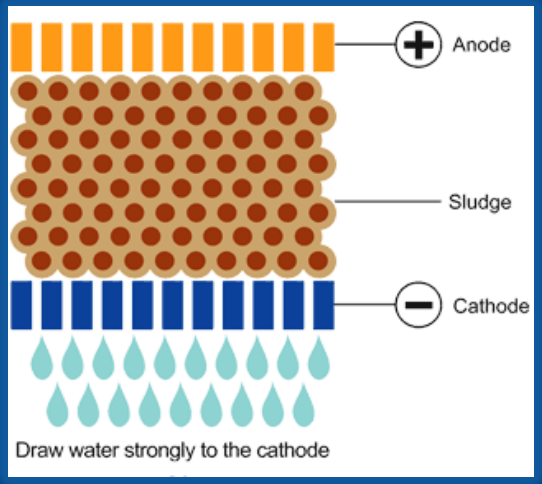
- NVD uses heat from ELODE by ventilating the sludge with natural air.
- Blower takes outside air and Electronic dryer can assist with low-energy.
- Moisture evaporates to the maximum and 90%ds Cake is achieved.

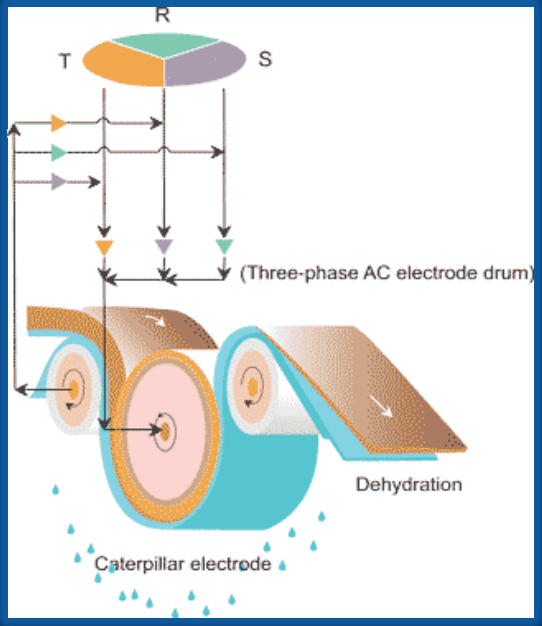
* Details after ELODE process

How ELODE works?

Dewatering Method

- Combined actions of **electrophoresis** and **electro-osmosis**
- The sludge cake first goes through bet ween the **anode Drum** and the **cathode Carbon.**
- Apply 3-phase DC voltage between the two electrodes, strongly push the sludg e particles (-) toward the anode and water (+) toward cathode.

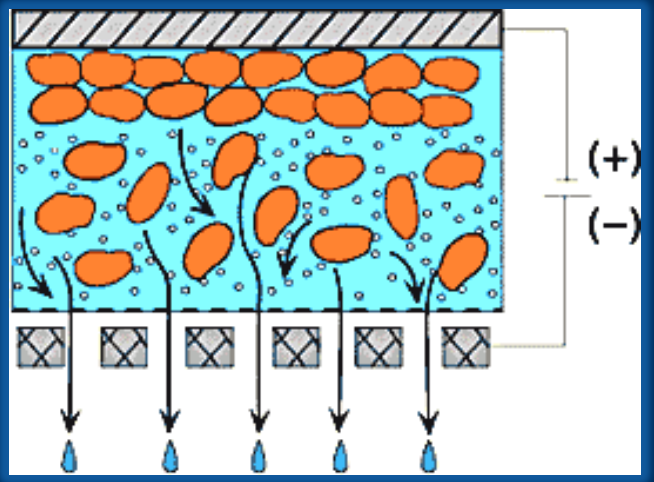




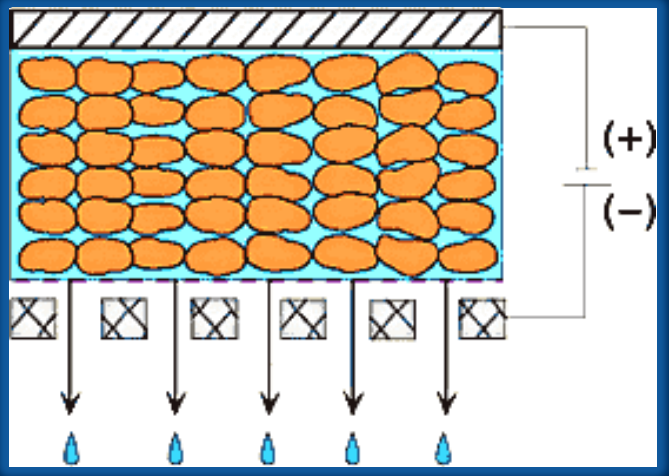
How ELODE works?

Electro-Osmosis Process FINE-ELODE

1. Early Electro-Osmosis, Electrophoresis
- Strongly push sludge particles (-) to anode (+) by an electrical potential difference



2. Intermediate Electro-Osmosis
- Dehydration through movement of water (+) to cathode (-)

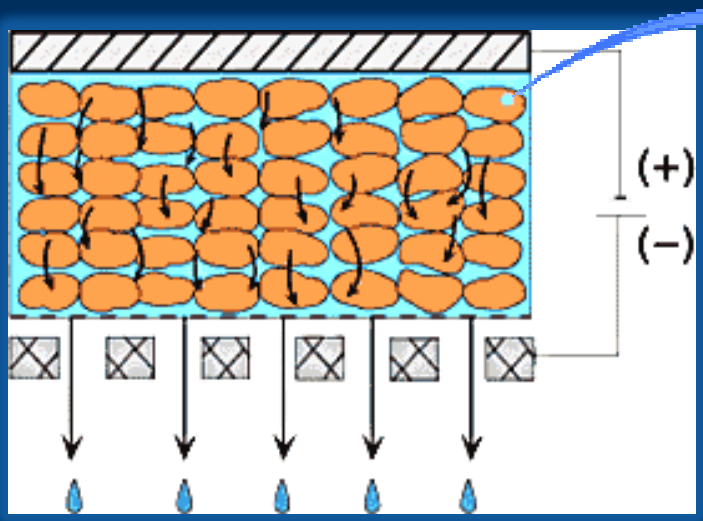


How ELODE works?

Electro-Osmosis Process FINE-ELODE

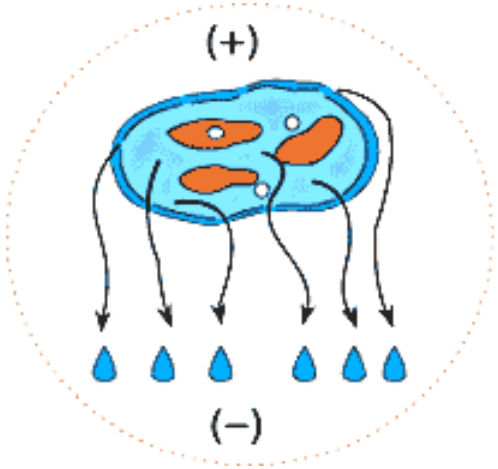
3. **Final Electro-Osmosis Capillary Pressure**

- **Force the absorbed water flow through porous solid to cathode (-)**



Destruction of Cell Membrane

- **Destruction of cell membrane discharge the absorbed water of sludge**

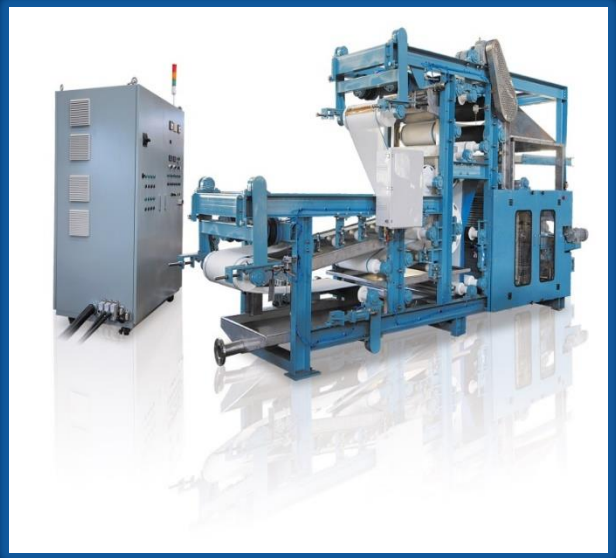


Type & Specification

EODS

SINGLE ELODE

- 2nd stage of dewatering
- Best fitted for Retrofitting to existing mechanical dewatering machine



EODB

BELT-PRESS BUILT-IN ELODE

- Integrate 1st & 2nd stage dewatering into one machine
- Best fitted for New Installation

EODS – Single type

BLUEWIN Co., Ltd.
a Family Group, EPC Turnkey company for Sludge Dewatering, Reduction, Recycling, Water, Wastewater, Algae Treatment, Utility, Devices, Equipment, System.

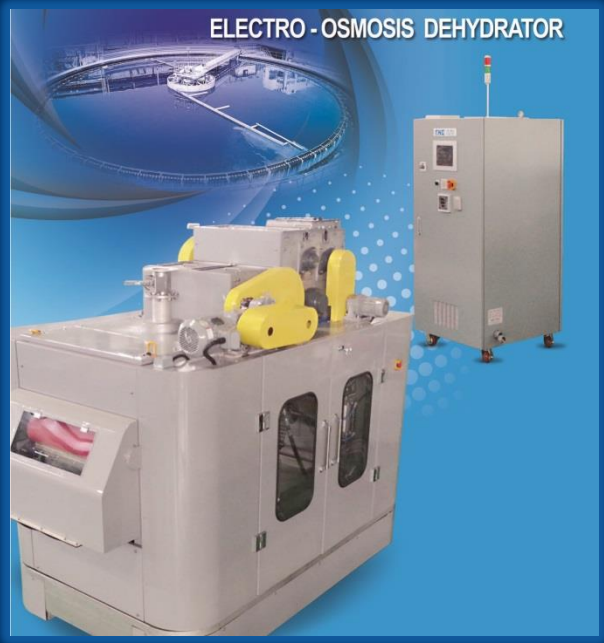
Specification

Dimension (m) L x W x H	Model	Belt Width (mm)	Throughput @20% DS (kg) Max	Energy Consumption (kw/h)
2.7 x 0.6 x 1.5	EODS-500	500	250	40~60
2.7 x 1.6 x 1.5	EODS-1000	1,000	500	80~120
2.8 x 2.6 x 1.6	EODS-2000	2,000	900	140 – 160
3.1 x 4.1 x 2.7	EODS-3000	3,000	1,250	190 – 220

Typical Examples with SELO

Dryness (% DS)	Wet Ton (Unit)	Improvement (Weight Reduction)
18% → 42%	100 → 43	57%
22% → 45%	100 → 49	51%

Note : Input sludge must be > 6% DS
: Optimal sludge condition for FINE-ELODE processing is with conductivity of 2000 μs – 8000 μs



EODB – Beltpress Built-in type

Specification

Dimension (m) L x W x H	Model	Belt Width (mm)	Throughput @1~2% DS (kg) Max	Energy Consumption (kw/h)
4.48 x 1.35 x 2.38	EODB-1000	1,000	7,800	80 – 120
4.58 x 2.56 x 2.38	EODB-2000	2,000	15,600	140 – 160
4.58 x 3.86 x 2.38	EODB-3000	3,000	23,000	190 – 220

Typical Example with BELO

Dryness (% DS)	Wet Ton (Unit)
1% → 45%	100 → 2.22

Note : Optimal sludge condition for FINE-ELODE processing is with conductivity of 2000 μs – 8000 μs

Process Sheet

BLUEWIN Co., Ltd.
a Family Group, EPC Turnkey company for Sludge Dewatering, Reduction, Recycling, Water, Wastewater, Algae Treatment, Utility, Devices, Equipment, System.

Sludge mixed with Polymer (Influent)

1% - 5% DS

1% - 5% DS

EODB

Mechanical dewatering devices
(Belt press, Filter Press, Thickener, Centrifugal, Decanter ,etc)

15% - 25% DS

15% - 25% DS

EODS

NVD

Huge Dryer

BDS, DDS, FDS

40% - 60% DS

NVD

40% - 60% DS

70% - 90% DS

70% - 90% DS

Legend for Arrow

- High energy consumption
- High operating cost

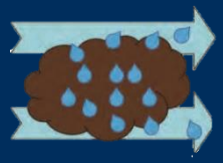
- Low energy consumption
- Low operating cost

For final disposal-Incineration, Agriculture, Landfill, Renewable Energy etc.,

What is NVD?

NVD = Natural Ventilation Dryer

: NVD is a compact dryer for ELODE that can maximize sludge dryness. It spends low energy using natural air and electronic heating system.

		
The water molecules in the sludge consist of polar molecules.	The water molecules by the electric field are rearranged.	Moisture evaporates by natural convection.
[Hydrogen] – [atom-positron] [Oxygen atom] - [negative electron]	Heat is generated by collision between rotating water molecules.	Water evaporation is maximized without additional energy.

Specification

Capacity : 355liter/hr evaporated at 155kW only.
Dimension (m) : 5.4 x 3.6 x 2.6 (L x W x H of Largest Model)
Small supplementary Equipment for Odor & Dust required
If needed, Scrubber for Deodorization can be provided.

Natural Ventilation Dryer

Specification

Dimension (m) L x W x H	Model	Belt Width (mm)	Throughput @40% DS (kg)	Energy Consumption (kw/h)
4.8 x 1.4 x 2.4	NVD-1000	1,000	250	55~75
5.1 x 2.5 x 2.5	NVD-2000	2,000	500	105~125
5.4 x 3.6 x 2.6	NVD-3000	3,000	800	135~155

Typical Example with NVD

Dryness (% DS)	Sludge Cake (ton)	Reduction
1% (First Inlet) → 90% (NVD outlet)	100 → 1.1	98%

Reduce Disposal Cost

Typical municipal sewage sludge

Example : Sludge concentration : 1%TS (99% wt)
Sludge weight : 1,000 ton daily

Mechanical dewatering device
(Belt-Press, Filter press, Centrifugal, Screw press, Decanter, Thickener-Dewatering, etc.,)

EODS+NVD

Sludge concentration : 90% DS (10% WT)
Sludge weight : 11.1 ton
Est. Disposal cost : USD 0
Est. Electricity cost : 13,000 kW x USD 0.10
= USD 1,300
Est. Total cost = USD 1,300

Sludge concentration : 20% DS (80% wt)
Sludge weight : 50ton
Est. Disposal cost : USD 4,000

Reduction in waste sludge = 38.9 ton (77.8%)
Cost Saving = USD 2,700 daily
Annual Saving = USD 985,500

Assumption

Sludge Disposal Cost = USD 80 / ton
Working Hour = 20 hrs / day
= 365days / year

Electricity tariff: USD 0.10kW.hr
Unit: EODS-3000 2 SET + NVD-3000 2 SET
Energy Consumption: EODS-3000+NVD 3000 = 325kWh (1SET)

Reduce Energy Consumption

Typical municipal sewage sludge
Example : 1,000 wet ton @ 1% DS

Mechanical dewatering device
50 wet ton @ 20% DS

EODS-3000

- 25 wet ton @ 40% DS
- Energy Consumption
  2 EODS-3000x180kWx20 hr
  ~ 7,200 kW.hr/d

NVD-3000

- 11.1 wet ton @ 90% DS
- Energy Consumption
  2 NVD-3000x145kWx20 hr
  ~ 5,800 kW.hr/d

Total Energy Consumption
ELODE+NVD
= 13,000 kW/d (Maximum)

Dryer 2 (S1)
- 25 wet ton @ 40% DS
- 30.5 ton water evaporated
- Energy Consumption
  ~ 30,500 kW.hr/d

(S2)
- 12.5 wet ton @ 80% DS
- 12.5 ton water evaporated
- Energy Consumption
  ~ 12,500 kW.hr/d

Total Energy Consumption
Dryer 2
= 43,000 kW.hr/d

Dryer 2 (S1+S2) - EODS+NVD-3000
= 30,000kW/d
69% Saving in Energy Consumption

Assumption
1 ton of water evaporated
Required 1,000 kW.hr
(Ave. 750 – 1,200 kW.hr)

Typical Concept of Full-Process

· Case 1

Sludge Weight : 3200m³/day @ 1.1% TS (=99% WT) ▶ ▶ ▶ **150m3/hr @ 1.1%TS 22h/day**

Sludge Characteristic : Activated Sludge of Municipal Sewage

Operating Time : 22hr/day 365day per year

Total Sludge Weight Reduction : 98.76%

Total Energy Consumption : 2,515kWh

Pre-Stage	1st Stage	2nd Stage	3rd Stage
 2 SET	 2 SET	 6 SET	 6 SET
TWIN DRUM THICKENER (KOWATS-1000SDT)	DECANTER CENTRIFUGE (KOWATS-610D)	Electro Osmosis Dewatering Equipment (EODS-3000)	Natural Ventilation Dryer (NVD-3000)
150m3/hr @1.1%TS ▶ 42m3/hr @4%DS	42m3/hr @4%DS ▶ 7.63m3/hr @22%DS	7.63m3/hr @22%DS ▶ 4.20m3/hr @40%DS	4.20m3/hr @40%DS ▶ 1.86m3/hr @90%DS

- 150m3/hr – 1.86m3/hr = 148.14tons of water removed (98% Weight Reduction)
- Electricity Consumption for Main Equipment & Utilities = 2,515kWh
- Energy / Evaporated water = 2,515kWh / 148,140L = 0.017kWh/1Liter removed

▶ 17kWh / 1m3 Water removed

Typical Concept of Full-Process

· Breakdown for Energy Consumption

APPLICATION	MODEL	ENERGY CONSUMPTION	Q'ty	TOTAL CONSUMPTION	REMARK
MAIN EQUIPMENT	TWIN DRUM THICKENER KOWATS-1000SDT	6	2	12	4%TS Guarantee
	DECANTER-CENTRIFUGE KOWATS-610D	73.5	2	147	22% DS Guarantee
	ELODE EODS-3000	200	6	1200	40% DS Guarantee
	NATURAL VENTILATION DRYER NVD-3000	155	6	930	90% DS Guarantee
	DEODORIZATION SYSTEM SCRUBBER DDSE-3000 for ELODE	15	2	30	<Option>
	DEODORIZATION SYSTEM SCRUBBER DDSN-3000 for NVD	37.5	2	75	<Option>
UTILITIES	POLY DOSING, SLUDGE TRANSFER, etc.			226	
GRAND TOTAL ENERGY CONSUMPTION INCLUDING OPTION				2,620kWh	

<Notes>

Energy consumption is Maximum Value including Safety Factor.

▶ Actual Operating energy is less than 2,620kWh.

Typical Concept of Full-Process

· Case 2

Sludge Weight : 2035m³/day @ 4.45% TS (=95.55% WT) ▶ ▶ ▶ 93m3/hr @ 4.45%TS 22h/day
Sludge Characteristic : Digested Sludge of Municipal Sewage Total Sludge Weight Reduction : 95.05%
Operating Time : 22hr/day 365day per year Total Energy Consumption : 5,028.05kWh

1st Stage	2nd Stage	3rd Stage
 7 SET	 13 SET	 13 SET
SCREWPRESS (KOWATS-1000SP)	Electro Osmosis Dewatering Equipment (EODS-3000)	Natural Ventilation Dryer (NVD-3000)
93m3/hr @4.45%SS ▶ 16.56m3/hr @25%DS	16.56m3/hr @25%DS ▶ 10.35m3/hr @40%DS	10.35m3/hr @40%DS ▶ 4.6m3/hr @90%DS

- 93m3/hr – 4.6m3/hr = 88.04tons of water removed (95.05% Weight Reduction)
- Electricity Consumption for Main Equipment & Utilities = 5,028.05kWh
- Energy / Evaporated water = 5,028.05kWh / 88,040L = 0.057kWh/1Liter removed

▶ 57kWh / 1m3 Water removed

Typical Concept of Full-Process

· Breakdown for Energy Consumption

APPLICATION	MODEL	ENERGY CONSUMPTION	Q'ty	TOTAL CONSUMPTION	REMARK
MAIN EQUIPMENT	SCREWPRESS KOWATS-1000SP	3.7	7	25.9	25%TS Guarantee
	ELODE EODS-3000	200	13	2600	40% DS Guarantee
	NATURAL VENTILATION DRYER NVD-3000	155	13	2015	70% DS Guarantee
UTILITIES	POLY DOSING, SLUDGE TRANSFER, etc.			387.15	
GRAND TOTAL ENERGY CONSUMPTION INCLUDING OPTION				5,028.05kWh	

<Notes>

Energy consumption is Maximum Value including Safety Factor.

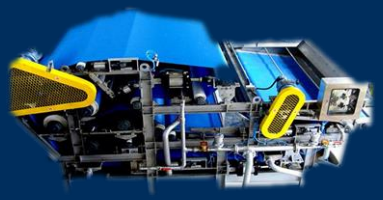
▶ Actual Operating energy is less than 5,028.05kWh.

Typical Concept of Full-Process

· Case 3

Sludge Weight : 2035m³/day @ 4.45% TS (=95.55% WT) ▶ ▶ ▶ 93m3/hr @ 4.45%TS 22h/day
Sludge Characteristic : Digested Sludge of Municipal Sewage
Operating Time : 22hr/day 365day per year

Total Sludge Weight Reduction : 95.05%
Total Energy Consumption : 6,635.65kWh

1st Stage	2nd Stage	3rd Stage
 7 SET	 17 SET	 13 SET
BELTPRESS (AKI-BFS-300)	Electro Osmosis Dewatering Equipment (EODS-3000)	Natural Ventilation Dryer (NVD-3000)
93m3/hr @4.45%SS ▶ 20.69m3/hr @20%DS	16.56m3/hr @25%DS ▶ 10.35m3/hr @40%DS	10.35m3/hr @40%DS ▶ 4.6m3/hr @90%DS

- 93m3/hr – 5.92m3/hr = 88.04tons of water removed (95.05% Weight Reduction)
- Electricity Consumption for Main Equipment & Utilities = 6,635.65kWh
- Energy / Evaporated water = 6635.65kWh / 88,040L = 0.075kWh/1Liter removed

▶ 75kWh / 1m3 Water removed

Typical Concept of Full-Process

- **Breakdown for Energy Consumption**

APPLICATION	MODEL	ENERGY CONSUMPTION	Q'ty	TOTAL CONSUMPTION	REMARK
MAIN EQUIPMENT	BELTPRESS AKI-BFS-300	45	7	315	25%TS Guarantee
	ELODE EODS-3000	200	17	3400	40% DS Guarantee
	NATURAL VENTILATION DRYER NVD-3000	155	17	2635	90% DS Guarantee
UTILITIES	POLY DOSING, SLUDGE TRANSFER, etc.			285.65	
GRAND TOTAL ENERGY CONSUMPTION INCLUDING OPTION				6,635.65kWh	

<Notes>

Energy consumption is Maximum Value including Safety Factor.

▶ Actual Operating energy is less than 6,635.65kWh.

Deodorization System

▶ **ELODE & NVD discharge a few Odor & Dust.**
DSSE &DSSN is suggested as an option.

DSS = Deodorization Scrubber System

: DDSE &DDSN are designed for complex odor from Sludge with **high-capacity by efficient treatment.** For Sludge characteristic & Odor capacity, detailed design changes.

- DDSE – For ELODE / DDSN – For NVD
- **Final CAKE dried through ELODE+NVD has very little scattering dust. No dust collector is required and No does not install DSS by default. DSS is installed when the odor is severe depending on the sludge characteristics. Better to decide whether to install DSS after operation!!**

- O^3 Generator and Water Spray
  :Design for removing the water-soluble odor & non-degradable odor by absorbing O_3 & H_2O with high oxidizing power.

- Water Curtain, Wet scrubber, Active Carbon
  : Combined Technologies for high-capacity, discharging odor as International Environmental Law Standard

Performance Photo only by ELODE

▶ Result of Final Cake Out from different sludge.

Municipal Sludge 57%wt

Chemical Sludge 53%wt

City Bio Sludge 55%wt

Livestock Sludge 52%wt

High Organic Dyeing 48%wt

Municipal + Excreta 51%wt

Performance Photo only by ELODE

Result of Final Cake Out from different sludge.

Industrial Oil Sludge 52%wt

Soy Bean Sludge 53%wt

Organic Mineral 55%wt

Pharmaceutical Sludge 48%wt

Milk Sludge 58%wt

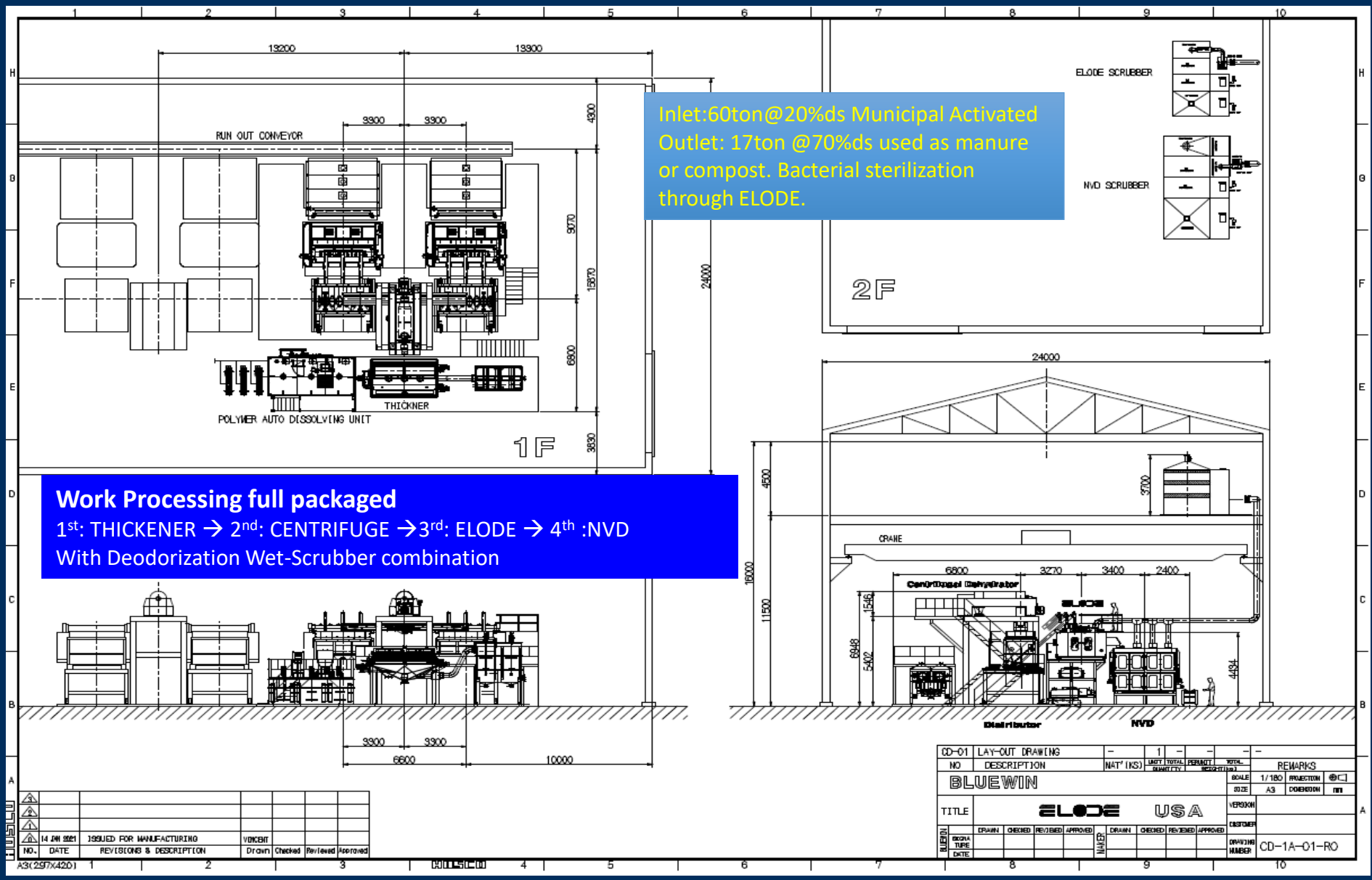
Human Excreta 43%wt

Daily 60ton@25%ds ➡ 70%ds Flowsheet

BLUEWIN Co., Ltd.
a Family Group, EPC Turnkey company for
Sludge Dewatering, Reduction, Recycling,
Water, Wastewater, Algae Treatment,
Utility, Devices, Equipment, System.

Inlet:60ton@20%ds Municipal Activated
Outlet: 17ton @70%ds used as manure or compost. Bacterial sterilization through ELODE.

Work Processing full packaged
1st: THICKENER → 2nd: CENTRIFUGE →3rd: ELODE → 4th :NVD
With Deodorization Wet-Scrubber combination

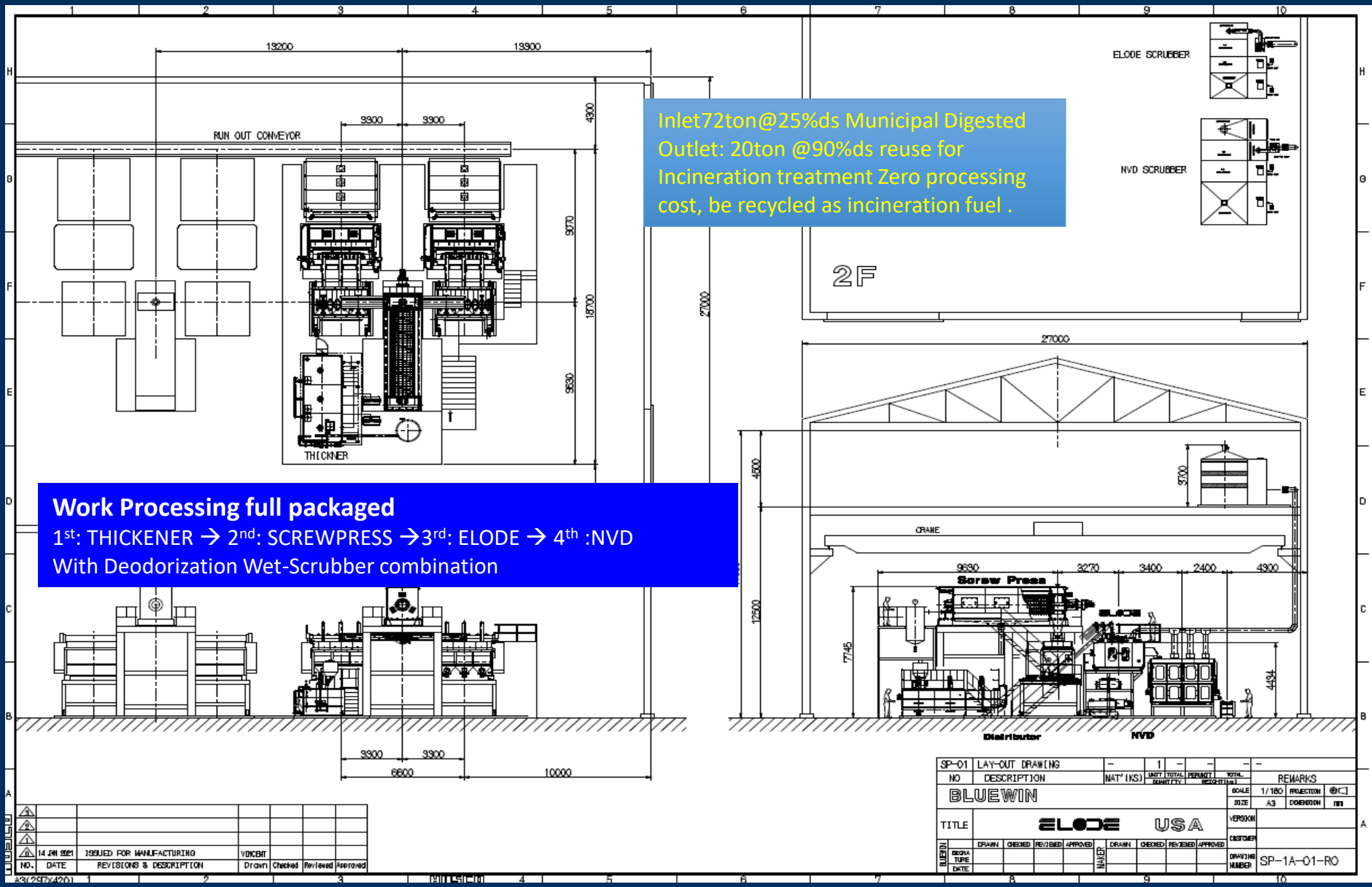


Daily 72ton@20%ds ➡ 90%ds Flowsheet

BLUEWIN Co., Ltd.
a Family Group, EPC Turnkey company for Sludge Dewatering, Reduction, Recycling, Water, Wastewater, Algae Treatment, Utility, Devices, Equipment, System.

Inlet72ton@25%ds Municipal Digested
Outlet: 20ton @90%ds reuse for Incineration treatment Zero processing cost, be recycled as incineration fuel .

Work Processing full packaged
1st: THICKENER → 2nd: SCREWPRESS →3rd: ELODE → 4th :NVD
With Deodorization Wet-Scrubber combination



Contact Point

BLUEWIN CO., LTD		
e-mail	antonio.kim@elode.co Antonio.kim@fine-tec.com Antonio.kim@korearoyal.com	www.bluewin.kr www.elode.co
Person in charge	**Antonio KIM/Managing Director**	**Office** **+82.70.7868.8920**

We're ready to reply within 24 hours for Serving you.

CONTACT ID
WhatsApp & Mobile Phone : +82 10 5231 8920