OMAN Seeb Sewage Treatment Plant

ELO Pilot Test Report

2025. 02.

Korea Water Technology

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Ⅰ Overview

PURPOSE

► The equipment for the pilot test is an electro-osmosis-based sludge cake dewatering machine.

► It reduces the moisture content of sludge cake in a short time and increases porosity, which helps to shorten the drying time and reduce odors.

► This equipment is developed using proprietary technology from **Korea Water Technology Inc.** and has been in operation for 15 years in various countries, proving its effectiveness.

► The technology has been recognized by the Korean government for its reliability and effectiveness, and this pilot test program receives support from KEITI—a subsidiary of the Korean Ministry of Environment.

► The purpose of this pilot test is to evaluate whether this technology can be effectively applied to Client's STP. The specific goals of the test are as follows:

1) Verify the actual performance of the equipment, including moisture reduction and power consumption.

2) Estimate the benefits that the STP can gain from operating the equipment.

3) Secure design parameters needed if NAMA decides to adopt this technology in the future.

TEST METHOD

► The pilot equipment was installed next to the sludge transport truck on the base floor of the sludge dewatering building at the Oman Seeb STP.

► Sludge cake discharged from the centrifuge B was dehydrated using the pilot equipment.

► Bad odor reduction test was conducted using the dehydrated cake discharged from the pilot equipment.

► DATE

1) 2024.12.16 ~ 2024.12.24: INSTALLATION

2) 2024.12.25 ~ 2025.01.01: SITE CUSTOMIZING

3) 2025.01.02 ~ 2025.01.16: PILOT TEST

► LOCATION: Next to the sludge transport truck on the base floor of the sludge dewatering building.

► Conducting the Pilot Test

1) Supervisor: KIM SUNGRYONG / KWT

2) Project Manager: Nikhil Benny / MMS

3) Operator: Pawan Chaubhary, M. Nouman Khen / MMS

► Key Performance Indicator

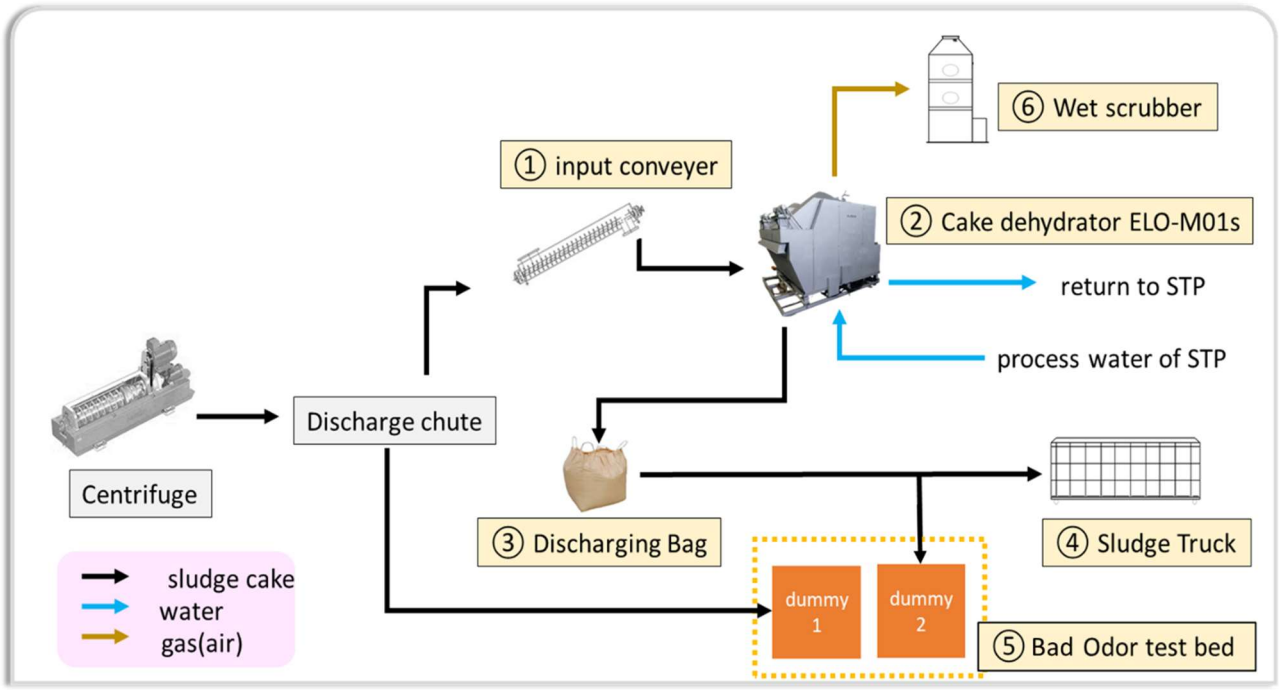
No	KPI	Target Indicators	Evaluation Method
1	Treatment capacity	Achieving Standard Processing Capacity 200kg/hr input	• The total amount of sludge cake fed into the equipment is measured. • The time it takes for all the sludge cake to be discharged is tracked. • Both of the above parameters are recorded daily, and using this data, the daily throughput and average throughput are calculated.
2	Dryness	Over 35% after ELO.	• Measure the dryness according to standard test methods daily.
3	Weight reduction	Over 50%	• Calculate the reduction rate based on the dryness of the input cake and the output cake. • To do this, extract cake samples from both the input and output sections to measure and record their dryness.
4	Power consumption	Below 200kWh/ton input	• Record the daily power consumption and input quantity. • Then calculate the average power consumption per ton of input by dividing the total power consumption by the input quantity.
5	Bad odor reduction	Over 50% reduction of unpleasant odor	• Prepare two piles of sludge with the same volume. • The first pile consists of sludge cake discharged from a centrifugal dewatering machine. • The second pile consists of sludge cake discharged from the pilot machine. • Measure and compare the odor of each sludge pile daily.
6	Water Conditioning	Max. Temp.: 30 ℃ Max. Hardness: 120 ppm	• The drum cooling water temperature is checked at the start of equipment operation to measure the water temperature. • Hardness is measured using a hardness tester (once)

Result Summary

No	KPI	Target	Result	Attainment
1	Treatment capacity	200 kg/hr	Avg. 206.3 kg/hr	100 %
2	Dryness	Over 35%	Avg. 40.73 %	100 %
3	Weight reduction	Over 50%	Avg. 53.99 %	100 %
4	Power consumption	Below 200kWh/ton	Avg. 195.8 kWh/ton	100 %
5	Bad odor reduction	Over 50%	74.53 %	100 %
6	Water Conditioning	Temperature ≤ 30 ℃ Hardness ≤ 120 ppm	22 ℃ / 105 mg/L	100 %

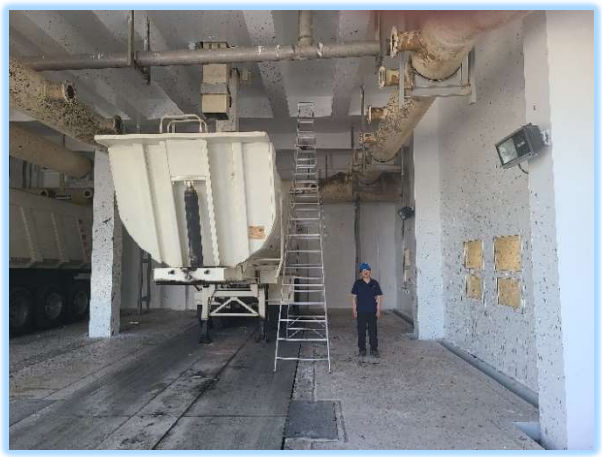
Ⅱ Test Procedure

PILOT SYSTEM CONFIGURATION



SITE FOR PILOT TEST

► Seeb Sewage Treatment Plant, Seeb, Muscat, Oman



DESCRIPTION OF PILOT SYSTEM

► Continuous operation type electro-osmosis cake dehydrator

► Throughput : 200kg/hr cake input

► Dryness : DS 15% ~ 20% → 30% ~ 40% adjustable

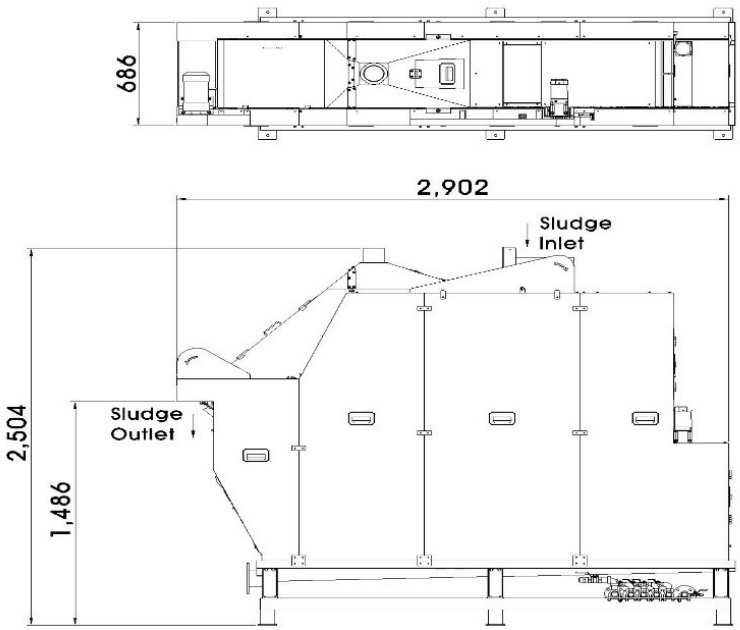
► Leading time : 2min

► Power consumption : 40kW~60kW (depends on sludge)

► Process water consumption : 12 L/min

► Configuration : main body, electric panel, cleaning water supply

► Size



► Pictures



TEST PROCEDURE

► Installation & Customizing

1) Check the Installation Site and positioning each equipment
2) Internal Wiring and Piping
3) External Utility Supply
4) Customizing of Input device

► Feeding of Sludge

1) Feed the sludge cake discharged from the centrifuge B into the ELO using a wedge slider type Input device.

► Decision of Test Parameter

1) Set the test parameter based on the results of the preliminary test.
2) 60V~70V/ Input thickness: 5mm/ Drum speed: 35 Hz.
3) Adjust the feeding device speed according to the operating conditions.

► Record Test Data

1) Test start/stop time
2) Cumulative power consumption before/after operation
3) DC voltage/current
4) Dehydrated sludge weight

► Bad Odor Reduction Test

1) Store 20 kg of sludge before and after passing through the ELO.
2) Set a specific time every day to sample the sludge about 10 cm below the surface and qualitatively record the type and intensity of the odor, as well as the degree of unpleasantness.
3) Once a week, flip the entire sludge to record the smell from the sludge at the bottom.
4) The trend of the smell should be recorded throughout the 2-week testing period.

► Dryness Measure

1) Take a representative sample once a day and send it to the NAMA laboratory for measuring of dryness.

Ⅲ Equipment Installation

▮ Preparation before Installation

► Shipped on August 17, 2024, and arrived at Oman Sohar port on September 22, 2024.

► On-site entry permit granted on November 07, 2024.

► Detailed plans and safety management measures finalized on December 10, 2024.

► Final approval of installation plan and installation work began on December 16.

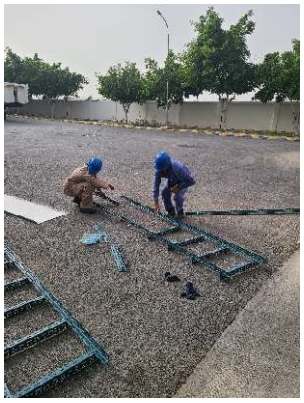
▮ Installation

► Installation #1 – Positioning of each equipment





► Installation #2 – On-Site customizing



► Installation #3 – Wiring






► Installation #4 – Hose Connection






IV Test Result

▮ Dehydration Test

► Dryness: Before 16~20%, After Around 40% → **Reduction around 55%**

► Sludge Characteristics: Except when the moisture content was too high, the sludge was generally clumped together in the size of a baseball or smaller. Compared to its visible characteristics, it had a consistency that didn't spread easily and was thick when applied.

► It appears to be sludge with a slightly less spreadable characteristic compared to typical wastewater sludge, but it actually tends to form a good thickness and has the property of not adhering to the press roll.

► The input is generally smooth, and both the scraping and washing conditions are good.

► Since the thickness forms well, the sludge scraping was effective, and there was no side leakage of sludge, so it is estimated that the solids recovery rate will also be excellent.

► Summary of dehydrating test result

Date	Operating Time (hh:mm)	Total Treatment Weight (kg)	Treatment Capacity (kg/hr)	Total Power C`mption (kWh)	Power C`mption Rate (kWh/ton)	Dryness (wt%)		Weight Reduction (%)
						Centrifuge	ELO	
02/01	5:02	1,090	216.6	200.3	183.7	19%	41%	53.66%
05/01	2:11	533	244.3	96.6	181.1	18%	38%	52.63%
06/01	2:29	465	187.4	104.5	224.6	19%	42%	54.76%
07/01	1:14	221	179.2	50.2	227.1	20%	42%	52.38%
08/01	3:31	704	200.2	139.8	198.6	18%	43%	58.14%
09/01	3:04	580	189.0	118.1	203.8	17%	39%	56.41%
13/01	2:54	475	163.9	101.9	214.4	20%	43%	53.49%
14/01	3:00	674	224.6	126.9	188.4	20%	40%	50.00%
15/01	4:24	973	221.2	167.8	172.4	20%	43%	53.49%
16/01	3:53	975	251.1	147.9	151.7	16%	39%	58.97%
19/01	1:52	358	191.7	74.3	207.6	19%	38%	50.00%
Total	**9:34**	**7,049**	**206.3**	**1328.3**	**195.8**	**18.73%**	**40.73%**	**53.99%**

▮ Bad Odor Reduction Test

► To ensure the fairness of the test, sludge discharged from the centrifugal dewatering machine and sludge discharged from the ELO were measured to have the same volume before forming the sludge piles for testing.

► After creating the piles, sludge was sampled daily (excluding weekends) at a depth of 10 cm inside the piles, and the odor concentration was measured using the Olfactory method.

► An attempt was made to measure the quantitative odor concentration using a simple odor measurement device, but detection was not possible due to the low concentration.

► Due to these limitations, the test was conducted solely using the olfactory method, and quantitative evaluation and analysis were determined based on the composting time relative to the storage duration.

► Result summary of bad odor reduction test

Date	Storage Time (hr)	Odor Checking	
		ELO	Centrifuge
06/01	0	• It has the distinctive smell of the ELO sludge, but it's not strong.	• It has the distinctive smell of a mechanical sludge cake, but it's not strong.
07/01	17	• No significant change	• No significant change.
08/01	41	• The type of odor has slightly changed. → It has a somewhat sour and unusual smell that is hard to encounter regularly. • The intensity of the odor has increased by about 50% compared to yesterday. • White mold has developed on the sludge. **→Aerobic digestion has started, as judged.**	• No significant change.
09/01	65	• No significant change	• No significant change.
10/01	89	• The intensity of the odor has increased by about 100% compared to the beginning. • However, the odor itself is not particularly unpleasant; it smells like soil or wood decomposing.	• No significant change.
13/01	161	• The smell itself has completely changed to an earthy odor. • The intensity of the smell has decreased by about half compared to last week.	• A distinctive sewer-like odor has started to appear. **→Anaerobic digestion has begun.** • The intensity of the smell is not strong.
14/01	185	• No significant change.	• The foul odor is gradually getting stronger.
15/01	209	• No significant change.	• No significant change.
16/01	233	• The odor has weakened to the point where one must put their nose close to the sludge to smell it.	• No significant change.
19/01	305	• No significant change.	• The odor has become so pungent and strong that it is difficult to bear.

▮ Other Parameters

► During the test period, the temperature and hardness of the washing water entering the treatment device were checked.

► The temperature was measured at around 22°C, which was higher than expected, possibly because the water is treated from the plant and supplied from the indoor reservoir.

► The hardness was slightly higher at 105 mg/L, but still lower than our standard threshold.

Temperature [℃]	Hardness [mg/L]
22	105

V Analysis

▮ Analysis of Sludge Dehydration

► When considering both the dehydrating reduction effect and the subsequent composting process, it is determined that a sludge dryness of around 40% from the ELO is the most effective.

► The operating conditions at this point are estimated as follows.

1) Voltage: 60V
2) Rated power consumption for 1 ton sludge: Avg. 197.3 kWh
3) Dryness of Discharging Sludge: around 40 %
4) Reduction ratio of Sludge Weight: around 55 %

► During the test period, the exhaust gases were collected and washed only with water, without the addition of chemicals, in the scrubber before being discharged.

► However, it did not have any significant impact on the atmospheric environment of the STP, indicating that the concentration of odor gases emitted from ELO was not high.

► Therefore, it is expected that, when installing the actual system, simply connecting it to the existing odor treatment system at the plant and installing a basic wash-type scrubber will be sufficient for effective treatment.

► Since the input device was installed as a temporary facility, there was some variation, but the analysis showed that up to about 220 kg per hour could be processed.

► It indicates that the standard processing capacity of our equipment can be applied to the Seeb STP.

► Summary of Dehydrating Performance

Treatment Capacity (kg/hr)	Power Consumption (kWh/ton)	Dryness (wt%)		Weight Reduction (%)
		Before	After	
200 ± 10%	200 ± 10%	15 ~ 20 %	36 ~ 42 %	50 ~ 55 %

▮ Analysis of Bad Odor Reduction Test

► Centrifuge Sludge Pile

1) Until around day 5, there was no significant change in the concentration or quality of the odor.
2) After about a week, unpleasant odors, likely originating from the sewage, began to emerge from within the sludge, indicating the start of aerobic digestion.
3) After about 2 weeks, the odor became so strong that it was difficult to bear.

► ELO Sludge Pile

1) A faint odor began to emerge after 1 day of storage, but it was not the typical sludge smell. Instead, it had a slightly sharp scent, though it was not unpleasant.
2) From the 2nd day, white mold began to appear, indicating that aerobic digestion was proceeding rapidly, even without any special treatment, simply by storing the sludge after ELO dewatering.
3) After about 5 days, the type of odor completely changed, and a pleasant, compost-like smell, resembling decaying leaves or straw, began to emerge.
4) After about 2 weeks, the typical unpleasant sludge odor was completely gone, and the odor intensity was so weak that it was almost unnoticeable.

► Odor Analysis Conclusion

1) In the case of ELO sludge, aerobic digestion was observed to begin after about 41 hours of storage.
2) In contrast, for the centrifuge sludge, anaerobic digestion was observed to begin after about 161 hours of storage.
3) The pollutant gases generated by anaerobic digestion are known to be more harmful to the human body and cause greater discomfort than those produced by aerobic digestion.
4) In actual experiments, the odor of centrifuge-dewatered sludge was also observed to be more unpleasant.
5) However, in this test, aside from the discomfort caused by the odor, the odor intensity was analyzed by substituting it with the composting period.
6) Based on this analysis, it was found that the odor from ELO sludge was reduced by 74.53% compared to the odor from centrifuge sludge.

▮ Performance Evaluation

► Based on the pilot test results and the analysis, an evaluation of the KPI performance was conducted, and the results are shown in the table below.

No	KPI	Target	Result	Attainment
1	Treatment capacity	200 kg/hr	Avg. 206.3 kg/hr	100 %
2	Dryness	Over 35%	Avg. 40.73 %	100 %
3	Weight reduction	Over 50%	Avg. 53.99 %	100 %
4	Power consumption	Below 200kWh/ton	Avg. 195.8 kWh/ton	100 %
5	Bad odor reduction	Over 50%	74.53 %	100 %
6	Water Conditioning	Temperature ≤ 30 ℃ Hardness ≤ 120 ppm	22 ℃ / 105 mg/L	100 %

▮ Implementation of the ELO

► Based on the analysis of the test results, it is determined that the standard processing capacity of our equipment can be sufficiently applied.

► Based on these results, the application of this technology to the A'Seeb STP is estimated as follows.

Item		Unit	Current Situation	Implementation of ELO
Sludge Amount	Daily Sludge Cake	ton/day	30[1)]	
	Weight Reduction Ratio[2)]	%	-	53.9
	kWh ratio[2)]	kWh/ton	-	195.8
	Daily Power Consumption[3)]	kWh/day	-	5,874
	Additional Electricity	kWh/month	-	176,220
	Monthly Sludge Amount	ton/month	900	414
Summary	**Additional Electricity**	**kWh/month**	**-**	**176,220**
	Monthly Sludge Amount	**ton/month**	**900**	**414**

1) Recommended ELO Model: ELO-M04s x 2 ea (800 kg/hr x 2ea x 20hr = 32 ton)

2) Values from the Pilot Test

3) Power Consumption Ratio (Pilot Test) x Daily Sludge Amount

Acknowledgements

I would like to express my heartfelt gratitude to all the individuals and organizations who supported the successful completion of this pilot test.

First and foremost, I would like to extend my sincere thanks to the representatives from KEITI for their invaluable assistance in ensuring that this project could take off and progress smoothly from the very beginning.

My sincere appreciation also goes to the teams at NAMA Water Services, MMS, and the Seeb sewage treatment plant in Oman for their dedicated efforts and support during the on-site operations. Their contributions were crucial to the successful implementation of the project.

I am deeply thankful for everyone's cooperation and effort in making this project a success.

VI Appendix

▮ Test Record

ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 2025.01.02

Written By: M.Nouman Khan

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	9:59	12:06	290.7	387.0	29	32	60	68	535	556	-	-	180	-	-	-
2	12:39	15:34	387.0	491.0	29	32	60	60	497	562	19%	41%	300	-	-	-

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 390 mm	
- CAM Motor / Drum Cooling Pump THR Alarm	
- Grease Input to input device crank connection sleeve: 10:00 / 12:00 / 14:00	
- Use Ton Bag for discharging sludge from 12:39	
-	
-	
-	

Pictures

ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 05.01.2025

Written By: M.Nouman Khen

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	10:04	12:15	497.1	593.7	36	40	60	65	450	600	0.18	38%	240	65	3/10	3/10
2																

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 390 mm	
- Input device Supporter Nut/Bolt Tightening - 08:15 AM	
- Grease Input to input device crank connection sleeve: 08:25 / 11:15	
- Dropped sludge stored last week thurday: 09:00 AM	
- CAM Motor THR Trip: 12:15 PM	
- After trip, the Centrifuge stopped also due to the low level of waste water.	
-	

Pictures






ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 06.01.2025

Written By: M.Nouman Khen

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	11:07	12:31	606.1	664.0	36	40	50	60	500	600			120	-	-	-
2	14:45	15:50	664.3	710.9	36	40	65	70	450	600	19%	42%	80	-	-	-

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 390 mm	
- Greasing Time 11:00 AM, 14:40 PM	
- Sampling Teim 11:20 ~ 11:45 AM	
- Truck container arrive at the site at 11:30 so, the machine can be run from 11:00 AM.	
- Water supply stop at 12:30 PM - STP Issue.	
- Centrifuge was stopped 12:45 ~ 14:30, due to the issue of the STP.	
- Store Before and after sludge at 16:30 PM	

Pictures




ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 07.01.2025

Written By: M.Nouman Khen

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	8:38	9:52	720.1	770.3	36	40	65	60	400	600	20%	42%	100	17	2/10	3/10
2																

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 390 mm	
- Greasing Time 08:15 AM	
- Sampling Time 08:20 ~ 08:35 AM (for tomorrow)	
- Odor checking Time 09:00 AM	
- Input conveyor was stopped at 09:52 due to connection bracket bolt was broken.	
- Parts for input conveyor fixing was prepared at 13:20 PM	
- But, the centrifuge was stopped due to the low level.	

Pictures

ELO Pilot Test in Seeb STP in Oman

Test Result

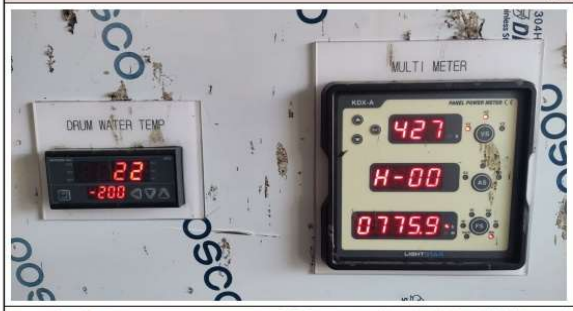
DATE: 08.01.2025

Written By: M.Nouman Khen

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	8:30	9:39	775.9	821.4	36	40	55	60	405	600	-	-	110	41	3/10	1/10
2	10:37	12:59	826.1	920.4	36	40	60	65	420	600	18%	43%	170			

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 390 mm	
- Assemble Input conveyor crank connecting bolt & Sleeve/ Tighten the Bracket bolt & Nut 08:10 AM	
- Greasing Time 08:15 AM, 10:40 AM, 12:40 PM	
- Sampling Time 08:20 ~ 08:35 AM (for tomorrow)	
- Odor checking Time 09:00 AM	
- Sludge Disposal Time 10:05 AM, 13:12 PM	
- The centrifuge was stopped due to the low level. 12:58 AM	

Pictures



ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 09.01.2025

Written By: Pawan Chaubhary Pawan

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	8:59	12:03	934.2	1,052.3	36	40	55	60	410	600	17%	39%	240	-	-	-
2																

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 375 mm	
- Change the Nut Sleeve 08:15 AM	
- Greasing Time 08:30 AM, 10:40 AM, 11:00 AM	
- Sampling Time 08:40 ~ 09:00 AM (can not submit due to lab finished too early)	
- Bag Drop off 12:25 PM	
- On-site observation by the NAMA team 10:20 AM ~ 10:40 AM	

Pictures

ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 13.01.2025

Written By: M.Nouman Khan

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	9:02	11:56	1,056.4	1,158.3	36	40	45	60	415	600	20%	43%	210	-	-	-
2																

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 380 mm	
- Nut Bolts tightening 08:20 AM	
- Greasing Time 08:30 AM, 11:00 AM	
- Sampling Time 08:45 ~ 09:00 AM	
- At 11:54 AM the centrifuge unit stopped	
- Bag Drop off time 12:25 PM	
- Check smell: ELO Sludge - Like a smoke of Burning / Centrifuge Sludge - The smell of the sewer from the sludge has started.	

Pictures

ELO Pilot Test in Seeb STP in Oman

Test Result

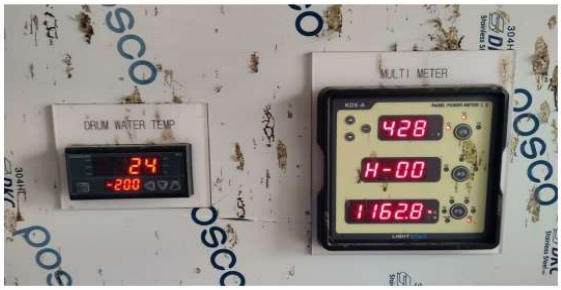
DATE: 14.01.2025

Written By: Pawan Chaubhary

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	9:05	12:05	1,162.8	1,289.7	36	40	55	60	405	600	20%	40%	320	-	-	-
2																

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 380 mm	
- Checking the Nut/Bolt of Input device 08:20 AM	
- Greasing Time 08:30 AM, 10:20 AM	
- Sampling Time 09:10 AM	
- Bag Drop off time 12:35 PM	

Pictures



ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 15.01.2025

Written By: M.Nouman Khen

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	9:00	11:34	1,292.1	1,391.4	36	40	60	60	410	600	-	-	260	-	-	-
2	12:12	14:02	1,392.0	1,460.5	36	40	55	60	415	600	20%	43%	170	-	-	-

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 380 mm	
- Checking the Nut/Bolt of Input device 08:20 AM	
- Greasing Time 08:25 AM, 11:00 AM, 12:40 PM	
- Sampling Time 08:40 AM	
- Bag Drop off time 12:00 PM	

Pictures

ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 16.01.2025

Written By: Pawan Chaudhary

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	8:32	9:24	1,463.7	1,499.1	36	40	55	60	416	601	-	-	110	-	-	-
2	9:50	12:51	1,501.4	1,613.9	36	40	55	60	417	602	16%	39%	270			

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 380 mm	
- Tightening the Nut/Bolt of Input device 08:10 AM	
- Greasing Time 08:25 AM, 10:30 AM	
- Bag Drop off time 11:45 AM, 13:05 PM	

Pictures







ELO Pilot Test in Seeb STP in Oman

Test Result

DATE: 19.01.2025

Written By: M.Nouman Khen

No.	START (hh:mm)	END (hh:mm)	Start kWh (kWh)	End kWh (kWh)	Operating Condition						Dryness (wt%)		Dischared Weight (kg)	Odor		
					Drum (Hz)	Pressroll (Hz)	Supply (HZ)	DC Voltage (V)	DC Current (A(min) ~ A(Max))		Centrifuge	ELO		Storage Time (hr)	Measure Result	
															ELO	Centrifuge
1	9:50	11:42	1,633.7	1,708.0	36	40	55	60	410	600	19%	38%	170	-	-	-
2																

Operational status and irregularities	Remarks
- Thickness of Discharged Sludge: 2 mm	
- Width of Discharged Sludge: 380 mm	
- Checking of Input device 08:20 AM	
- Greasing Time 08:30 AM	

Pictures





Measure Result

<NAMA Lab Dryness Measure #1 – Sludge After ELO #1>

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Fax: +968 24592744
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Central Laboratory Test Report

Reported Date: 08/01/2025 Report No: 2025-437270 Version: 1

CUSTOMER INFORMATION

Contact	**: Intisar Al Sulaimi**	**Email**	**: intisar.sulaimi@owwsc.nama.om**
Customer	**: Intisar Al Sulaimi**	**Phone No**	**: +968-24116320**
Address	**: NAMA WATER SERVICES COMPANY /Asset Engineering_DT**		

SAMPLE INFORMATION

Sample ID	: 437270	Sampling Date and Time	: 06/01/2025 10:00
Sampled By	: Customer	Received Date and Time	: 06/01/2025 13:52
Plant Name/ Plant	:	Date Completed	: 07/01/2025 9:09
Sample Point	:	Sampling Procedure	: APHA 2540 G
Sample Condition	: Acceptable	Enviromental Condition	: Not Applicable
Sample Method	: Grab	Analysis Start Date and Time	: 1/6/2025 1:52:01 PM
Sample Description	Al Seeb STP 60V Sludge		:

Analysis		Method	LOQ	Unit	Std Limit	U(k=2)	Results	Analyzed
Chemical Lab Analyses								
SSC	Sludge Solids Concentrate (SSC)*	APHA 2540 G	1	%		±1	42	CENTRAL

Remarks: MD145/93(Wastewater Re-use&Discharge),MD159/2005(Discharge Liquid Waste to Marine Env),OS8/2012(Unbottled Drinking Water Std),RD115/2001(Discharge Nonhousehold liquid Waste into SewageSystem).Results based on specification std limit,excluding uncertainty factors,Micro result calculated based on log 10

Approved By:

Marwa Al Rubkhi - RG Manager

Legend:
LOQ = Limit of Quantification
U = Expanded Measurement Uncertainity at k=2
n/a = Not Available
(-) = Negative
ND = Not Detected
Results in Red /* = Out of Limits
(**) = parameters not accredited by GAC

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<NAMA Lab Dryness Measure #2 – Sludge After ELO #2>

نماء nama لخدمات المياه WATER SERVICES

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P.O. Box 1047 PC 133 Al Khuwair, Muscat, Oman

نتقدم بثقة Moving Forward with Confidence رؤية عمان 2040

Central Laboratory Test Report

Reported Date: 08/01/2025 Report No: 2025-437271 Version: 1

CUSTOMER INFORMATION

Contact	**: Intisar Al Sulaimi**	**Email**	**: intisar.sulaimi@owwsc.nama.om**
Customer	**: Intisar Al Sulaimi**	**Phone No**	**: +968-24116320**
Address	**: NAMA WATER SERVICES COMPANY /Asset Engineering_DT**		

SAMPLE INFORMATION

Sample ID	: 437271	Sampling Date and Time	: 06/01/2025 10:00
Sampled By	: Customer	Received Date and Time	: 06/01/2025 13:52
Plant Name/ Plant	:	Date Completed	: 07/01/2025 9:09
Sample Point	:	Sampling Procedure	: APHA 2540 G
Sample Condition	: Acceptable	Enviromental Condition	: Not Applicable
Sample Method	: Grab	Analysis Start Date and Time	: 1/6/2025 1:52:01 PM
Sample Description	Al Seeb STP 65V Sludge		:

Analysis		Method	LOQ	Unit	Std Limit	U(k=2)	Results	Analyzed
Chemical Lab Analyses								
SSC	Sludge Solids Concentrate (SSC)*	APHA 2540 G	1	%		±1	43	CENTRAL

Remarks: MD145/93(Wastewater Re-use&Discharge),MD159/2005(Discharge Liquid Waste to Marine Env),OS8/2012(Unbottled Drinking Water Std),RD115/2001(Discharge Nonhousehold liquid Waste into SewageSystem).Results based on specification std limit,excluding uncertainty factors,Micro result calculated based on log 10

Approved By:

Marwa Al Rubkhi - RG Manager

GCC ACCREDITATION CENTER GAC Testing ISO/IEC 17025:2017 ATL 0123

Legend:
LOQ = Limit of Quantification
U = Expanded Measurement Uncertainity at k=2
n/a = Not Available
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Results in Red /* = Out of Limits
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<NAMA Lab Dryness Measure #3 – Sludge After ELO #3>

نماء nama لخدمات المياه WATER SERVICES

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P.O. Box 1047 PC 133 Al Khuwair, Muscat, Oman

رؤية عُمان 2040 — نتقدم بثقة Moving Forward with Confidence

Central Laboratory Test Report

Reported Date: 08/01/2025 Report No: 2025-437272 Version: 1

CUSTOMER INFORMATION

Contact	**: Intisar Al Sulaimi**	**Email**	**: intisar.sulaimi@owwsc.nama.om**
Customer	**: Intisar Al Sulaimi**	**Phone No**	**: +968-24116320**
Address	**: NAMA WATER SERVICES COMPANY /Asset Engineering_DT**		

SAMPLE INFORMATION

Sample ID	: 437272	Sampling Date and Time	: 06/01/2025 10:00
Sampled By	: Customer	Received Date and Time	: 06/01/2025 13:52
Plant Name/ Plant	:	Date Completed	: 07/01/2025 9:09
Sample Point	:	Sampling Procedure	: APHA 2540 G
Sample Condition	: Acceptable	Enviromental Condition	: Not Applicable
Sample Method	: Grab	Analysis Start Date and Time	: 1/6/2025 1:52:01 PM
Sample Description	Al Seeb STP 70V Sludge		:

Analysis		Method	LOQ	Unit	Std Limit	U(k=2)	Results	Analyzed
Chemical Lab Analyses								
SSC	Sludge Solids Concentrate (SSC)*	APHA 2540 G	1	%		±1	42	CENTRAL

Remarks: MD145/93(Wastewater Re-use&Discharge),MD159/2005(Discharge Liquid Waste to Marine Env),OS8/2012(Unbottled Drinking Water Std),RD115/2001(Discharge Nonhousehold liquid Waste into SewageSystem).Results based on specification std limit,excluding uncertainty factors,Micro result calculated based on log 10

Approved By:

Marwa Al Rubkhi - RG Manager

GCC ACCREDITATION CENTER GAC Testing ISO/IEC 17025:2017 ATL 0123

Legend:
LOQ = Limit of Quantification
U = Expanded Measurement Uncertainity at k=2
n/a = Not Available
(-) = Negative
ND = Not Detected
Results in Red /* = Out of Limits
(**) = parameters not accredited by GAC

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<NAMA Lab Dryness Measure #4 – Sludge Before ELO #1>

نماء nama لخدمات المياه WATER SERVICES

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P.O. Box 1047 PC 133 Al Khuwair, Muscat, Oman

رؤية عُمان 2040 — نتقدم بثقة Moving Forward with Confidence

Central Laboratory Test Report

Reported Date: 08/01/2025 Report No: 2025-436655 Version: 1

CUSTOMER INFORMATION

Contact	**: Intisar Al Sulaimi**	**Email**	**: intisar.sulaimi@owwsc.nama.om**
Customer	**: Intisar Al Sulaimi**	**Phone No**	**: +968-24116320**
Address	**: NAMA WATER SERVICES COMPANY /Asset Engineering_DT**		

SAMPLE INFORMATION

Sample ID	: 436655	Sampling Date and Time	: 07/01/2025 7:00
Sampled By	: STP Operator	Received Date and Time	: 07/01/2025 10:41
Plant Name/ Plant	: Seeb STP	Date Completed	: 08/01/2025 11:05
Sample Point	: SB_SL4_B	Sampling Procedure	: APHA 2540 G
Sample Condition	: Acceptable	Enviromental Condition	: Not Applicable
Sample Method	: Grab	Analysis Start Date and Time	: 1/7/2025 10:41:25 AM
Sample Description			:

Analysis		Method	LOQ	Unit	Std Limit	U(k=2)	Results	Analyzed
Chemical Lab Analyses								
SSC	Sludge Solids Concentrate (SSC)*	APHA 2540 G	1	%		±1	20	CENTRAL

Remarks: Results based on specification standard limit, excluding uncertainty factors,Micro result calculated based on log 10

Approved By:

Marwa Al Rubkhi - RG Manager

GCC ACCREDITATION CENTER GAC Testing ISO/IEC 17025:2017 ATL 0123

Legend:
LOQ = Limit of Quantification
U = Expanded Measurement Uncertainity at k=2
n/a = Not Available
(-) = Negative
ND = Not Detected
Results in Red /* = Out of Limits
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<NAMA Lab Dryness Measure #5 – Sludge Before ELO #2>

نماء nama لخدمات المياه WATER SERVICES

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تقدم بثقة Moving Forward with Confidence رؤية عمان 2040

Central Laboratory Test Report

Reported Date: 08/01/2025 Report No: 2025-437265 Version: 1

CUSTOMER INFORMATION

Contact	**: Intisar Al Sulaimi**	**Email**	**: intisar.sulaimi@owwsc.nama.om**
Customer	**: Intisar Al Sulaimi**	**Phone No**	**: +968-24116320**
Address	**: NAMA WATER SERVICES COMPANY /Asset Engineering_DT**		

SAMPLE INFORMATION

Sample ID	: 437265	Sampling Date and Time	: 06/01/2025 10:00
Sampled By	: Customer	Received Date and Time	: 06/01/2025 13:52
Plant Name/ Plant	:	Date Completed	: 07/01/2025 9:09
Sample Point	:	Sampling Procedure	: APHA 2540 G
Sample Condition	: Acceptable	Enviromental Condition	: Not Applicable
Sample Method	: Grab	Analysis Start Date and Time	: 1/6/2025 1:52:01 PM
Sample Description	Al Seeb STP Input Sludge		:

Analysis		Method	LOQ	Unit	Std Limit	U(k=2)	Results	Analyzed
Chemical Lab Analyses								
SSC	Sludge Solids Concentrate (SSC)*	APHA 2540 G	1	%		±1	19	CENTRAL

Remarks: MD145/93(Wastewater Re-use&Discharge),MD159/2005(Discharge Liquid Waste to Marine Env),OS8/2012(Unbottled Drinking Water Std),RD115/2001(Discharge Nonhousehold liquid Waste into SewageSystem).Results based on specification std limit,excluding uncertainty factors,Micro result calculated based on log 10

Approved By:

Marwa Al Rubkhi - RG Manager

GCC ACCREDITATION CENTER GAC Testing ISO/IEC 17025:2017 ATL 0123

Legend:
LOQ = Limit of Quantification
U = Expanded Measurement Uncertainity at k=2
n/a = Not Available
(-) = Negative
ND = Not Detected
Results in Red /* = Out of Limits
(**) = parameters not accredited by GAC

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Pictures



installation



Operation Site View	Input Device	Sludge Input



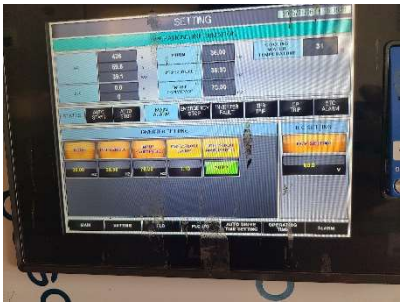
Sludge Discharging



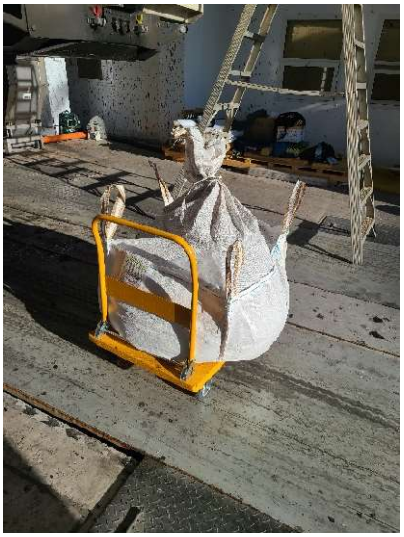
Sampling



Discharged Sludge

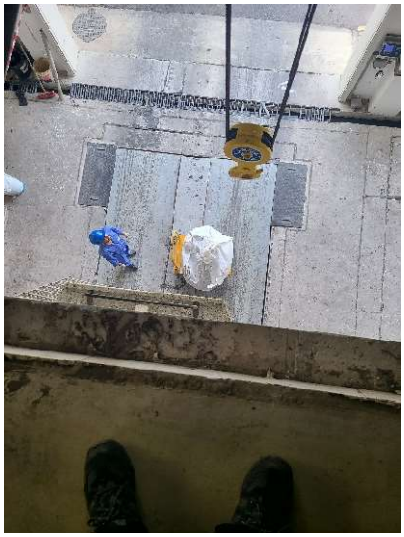




Sludge Compare	Operation



Discharged Sludge Weight Measure

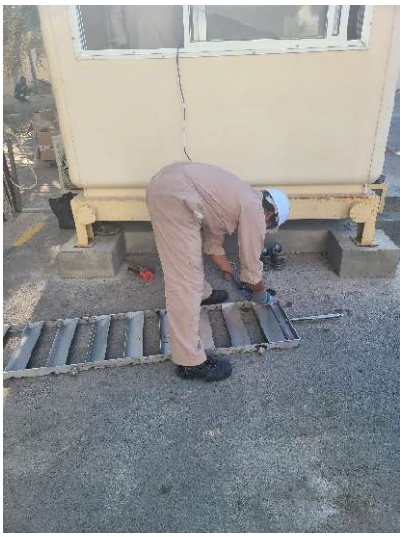
Smell Checking Test

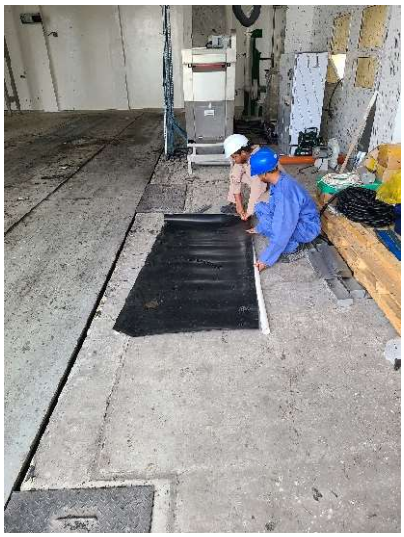


Sludge Disposal



Meeting with Local Agency & Customer





Site Customizing



On-site Demonstration