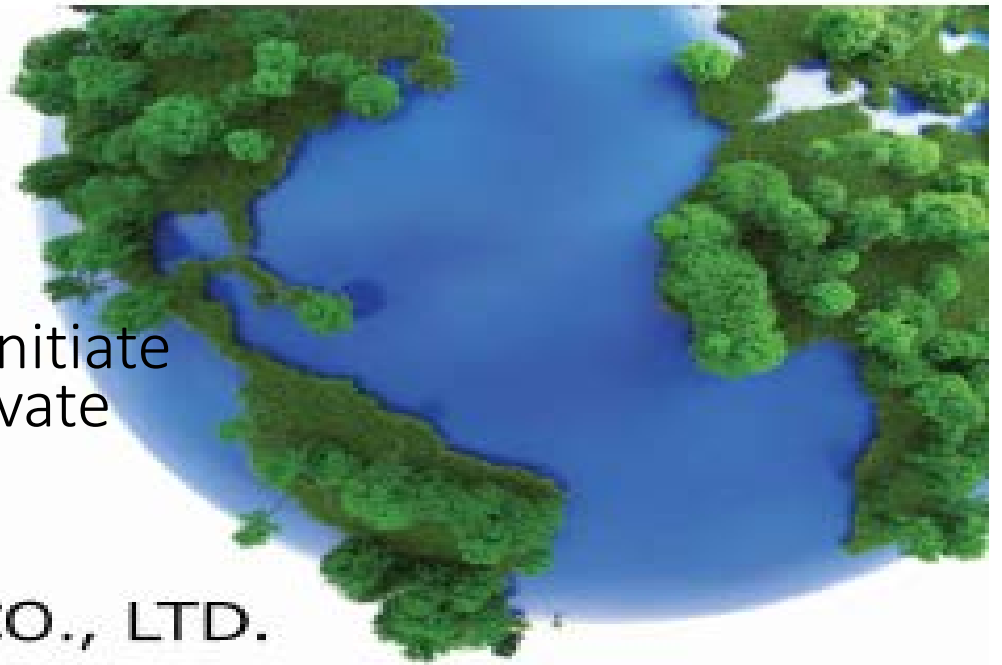
DOWA



Myanmar's waste management system and plans to initiate co-processing to tackle plastic wastes seen from a private company.

GOLDEN DOWA ECO-SYSTEM MYANMAR CO., LTD.

motivate our planet

Mr. Hideki Yomo, Managing Director, Golden DOWA Eco-System, Yangon, Myanmar

Oct.28 2022

3 Globes Express:
"Employees" - "Stakeholders"
"The Earth to be Inherited to The Future"

< Organization of “DOWA” >

DOWA HOLDINGS CO., LTD. http://www.dowa.co.jp/

Capital : JPY36.4bil Founded : 1884 Revenue: JPY464.2bil(2014)

Environmental Management & Recycling	Nonferrous Metals	Electronics Materials	Metal Processing	Heat Treatment
ECO-SYSTEM	Metals & Mining	Electronics Materials	Metaltech	Thermo-tech

Units

- Waste Treatment Business Unit
- Soil & Groundwater Remediation Business Unit
- Metal Recycling Business Unit
- Logistics Unit
- Planning Office, R&D Center, Asian Group Companies

< Environmental Business in Asia >

Metal Recycling

* “DOWA group” is engaged in waste treatment business for more than 30 years in Japan and South East Asia.

Waste Management

Metal Recycling
Soil Remediation

Waste Management
Metal Recycling
Soil Remediation

Waste Management
Metal Recycling

Waste Management
Metal Recycling
Soil Remediation

1. Company profile

Company Name :

GOLDEN DOWA ECO-SYSTEM MYANMAR CO.,LTD.(GEM)

Capital : 36 Million USD

Share Holder : DOWA ECO-SYSTEM (JAPAN) 100%

Board of Directors : 2 Persons (DOWA)

Employee : About 65 persons

Established : 17 December, 2014 (310 FC of 2014-2015 TSEZ)

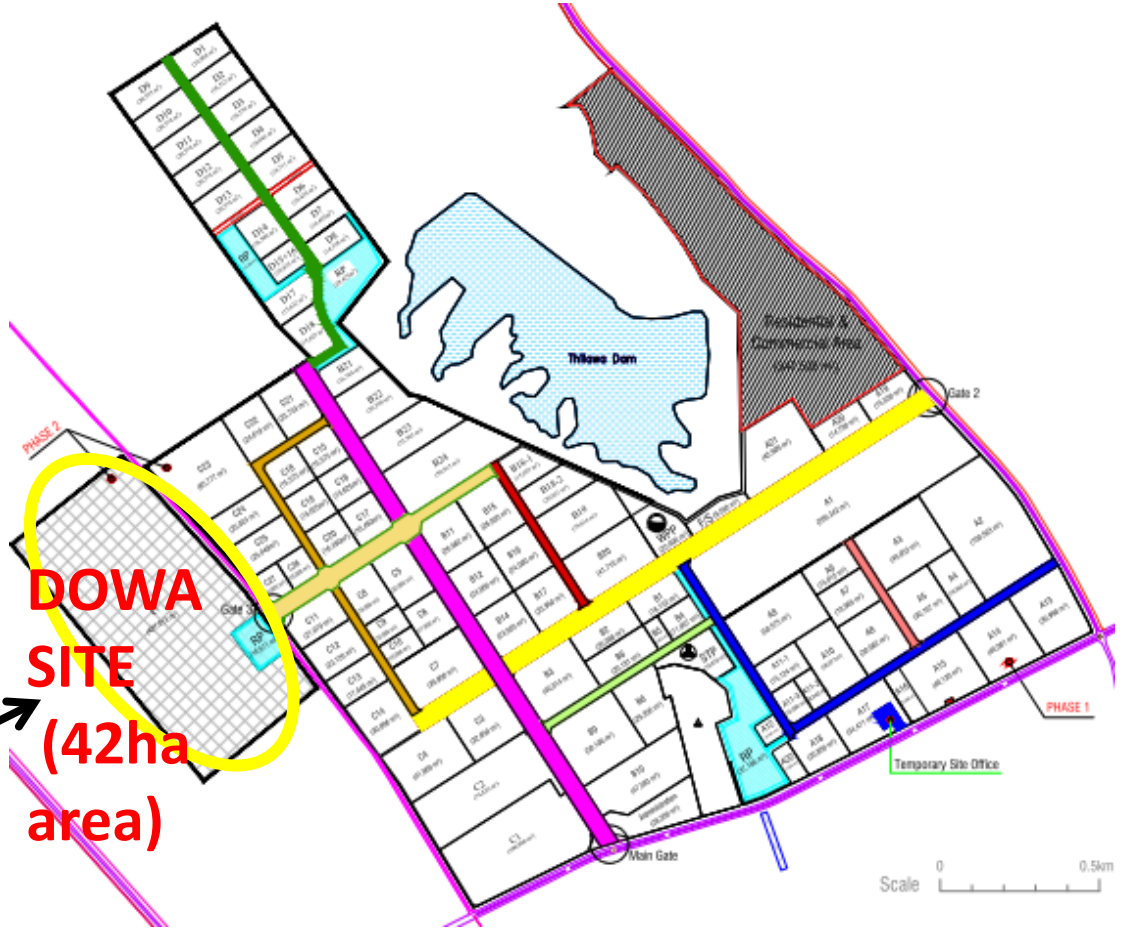
Approval of Waste Management Business

SEZ Management committee approved us to do waste management business.

EIA： Under the Environmental Impact Assessment procedures of Myanmar, We had done EIA of our business already. We got approval letter from Thilawa SEZ Management Committee on 30 June, 2015.

Location


Yangon City
ダラ
シリアム
သန်လျင်
Thilawa
SEZ
Pyawbwe


DOWA
SITE
(42ha
area)
Thilawa Dam
PHASE 2
PHASE 1
Gate 2
Main Gate
Temporary Site Office
Scale
0
0.5km

Contents of the Facilities

1.Controlled Secured Landfill (Phase -1)

- Landfill Area 80mX80m X 2 Sites (**Haz and Non-Haz**)
- Capacity 44,000m3(Non-Haz) 43,000m3(Haz)

(After closure of phase 1 site, we'll continually develop new area beside phase 1.)

- Total capacity is around 400,000m3 during operation.

2.Sorting/Stabilization Facilities

- Size 24.5m X 44m X 10m

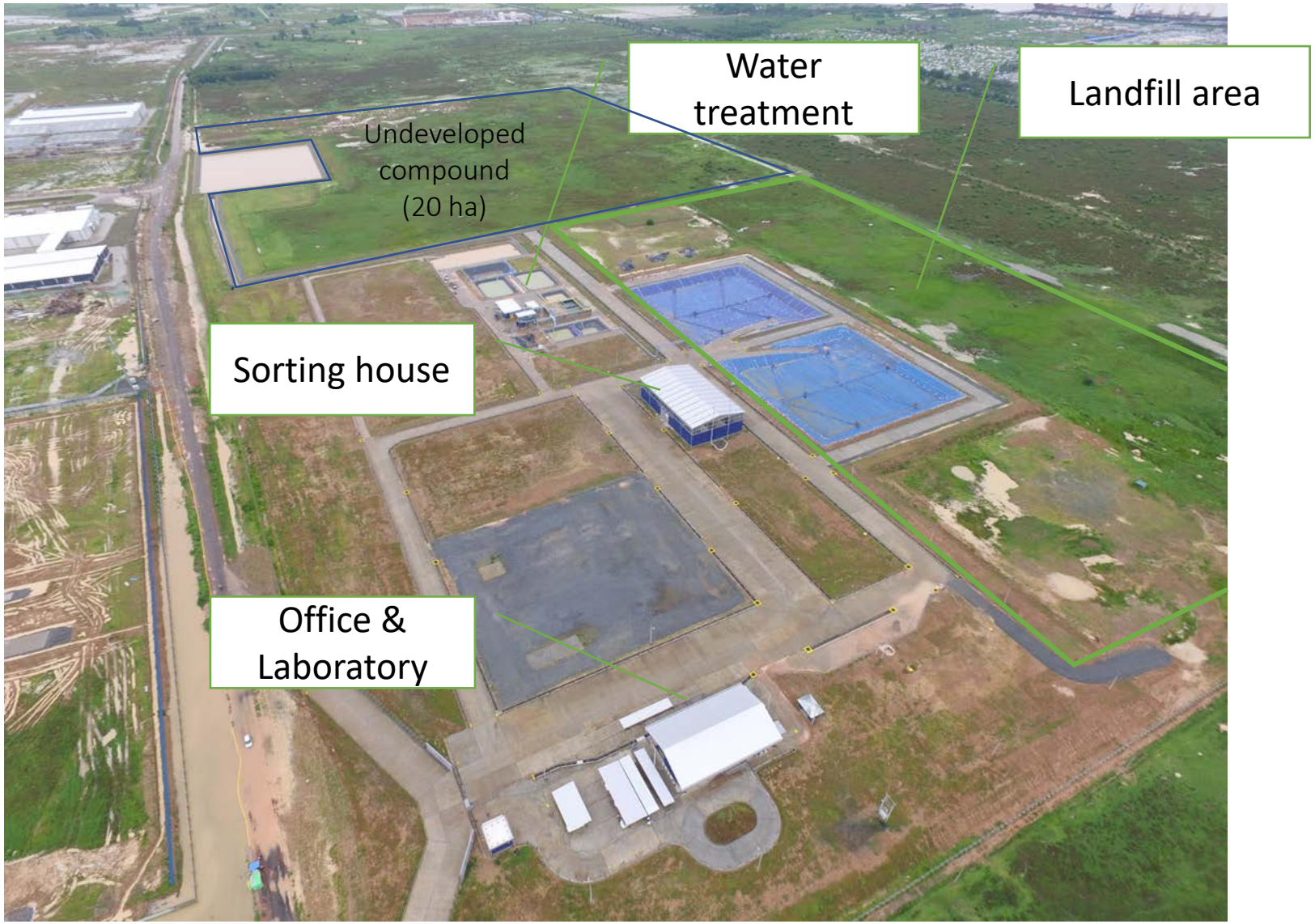
3.Waste water and Leachate water treatment Facility

- Ability 35m3/Day
- Treatment Method Biological Treatment +Flocculation
- Pond Capacity 300m3 × 3

4.Office(with Lab.)

- Size 16mX28mX3m

5.Incinerator (will invest 2 year after = tentative)


Water treatment
Landfill area
Undeveloped compound (20 ha)
Sorting house
Office & Laboratory

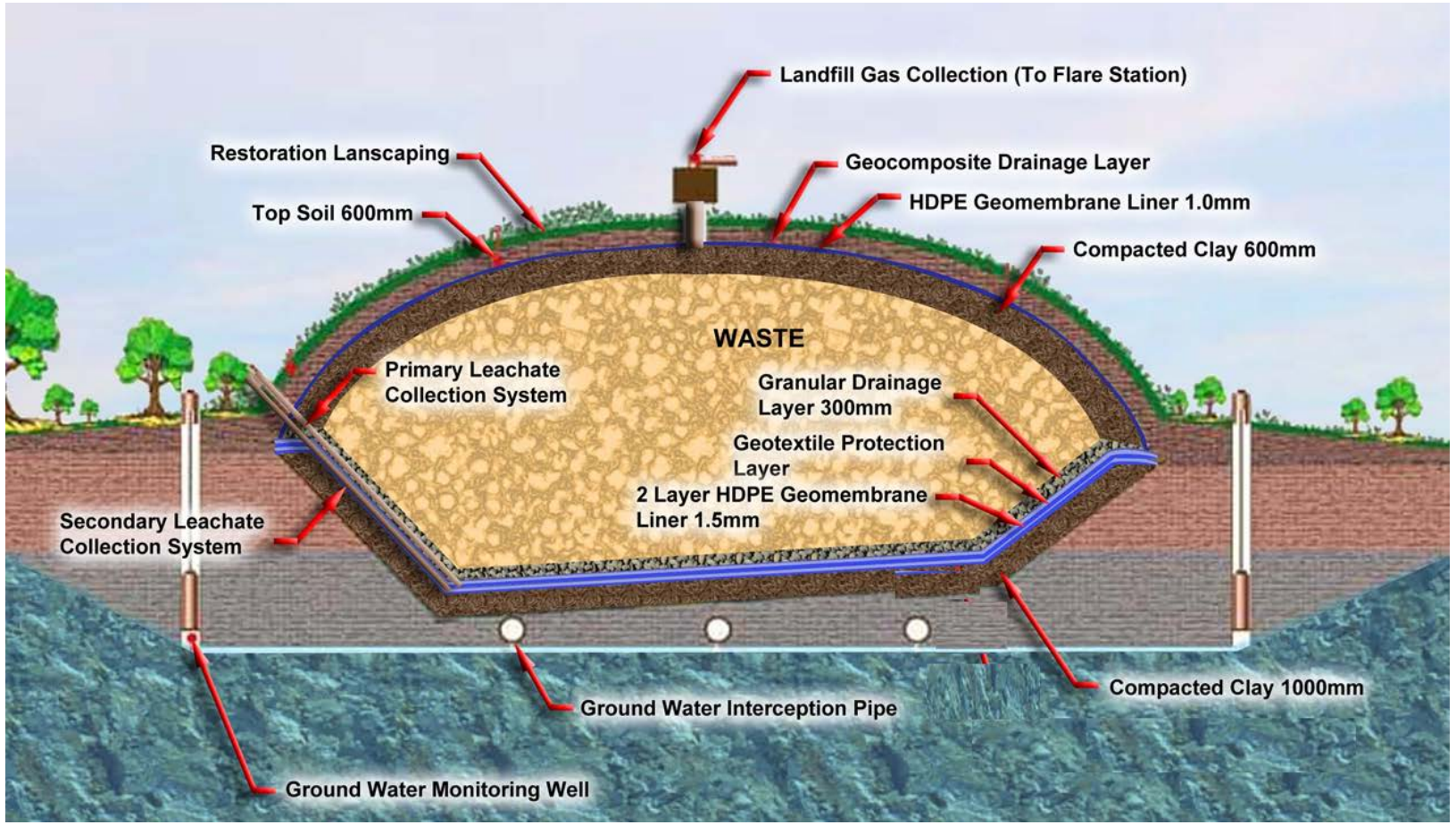
Landfill

Water treatment

Laboratory

Sorting house

Landfill structure

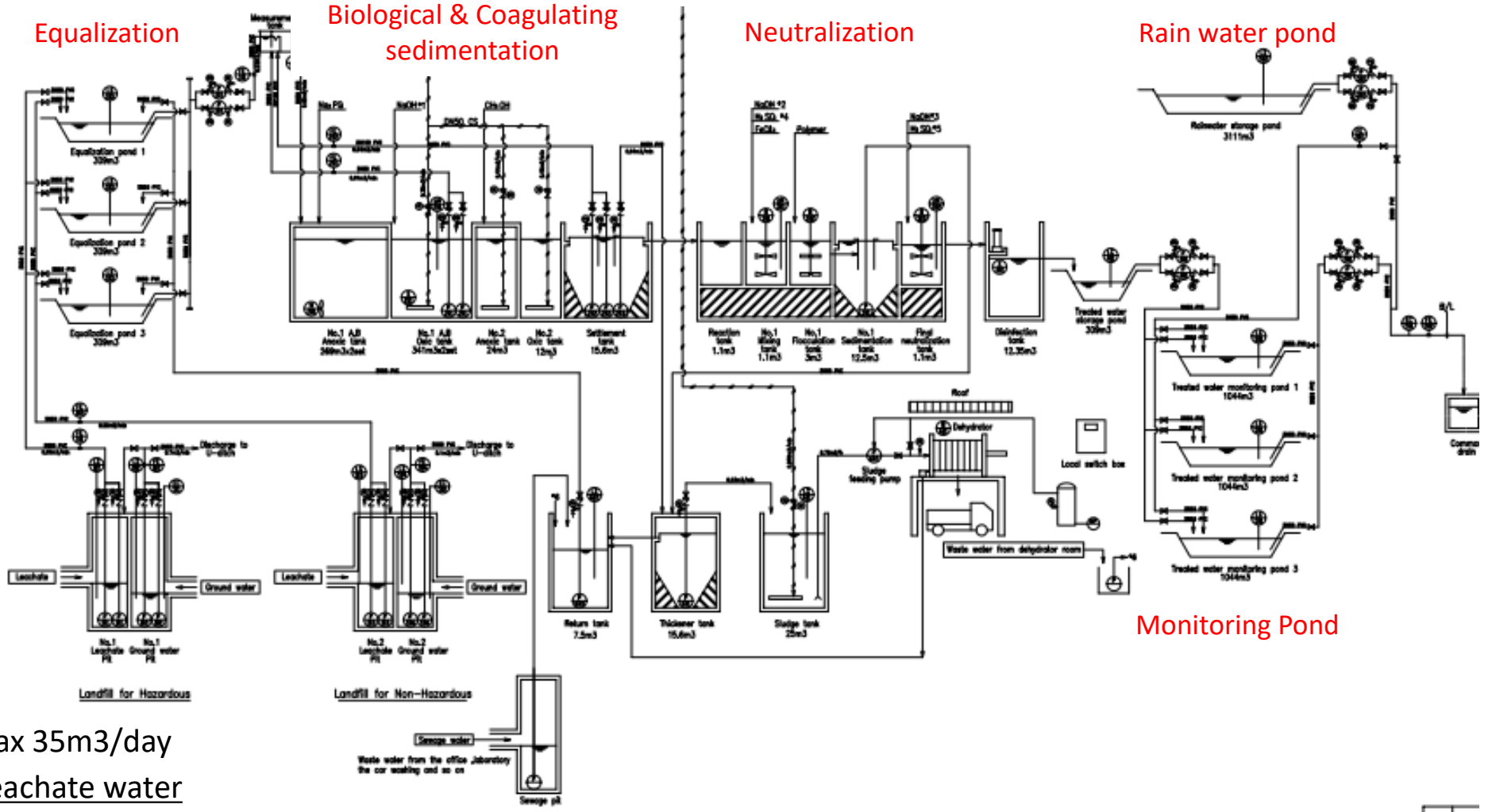


The structure that has high ability to prevent from leak and entry is based on USEPA(US Environmental Protection Agency) regulation

USEPA regulation is actual standards of the world., our plan in Thilawa also apply to this standards. (Hazardous waste)

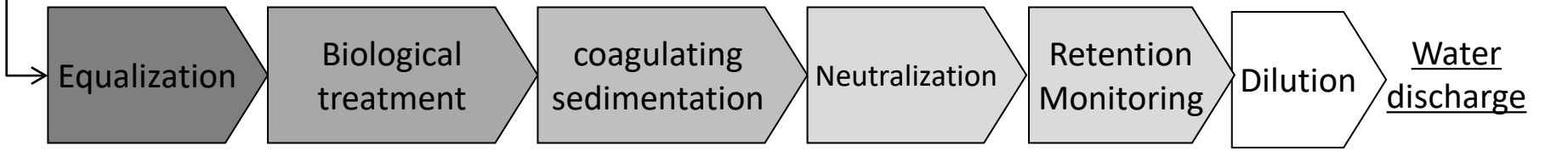
In our understanding, there are no facilities of this type in Myanmar.

Process of Water Treatment



Max 35m3/day

Leachate water



MYANMAR

1. Land Area : 680,000Km2
2. Population : 56.6mil
3. Real GDP :Growth rate: 2019/6.75%, 2020/3.19%, 2020/△17.94%
4. Real GDP:2019/68.8 Bil. USD, 2020/ 81.3 Bil.USD, 2021/65.2 Bil.USD
5. Real GDP/person :2019/1,302USD,2020/1,527USD, 2021/1,217USD

Myanmar Existing Laws and under processes

No.	Title
1	Environmental policy (1994)
2	Myanmar Agenda 21 (1997)
3	National Sustainable Development Strategy – NSDS (2009)
4	Environmental Conservation Law (2012)
5	Prevention of Hazard from Chemicals and Related Substances Law (2013 and 2016)
6	Environmental Conservation Rule (2014)
7	Procedures for Environmental Impact Assessment (2015:Dec)
8	Environmental Emission Quality Guidelines (2015: Dec)
9	Myanmar National Waste Management Strategy and Master Plan (2018-2030)
10	National Environmental Policy of Myanmar (2019)

A. Hazardous Wastes Management rule

B. Implementation the Project on Ocean Plastic Turned in to an Opportunity in Circular Economy- OPTOCEC.

C. Progress and Issues for Guidelines for Co-processing of alternative fuels and raw materials and treatment of organic hazardous wastes in cement kilns in Myanmar" (Draft)

Profile

Area : The administrative boundary of YCDC, in 1985 (133.643 Sq-Miles) and now a day (292.426) Square Miles.

Population : 6 million (2014)

Township ; 33 Tsps

Generation Rate ; 0.41 Kg / Capita / Day

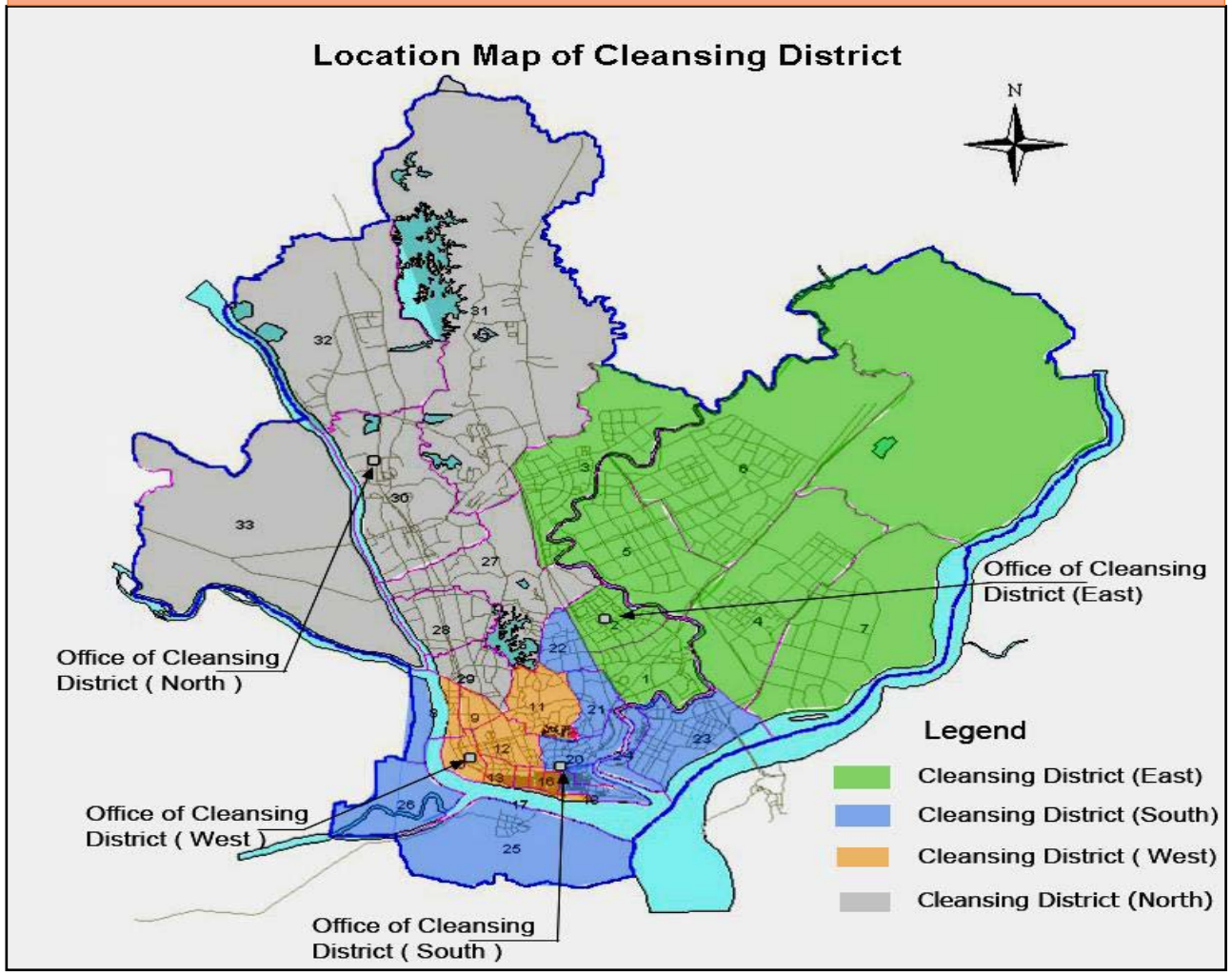
Household Waste Generated : 2000 tons per day

Industrial Waste :150 tons per day

Yearly Waste Collected

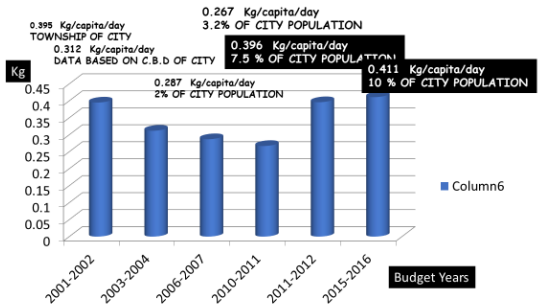
	Waste Collected
2007-2008	456344
2008-2009	433764
2009-2010	437472
2010 - 2011	426999
2011 - 2012	479280
2012 - 2013	553719
2013-2014	506657
2014-2015	590632
2015-2016	716051

Area Map



Existing Used Main (2) Final Disposal Sites & (4) Temporary Small FDS

2015 – 2016 Generation Rate



2016-2017…Waste Generated = (2000) TPD

No	Name	Constructed Year	Site Area (Acre)	Remaining area (Acre)	Dispose ton per day (Est.)	Remark
1	Htain Bin	2002	290 (Used-220)	70 Acre	1111.12	Open Dumping
2	Htwei Chaung	2001	141 (Used- 110)	31	945.61	Open Dumping
3	Dala	2003	1.3 (Used-1)	0.3	33.36	Low Landfill Temporary Site
4	Seikkyi Khaungto	2003	0.25 (Used-0.1)	0.15	7.11	Low Landfill Temporary Site
5	Mingalardon	2003	0.91	-	60	Low Landfill Temporary Site
6	Shwe Pyi Thar	2005	1	-	60	Low Landfill Temporary Site

Myanmar situation

→Dumping site: odd and contaminated water with no control leachate, fire and Plastics inflow into river from dumping site

Cement Factory in Myanmar

Location of Cement Factory

Shan
3 factory

Magway
2 factory

Ayarwardy
1 factory

Mandalay
10 factory

Nay Pyi Taw
1 factory

Kayin
1 factory

Mon
3 factory

Cement Factory in Myanmar

No.	Company	Location	Production Capacity (ton/d)	Production Capacity (ton/y)
1	Duoble Rhinos	Kyaukse, Mandalay	1x5000 (dry) 1 x 5000 (dry) planned	1.2 1.2 after commissioning
2	Alpha Cement	Kyaukse, Mandalay	1x5000 (dry)	1.2
3	Sin Minn	Kyaukse, Mandalay	1 x 1200 (dry)	0.3
4	Myanmar Elephant	Kyaukse, Mandalay	2 x 200 (dry)	0.13
5	AAA	Kyaukse, Mandalay	1 x 5000 (dry) planned	1.2 after commissioning
6	Tiger Head	Kyaukse, Mandalay	1 x 300 (wet)	0.09
7	Apache Cement	Pyi Nyaung, Tharzi, Mandalay	1 x 500 (dry) 1 x 3500 (dry) planned	0.5 1.1 after commissioning
8	Blue Diamond	Pyi Nyaung, Tharzi, Mandalay	1 x 1500 (dry)	0.45
9	YSKMK Mining	Pyi Nyaung, Tharzi, Mandalay	1 x 12000 (dry) planned	3.6

Cement Factory in Myanmar

No.	Company	Location	Production Capacity (ton/d)	Production Capacity (ton/y)
10	Max Cement	Pyi Nyaung, Tharzi, Mandalay	1 x 500 (wet) To be upgraded to 1 x 1500 (dry)	0.16 (now) 0.5 after commissioning
		Leiway, Nay Pyi Taw	1 x 2100 (dry)	0.63
11	SCG Cement	Mawlamyine, Mon	1 x 5000 (dry)	1.75
12	June Cement	Kyaiee Mayaw township, Mon	1 x 3150 (dry) under construction	0.945 after commissioning
13	Zaykabar Cement	Kyaiee Mayaw township, Mon	1 x 5000 (dry) planned	1.2 after commissioning
14	Crown Cement	Naung Cho Township, Northern Shan State	1 x 1000 (dry) 1 x 4000 (dry) under construction	0.3 1.2 after commissioning
15	Dragon Cement	Pinlaung, Shan	1 x 600 (wet)	0.135
16	KBZ Cement	Taunggyi, Shan	1 x 1000 (dry)	0.3

Cement Factory in Myanmar

No.	Company	Location	Production Capacity (ton/d)	Production Capacity (ton/y)
17	No.31 heavy industry	Thayet, Magway Region	2 x 400 (wet) 1 x 200 (wet)	0.1
18	Paan Cement	Myainggale, Magway	1 x 800 (dry)	0.24
19	MCI	Kyangin, Ayeyarwady	4 x 400 (wet)	0.36
20	MHECL	Myaing Galay, Hpa-an, Kayin	1 x 700 (wet) 1 x 4000 (dry)	0.24 1.2

Overall Objective of Implementation Plan of demonstration

Objective

The implementation plan aims to explore the feasibility of developing a pilot demonstration project to utilize waste as raw material and fuel at a specific cement facility in Myanmar with Private companies.

Implementing Team

- A Private Cement Company in Myanmar (SHWE TAUNG GROUP)
- Nippon Koei Co., Ltd.(NK)/ Myanmar Koei International Ltd. (MKI)/ Golden Dowa Eco-system Myanmar Co., Ltd. and support by SINTEF

Expected Project Timelines

- Preparation of the Implementation Plan (draft): by March 2022
- Finalization of the Implementation Plan: Nov. of 2022
- Implementing pilot demonstration: Dec. of 2022- Mar. of 2023

Methodology of Implementation Plan

Period

From Oct 2021 to March 2022

- Collection of relevant information on the cement factories and waste management in Myanmar
  - Collect the latest status related to the Guidelines
  - Collect relevant information from cement factories
  - Collect information on solid waste management
- Collection and analysis of specific information on waste co-processing in cement kilns
  - Review draft guidelines by ECD/MONREC
  - Review other relevant guidelines from other countries
  - Collect information about waste co-processing in cement plant
  - Analysis of specific information
- Preparation of the draft Implementation Plan for the pilot project on co-processing of waste in target cement factories
  - Collect related consideration of pilot demonstration
  - Prepare draft pilot demonstration
  - Collect criteria of waste acceptance
  - Prepare draft implementation plan for pilot project

From Oct. of 2022 to Early 2023 (Expected schedules)

- Finalization of Implementation Plan
- Implementing the pilot demonstration of co-processing of waste in cement production
- Disseminating the results of the pilot demonstration to related stakeholders

No.	Company (brand name)	Plant Location	Process	Daily Production Capacity in tpd	Annual Production capacity (Mta)	Remarks
1.	Shwe Taung Group (Apache Cement)	Pyi Nyaung, Tharzi, Mandalay	Dry	1 x 1500 1 x 3500 (planned)	0.5 now 1.60 after expansion	Source: company officials
2.	Mawlamyine Cement Ltd (SCG)	Mawlamyine, Mon	-	-	1.75	Could not get data
3.	Max Manufacturing Co. Ltd (Max Cement)	Pyi Nyaung, Tharzi, Mandalay	Wet	1 x 400	0.15	Not in operation
		Leiway Township, Nay Pyi Taw	Wet	1 x 400 1 x 1500 – (dry process planned)	0.13 now 0.5 after expansion	

Current Progress

Consideration of the Pilot Demonstration	Preparation of Draft Pilot Demonstration	Confirmation of the Regulatory compliance
Development of Environmental Management System and Assessment of Possible Impacts	Development of Waste Utilization Management Processes	Development of Environmental Monitoring during the Pilot Demonstration

Period - From October 2021 to March 2022

▪ Consideration of the Pilot Demonstration

Consideration of Pilot Demonstration

Considering gas emission quality and cement quality

To make a Criteria to acceptance

A. Blending method (Solid or liquid)
B. Waste profile
1.Lab test method for each parameter
2.Lab. Data before blending and after blending
3. Size
B. Supply volume
C. Transportation method and package

A. Charging method
B. Consideration of effect for quality of cement
C. Ratio of waste to charge
D. Temperature control method
E. Storage volume and place
F. Emission gas monitoring method
G. Ash control

Regulatory compliance

The Myanmar cement industry must follow the various environmental acts and regulations notified by the Ministry of Natural Resources and Environmental Conservation (MONREC/ECD)

(1) National Environmental Quality (Emission) Guidelines 2015 (NEQG 2015)

- Air emission levels for cement manufacturing (page 86 in NEQG)
- Air emission levels for lime manufacturing (page 87 in NEQG)
- Wastewater, effluent, sanitary discharges, and storm water runoff (General application) (page 10 in NEQG)
- Effluent levels for cement and lime manufacturing (page 85 in NEQG)
- General Guidelines for noise level (page 13 in NEQG)
- General Standard of odorant (page 13 in NEQG)

(2) Guidelines for Co-processing of alternative fuels and raw materials and treatment of organic hazardous wastes in cement kilns in Myanmar (First Draft)

Environmental Management System and Assessment of Possible Impacts

Environmental Management System

- Conduct an initial environmental review
- Identify environmental aspects and impacts
- Setting an environmental policy;
- Understanding and complying with local environmental legislation and regulations and other standards
- Setting environmental objectives and targets;
- Implementing an environmental management program;
- Setting and implementing environmental procedures;
- Establishing environmental training and awareness;
- Establishing an environmental communication system;
- Establishing a system for document and operational control;
- Installing an emergency preparedness and response plan;
- Monitoring and measuring;
- Understanding non-conformance and implementing correction and prevention;
- Having an audit and
- Management review and control.

Assessment of Possible Impacts

- Assess the potential impact of transporting, unloading, storing
- Assess what personal protective equipment required for employees
- Assess the compatibility of wastes
- Assess the effect the waste
- Assess the potential impact on process stability and quality of the final product
- Assess the effect of waste on plant emissions
- Determine materials analysis data for the waste supplier

Source: Guidelines for Co-processing of alternative fuels and raw materials and treatment of organic hazardous wastes in cement kilns in Myanmar (First Draft)

Waste Utilization Management Processes

- Waste Selection
- Waste Collection
- Waste Transport
- Waste Reception and Handling
- Waste Assessing
- Waste Pre-processing and Storage

List of candidate waste

	WASTE NAME	EXISTING VOLUME in GEM	FUTURE VOLUME in GEM	EXPECTED HEATING VALUE(kcal/kg)	SPECIFICATION
1	Waste oil (Used Oils)	200t/year	1000 -2000t/Year Depending on collection strategies	8000-9000kcal/kg	Need to co-create a specification considering QC of cement product
2	Solvent	30t/year	300-500t/Year (estimates)	3000-5000kcal/kg	
3	Waste Water	500t/year	2000t/year	1000kcal/kg	
4	Oily Sludge	1000t/year	2000-3000t/year	2000kcal/kg, possible to adjust to higher value	
			1000-2000t/year	Less than 1000kcal/kg	
5	Paint Sludge	100t/year	300-500t/year Depending on Automobile company production plan	7000-8000kcal/kg	
6	Waste Water Sludge	200-400t/year	600t-1200t/year	Less than 1000kcal/ kg	
7	Plastic waste	2000t/year	6000t-8000t/year Mainly PP, PET, PE, PS, not including PVC	4000-6000Kcal/kg	
8	RPF Investment will be required.	2000t/year	6000t-8000t/year same as the above plastic and paper refused by recycler	8000-9000kcal/kg	
9	Tiers Investment will be required.	600-1000t/year (estimates)	5000t-10000t/year Depending on capacity of machines (c.f. crushers) Potential market will be much bigger	7000kcal/kg	Without steel wire sizing follows the customer request
10	Waste Resin	10t/year	20t/year Like Glue or Adhesive	4000-6000kcal/kg	Need to co-create a specification considering QC of cement product
11	Working Clothes / Gloves contaminated with paint and others	5t/year	20t/year	4000-6000Kcal/kg	

Future Plan

Finalization of the Implementation Plan

Implementing the pilot demonstration of co-processing of waste in cement production

Disseminating the results of the pilot demonstration to related stakeholders

Expected Period - Finalization of the Implementation Plan: Dec.of 2022

Implementing pilot demonstration: Dec of 2022- March 2023

A Sample of GEM supply as alternative fuel

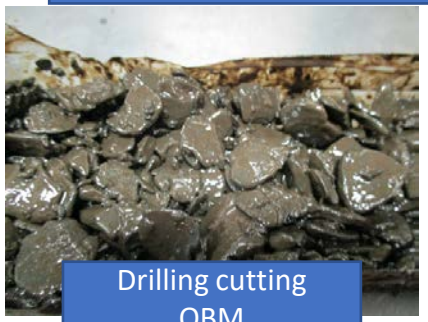
Rubber & Mix plastics

Mix plastics

Polystyrene form

paper

A Sample of GEM supply as raw material



Drilling cutting OBM

OBM sludge

Consideration of Pilot Demonstration

Considering gas emission quality and cement quality

To make a criteria for waste acceptance

A. Blending method (Solid or liquid)
B. Waste profile
1.Lab test method for each parameter
2.Lab. Data before blending and after blending
2. Size
B. Supply volume
C. Transportation method and package

A. Feeding method
B. Consideration of impacts on quality of cement
C. Ratio of waste to total input
D. Temperature control method
E. Storage volume and location
F. Emission gas monitoring method
G. Ash control

Pilot Demonstration DRAFT

Pilot Demonstration DRAFT

1. Batch Test (limited volume for 1hr or 2hr)
2. Continuous Test for 1week
3. Evaluation for long run demonstration
4. Long run demonstration for 1 year
5. Evaluation for EIA, Supplemental EIA or revised EIA

A example of Criteria for acceptance of waste by cement kilns

For Liquid

	Palameter	unit	Used Oil	Industrial waste	Aqueous waste
1	Viscosity	Centiposises	≦50,000	≦50,000	≦50,000
2	Deansity		≧1.2	≦1.2	≦1.2
3	Low heating value	Kcal/kg	≦8,000	≦500-8000	500
4	water	%	20	85	No Limit
5	pH	℃ -	12-5		
6	Flash point		23		
7	Size of the particlur in suspension	%	30%		
8	Particle size		10μ		
9	Chloride:Cl	%	2		
10	Sulfer:S	%	2		
11	Heavy Metal: Cr+Cd+Pb+V+Ni +As	%	2		
12	Cu+Zn	%	2		
13	Hg+Ti	ppm	200		
14	Total Halogen Content: F, Br, I	%	2		

For Solid

Parameter			Unit	Criteria
Physical & Chemical Properties	1	Heat Value	Kcal/Kg	<500
	2	Moisture	%	≦30
	3	Ash content	%	-
	4	Chloride content	%	≦6
	5	Sulfur content	%	≦15
Heavy Metal Content	6	Antimony(Sb)	%	≦10
	7	Arsenic(As)	%	≦0.5
	8	Bariun(Ba)	%	≦10
	9	Cadmium(Cd)	%	≦0.1
	10	Chromium(Cr)	%	≦0.5
	11	Lead(Pb)	%	≦1.0
	12	Mercury(hg)	%	≦0.05
	13	Nickel(Ni)	%	≦10.0
	14	Potassum(K)	%	-
	15	Selenium(Se)	%	≦10.0
	16	Silver(Ag)	%	≦10.0
	17	Sodium(Na)	%	-
	18	Thallium(Tl)	%	≦10.0
	19	Vanadium(V)	%	≦10.0
	20	Zinc(Zn)	%	≦10.0
	21	Copper(Cu)	%	≦4.0
Other Oxides	22	Al2O3	%	
	23	MgO	%	
	24	SiO2	%	
	25	CaO	%	
	26	Fe2O3	%	

Air emission standards for cement manufacturing (EQEG)

No.	Standard		MM-EQEG (2015) Value	MM-EQEG (2015) Unit*1	Note
1	Cadmium + Thallium		0.05	mg/Nm³	
2	Dioxins / Furans		0.1	mg TEQ/Nm3	Challengeable
3	Dust (other point sources including clinker cooling, cement grinding)	Not defined	50	mg/Nm³	
		Old-Grey cement kiln			
		Old-White cement kiln			
		Old-clinker cooler, etc.			
		New-Grey cement kiln			
		New-White cement kiln			
		New-clinker cooler, etc.			
		(designated place)			
4	Hydrogen chloride (HCl)		10	mg/Nm³	Challengeable
5	Hydrogen fluoride (HF)		1	mg/Nm³	
6	Mercury (Hg)	Not defined	0.05	mg/Nm³	Challengeable
		(new plants)			Challengeable
		(existing plants)			Challengeable
7	Nitrogen oxides(NOx)	Not defined	600	mg/Nm³	
		(new plants)			
		(existing plants)			
		Emissions of 100,000 m³ or more			
		Emissions of less than 100,000 m³			

No.	Standard		MM-EQEG (2015) Value	MM-EQEG (2015) Unit*1	Note
6	Mercury (Hg)	Not defined	0.05	mg/Nm³	Challengeable
		(new plants)			Challengeable
		(existing plants)			Challengeable
7	Nitrogen oxides(NOx)	Not defined	600	mg/Nm³	
		(new plants)			
		(existing plants)			
		Emissions of 100,000 m³ or more			
		Emissions of less than 100,000 m³			
8	PM10 (existing)		100	mg/Nm3	Challengeable
9	PM10 (new)		30	mg/Nm3	
10	Sulfur dioxide (SO2)	Not defined	400	mg/Nm3	Challengeable
		Old-Grey cement kiln			
		Old-White cement kiln			
		New-Grey cement kiln			
		New-White cement kiln			
11	Total metals*2		0.5	mg/Nm3	
12	Total organic carbon		10	mg/Nm3	

1. There are many parameters not analyzable
2. Minimum requirement should be decided for pilot demonstration feeding limited amount of waste.
3. Challenge to find a laboratory in neighboring countries to send gas samples

Overall Schedule for MOEJ Study on Pilot Demonstration Project On Co-Processing of Waste in Cement Production of A Cement Plant in Myanmar

as of October 18, 2022

Work item / Date	Corresponding organization/memo	2021			2022		
		10	11	12	1	2	3
Support for implementation of pilot projects for waste utilization at cement facilities							
(1) Detailed examination of the project implementation plan							
1) Renewal of pilot project plan (draft), materialization of plan	NK/MKI & GEM prepare, STC input						
2) Meetings for update/materialization	NK/MKI+ GEM+ STC	▲	▲	▲			
3) Myanmar translation of the implementation plan	NK/MKI						
(2) Implementation of pilot projects							
1) study and make a plan of a demonstion detail.(type of waste, size, charging method, charging volume, emmision gas sampling method and timing.	GEM・STC + NK/MKI						
2) Waste procurement, test analysis, pretreatment	GEM						
3) shipping	GEM/STC						
4) Implementation of input management and pilot projects	1 hour batch, Max 1 week test						
5) Stakeholder coordination	NK/MKI						
6) Actual Implmentation/recording	NK/MKI						
7) Environmental monitoring	SINTEF or NK/MKI				▲	▲	
8) Analysis and evaluation of measurement results	GEM, SINTEF and NK/MKI						
9) Extracting issues and organizing lessons learned through pilot projects	GEM, SINTEF, NK/MKI						
(3) Dissemination of Pilot Project Results							
1) Consideration and preparation of workshops	NK/MKI						
2) Hold a workshop	NK/MKI						▲
3) Preparation of meeting minutes, etc.	NK/MKI						
(4) Support for consideration of waste acceptance standards at cement facilities							
1) Examination of waste acceptance standards	NK/MK+GEM						
2) Provision of necessary information and advice based on the neighboring countries cases and results of	NK/MK+GEM						
(5) Support for formulation of guidelines for waste utilization at cement facilities							
1) Report the results of the pilot project and discuss measures to utilize the results.	ECD+NK/MKI, Input from Mr.Yomo, GEM					▲	▲
2) Organize the concept of application, and make specific improvement proposals (if necessary)	ECD+NK/MKI, Input from Mr.Yomo, GEM						
3) Support for MONREC/ECD	NK/MKI						
6 Summary of survey results							
Creating a report	NK/MKI						
Submission of the report	NK/MKI	● survey plan				draft	● ●

THANK YOU !