Project for Improvement of Water Environment by Utilizing Johkasou as An Appropriate Technology

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DAIGO SANGYO Co., Ltd

Profile of DAIGO SANGYO Group

company that create the future with you

DAIGO GROUP
あなたと共に未来を創る企業
-大五産業株式会社-

Enterprise contents of DAIGO SANGYO Co., Ltd (about 100 staff member)

Overseas business	Johkasou business, restaurant business
Johkasou management business	10 johkasou technicians, O&M, desludging 800 unit johkasou, 8 vacuum truck
Waste disposal business	-
Sewer maintenance business	-
Water quality analysis business	-

Other Businesses

Building Maintenance Business, Restaurant Business, Recycling Business

Total staff member of Daigo Sangyo Group is about 1,000

Information and Situation of Yangon City

①Area: 598.75 km2,

②Population (2010): 4,348,000 people

③Center of Myanmar economy

Future tasks・・

・population will be 10 million in 2040,
・air pollution and pollution of rivers and lakes,
・unstable electric power supply
・・・・・・・・

Water environment in Yangon City

1） Water quality of river

	COD (mg/L)		BOD (mg/L)	
	Range	Avg.	Range	Avg.
Rainy season				
River	96 - 2560	888	27 - 900	405
Drainage ditch	96 - 224	171	6 - 62	36
Dry-season				
River	110 - 985	658	50 - 520	328
Drainage ditch	100 - 322	207	28 - 96	56

2） Outline of sewage treatment plant and pipeline facilities

Facility		Specification
Sewage treatment Plant		
	site area	2.25ha (5.56 acre)
	completion	Jan.2005
	planned population	300,000
	treatment process	activated sludge process
	capacity	14,775 m3/d (3.25 MGD)
	real flow rate	1,364 m3/d (0.3 MGD)
	raw wastewater quality	BOD 600 mg/L, SS 700 mg/L
	effluent water quality	BOD 60 mg/L, SS 40 mg/L
Sewer network		
	completion	Mar. 1890
	planned population	40,000
	service area	8 township
	length of sewer pipe	Northern trunk sewer 5.55 km Southern trunk sewer 5.03 km Total 10.58 km
	material of sewer pipe	casting iron
	ejector station	40 (34 st. are in operation)

3)Form of individual wastewater treatment facility

	Flush toilet (sewerage)	Pour flush toilet (ST,VIP)	Unimproved toilet (pit latrine, etc.)	without toilet	NA	Total
Number of toilet	580	8,278	1,098	58	31	10,045
(%)	5.8	82.4	10.9	0.6	0.3	100

Source: JICA project report

Condominium
Septic tank

disposal

Sewage treatment plant

From septic tank Sludge treatment plant (dry-bed facility)

Establishment of water related environmental Law

1990 Yangon City Development Law

2012 Environmental Protection Act was enacted in April 2012

No national regulations/discharge standards

Yangon City's Std.

Discharge standard for effluent of sewerage treatment

Item	Criterion
PH	6.0 - 8.0
Grease	10 mg/L
T-P	10 mg/L
PO4	5 mg/L
TDS	1,200 mg/L
Temperature	20 – 35℃
TSS	100 mg/L
turbidity	300 UTN
T-N	20 mg/L
COD	100 mg/L
BOD5	50 mg/L

出所：YCDC下水処理場

Discharge standard for effluent of industrial wastewater

Item	Criterion	
	This survey	2012
BOD5	20 – 60 mg/l	
pH	6 – 9.5	
COD	200 mg/l	
Suspended Solids	500 mg/l	200 mg/l
Total Solids	1,000 mg/l	500 mg/l

Discharge Standards for buildings

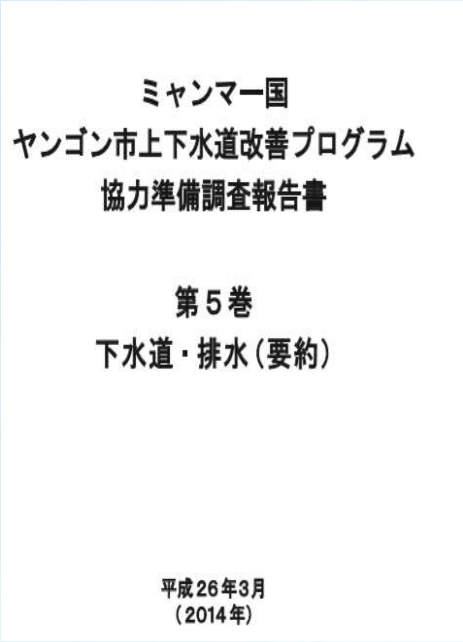
No. of Floor	Check and approval of documents	Effluent BOD (mg/L)	Recommended facility	Note
13F	CQHP and YCDC check and approve	20 mg/L	Wastewater treatment plant[1)]	License issued by YCDC
9-12F	CQHB gives comments, YCDC checks and approves	20 mg/L	Wastewater treatment plant[1)]	
4-8F	YCDC checks and approves	No regulation	Septic tank with up-flow filter	
1-3F			Septic tank	

注1) johkasou or treatment plant with activated sludge process
Source：YCDC

Item	Discharge to rain drainage (mg/L)	Discharge to sewerage system (mg/L)
BOD	50(20)	150
COD_{Cr}	100	200
SS	50(30)	150

Source：CQHP and YCDC
Note) data In parentheses, YCDC's additional standard

Master plan for domestic wastewater treatment



Yangon City Development Committee
（YCDC）

e.	下水道条例の制定			●		
5.	環境基準・排水基準に関する検討及び国との協議					
a.	水質環境基準素案の作成			●		
b.	汚泥処理に関連する廃棄物処理関連法規の検討			●		
c.	国、地方政府、大学、事業者等との協議			●		
d.	一律排水基準の素案作成及び国への制定要請				●	
e.	YCDC での上乗せ排水規制素案の作成、制定				●	
6.	他の汚水処理に関する法規・助成制度の創設					
a.	腐敗槽の改良に関する方策の検討	●				
b.	浄化槽・腐敗槽に関する法規（構造基準）の検討及び国との協議	●				
c.	腐敗槽の改良、浄化槽設置に関する助成制度の検討・創設		●			
7.	開発行為に関する規制法規の基本方針と国との協議					
a.	必要規制、協力要請事項の検討		●			
b.	規制に関する都市計画法との調整、国との協議		●			
c.	開発行為の下水道に関連する規制条例の検討、制定			●		
8.	工場排水受け入れに関する条例制定					
a.	業種別の工場排水水質調査		●			
b.	利害関係者（国、地方政府、YCDC 他部署、事業者）との協議			●		
c.	工場排水の下水道受け入れに関する条例制定				●	
9.	下水道・汚水処理に関する市民への PR					
a.	一般的な啓蒙資料、制度紹介資料等の作成			●		
b.	説明会の開催				●	
10.	供用開始・事業進捗に向けての手続き					
a.	各種手続き、及び管理台帳、運転日報・月報等の作成					●

Necessary of johkasou installation ⇒ Promotion of johkasou installation

⇒ About 300 unit johkasou are in operation

However, O&M of installed johkasou is not carried out regularly in most cases.

Outline of the johkasou project in Yangon

Purpose

- Verification of treatment capacity of Johkasou
- Verification of maintenance effect using existing Johkasou
- Capacity development of installation and maintenance technic for YCDC

Output of the activities

Output 1: Effluent water quality of existing Johkasou is improved through the transfer of appropriate O&M skills of Johkasou to YCDC.

Output 2: Through the creation of Johkasou guideline, YCDC's capacity for installation supervision and O&M of Johkasou is developed.

Output 3: Understanding of the importance Johkasou O&M among related officials is promoted.

Activities for the Outputs

- **Activities for Output 1**

Act 1: Installation of new Johkasou in Maha Bandula Park and Kan Taw Min Lake Park
Act 2: On-the-Job training for O&M of Johkasou including operating, desludging and inspection, targeting the staff of YCDC.
Act 3: Water quality monitoring to verify effectiveness of appropriate Johkasou O&M skills.

- **Activities for Output 2**

Act 4: Formulation of draft guideline covering capacity calculation, installation, supervision and O&M of Johkasou.
Act 5: Establishment of draft ledger of Johkasou as well as systematic and phased O&M plan of Johkasou, based on the draft guideline.

- **Activities for Output 3**

Act 6:Creating materials on environmental education including utility of Johkasou and Holding seminar

Act 1: Installation of Johkasou

Installation of new Johkasou in Maha Bandula Park and Kan Taw Min Lake Park for public awareness

Johkasou installed in
Kan Taw Min Lake Park
(Johkasou capacity: 80 m^3/d)

Johkasou installed in
Maha Bandula Park
(Johkasou capacity:
1.0 m^3/d X 5 unit)

Act 2: On-the-Job training for O&M of Johkasou OJT

Practice training

OJTおよび講義

Lecture

Act 3 Water analysis

Act 2） Main content of OJT

・Basic operation check such as pump and air flow rate

・Condition of water flow, situation of use, occurrence of offensive odor, occurrence situation of fly etc.)

・PH, Sludge volume, dissolved oxygen content, residual chlorine concentration, transparency etc.

・Adjustment for various abnormalities is also carried out

ACT2: O-J-T CONTENT

Category	Item	Contents	Training time (hr)		
			Lecture	OJT	Total
General Statement of Johkasou	General statement	About Johkasou	3	0	3
		Summary	9	0	9
	Johkasou administration	Role, guideline	60	0	60
	Structure and Function	Structure	6	3	9
		Basic manner of control and Adjustment	3	12	15
	Safety Control	Safety Control	3	3	6
Installation work	Installation work	Installation manner and precaution	3	0	3
Maintenance Inspection	Inspection manner	Outline of inspection	9	21	30
		Item of inspection	3	3	6
		Inspection manner	3	6	9
	Advanced manner of control and adjustment	nitrification / denitrification	3	0	3
		Emergency response	6	8	14
	Water quality management	BOD test	15	46	61
		Effluent standard	3	0	3
Desludging	Desludging	Item and manner of desludging	3	9	12
Legal inspection	Legal inspection	Item and manner of legal inspection	9	24	33
		Summary	3	3	6
Johkasou Ledger	Johkasou Ledger	Manner of describe and update	3	3	6
Evaluation Test	Evaluation Test	Evaluation Test	3	0	3
Total			150	141	291

LECTURE

administration	60hours
maintenance	9hours
water quality	15hours
. . . . .	
total	150hours

OJT（On-site training）

Structure and function Adjustment	12hours
Inspection and adjustment	21hours
water quality(BOD)	46hours
item and manner of legal inspection	24hours
. . . . .	
total	141hours

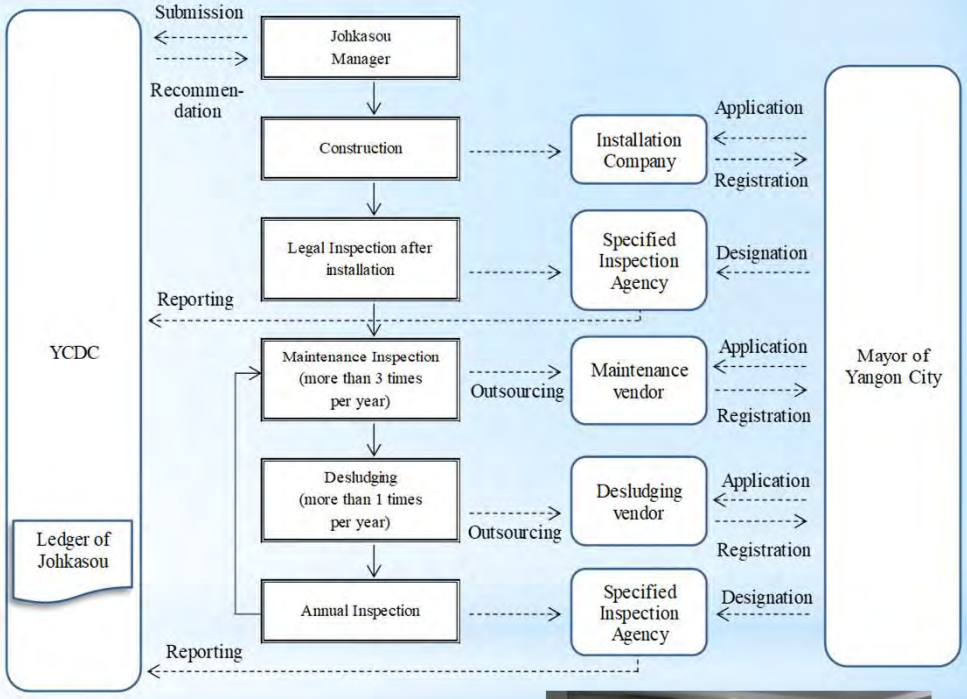
Contents of Johkasou Maintenance training

Act4 and Act5 : Preparing johkasou guideline

Guideline index

Johkasou Guideline
Chapter 1. Basic Philosophy
Chapter 2. Definition of Johkasou
Chapter 3 Process from installation to maintenance of Johkasou
3.1. Installation of Johkasou
3.2. Maintenance of Johkasou
Chapter 4. Inspecting of Johkasou
Chapter 5. Frequency of maintenance inspections and desludging of a Johkasou
Chapter 6. Cost of Johkasou Installation and Maintenance
Chapter 7. Promotion of Outsourcing
Chapter 8. Johkasou installed before enactment of this guideline
Outsourcing Guidelines
1. Purpose of establishing these guidelines
2. Scope of Application
3.Installation work
4. Maintenance inspection
5. Desludging

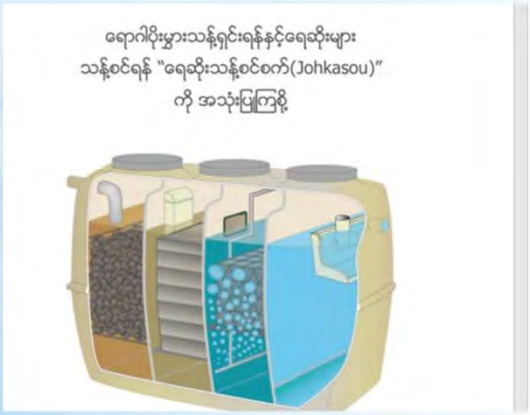
Part of the Guidelines

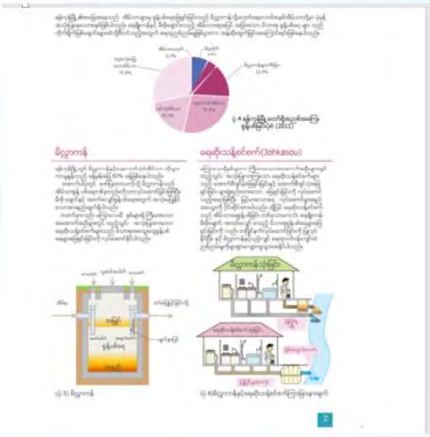


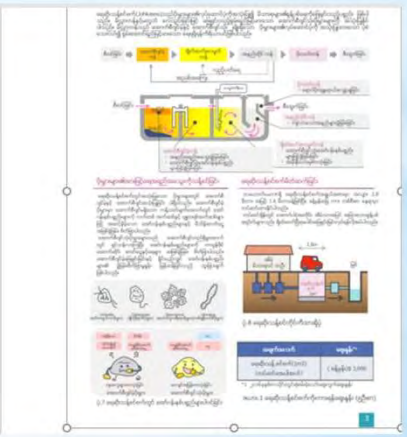
ACT5: Establishment of draft ledger of Johkasou

Yangon Current Maintenance List									
Pt. No	Customer/Company Name	Model No.	Flow Rate	Township	Road	Building Type	House No.	Name of Johkasou Buyer	Phone number
1	Construction	K-HC-R2S-40	40m3	Alone	Kyeemyindaing Kanner	Condo	Room(906)		01-552514
2	Construction	K-HC-R2S-40	40m3	Alone	Kyeemyindaing Kanner	Condo	Room(906)		01-552514
3	Development	K-HC-R2S-100	100m3	Alone	The corner of the Thittaw	Condo	No.384		09-5056172

Act 6: Poster for environmental education and holding seminar







Improvement of johkasou treatment performance through appropriate maintenance and management (the cases in Japan)

	Possible causes	Example of countermeasures
Low pH	Over aeration due to large air rate	Reduce the air rate in aeration tank
Low DO	Insufficient aeration due to small air rate	Increase the air rate in aeration tank
High transparency	Outflow of sludge	Desludging the johkasou
	Biofilm separation	Adjust the air rate in aeration tank
	Mass generation of Sakamaki Shellfish (physa acuta)	Stop aeration temporarily and disinfect the water of each tank with chemical agent
	Mass generation of fine suspended solid (SS)	Adjust the flow rate of stirring water
Effluent BOD concentration is too high	Biofilm is not produced	Confirmation of microorganisms
	Flow rate of return water is not appropriate	Adjust the flow rate

Note: This is only an example, and the measure also changes depending on the cause.
Because it is maintenance by organisms, cause and measures for that are necessary.

Actual condition of johkasou maintenance and management

In Daigo Sangyo,

One Johkasou operater manage and conduct O&M for 70 to 80 Johkasou of different size per year.

One vacuum truck is necessary for desludging 100 Johkasou of different size per year.

In Shiga prefecture, Japan,
The penetration rate of sewerage system is very high, and johkasou are getting less. Johkasou is considered to be complementary system for the sewerage system in Shiga prefecture. When the service area of sewerage system is expanded, population served by johkasou tends to decrease steadily.

Perspectives and issues

1) It is necessary to share the sewage master plan as YCDC.
   And it is necessary to have a common understanding as to how to spread the Johkasou.
2) How can the Johkasou contribute to the water environment? It is necessary to set the target.
3) Deepening of understanding that Johkasou is useful for improvement of water environment in Yangon City
4) Learning knowledge of water environment engineering
5) Enrichment of education to learn environmental problems from lower grade.
6) Construction of Johkasou sludge treatment plant,etc.

Thank you for your attention.