HORIBA, Ltd.
International Sales Dept.
Process & Environmental Team
Kinta SEKIGUCHI

Dyeing wastewater treatment pilot plant for Myanmar traditional clothes “Longyi”

The 13th WEPA Annual Meeting in Jakarta
27 September 2017
Outline

- Background of the project
- Feasibility Study in 1st Phase
- Pilot Plant in 2nd Phase
- Another activity and conclusion
Environmental & Analysis Education for Myanmar (Internship program)

1st (Jun. 2014)
Period: 2 months
Trainees: 3 persons from
①ECD(Environmental Conservation Department)

2nd (Oct. 2015)
Period: 2 weeks
Trainees: 4 persons from
①ECD, ②YCDC, ③Yezin Agricultural Univ.

3rd (Jul. 2016)
Period: 3 weeks
Trainees: 5 persons from
①ECD, ②YCDC, ③MCDC, ④Yangon Technological Univ.

Supported by Japan-Asia Youth exchange program and Kyoto Univ.

Purpose:
To assist Myanmar Human Capital Building through teaching Japanese environmental history, activities & analysis technologies.
Current situation in Wundwin Township

- Dyeing wastewater from “Longyi” factories
  - Approx. 6,300 Longyi factories in Wundwin.
  - Approx. 630 factories with dyeing process.
Wundwin wastewater treatment project

- Ministry of the Environment Japan support project
  - To improve people’s mind on Environmental conservation through waste water treatment demonstration of dye effluent from Longyi factories with Japanese technologies.

- Action plan
  - Phase 1 Feasibility Study (Aug.2015 ~ Mar.2016 Done)
  - Phase 2 Demonstration (Apr.2016 ~ Mar.2017 Done)
  - Phase 3 Follow-up (Apr.2017 ~ Mar.2018 On-going)
Main factories and drainage water amount
- Visited major 7 factories.
- Max amount is 65t/day

Dye factory drainage
- Waste water from dying process directly goes to river through pipes.
- Some factories have wastewater treatment tank but not enough treatment.
- Two major factories installed dye machine made in India.

Htee Hlaing Lake
- Treatment trial by ECD in Htee Hlaning Village but not enough treatment.
- Decided as demonstration site.
Actual situation survey in Wundwin
-Environmental effect from dye drainage-

Black river may make people’s environmental mind down?

Drainage from dye factory

Black river

When you touch

Cows and garbage

Dyeing wastewater Pond

Garbage
Actual situation survey in Wundwin
-Environmental water quality survey-

- No clarity of water, less oxygen so that creatures cannot live in the black river.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Sep.‘15 (Rainy)</th>
<th>Dec.‘15 (Dry)</th>
<th>Feb.‘16 (Dry)</th>
<th>US EPA Guideline</th>
</tr>
</thead>
<tbody>
<tr>
<td>pH</td>
<td>8.08</td>
<td>9.04</td>
<td>9.26</td>
<td>6.0-8.0</td>
</tr>
<tr>
<td>DO(mg/L)</td>
<td>3.84</td>
<td>0.12</td>
<td>0.27</td>
<td>—</td>
</tr>
<tr>
<td>Turb.(NTU)</td>
<td>150</td>
<td>995</td>
<td>1000*</td>
<td>300</td>
</tr>
<tr>
<td>TDS (g/L)</td>
<td>0.48</td>
<td>3.06</td>
<td>4.74</td>
<td>1.2</td>
</tr>
<tr>
<td>COD(mg/L)</td>
<td>30</td>
<td>150</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>Oil and Grease(mg/L)</td>
<td>2.0</td>
<td>3.5</td>
<td>N.D.</td>
<td>10.0</td>
</tr>
</tbody>
</table>

-: No indication, N.D.: Not detected, *Turb: Detect limit is Max 1000NTU
Actual situation survey in Wundwin
-Heavy metal analysis in dye-

- Very small content of heavy metal so that not serious effect on health is expected.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Dye Powder (Black)</th>
<th>Dye Waste Water (Lake1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cd(mg/L)</td>
<td>0</td>
<td>N.D.</td>
</tr>
<tr>
<td>Cr(mg/L)</td>
<td>13</td>
<td>N.A.</td>
</tr>
<tr>
<td>Co(mg/L)</td>
<td>0</td>
<td>N.D.</td>
</tr>
<tr>
<td>Cu(mg/L)</td>
<td>2</td>
<td>0.54</td>
</tr>
<tr>
<td>Ni(mg/L)</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Zn(mg/L)</td>
<td>4</td>
<td>0.11</td>
</tr>
<tr>
<td>Hg(mg/L)</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Pb(mg/L)</td>
<td>0</td>
<td>-</td>
</tr>
</tbody>
</table>

N.A.: Not available
N.D.: Less than min detect limit(Cd=<0.002, Co=<0.02)
-: Not measured
※X-ray analysis for dye powder, Atomic absorption spectrophotometry for waste water
Technical survey
-Coagulation test-

COD remove: 1,800mg/L ⇒ 200mg/L

SS・Color remove: Clear phase

Good efficiency of coagulant reagent (FeCL3、PAC、PAM) purchased in Yangon
Technical survey
-Continuous treatment test in lab-

The treatment flow is effective to the wastewater

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Raw water</th>
<th>Effluent water</th>
<th>EQG value</th>
</tr>
</thead>
<tbody>
<tr>
<td>BOD</td>
<td>110</td>
<td>20</td>
<td>40</td>
</tr>
<tr>
<td>COD&lt;sub&gt;Cr&lt;/sub&gt;</td>
<td>832</td>
<td>160</td>
<td>160</td>
</tr>
<tr>
<td>TSS</td>
<td>1300</td>
<td>50</td>
<td>50</td>
</tr>
</tbody>
</table>
Seminar and workshop in Wundwin

- Environmental awareness seminar for factories in Wundwin
  - Environmental history in Japan.
  - More than 40 attenders from factories.
  - Some factories wish to install waste water treatment system in their new factories.
  - Most factories cannot afford the system.
    ⇒ Expecting government assist

- Work shop through field survey
  - How to use HORIBA Multi water quality checker and oil content analyzer.
    ⇒ Required user-friendly and reliability of analysis.
Plan for 2nd phase demonstration
Design for pilot treatment system

**Treatment flow according to test in 1st phase**

- Raw Water
- PH Adjustment
- Coagulation
- Biological Aeration
- Hi-speed Filtration
- Chlorine Treatment
- Effluent Monitor

Dye waste water

Raw Water Monitor

Dilution

Reducing power consumption by DO monitoring blower control.

Chemical dose control by UV meter minimizes chemical consumption.

Hi-speed filtration (Marimo) reduces initial cost.

Effluent to river
Pilot plant for dyeing wastewater treatment

Hi-speed Filtration (Marimo)

Coagulation

Biological aeration

pH meter

DO meter

UV meter

Data

Raw COD: 421mg/L
Raw SS: 857mg/L
Effluent COD: 86.3mg/L
Effluent SS: 11.0mg/L

Raw COD: 421mg/L
Raw SS: 857mg/L
Effluent COD: 86.3mg/L
Effluent SS: 11.0mg/L
The result of demonstration test

Waste water treatment visual

Dye waste water

Raw Water  PH Adjustment  Coagulation  Biological Aeration  Hi-speed Filtration  Chlorine Treatment  Effluent Monitor

Effluent to river

① Raw water  ② After Coagulation  ③ Before Filtration
### Test result (Water quality)

<table>
<thead>
<tr>
<th>Water Quality</th>
<th>Before treated</th>
<th>After treated</th>
<th>EQG value</th>
</tr>
</thead>
<tbody>
<tr>
<td>COD [mg/L]</td>
<td>512</td>
<td>96</td>
<td>160</td>
</tr>
<tr>
<td>TSS [mg/L]</td>
<td>2,440</td>
<td>51</td>
<td>50</td>
</tr>
<tr>
<td>Color [Pt-Co]</td>
<td>10,100</td>
<td>312</td>
<td>-</td>
</tr>
</tbody>
</table>
The result of demonstration test

**Test result (Blower control by DO meter)**

<table>
<thead>
<tr>
<th>Blower control</th>
<th>Test time</th>
<th>Power consumption</th>
<th>Reduction rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>No control (Continuous)</td>
<td>3,000 mins</td>
<td>4.78kW</td>
<td>-</td>
</tr>
<tr>
<td>ON/OFF Control by DO (1.5-3.0mg/L)</td>
<td>3,000 mins</td>
<td>2.26kW</td>
<td>Approx. 53%</td>
</tr>
</tbody>
</table>

Biological aeration

![Biological aeration](image)

**Blower power consumption in aeration**

- No control
- Control by DO

![Blower power consumption in aeration](image)
The result of demonstration test

- **Test result (FeCl₃ dose control by UV meter)**
  - Controlling the volume of FeCl₃ dosing depending on raw water quality by monitoring UV meter
  
  ⇒ **Approx. 40% of FeCl₃ consumption was saved**
O&M of pilot treatment system

- O&M training to Myanmar ECD
  - 2 Trainees / 3 weeks / at pilot plant

How to set & start the system
How to operate the system
Understanding Water treatment flow
Coagulation beaker test
How to operate & maintain on-line analyzers
How to do manual analysis

ECD: Environmental Conservation Department
Japanese technologies in the pilot plant

Proposing water treatment and analysis technologies for Myanmar

On-site analysis
Multi water quality checker

Energy saving water treatment
• Membrane diffuser × DO control
• Fiber filtration 「Marimo」 (Hi-speed filtration)

No reagent
less maintenance
Effluent monitor
UV meter (COD, SS)

User friendly

Environ. Survey

Lab analysis
Oil content analyzer

WQ control

DO meter

Effluent monitor

pH meter

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Environmental & Analysis Education for Indonesia & Philippine (Japan Field Study Program)

Period: May 21 to June 6, 2017

<Indonesia> 5 persons
- The Ministry of Environment and Forestry
- Indonesian Institute of Science

<Philippine> 5 persons
- Environmental Management Bureau, DENR
- Maynilad Water Service Inc.
Conclusion

Providing capacity building in Japan

- We are able to provide not only analyzers but also capacity building by inviting you to Japan.
- Experiences for Myanmar, Indonesia and Philippine.

Conclusion of the demonstration

- This pilot plant is able to treat dye waste water from “Longyi” factories in Wundwin township.
- We would like to support Myanmar to improve the environmental pollution.

Technical support and solution provide

- We are able to provide technical support and propose solutions for environmental issues in your countries.

What can we support in your countries?
Company Information

(As of December 31, 2016)

• **Business Content**
  Analyzers Manufacture

• **Incorporation**
  January 26, 1953

• **Sales**
  170.0 BJPY (1,460MUSD)

• **Operating Income**
  18.4 BJPY (158MUSD)

• **Worldwide Employees**
  7,149

* HORIBA observes fiscal year by January – December.

Head Office at Kyoto, Japan
Business Segments

Automotive Test Systems
- Emission Measurement Systems (EMS)
- Test Automation Systems (TAS)
- Driving Control Systems (HIT)

Process & Environmental
- Environmental Systems, Maintenance
- System Integration
- Environmental Regulation & Process Business

Medical
- In-Vitro Diagnostic (IVD) Systems
- Integration of HORIBA ABX’s Technology & Marketing Know-How

Semiconductor
- Mass Flow Controller
- In-situ Analysis

Scientific
- Synergy of HORIBA and HORIBA Jobin Yvon’s Technologies
- Raman, Grating, and Fluorescence
Analyzers for Process & Environmental

**Water Analyzers**
- Water Pollution Monitor
- Process Liquid Analyzer
  - Oil Content Analyzer (OCMA-500 Series)
  - Water Quality Checker (U-50 Series)
  - COD Monitor (UV method) (OPSA-150)

**Gas Analyzers**
- Process Gas Analyzers
- Ambient Air Monitor
- Combustion Control Monitor
- Automotive Emissions Analyzers
  - Continuous Water Quality Analyzer (H-1 Series)
  - Portable Gas Analyzer (PG-300 Series)
  - Stack Gas Monitor ENDA-7000
  - Automotive Emissions Analyzer (MEXA-324M)
  - Ambient Monitor AP-370
Environmental Monitoring Network

- Air Quality Monitoring System (AQMS)
- Water Quality Monitoring System (WQMS)

Mobile AQMS

WQMS at dam and river

Monitoring Data Communication through MODEM or WEB NETWORK

AQMS

WQMS at lake

Local Office
HORIBA network in Asia

Headcounts in HORIBA Gr. 3,761

Distributors in every country

(As of December 31, 2016)

- Japan
- China
- Korea
- Singapore
- Thailand
- India
- Taiwan
- Vietnam
- Indonesia

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HORIBA Instruments (Singapore) Pte Ltd.
HORIBA, Ltd.
HORIBA Advanced Techno Co., Ltd.
HORIBA STEC, Co., Ltd.
HORIBA TECHNO SERVICE Co., Ltd.
HORIBA Taiwan, Inc.

HORIBA India Private Limited
HORIBA India Private Limited, Technical Center
HORIBA Instruments (Singapore) Pte Ltd.

- Kyoto
- Fukuchiyama
- Tokyo
- Osaka
- Nagoya
- Fukuoka
- Otsu
- Aso
# Corporate Snapshot of Hitz

<table>
<thead>
<tr>
<th><strong>Company name</strong></th>
<th>Hitachi Zosen Corporation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date of founding</strong></td>
<td>April 1, 1881</td>
</tr>
<tr>
<td><strong>Date of establishment</strong></td>
<td>May 29, 1934</td>
</tr>
<tr>
<td><strong>Location of Head Offices</strong></td>
<td>Osaka, Tokyo</td>
</tr>
<tr>
<td><strong>President</strong></td>
<td>Takashi Tanisho, Representative Director Chairman &amp; President</td>
</tr>
<tr>
<td><strong>Capital</strong></td>
<td>¥45,442,365,005 (As of March 31, 2017)</td>
</tr>
<tr>
<td><strong>Net Sales (consolidated)</strong></td>
<td>¥399,331 million (Fiscal year ended March 31, 2017)</td>
</tr>
<tr>
<td><strong>Number of Employees</strong></td>
<td>10,131 (As of March 31, 2017)</td>
</tr>
</tbody>
</table>
Global Network

Japan
2 Head Offices
8 Domestic Offices
8 Works Locations

Overseas office
Total 17 Overseas Offices

Overseas Subsidiaries & Affiliates
42 Overseas Subsidiaries & Affiliates

as of Aug, 2017

(c) 2017 Hitachi Zosen Corporation
Business segments

Infrastructure
- Shield Tunneling Machines
- Disaster Prevention System

Machinery
- Marine diesel engines with SCR system
- Process/Nuclear Equipment
- Press machines

Environment
- Energy-from-Waste Plants
- Desalination Plant
- Remote Operations Center (ROC)

Sales (FY2016) 399 Billion Yen
- Infrastructure: 64%
- Machinery: 26%
- Environment: 7%
- Other: 3%
Business portfolio of water treatment business

Hitachi Zosen Corporation

MACHINERY BUSINESS
- Process Equipment
  • Pressure vessels
  • Spent nuclear fuel storage cask & canister (container) etc.
- Machinery
  • Marine diesel engines
  • Press machines
  • Precision machinery etc.

ENVIRONMENT BUSINESS
- Environmental Systems
  • EfW plants
  • Material recycle system
  • Water & sludge treatment etc.
- Industrial Plants
  • Desalination plants
  • Power generation facilities
  • Renewable energy

INFRASTRUCTURE BUSINESS
- Infrastructure
  • Shield tunneling machine
  • Bridges
  • Disaster prevention sys. etc.

WATER TREATMENT BUSINESS

ENVIRONMENTAL PLANTS
- Provide Full-/Semi-Turn Key EPC Services of
  • Human Waste Treatment
  • Municipal Sewage Treatment
  • Water Treatment
  • Methane fermentation
- Provide operation and maintenance Services

MACHINERIES
- Manufacture and Supply
  • Mechanical aerator/Agitator/Dehydrator
  • Screen
  • Vacuum / Press / Sand Filter