Appendix 1  MRV

JCM proposed methodology

Spread Sheet
Joint Crediting Mechanism Proposed Methodology Form

Cover sheet of the Proposed Methodology Form

Form for submitting the proposed methodology

<table>
<thead>
<tr>
<th>Host Country</th>
<th>Vietnam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name of the methodology proponents submitting this form</td>
<td>Oriental Consultants Co., Ltd</td>
</tr>
<tr>
<td>Sectoral scope(s) to which the Proposed Methodology applies</td>
<td>Waste energy recovery</td>
</tr>
</tbody>
</table>
| Title of the proposed methodology, and version number | Title: Waste Heat Recovery and Utilization in Textile and Garment Factory  
Version number: 01.0 |
| List of documents to be attached to this form (please check): | The attached draft JCM-PDD:  
Additional information |
| Date of completion | 14 February 2018 |

History of the proposed methodology

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Contents revised</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.0</td>
<td>14 February 2018</td>
<td></td>
</tr>
</tbody>
</table>

A. Title of the methodology

Waste Heat Recovery and Utilization in Textile and Garment Factory

B. Terms and definitions

<table>
<thead>
<tr>
<th>Terms</th>
<th>Definitions</th>
</tr>
</thead>
</table>
| Textile dyeing and finishing | The procedures from fabric pre-treatment to finishing in textile and garment dyeing houses.  
Including main procedures of fabric pre-treatment, dyeing and finishing (washing, drying) that is the chemical and physical treatments consuming heat and steam. |
**C. Summary of the methodology**

<table>
<thead>
<tr>
<th>Items</th>
<th>Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHG emission reduction measures</td>
<td>Recovered waste heats are used for preheating feed-water to boilers and dyeing machines so that reduce fuel consumption of boilers that provide steam for dyeing and finishing process.</td>
</tr>
<tr>
<td>Calculation of reference emissions</td>
<td>Reference emission is calculated based on the amount of waste energy/heat utilized, boiler efficiency and CO2 emission factor of the fossil fuel that is used for providing energy to the dyeing process. Conservative values of the parameters are used to ensure the reference emission is lower than BaU emission.</td>
</tr>
<tr>
<td>Calculation of project emissions</td>
<td>The project emission is calculated based on the electricity consumption of waste heat recovery system and CO2 emission factor of electricity.</td>
</tr>
<tr>
<td>Monitoring parameters</td>
<td>The following parameters need to be monitored. The temperature and amount of feed-water through heat exchanger system to boiler and/or dyeing machines in the project. The temperature of feed-water at the inlet of heat exchanger system in project. The amount of electricity consumed by the waste heat recovery (heat exchanger) system.</td>
</tr>
</tbody>
</table>

**D. Eligibility criteria**

This methodology is applicable to projects that satisfy all of the following criteria.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 1</td>
<td>Waste heat (heat from dyeing waste water) recovery from dyeing and finishing process in the existing or new textile and garment factories.</td>
</tr>
<tr>
<td>Criterion 2</td>
<td>Spiral heat exchanger is applied for heat recovery.</td>
</tr>
<tr>
<td>Criterion 3</td>
<td>Targeting factories with dyeing capacity more than 10 ton/day</td>
</tr>
</tbody>
</table>
### E. Emission Sources and GHG types

<table>
<thead>
<tr>
<th>Emission sources</th>
<th>GHG types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fossil fuel consumption for getting the same amount of energy (steam and heat) from waste heat recovery and utilized</td>
<td>CO₂</td>
</tr>
</tbody>
</table>

### Project emissions

<table>
<thead>
<tr>
<th>Emission sources</th>
<th>GHG types</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity consumption by the waste heat recovery system</td>
<td>CO₂</td>
</tr>
</tbody>
</table>

### F. Establishment and calculation of reference emissions

#### F.1. Establishment of reference emissions

The reference emission is the emission from consumption of fossil fuel to gain the same amount of energy utilized from waste heat recovery system.

#### F.2. Calculation of reference emissions

\[
RE_p = (T_p - T_{Re}) \times W_{th} \times F_w \times \frac{1}{EF} \times EF_{CO2,fuel} \times 10^{-6}
\]

- **RE<sub>p</sub>**: Reference emission [tCO₂/p]
- **T<sub>p</sub>**: Temperature of feed-water to machines through heat exchanger in the project [°C]
- **T<sub>Re</sub>**: Temperature of feed-water at the inlet of the heat exchange system in the project [°C]
- **W<sub>th</sub>**: The specific heat of water [kJ/kg.°C]
- **F<sub>w</sub>**: The amount of the feed-water to machines through heat exchanger in the project [t/p]
- **EF**: Boiler efficiency [ratio]
- **EF<sub>CO2,fuel</sub>**: CO₂ emission factor the fossil fuel that is used to provide energy for dyeing and finishing process [tCO₂/TJ]
Project emission is calculated based on the amount of electricity consumed by the waste heat recovery system and electricity CO\(_2\) emission factor.

\[ PE_p = EC\text{pl}_p \times EF_{\text{elec}} \]

\( PE_p \): Project emissions [t CO\(_2\)/y]

\( EC\text{pl}_p \): Electricity consumption by the waste heat recovery system [MWh/p]

\( EF_{\text{elec}} \): CO\(_2\) emission factor of electricity [t CO\(_2\)/MWh]

H. Calculation of emissions reductions

\[ ER_p = RE_p - PE_p \]

\( ER_p \): Reference emissions [t CO\(_2\)/p]

\( RE_p \): Project emissions [t CO\(_2\)/p]

I. Data and parameters fixed \textit{ex ante}

The source of each data and parameter fixed \textit{ex ante} is listed as below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Description of data</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ef</td>
<td>Boiler efficiency</td>
<td>Textile factories (100% is used for conservativeness)</td>
</tr>
</tbody>
</table>
| \( EF_{\text{CO}_2\text{,fuel}} \) | CO\(_2\) emission factor of the fuel used for steam generation  
Coal: 87.3 tCO\(_2\)/TJ (lower case of default value) | 2006 IPCC Guidelines for National Greenhouse Gas Inventories. Table 1.4, Chapter 1, Volume 2. |
| \( EF_{\text{elec}} \) | CO\(_2\) emission factor of electricity  
In the case of grid: 0.508 tCO\(_2\)/MWh  
In the case of captive power plant (diesel): 0.8 tCO\(_2\)/MWh | In the case of grid (Official data from Vietnam Government). ((IGES's List of Grid Emission Factors updated in Agust 2017)). |
| In the case of diesel captive power plant (Table I.F.1, Small Scale CDM Methodology: AMS I.F. ver.2). |
### Table 1: Parameters to be monitored *ex post*

<table>
<thead>
<tr>
<th>Monitoring point No.</th>
<th>Parameter Description of data</th>
<th>(a) Estimate Values</th>
<th>(b) Units</th>
<th>(c) Monitoring option</th>
<th>(d) Source of data</th>
<th>(e) Measurement methods and procedures</th>
<th>(f) Monitoring frequency</th>
<th>(g) Other comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) T&lt;sub&gt;af,ta&lt;/sub&gt;</td>
<td>Temperature of feed-water at the outlet of waste heat recovery system in the project</td>
<td>63</td>
<td>°C</td>
<td>Option C</td>
<td>Monitored data</td>
<td>Collecting the data with validated/calibrated monitoring devices and inputting to a spreadsheet manually or electrically. Verified monitoring devices are installed and they are calibrated once a year. Verification and calibration shall meet international standard on corresponding monitoring devices.</td>
<td>continuous</td>
<td></td>
</tr>
<tr>
<td>(2) T&lt;sub&gt;bi,ta&lt;/sub&gt;</td>
<td>Temperature of feed-water at the inlet of waste heat recovery system in the project</td>
<td>30</td>
<td>°C</td>
<td>Option C</td>
<td>Monitored data</td>
<td>Collecting the data with validated/calibrated monitoring devices and inputting to a spreadsheet manually or electrically. Verified monitoring devices are installed and they are calibrated once a year. Verification and calibration shall meet international standard on corresponding monitoring devices.</td>
<td>continuous</td>
<td></td>
</tr>
<tr>
<td>(3) F&lt;sub&gt;wa,ta&lt;/sub&gt;</td>
<td>The amount of the feed-water to machines through the waste heat recovery system in the project</td>
<td>93,600</td>
<td>t/p</td>
<td>Option C</td>
<td>Monitored data</td>
<td>Collecting the data with validated/calibrated monitoring devices and inputting to a spreadsheet manually or electrically. Verified monitoring devices are installed and they are calibrated once a year. Verification and calibration shall meet international standard on corresponding monitoring devices.</td>
<td>continuous</td>
<td></td>
</tr>
<tr>
<td>(4) ECPJ,y</td>
<td>Electricity consumption by the waste heat recovery system</td>
<td>124</td>
<td>MWh/y</td>
<td>Option C</td>
<td>Monitored data</td>
<td>Collecting electricity consumption data with validated/calibrated monitoring devices and inputting to a spreadsheet electrically. Verified monitoring devices are installed and they are calibrated once a year. Verification and calibration shall meet international standard on corresponding monitoring devices.</td>
<td>continuous</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2: Project-specific parameters to be fixed *ex ante*

<table>
<thead>
<tr>
<th>Parameter s Description of data</th>
<th>(a) Estimate Values</th>
<th>(b) Units</th>
<th>(c) Monitoring option</th>
<th>(d) Source of data</th>
<th>(e) Other comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ef Boiler efficiency</td>
<td>1.00</td>
<td>Ratio</td>
<td></td>
<td></td>
<td>0.75 from manufacture specification (however, 1 is taken for ensure conservativeness)</td>
</tr>
<tr>
<td>EF&lt;sub&gt;elec&lt;/sub&gt; CO&lt;sub&gt;2&lt;/sub&gt; emission factor of electricity</td>
<td>0.8154</td>
<td>t CO&lt;sub&gt;2&lt;/sub&gt;/MWh</td>
<td></td>
<td></td>
<td>CO&lt;sub&gt;2&lt;/sub&gt; emission factor of Vietnam</td>
</tr>
</tbody>
</table>

### Table 3: *Ex-ante* estimation of CO<sub>2</sub> emission reductions

<table>
<thead>
<tr>
<th>CO&lt;sub&gt;2&lt;/sub&gt; emission reduction</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,110 t CO&lt;sub&gt;2&lt;/sub&gt;/p</td>
<td></td>
</tr>
</tbody>
</table>

**[Monitoring option]**

- Option A: Based on public data which is measured by entities other than the project participants (Data used: publicly recognized data such as statistical data and specifications)
- Option B: Based on the amount of transaction which is measured directly using measuring equipments (Data used: commercial evidence such as invoices)
- Option C: Based on the actual measurement using measuring equipments (Data used: measured values)
## Calculations for emission reductions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Fuel type</th>
<th>Value</th>
<th>Units</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emission reductions during the period of p</td>
<td></td>
<td>1110</td>
<td>tCO₂/p</td>
<td>ERₚ</td>
</tr>
</tbody>
</table>

## Selected default values, etc.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>The specific heat of water</td>
<td>4.18</td>
<td>kJ/kg, °C</td>
</tr>
<tr>
<td>CO₂ emission factor the fossil fuel that is used to provide energy for dyeing and finishing process</td>
<td>87.3</td>
<td>t CO₂/TJ</td>
</tr>
</tbody>
</table>

## Calculations for reference emissions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference emissions during the period of p</td>
<td>1128</td>
<td>tCO₂/p</td>
</tr>
<tr>
<td>Temperature of feed-water in the project</td>
<td>63</td>
<td>°C</td>
</tr>
<tr>
<td>Temperature of feed-water in the case of without the project</td>
<td>30</td>
<td>°C</td>
</tr>
<tr>
<td>Boiler efficiency</td>
<td>1.00</td>
<td>ratio</td>
</tr>
<tr>
<td>The amount of the feed-water in the project</td>
<td>93,600</td>
<td>t/p</td>
</tr>
</tbody>
</table>

## Calculations of the project emissions

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project emissions during the period of p</td>
<td>18</td>
<td>tCO₂/p</td>
</tr>
<tr>
<td>Electricity consumption by the waste heat recovery system</td>
<td>22</td>
<td>MWh/p</td>
</tr>
<tr>
<td>CO₂ emission factor of electricity</td>
<td>0.82</td>
<td>t CO₂/MWh</td>
</tr>
</tbody>
</table>

## List of Default Values

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specific heat</td>
<td>Wₜₜ</td>
</tr>
<tr>
<td>CO₂ emission factor of the fossil fuel that is used to provide energy for dyeing and finishing process</td>
<td>EF_CO₂,fuel</td>
</tr>
</tbody>
</table>
Appendix 2  PDD

Draft  PDD
A. Project description

A.1. Title of the JCM project

Waste Heat Recovery from the Dyeing and Finishing Process of Textile Factory in Ho Chi Minh

A.2. General description of project and applied technologies and/or measures

The project introduces a waste heat recovery system to dyeing and finishing section of a textile factory in Ho Chi Minh, Vietnam. As a waste heat recovery system, a spiral type heat exchanger from a Japanese company is applied to Agtex 28, one of the biggest textile factories in Ho Chi Minh. In textile factories, dyeing and finishing processes consume a huge amount of steam and water. Steam is used for drying and increasing the temperature of water in dyeing machines; after the dyeing contaminated water with high temperature, in most cases, is drained to waste water treatment facility directly. In this project, the waste heat recovery system (a spiral heat exchanger and pumps) installed will recover the heat of waste water from the dyeing machines and use the recovered energy is used to increase the temperature of feed water (fresh water) so that decrease the amount of steam used for increasing the temperature of the feed water. The steam reduction will result in decrease in the fuel consumption of boiler in the factory.

Figure 1 Agtex 28 Factory

In total, 2 waste heat recovery systems to be installed in the factory. One is for dyeing section to recover heat from waste water in dyeing process and another is for boiler section to recover heat from scrubber water from boiler boilers in the factory.

The estimated CO₂ emission reduction from the project is 893 ton/year.

A.3. Location of project, including coordinates

<table>
<thead>
<tr>
<th>Country</th>
<th>Vietnam</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region/State/Province etc.:</td>
<td>Ho Chi Minh</td>
</tr>
<tr>
<td>City/Town/Community etc:</td>
<td>Ho Chi Minh</td>
</tr>
<tr>
<td>Latitude, longitude</td>
<td>10°46¢36.8²N106°42¢02.9²E</td>
</tr>
</tbody>
</table>

A.4. Name of project participants

| The Socialist Republic of Viet Nam |   |
A.5. Duration

<table>
<thead>
<tr>
<th>Starting date of project operation</th>
<th>TBD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expected operational lifetime of project</td>
<td>15 years</td>
</tr>
</tbody>
</table>

A.6. Contribution from Japan

The proposed project will receive financial support from the government of Japan. The project is to apply for JCM model projects by the Ministry of the Environment, Japan (MOE). As a result of the financial support provided by MOE program, the initial investment cost of the proposed project has been partially financed by Japanese government (up to 50% of the initial investment cost). Further, the proposed project promotes diffusion of low carbon technologies within Viet Nam. Through the MOE program, spiral type heat exchangers can be applied in textile and other food processing factories.

B. Application of an approved methodology(ies)

B.1. Selection of methodology (ies)

<table>
<thead>
<tr>
<th>Selected approved methodology No.</th>
<th>A new methodology has developed for the project which needs to be approved by Joint Committee</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version number</td>
<td></td>
</tr>
</tbody>
</table>

B.2. Explanation of how the project meets eligibility criteria of the approved methodology

<table>
<thead>
<tr>
<th>Eligibility criteria</th>
<th>Descriptions specified in the methodology</th>
<th>Project information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Criterion 1</td>
<td>Waste heat (heat from dyeing waste water) recovery from dyeing and finishing process in the existing or new textile and garment factories.</td>
<td>The project recoveries waste heat from dyeing and finishing processes of an existing textile factory</td>
</tr>
<tr>
<td>Criterion 2</td>
<td>Spiral heat exchanger is applied for heat recovery.</td>
<td>The project applies spiral type heat exchangers provided by Kurose Co., Ltd.</td>
</tr>
<tr>
<td>Criterion 3</td>
<td>Targeting factories with dyeing capacity more than 10 ton/day</td>
<td>The production capacity of the target factory is around 15–20 ton/day</td>
</tr>
</tbody>
</table>

C. Calculation of emission reductions

C.1. All emission sources and their associated greenhouse gases relevant to the JCM project

<table>
<thead>
<tr>
<th>Reference emissions</th>
</tr>
</thead>
</table>
### C.2. Figure of all emission sources and monitoring points relevant to the JCM project

![Diagram showing emission sources and monitoring points](image)

### C.3. Estimated emissions reductions in each year

<table>
<thead>
<tr>
<th>Year</th>
<th>Estimated Reference emissions (tCO₂e)</th>
<th>Estimated Project Emissions (tCO₂e)</th>
<th>Estimated Emission Reductions (tCO₂e)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019</td>
<td>923</td>
<td>30</td>
<td>893</td>
</tr>
<tr>
<td>2020</td>
<td>923</td>
<td>30</td>
<td>893</td>
</tr>
<tr>
<td>2021</td>
<td>923</td>
<td>30</td>
<td>893</td>
</tr>
<tr>
<td>2022</td>
<td>923</td>
<td>30</td>
<td>893</td>
</tr>
<tr>
<td>2023</td>
<td>923</td>
<td>30</td>
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</tr>
<tr>
<td>2024</td>
<td>923</td>
<td>30</td>
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</tr>
<tr>
<td>2025</td>
<td>923</td>
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</tr>
<tr>
<td>2026</td>
<td>923</td>
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<tr>
<td>2027</td>
<td>923</td>
<td>30</td>
<td>893</td>
</tr>
<tr>
<td>2028</td>
<td>923</td>
<td>30</td>
<td>893</td>
</tr>
</tbody>
</table>
D. Environmental impact assessment

Legal requirement of environmental impact assessment for the proposed project

<table>
<thead>
<tr>
<th>Stakeholders</th>
<th>Comments received</th>
<th>Consideration of comments received</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

E. Local stakeholder consultation

E.1. Solicitation of comments from local stakeholders

Stakeholder meetings regarding the project will be organized in due course.

E.2. Summary of comments received and their consideration

F. References

Reference lists to support descriptions in the PDD, if any.

Annex

Revision history of PDD

<table>
<thead>
<tr>
<th>Version</th>
<th>Date</th>
<th>Contents revised</th>
</tr>
</thead>
<tbody>
<tr>
<td>01.0</td>
<td>14 February 2018</td>
<td>First edition</td>
</tr>
</tbody>
</table>
Appendix 3  Workshop Presentation
Giới thiệu Dự án thúc đẩy hợp tác phát triển Carbon thấp
Trong khuôn khổ hợp tác giữa TP.HCM và TP.Osaka

Workshop on the Promotion of Low Carbon Development
under Ho Chi Minh City - Osaka City Cooperation Project
for Developing Low Carbon City

25 tháng 09 năm 2017
Sở Tài nguyên và Môi trường thành phố Hồ Chí Minh

September 25th, 2017
HCMC Department of Natural Resources and Environment
Outline of the JCM Feasibility Study under Cooperation between Ho Chi Minh and Osaka

Osaka City
Oriental Consultants Co., Ltd
Japan Textile Consultants Center
Kurose Chemical Equipment Co., Ltd
Nippon Thermoener Co., Ltd
Yuko-Keiso Co., Ltd
Resona Bank Ltd
July 2013, Vietnam and Japan signed MOU on the application of Joint Crediting Mechanism (JCM)

September 2013, the first JCM Joint Committee Meeting in Hanoi approved “Guidance for implementation of JCM and rules of procedure for JCM
There are JCM feasibility projects and JCM model projects. JCM model projects can be benefited from the financial support up to 50% of investment cost including facilities, equipment and vehicles, which contribute to reduction of CO2 emission as well as cost for installing these facilities.
Since 2013, there have been 66 JCM projects in Vietnam, among them there are 15 JCM model projects.

As of September 2017, the model projects are:

<table>
<thead>
<tr>
<th>Energy Efficiency Improvement</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Beer factory energy efficiency improvement</td>
<td>1</td>
</tr>
<tr>
<td>Rubber factory energy efficiency improvement</td>
<td>1</td>
</tr>
<tr>
<td>Electric wire factory energy efficiency improvement</td>
<td>1</td>
</tr>
<tr>
<td>Lens factory energy efficiency improvement</td>
<td>2</td>
</tr>
<tr>
<td>Energy efficient air conditioner systems to factories</td>
<td>1</td>
</tr>
<tr>
<td>Energy efficient air conditioner system to hotels</td>
<td>1</td>
</tr>
<tr>
<td>Battery factory energy efficiency improvement</td>
<td>1</td>
</tr>
<tr>
<td>Energy efficient transformers</td>
<td>3</td>
</tr>
<tr>
<td>Energy efficient pumps</td>
<td>1</td>
</tr>
<tr>
<td>Energy efficient furnace (ceramic factory)</td>
<td>1</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Renewable Energy Promotion</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rooftop solar power generation (shopping mall)</td>
<td>1</td>
</tr>
</tbody>
</table>

| Total                                                  | 14     |
Energy saving projects for textile factories in Ho Chi Minh City
  • Introduction of high efficiency boilers
  • Heat recovery from the waste water of dyeing process through application of heat exchangers.
Organize workshops on the promotion of JCM projects in Ho Chi Minh.
Before

High efficiency boilers are provided by NTEC

After

Spiral heat exchangers are provided by Kurose
JCM Project Implementation Scheme

MoE

Credit

Negotiation

JCM Joint Committee

Project registration / Methodology approval

International Consortium

Representative entity (TBD)

Reporting

Subsidy

Textile factories

Order

Heat exchangers and Boilers

Technology provision

Oriental Consultants

Project implementation support
Methodology development support

Kurose (heat exchanger)
NTEC (boiler)
In textile factories, electric energy is the main energy used for processes except for dyeing process.

<table>
<thead>
<tr>
<th></th>
<th>Spinning</th>
<th>Knitting</th>
<th>Dyeing</th>
<th>Sewing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric energy</td>
<td>☀️</td>
<td>☀️</td>
<td>⚫️</td>
<td>⚫️</td>
</tr>
<tr>
<td>Heat energy</td>
<td>×</td>
<td>×</td>
<td>☀️</td>
<td>×</td>
</tr>
</tbody>
</table>

Electric energy is mostly consumed by motors and by air compressors partly.

Dyeing process consumes a large amount of heat energy, which provided by boilers (steam and heat boilers).

Dyeing process also generates a huge amount of heated wastewater.

Energy saving potentiality in textile factories

- Steps of the production processes in order of greatest to least energy consumption
  1) dyeing process 2) spinning 3) knitting 4) sewing
Energy Saving Practices in Textile Factories

- Metering (water, steam, electricity) and understanding the potentiality of energy saving in a factory is very important.
- Fuel related energy saving practices are as follows.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Range of Typical Fuel Savings (kg coal/ton fabric)</th>
<th>Range of Typical Percentage Savings* (steam)</th>
<th>Largest % Savings Seen at Any Mill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recover heat from hot water</td>
<td>78–249</td>
<td>6.6–10.4%</td>
<td>29.7%</td>
</tr>
<tr>
<td>Improve boiler efficiency</td>
<td>39–89</td>
<td>2.6–4.31%</td>
<td>19.7%</td>
</tr>
<tr>
<td>Maintain steam traps and system</td>
<td>12–54</td>
<td>1–4.3%</td>
<td>10.3%</td>
</tr>
<tr>
<td>Recover heat from hot air</td>
<td>11–39</td>
<td>0.7–2.8%</td>
<td>5.7%</td>
</tr>
<tr>
<td>Insulate equipment and tanks</td>
<td>21–56</td>
<td>1.4–3.2%</td>
<td>19.2%</td>
</tr>
<tr>
<td>Fuel savings from reuse of condensate</td>
<td>6–40</td>
<td>0.6–3.1%</td>
<td>7%</td>
</tr>
<tr>
<td>Fuel savings from leak detection, preventive maintenance, improved cleaning</td>
<td>N/A–9</td>
<td>N/A–1%</td>
<td>2.2%</td>
</tr>
<tr>
<td>Fuel savings from reuse of process water</td>
<td>N/A–10</td>
<td>N/A–0.9%</td>
<td>2.9%</td>
</tr>
<tr>
<td>Fuel savings from reuse of cooling water</td>
<td>N/A–5</td>
<td>N/A–0.3%</td>
<td>0.5%</td>
</tr>
<tr>
<td>Total</td>
<td>169–550</td>
<td>12.9–30.4%</td>
<td></td>
</tr>
</tbody>
</table>

*Ranges given as 1 quartile around the median to show typical savings; 25% of factories experienced higher and 25% experienced lower savings.

**Note that while the fuel saving best practices were calculated on the basis of the use of coal as a fuel, these measures would also save energy at mills using natural gas, wood, or other fuels to generate steam.**

Source: Natural Resources Defense Council Best Practices for Textile Mills to Save Money and Reduce Pollution
Energy Saving Practices in Textile Factories

- Water related energy saving practices are as follows.
- Water saving itself can save money and also save energy used for preparing the water.

<table>
<thead>
<tr>
<th>Practice</th>
<th>Range of Typical Water Savings* (ton/ton fabric)</th>
<th>Range of Typical Percentage Savings*</th>
<th>Largest % Savings Seen at Any Mill</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water leak detection, preventive maintenance, improved cleaning</td>
<td>0.6–3.1</td>
<td>1.1–5%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Reuse cooling water</td>
<td>0.7–3.9</td>
<td>2–8.9%</td>
<td>18.6%</td>
</tr>
<tr>
<td>Reuse condensate</td>
<td>0.2–3.9</td>
<td>0.2–5.4%</td>
<td>20.3%</td>
</tr>
<tr>
<td>Reuse process water</td>
<td>0.9–4.4</td>
<td>1.1–6%</td>
<td>21.1%</td>
</tr>
<tr>
<td>Water savings from maintaining steam traps and system</td>
<td>N/A–0.1</td>
<td>N/A–0.1%</td>
<td>0.8%</td>
</tr>
<tr>
<td>Total</td>
<td>2.4–15.4</td>
<td>4.3–25.4%</td>
<td></td>
</tr>
</tbody>
</table>

*Ranges given as 1 quartile around the median to show typical savings; 25% of factories experienced higher and 25% experienced lower savings.

Source: Natural Resources Defense Council Best Practices for Textile Mills to Save Money and Reduce Pollution
# Energy Saving Practices in Textile Factories

Process management and operation related energy saving practices are as follows.

<table>
<thead>
<tr>
<th>Automation</th>
<th>Automation to monitor and control dyeing and printing processes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Recipe upgrades</strong></td>
<td>Enzymes to pretreat and finish cotton fabric</td>
</tr>
<tr>
<td></td>
<td>Increased reliance on higher-quality dyes and chemicals, high fixation, and environmentally friendly dyes</td>
</tr>
<tr>
<td><strong>Equipment upgrades</strong></td>
<td>Cold pad batch processing</td>
</tr>
<tr>
<td></td>
<td>Low-liquor-ratio dyeing machines</td>
</tr>
<tr>
<td></td>
<td>Digital printing machines</td>
</tr>
<tr>
<td></td>
<td>Continuous wash (open width) for knit fabrics</td>
</tr>
<tr>
<td></td>
<td>Foam finishing</td>
</tr>
<tr>
<td><strong>Improved process management</strong></td>
<td>Benchmark energy and water use and set concrete reduction targets</td>
</tr>
<tr>
<td></td>
<td>Monitor continuously to ensure implementation of improvements</td>
</tr>
<tr>
<td></td>
<td>Undertake failure analysis when things go wrong</td>
</tr>
<tr>
<td></td>
<td>Standardize optimal methods and recipes</td>
</tr>
<tr>
<td></td>
<td>Improve machine utilization, particularly for the most energy-intensive machines</td>
</tr>
<tr>
<td></td>
<td>Schedule colors more carefully to minimize the need for extensive cleaning between batches</td>
</tr>
<tr>
<td></td>
<td>Work with dye/chemical suppliers to optimize process and completely exhaust dyes and finishes</td>
</tr>
<tr>
<td></td>
<td>Sequence dye baths to stagger machine times and cut down maximum mill steam loading needs</td>
</tr>
</tbody>
</table>

Source: Natural Resources Defense Council Best Practices for Textile Mills to Save Money and Reduce Pollution
2. Spiral Heat Exchanger

1) Low maintenance cost due to easy access. Removable covers provide easy access to interior heat transfer surfaces for field inspections, routine maintenance, or manual cleaning if required.
2) The spiral heat exchanger is compact and requires minimal space for installation and servicing.
3) High thermal efficiency. High heat transfer coefficients are 50-100% greater than shell & tubes.
4) Self-cleaning effect reduces fouling and makes spiral heat exchangers ideal for handling tough fluids such as process slurries, sludge, and media with suspended solids or fibers.
## Waste Heat Recovery (Case Study)

### Production capacity
- **Amount of waste water**: 353 ton/day
- **Average temperature of waste water**: 66 °C
- **Boiler (efficiency)**: Gas boiler (CNG) (87%)

### Waste water temperature (°C)
- 40~59°C: 141 ton/day
- 50~79°C: 141 ton/day
- >80°C: 71 ton/day
- **Total**: 353 ton/day

### Supply water flow rate (t/hr)
- **Supply water flow rate**: 14.7 t/hr
- **Supply water inlet temperature (°C)**: 26
- **Surface area of heat exchanger (m²)**: 32
- **Waste water outlet temperature (°C)**: 37
- **Supply water outlet temperature (°C)**: 50

### Recovered energy
- **Recovered energy**: 10,637,867 MJ/year

### Saved natural gas
- **Saved natural gas**: 335,728 m³/year

### CO₂ reduction
- **CO₂ reduction**: 585 t/year

### Economic Analysis
- **With 50% subsidy**: IRR = 28%; Payback period = 3.2 year

### In the case of coal (in Vietnam)
- **Boiler efficiency**: 80%
- **Net caloric value of coal (TJ/Gg)**: 31
- **Coal CO₂ emission factor (t/TJ)**: 87.3
- **Coal saved (t/year)**: 429
- **CO₂ reduction (t/year)**: 1156
The situation and prospect of the Textile industry in Vietnam

NGUYEN THI TUYET MAI – Vice General Secretary

Ho Chi Minh City, 25th Sept. 2017
1. Situation & Prospect of Textile Industry in Vietnam
2. Energy Consumption in Textile Industry
I. Situation & Prospect of Textile Industry in Vietnam

- 6,000 Enterprises
  2,8 million labors

- 6 first month/2017:
  Export $US 14 Bill.
  (growth > 9%)

- 5% total value of national production

- 2011-2015: Average growth 17%/year
- 2016: export $US 28,5 bill.
  (growth by 4%/2015)

Big Export Value
Top 2 within National

Top 5 export country for garment all over the world
I. Situation & Prospect of Textile Industry in Vietnam

Classify Enterprises Industry

- Processing Cotton & Yarn: 2%
- Textile: 8%
- Accessories & Supporting: 15%
- Garment: 75%
- 15% FDI
- SMEs: 80%
I. Situation & Prospect of Textile Industry in Vietnam

 Classified Enterprises by location
(in the South)

- HCMC: 30%
- BinhDuong: 20%
- Dong Nai: 25%
- Mekong Data: 15%
- Other: 10%
I. Situation & Prospect of Textile Industry in Vietnam

- Fashion Center
- Textile Material Trading Center
- Development of Supporting Industry
- Eliminate polluted factories
- Supply chain from yarn to weaving, knitting and dyeing in industrial zones with complete waste-water treatment system
I. Situation & Prospect of Textile Industry in Vietnam

Export Market 2016 (%)

- USA: 41%
- EU: 12%
- Japan: 10%
- Korea: 8%
- Asean: 2%
- Others: 27%
I. Situation & Prospect of Textile Industry in Vietnam
II. Energy Consumption in Textile Industry in Vietnam

Energy Consumption in Textile Factories

<table>
<thead>
<tr>
<th></th>
<th>Spinning</th>
<th>Knitting</th>
<th>Dyeing</th>
<th>Sewing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric energy</td>
<td>★</td>
<td>★</td>
<td>⭐</td>
<td>⭐</td>
</tr>
<tr>
<td>Heat energy</td>
<td></td>
<td></td>
<td>⭐</td>
<td>⭐</td>
</tr>
</tbody>
</table>

1. **Electric energy**: Main energy used for processes (*motors, air compressors*) except for Dyeing process

2. **Dyeing process**: consumes a large of **heat energy**, which provided by **boilers** and generates a huge amount of **heated waste-water**

3. **Energy saving potentiality**: in order of greatest to least energy consumption
   Dyeing/Spinning/Knitting(Weaving)/Sewing
## II. Energy Consumption in Textile Industry in Vietnam

### Statistication of energy consumption in sub-sectors

<table>
<thead>
<tr>
<th>Phân ngành</th>
<th>Unit</th>
<th>Energy consumption rate</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber sector</td>
<td>kWh/kg</td>
<td>3,780</td>
<td>3,034</td>
<td>2,206</td>
<td></td>
</tr>
<tr>
<td>Textile sector</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Denim, Wool</td>
<td>14.005</td>
<td>11.758</td>
<td>10.080</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Cotton fabric, PE</td>
<td>4.869</td>
<td>3.843</td>
<td>3.092</td>
<td></td>
</tr>
<tr>
<td>Dyeing sector</td>
<td>MJ/1000m</td>
<td>26.356</td>
<td>17.553</td>
<td>10.834</td>
<td></td>
</tr>
</tbody>
</table>

*Source: ET (2015)*
### III. Energy consumption in textile industry in Vietnam

**Energy saving in sub-sectors**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Energy saving potentiality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiber sector</td>
<td>12.2%</td>
</tr>
<tr>
<td>Knitting/Weaving sector</td>
<td>4.3%</td>
</tr>
<tr>
<td>Dyeing sector</td>
<td>6%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>22.5%</strong></td>
</tr>
</tbody>
</table>

*Source: ET (2015)*
Energy-saving Solutions

1. High efficiency boiler and good steam distribution system
2. Heated Waste-water system
3. Lighting system (LED)
4. Sewing machines and specialized machines (motors)
5. Air compressor system
III. Energy consumption in textile industry

Energy-saving Solution

Recommendation:

• Existing factory: Energy audit / Energy saving solution consulting
• Set up a new factory: comprehensive consultancy (combine solutions to invest the technological line with energy saving.....)
• There should be an automatic mechanism for collecting energy data and national energy database of industries, including textile.
VIETNAM TEXTILE & APPAREL ASSOCIATION (VITAS)

Thank you
ENERGY SAVING POTENTIAL IN THE INDUSTRIAL SECTOR
1. VIETNAM ENERGY OVERVIEW
2. EXISTING POLICIES ON ENERGY EFFICIENCY
3. CURRENT STATUS OF ENERGY EFFICIENCY TECHNOLOGIES IN TYPICAL SECTORS
4. ENERGY EFFICIENCY EQUIPMENT & ITS ENERGY SAVING POTENTIAL
5. RECOMMENDATIONS FOR PROMOTING ENERGY EFFICIENCY IN VIETNAM
6. ESCO MODEL
1. VIETNAM ENERGY OVERVIEW

Current situation and forecast of energy demand in Viet Nam

![Graph showing energy demand trends from 1990 to 2025 for various sectors.]

Source: Institute of Energy
Electricity production: >164 TWh in 2015.
The annual increase: 12% - 15%.
Hydropower, natural gas and coal are the most important primary energy sources for electricity production.
1. VIETNAM ENERGY OVERVIEW

Installed capacity targets - National Development Plan VII

- **2015**
  - Installed Capacity: 39 GW
  - Breakdown:
    - Nuclear: 37.3%
    - Import: 22.5%
    - Hydro: 33.5%
    - Gas: 5.4%

- **2020**
  - Installed Capacity: 60 GW
  - Breakdown:
    - Nuclear: 30.1%
    - Import: 14.9%
    - Hydro: 42.7%
    - Gas: 9.9%

- **2025**
  - Installed Capacity: 96 GW
  - Breakdown:
    - Nuclear: 21.1%
    - Import: 15.6%
    - Hydro: 49.3%
    - Gas: 12.5%

- **2030**
  - Installed Capacity: 129.5 GW
  - Breakdown:
    - Nuclear: 16.9%
    - Import: 14.7%
    - Hydro: 42.6%
    - Gas: 21.0%
1. VIETNAM ENERGY OVERVIEW

Energy consumption by sector in 2015

- Industry: 46.4%
- Transportation: 29.8%
- Residential areas: 15.3%
- Others: 8.5%

Source: Energy Consumption by Sector, Institute of Energy
1. VIETNAM ENERGY OVERVIEW

Vietnam Energy Intensity in 2011

Unit: kgOE /1,000 USD

**Source:** Institute of Energy
1. VIETNAM ENERGY OVERVIEW

Energy saving potential by sectors

- Commercial Building: 25%
- Water treatment: 15%
- Agriculture: 50%
- Food Processing: 20%
- Steel: 20%
- Garment and Textile: 30%
- Thermal Power Plant: 25%
- Ceramic: 35%
- Cement: 50%

Energy saving potential in industrial sector: > 20%

2. EXISTING POLICIES ON ENERGY EFFICIENCY

- Law on Energy Efficiency and Conservation No. 50/2010/QH12
- Electricity Law 2004 28/2004-QH11
- Decision No.1855/QD-TTg, approving the national energy development strategy of Vietnam to 2020, with the vision to 2050
- Decision No.1427/QĐ-TTg, approving National target program on energy efficiency and conservation (EC&C) for the period 2012 – 2015.
- Circular No.36/2016 /TT-BCT, on the regulation of labeling energy label for energy-using equipment
2. EXISTING POLICIES ON ENERGY EFFICIENCY

Law on Energy Efficiency & Conservation

- Industrial facilities
- Transportation sector
- Agriculture sector
- Residential & services
- Construction and Public lighting
- Energy consuming Equipment and Machinery
- Investment projects and agencies, units using State budget

Designated Energy-using Units
3. CURRENT STATUS OF EE TECHNOLOGIES IN TYPICAL SECTORS

- Garment and textile Sector
  - High demand for electricity and thermal energy.
  - Some typical enterprises: Cost of thermal energy is over 50% of energy cost.
  - Energy cost accounts for 10-15% of production cost whereas energy waste is up 20-32% due to old technologies and outdated energy management systems.

Energy consumption structure in textile plant
Source: ECC-HCMC
3. CURRENT STATUS OF EE TECHNOLOGIES IN TYPICAL SECTORS

- **Garment and textile Sector (cont.)**
  - Energy saving potential: up to 30%.
  - The EE equipment can be applied:
    - High efficiency boilers
    - Waste heat recovery systems.
    - High efficiency air compressors.
    - EE motors and variable speed drives.
    - Production equipment: EE electric sewing machines, …
3. CURRENT STATUS OF EE TECHNOLOGIES
IN TYPICAL SECTORS

- **Food processing sector:**
  - High demand for electricity.
  - Accounts for about **18%** of the total electricity demand for the manufacturing industry in HCMC.
  - Energy consumption structure as follows:

  ![Energy consumption structure by systems](image)

  ![Energy consumption structure by types](image)
3. CURRENT STATUS OF EE TECHNOLOGIES IN TYPICAL SECTORS

- **Food processing sector (cont.)**
  - Major equipment: refrigeration systems.
  - The technological level: old, low energy efficiency.
  - Energy saving potential: up to 20%.
  - The EE equipment can be applied:
    - EE motors and variable speed drive (VSD)
    - LED
    - High efficiency boilers, heat pumps, solar water heaters
    - Insulation materials;
    - Production equipment: EE freezing machines, ice making machines, …
3. CURRENT STATUS OF EE TECHNOLOGIES IN TYPICAL SECTORS

- **Rubber & Plastic sector**
  - High demand for electricity.
  - Accounts for about 28% of the total electricity demand for the manufacturing industry in HCMC.
  - Energy consumption structure as follows:

![Energy Consumption Structure](image)

Energy consumption structure
Source: ECC-HCMC
3. CURRENT STATUS OF EE TECHNOLOGIES IN TYPICAL SECTORS

- Rubber & Plastic sector (cont.)
  - Major equipment: injection, extrusion and blowing systems.
  - The technological level: old, inefficient technologies or outdated processes.
  - Energy saving potential: up to 15%.
  - The EE equipment can be applied:
    - LED
    - EE motors, servo motors and variable speed drive (VSD)
    - High efficiency air compressors
    - Production equipment: electric molding machine, electromagnetic heating technology, high-performance automatic bottle blowing machine, robotics…
4. ENERGY EFFICIENCY EQUIPMENT & ITS ENERGY SAVING POTENTIAL

- Ventilation Fans: Energy saving up to: 10% - 15%
- LED lamps: Energy saving up to: 30% - 50%
- Boiler System: Energy saving up to: 20 - 30%
- Inverter: Energy saving up to: 10% - 40%
4. ENERGY EFFICIENCY EQUIPMENT & ITS ENERGY SAVING POTENTIAL

- **Solar Water Heater**
  - Energy saving up to: 60% - 90%
  - Fuel saving up to: 15% - 20%

- **Electronic sewing machine**
  - Energy saving up to: 35% - 40%

- **Sew saver**
  - Fuel saving up to: 60%

- **Heat pump**
4. ENERGY EFFICIENCY EQUIPMENT &
ITS ENERGY SAVING POTENTIAL

IQF (individually quick frozen)

Energy saving up to:
5 – 10%

Refrigerator with screw compressor

Energy saving up to:
10 – 15%
5. RECOMMENDATIONS FOR PROMOTING ENERGY EFFICIENCY IN VIETNAM

- Implement pilot projects
- Build a financial mechanism for investing new technology: ESCO, leasing financial, ….
- Cooperate with a Vietnam’s agency for implementing the technology transfer to reduce the investment cost.
6. ESCO MODEL

What is ESCO model?

- Energy costs before investment
- Energy costs after investment
- ESCO investment
- Energy Audit
- Assure for energy saving
- M & V

- Benefit of customer
- ESCO Fee
  - Energy Audit Consultant-Investment
  - Assure for energy saving

- Cost sharing
- Cost reduction
- Cost saving
6. ESCO MODEL

What are potential areas for ESCO investment?

- Public lighting
- Commercial buildings
- Industrial plants/factories
- Electricity distribution system
- Renewable energy
6. ESCO MODEL

Typical ESCO projects
6. ESCO MODEL

Typical ESCO projects

- TAY DO STEEL PLANT
- GREEN BEE PACKAGING COMPANY
- PUBLIC LIGHTING IN BEN TRE
Thank you
CCAP Capacity Building

Osaka City Government
Development of a Low Carbon City MOU Signing between Ho Chi Minh City and Osaka City

6 September 2016

Ho Chi Min City

1. Development of human resources
2. Sharing professional skills and knowledge on low-carbon and Environmental conservation measures
3. Creating new projects toward the realization of a low-carbon city
4. Promoting public awareness and dissemination of information on the prevention of global warming.
Low Carbon Project in Ho Chi Minh

PDCA cycle of CCAP

Measurement and assessment of GHG emission reduction
Formulation of CCAP
Review of low carbon projects and programs
Implementation of policy for a low carbon city

Strengthening human resource development for proper PDCA
Administrative staff undertakes professional training on prevention of global warming.
  e.g. Choice of low carbon technologies and projects
    GHG inventory in 10 fields
Installation of Low Carbon Technology

Initiatives in the field of energy is effective regarding GHG emission reduction

- LED lighting
- Solar panels
- Hydroelectric power facility
- Water purification plant
- Promotion of ESCO projects

Installation of low carbon technologies at public facilities
Promotion of GHG Emissions Reduction for Citizens and Businesses

Osaka City Eco Housing Promotion Project

Zero energy house

Support projects for energy saving
- Improvement of operations
- Installation of energy saving equipment
- Case example on energy saving

Promotion of energy efficiency and CO2 reduction

Comprehensive Assessment System for Building Environmental Efficiency

Excellent building

Promotion of the use of area energy networks

Ensuring the supply of energy for business continuation in times of disaster
Adaptation Measures for Climate Change

Promotion of Public Awareness on Global Warming

Seminars

Transfer of Osaka City’s experience and expertise
GHG emission = \[ \sum (\text{Activity date} \times \text{Emission factors} \times \text{Global warming potential}(\text{GWP})) \]

**Field** | **Statistical data (e.g.)**
---|---
Energy | Fossil fuel consumption
Industry | Shipment amount of products
Waste management | Amount of landfill waste
Transportation | Automobile mileage
Agriculture | Number of cows

<table>
<thead>
<tr>
<th>Type of greenhouse gas</th>
<th>Business Activities for which the Emission Calculation is Required</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy-derived carbon dioxide (CO₂)</td>
<td>Use of fuels, Use of electricity supplied from another party, Use of heat supplied from another party</td>
</tr>
<tr>
<td>Methane (CH₄)</td>
<td>Non-energy derived CO₂, Production of cement, Production of ethylene, etc.</td>
</tr>
<tr>
<td>Nitrous oxide (N₂O)</td>
<td>CH₄, CH₄ Mining of coal, Waste disposal by landfill, Treatment of sewage, night soil, etc.</td>
</tr>
<tr>
<td>Hydrofluorocarbons (HFC)</td>
<td>Nitrogen trifluoride (NF₃)</td>
</tr>
<tr>
<td>Perfluorocarbons (PFC)</td>
<td>Sulfur hexafluoride (SF₆)</td>
</tr>
<tr>
<td>SF₆</td>
<td>Production of aluminum, etc.</td>
</tr>
<tr>
<td>NF₃</td>
<td>Production of SF₆, etc.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GHG</th>
<th>GWP</th>
</tr>
</thead>
<tbody>
<tr>
<td>CO₂</td>
<td>1</td>
</tr>
<tr>
<td>CH₄</td>
<td>25</td>
</tr>
<tr>
<td>N₂O</td>
<td>298</td>
</tr>
<tr>
<td>HFC</td>
<td>1,430, etc.</td>
</tr>
<tr>
<td>PFC</td>
<td>7,390, etc.</td>
</tr>
<tr>
<td>SF₆</td>
<td>22,800</td>
</tr>
<tr>
<td>NF₃</td>
<td>17,200</td>
</tr>
</tbody>
</table>

**Link to SPI-NAMA project**
Future Training

◆ October 2017; Osaka City
  “Global Dialogue on Technology for Resilient Cities”

◆ December 2017; Osaka City and Kansai area
  “Training for formulation of low carbon city plan”

◆ January 2018; Ho Chi Minh City
  “Training for low carbon projects and GHG inventory”
Thank you very much!
Kế hoạch hành động ứng phó với biến đổi khí hậu trên địa bàn TP.HCM giai đoạn 2017-2020, tầm nhìn đến năm 2030

Osaka, tháng 10/2017
Mục lục

1. Nguyên tắc xây dựng
2. Mục tiêu của KHHĐ
3. Các nhóm giải pháp ứng phó BĐKH
4. Cách thức triển khai KHHĐ
5. Khó khăn
6. Định hướng chương trình phát thải carbon thấp
1. Nguyên tắc xây dựng

KHHĐ ứng phó BĐKH dựa trên 4 nguyên tắc chính:

- Các giải pháp thích nghi phải dựa trên nỗ lực tổng hợp của nhiều bên liên quan dưới sự chỉ đạo xuyên suốt của lãnh đạo Thành phố.

- Triển khai được các dự án giảm thiểu BĐKH cụ thể.

- Các bên tham gia đều có lợi.

- Phát triển thể chế về BĐKH.
1. Nguyên tắc xây dựng

10 lĩnh vực trong KHHĐ ứng phó với BĐKH:

① Quy hoạch đô thị
② Năng lượng
③ Giao thông
④ Công nghiệp
⑤ Quản lý nước
⑥ Quản lý chất thải
⑦ Xây dựng
⑧ Y tế
⑨ Nông nghiệp và an ninh lương thực
⑩ Du lịch, văn hóa và nâng cao nhân thức công đồng
2. Mục tiêu của KHHĐ

- Lồng ghép các yếu tố BĐKH vào các Chiến lược, Chương trình, Quy hoạch và Kế hoạch phát triển kinh tế-xã hội của TP. HCM với điều kiện cụ thể và phù hợp với giai đoạn 2016-2020.

- Xây dựng và triển khai chương trình, dự án ưu tiên nhằm thúc đẩy ứng BĐKH, giảm lượng khí nhà kính phát thải trong 10 lĩnh vực phát triển KTXH.

- Nâng cao năng lực hợp tác quốc tế và khả năng thu hút đầu tư trong công tác ứng phó với BĐKH.

- Tăng cường công tác quản lý và nỗ lực triển khai hoạt động giảm phát thải khí nhà kính.
3. Các nhóm giải pháp ứng phó BĐKH

① Nhóm các giải pháp trong khuôn khổ KHHĐ

Gồm những nhiệm vụ khá thô thi triển khai trong giai đoạn 2017-2020, phù hợp với điều kiện tài chính và các nguồn lực khác của TP.HCM.

② Nhóm các giải pháp phát triển kinh tế xã hội cần thiết cho công tác ứng phó BĐKH

Gồm những nhiệm vụ phát triển cơ sở hạ tầng vĩ mô; những nhiệm vụ khó triển khai bằng ngân sách TP nhưng rất cần thiết cho nhu cầu ứng phó BĐKH.

→ BĐĐĐKH sẽ phối hợp kêu gọi đầu tư và triển khai thực hiện.
QUY HOẠCH ĐÔ THỊ

ĐỊNH HƯỞNG

Lồng ghép BĐKH vào quy hoạch đô thị
Phát triển hệ thống văn bản pháp lý
Phòng chống và giảm thiệt hại của ngập lụt
Nâng cao chất lượng sống trong điều kiện BĐKH

HÀNH ĐỘNG ỨNG PHÓ

Lồng ghép BĐKH trong điều chỉnh và cập nhật quy hoạch đô thị
Xây dựng và hoàn thiện các quy định và hoạt động quy hoạch đô thị
Kết hợp các công trình nhằm tăng diện tích mặt nước và mạng xanh
Đến 2020, 10% DN tiêu thụ NL trong điểm áp dụng ISO 50001.

Thúc đẩy năng lượng tái tạo. Năm 2020: tỷ lệ năng lượng tái tạo >1,74% so với tổng NL tiêu thụ của TP.

Tỷ lệ tồn tại điện năng đến 2020 còn khoảng 5% và đến 2025: 4,8%.

Cải thiện hệ thống chiếu sáng công cộng bằng các loại đèn có hiệu quả tiêu thụ điện năng cao hơn.

Đây mạnh tuyên truyền, nâng cao nhận thức công đồng về sử dụng năng lượng có hiệu quả trong đời sống và sản xuất.
GIAO THÔNG VĂN TẢI

Lồng ghép BĐKH vào quản lý giao thông, xây dựng chính sách và nâng cao nhận thức

Nâng cao hiệu quả tiêu thụ năng lượng, sử dụng năng lượng sạch giảm phát thải KNK

Phát triển và định hướng chuyển đổi sang giao thông công cộng phù hợp

ĐỊNH HƯỞNG

HÀNH ĐỘNG ỦNG PHÓ

Nâng cao diện tích và chất lượng đường giao thông, giảm số điểm và thời gian ủ tắc.

Khuyến khích việc sử dụng phương GT thông chay bằng điện hoặc các loại nhiên liệu sạch.

Nâng cao công tác tuyên truyền, khuyến khích, tạo điều kiện thuận lợi cho việc sử dụng phương tiện giao thông công cộng.

Phát triển giao thông thủy nhằm hỗ trợ giảm áp lực cho hệ thống giao thông đường bộ.

Xây dựng các chính sách khuyến khích đầu tư vào hệ thống giao thông.
CÔNG NGHIỆP

ĐỊNH HƯỚNG

Nâng cao hiệu quả tiêu thụ năng lượng và tài nguyên trong sản xuất công nghiệp

HÀNH ĐỘNG ÚNG PHÓ

Xây dựng quy định về báo cáo phát thải KNK hàng năm đối với nhà máy sản xuất CN trên địa bàn thành phố.

Khuyến khích và hỗ trợ các doanh nghiệp chuyển đổi sang công nghệ và trang thiết bị hiệu quả năng lượng hơn, tăng cường tái sử dụng, tái chế nguyên vật liệu và chất thải trong hoạt động sản xuất.

Tăng cường quản lý và kiểm toán năng lượng ở các khu công nghiệp, doanh nghiệp.
**QUẢN LÝ NƯỚC**

**Định hướng: cấp nước**

<table>
<thead>
<tr>
<th>Số</th>
<th>Mục</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Đảm bảo an ninh nguồn nước cấp.</td>
</tr>
<tr>
<td>2</td>
<td>Đa dạng hóa các nguồn dự trữ nước cấp.</td>
</tr>
<tr>
<td>3</td>
<td>Hạn chế khai thác tài nguyên nước ngầm.</td>
</tr>
<tr>
<td>4</td>
<td>Thúc đẩy các cơ chế quản lý nguồn nước liên vùng.</td>
</tr>
<tr>
<td>5</td>
<td>Nâng cao hiệu quả sử dụng năng lượng trong quá trình xử lý và phân phối nước.</td>
</tr>
<tr>
<td>6</td>
<td>Tăng cường khả năng chống chịu của mạng lưới cấp nước trước các điều kiện thời tiết khắc nghiệt.</td>
</tr>
<tr>
<td>7</td>
<td>Tăng cường sử dụng nước có hiệu quả.</td>
</tr>
</tbody>
</table>
### Đính hướng: Thoát nước

<table>
<thead>
<tr>
<th>Số</th>
<th>Nội dung</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Quần lý chất chế công tác quy hoạch đô thị, hạn chế việc giảm diện tích mặt nước.</td>
</tr>
<tr>
<td>2</td>
<td>Thay đổi quan điểm chống ngập: điều tiết nước và thích nghi tích cực.</td>
</tr>
<tr>
<td>3</td>
<td>Nâng cao hiệu quả hệ thống thoát nước và xử lý nước thái.</td>
</tr>
<tr>
<td>4</td>
<td>Tăng diện tích trú nước, giảm dòng chảy đỉnh lũ, giảm thiệt hại do ngập úng.</td>
</tr>
<tr>
<td>5</td>
<td>Xây dựng liên hồ điều tiết nước, giảm nguy cơ ngập</td>
</tr>
<tr>
<td>6</td>
<td>Khuyến khích công trình có thẩm thực vật và hệ thống thu trú nước mưa.</td>
</tr>
</tbody>
</table>
GIẢM THIỂU PHÁT SINH CHẤT THẢI RĂN

- Tuyên truyền nâng cao nhận thức; tái sử dụng, tái chế các loại chất thải rắn chiếm thành phân lớn.
- Nhận rồng mô hình phân loại chất thải rắn tại nguồn.
- Triển khai các dự án tái chế chất thải; xử lý chất thải tái sinh năng lượng.
- Tăng cường công tác thu gom, tái chế và xử lý bùn thải, các loại chất thải công nghiệp, y tế, nguy hại.
- Tăng cường nâng lực quản lý chất thải rắn và nước thải, ứng dụng công nghệ thông tin vào quản lý chất thải.
Giảm năng lượng chiếu sáng và điều hòa cho các công trình

Sử dụng vật liệu xây dựng mới, thân thiện với môi trường

Thực đẩy xây dựng công trình xanh

Nâng cao năng lực quản lý đầu tư xây dựng và quản lý công trình xây dựng thân thiện với môi trường.

Tái sử dụng và tái chế chất thải xây dựng.

Tăng cường sử dụng gạch không nung.

Sử dụng năng lượng hiệu quả trong hoạt động thi công xây dựng

Xây dựng khung pháp lý tăng hệ số sử dụng đất khi quy hoạch các dự án xây dựng công trình thân thiện với môi trường

Xây dựng quy định về dán nhãn sinh thái đổi với vật liệu xây dựng thân thiện với môi trường và công trình xanh.

Xây dựng chính sách hỗ trợ, ưu đãi đầu tư nhằm khuyến khích phát triển và tạo điều kiện cho các dự án sản xuất vật liệu xây dựng thân thiện với môi trường, công trình xanh.
ĐỊNH HƯỞNG

Đào tạo, tập huấn nâng cao chất lượng đội ngũ y tế địa phương.

Xây dựng mô hình dự báo tác động của BĐKH đến sức khỏe cộng đồng theo các kịch bản cấp nhất.

Xây dựng hệ thống cảnh báo sớm dịch bệnh truyền nhiễm.

Xây dựng các kịch bản cấp cứu ứng phó với thảm họa thiên tai và BĐKH.

Đảm bảo nguồn đầu tư, hỗ trợ xây dựng cơ sở vật chất kỹ thuật nhằm tăng cường năng lực mạng lưới trạm y tế.

Nhảng cao năng lực ứng phó với tác động gián tiếp của BĐKH: dịch bệnh, thiên tai và di dân

Phi tập trung hóa dịch vụ y tế cộng đồng, giảm nhu cầu y tế chuyên tuyến vào nội thành

HÀNH ĐỘNG ÚNG PHÓ
ĐỊNH HƯỚNG

Nâng cao năng lực, nhận thức về giảm thiểu và thích ứng

Đào tạo, tập huấn; Tuyên truyền, phổ biến thông tin, kiến thức.

Quản lý diện tích rừng hiện có; phát triển diện tích rừng, cây xanh TP.

Đánh giá tác động BĐKH đến lĩnh vực NN, LN, TS, thủy lợi và phát triển nông thôn.

Triển khai thực hiện dự án ưu tiên.

HÀNH ĐỘNG ÚNG PHÓ

Đánh giá tác động BĐKH các lĩnh vực nông nghiệp
Nâng cao ý thức bảo vệ môi trường trong hoạt động du lịch cho du khách.

Đa dạng hóa các hoạt động du lịch, đẩy mạnh hoạt động du lịch sinh thái và du lịch dưỡng thủy.

Tuyên truyền khêu khích hoạt động du lịch gắn với việc bảo vệ và thân thiện với MT.

Thay thế, đầu tư các trang thiết bị có hiệu quả sử dụng năng lượng trong hoạt động du lịch.
NHIỆM VỤ KHÁC

Tổng hợp

- Xây dựng hệ thống kiểm kê khí nhà kính, MRV cấp TP.
- Xây dựng, nâng cấp hệ thống giám sát KTTV và BĐKH.
- Nâng cao năng lực quản lý rủi ro, cứu hộ, cứu nạn.
- Xây dựng tài liệu tuyên truyền về BĐKH.
- Tổ chức hội nghị, hội thảo về ứng phó BĐKH.
- Đánh giá tác động BĐKH đến quy hoạch phát triển KT-XH.
- Nâng cao năng lực quản lý nhà nước ứng phó với BĐKH.
- Nghiên cứu mô hình quản lý đô thị trong điều kiện BĐKH
- Nâng cao nhận thức cộng đồng về BĐKH.
4. Cách thức triển khai KHHĐ

- Các sở ngành
- Cần cừ KHHĐ
- Cập nhật, bổ sung KHHĐ

- Xác định nguồn lực thực hiện
- Chương trình/dự án hàng năm
- Lồng ghép nhiệm vụ chuyên ngành

- Theo dõi tiến độ, đánh giá, báo cáo hàng năm và giai đoạn
5. Khó khăn

- Về mặt chuyên môn: BĐKH là lĩnh vực còn khá mới, phạm vi rộng và đan xen trong nhiều ngành, lĩnh vực.

- Về thông tin, số liệu: Chưa đầy đủ, còn rối rắm, chưa có tập hợp được đầu mối; cơ chế chia sẻ, cập nhật thông tin giữa các ngành còn hạn chế.

- Về kinh phí: Kinh phí đầu tư khá lớn, trong khi TP phải giải quyết cơ sở hạ tầng giao thông, chống ngập, xử lý chất thải... và cả vấn đề xã hội khác.

- Nguồn kinh phí hỗ trợ từ quốc tế cũng có giới hạn.
6. Định hướng chương trình phát triển carbon thấp

1) Tuyên truyền CBCC, cộng đồng, doanh nghiệp về các hoạt động giảm phát thải KNK.

2) Triển khai hoạt động kiểm kê KNK 2 năm/lần vào năm chẩn.

3) Triển khai thí điểm hoạt động giảm phát thải KNK NAMA/MRV. Lồng ghép các hoạt động này trong Kế hoạch thực hiện chiến lược Tăng trưởng xanh.

4) Từng bước xây dựng thể chế, chính sách để tạo hành lang pháp lý và tăng cường sự tham gia của công đồng.

5) Xây dựng và triển khai các chương trình, dự án trên cả hai mục tiêu, thích ứng và giảm thiểu BĐKH.

6) Tăng cường hợp tác quốc tế trên lĩnh vực giảm thiểu BĐKH: chuyên giao công nghệ, tái sinh năng lượng, năng lượng tái tạo.
CHÂN THÀNH CẢM ƠN
2st Workshop on the Promotion of Low Carbon Development  
under Ho Chi Minh City - Osaka City Cooperation Project  
for Developing Low Carbon City

22 tháng 01 năm 2018  
Sở Tài nguyên và Môi trường thành phố Hồ Chí Minh
Outcome of the JCM Feasibility Study under Cooperation between Ho Chi Minh and Osaka

Osaka City
Oriental Consultants Co., Ltd
Japan Textile Consultants Center
Kurose Chemical Equipment Co., Ltd
Nippon Thermoener Co., Ltd
Yuko-Keiso Co., Ltd
Resona Bank Ltd
Conduct energy auditing in textile factories in Ho Chi Min City to confirm energy saving potentiality for

- Introduction of high efficiency boilers
- Heat recovery from the waste water of dyeing process through application of heat exchangers.

Organize workshops on the promotion of JCM projects in Ho Chi Minh.
Energy Auditing

- Targets factories: Tuong Long and Agtex 28
- Schedule: Sep.25~29, 2017 (two days for each)

Objectives:

- Observe operation condition of boilers
- Confirm operation condition of dyeing, washing and other machines
- Observe the volume and temperature of waste water and clean supply water

![Chart: Ratio for Heat Energy in Dyeing Process]
Image of Waste Energy Recovery

Before

After

Spiral heat exchangers are provided by Kurose
Temperature of waste water from scouring and bleaching machines.

- Supplied water: 30°C ± 45°C
- Waste water: 75°C (average)
Temperature of waste water from dyeing machines.

<table>
<thead>
<tr>
<th>Time</th>
<th>Supplied Water</th>
<th>Waste Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>09/26</td>
<td>30°C ± 45°C</td>
<td>75°C (average)</td>
</tr>
<tr>
<td>09/27</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Temperature of Waste Water (September 26~27)
## Energy Recovery

### Potential Waste Energy (TJ/year)

<table>
<thead>
<tr>
<th>Waste water flow rate</th>
<th>Amount of waste water</th>
<th>Average temperature of waste water</th>
<th>Temperature of supplied water</th>
<th>Working days and machine operation rate</th>
<th>Potential heat energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>32 ton/h</td>
<td>768 ton/day</td>
<td>75 °C</td>
<td>30 °C</td>
<td>300 days/year and 50%</td>
<td>21 TJ/year</td>
</tr>
</tbody>
</table>

The specific heat of water: 4.184 kJ/kg \cdot °C

### Outcome of the heat exchanger

| Waste water inlet temperature (°C) | 75 |
| Supply water inlet temperature (°C) | 30 |
| Surface area of heat exchanger (m²) | 56 |
| Waste water outlet temperature (°C) | 48 |
| Supply water outlet temperature (°C) | 63 |
| Supply water flow rate (ton/h)     | 24 |

Energy can be recovered by using a heat exchanger with 60 % efficiency

### Energy Saving

- **Boiler efficiency**: 70%
- **Net caloric value of coal (Kcal/kg)**: 5,900
- **Coal CO₂ emission factor (t CO₂/TJ)**: 87.3
- **Coal saved (t/year)**: 759
- **CO₂ reduction (t/year)**: 1,134
## Investment Analysis

### Total Cost of Waste Heat Recovery System

**Introduction**

Unit: 10 thousand Japanese yen (¥)

<table>
<thead>
<tr>
<th>Heat exchanger (one unit)</th>
<th>Pumps, flow and temperature meters, control panel and their installation</th>
<th>Packaging and transportation</th>
<th>Custom and other taxes</th>
<th>Total</th>
</tr>
</thead>
</table>

| 810 | 1485 | 10 | 193 | 2,588 |

### Introduction

- **Heat exchanger:** 810
- **Pumps, flow and temperature meters, control panel and their installation:** 1485
- **Packaging and transportation:** 10
- **Custom and other taxes:** 193
- **Total:** 2,588

---


**With 50% subsidy**

### Cash Flow Table

<table>
<thead>
<tr>
<th>No</th>
<th>Items</th>
<th>Total</th>
<th>Construction Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cash inflow</td>
<td>7,590</td>
<td>0</td>
</tr>
<tr>
<td>1.1</td>
<td>Saved coal cost</td>
<td>7,590</td>
<td>0</td>
</tr>
<tr>
<td>2</td>
<td>Cash outflow</td>
<td>1,794</td>
<td>1,294</td>
</tr>
<tr>
<td>2.1</td>
<td>Initial cost</td>
<td>1,294</td>
<td>1,294</td>
</tr>
<tr>
<td>2.2</td>
<td>Maintenance</td>
<td>500</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>Net cash flow</td>
<td>5,796</td>
<td>-1,294</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Payback period (year)</th>
<th>1.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Net benefit</td>
<td>5,796</td>
</tr>
<tr>
<td>IRR</td>
<td>54%</td>
</tr>
</tbody>
</table>
Insulation of scouring and bleaching machines

- Insulation of washing chamber and cylinder also helps saving energy from the process

Insulation Materials

- For cylinder
- For washing chamber
Energy Auditing

- Energy saving and emission reduction

<table>
<thead>
<tr>
<th>Total radiation</th>
<th>Insulation efficiency</th>
<th>Working days and machine operation rate</th>
<th>Cal/joule</th>
<th>Potential energy can be saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>138,408 kcal/h</td>
<td>80%</td>
<td>300 days/year and 50%</td>
<td>4.184</td>
<td><strong>1.6 TJ/year</strong></td>
</tr>
</tbody>
</table>

Boiler efficiency 70%  
Net caloric value of coal (Kcal/kg) 5,900  
Coal CO₂ emission factor (t CO₂/TJ) 87.3  
Coal saved (t/year) 96  
CO₂ reduction (t/year) 139

- Total cost = ¥3,035 thousand  
- The coals price is ¥10,000 /ton (field survey) => ¥960 thousand /year can be saved.  
- The cost can be payback in nearly 3 years.
Temperature of all waste water from scouring, bleaching and dyeing machines.

![Temperature of Waste Water (September 27~28)](chart)

This is the temperature of all waste water from process machines and measured at the point outside of the workshop. The temperature of waste water at the dropping point of machines is far higher than the above temperature.
## Energy Recovery

### Potential Waste Energy (TJ/year)

<table>
<thead>
<tr>
<th>Machines</th>
<th>Waste water flow rate</th>
<th>Average temperature of waste water</th>
<th>Temperature of supplied water</th>
<th>Working days and machine operation rate</th>
<th>Potential heat energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scouring</td>
<td>9 ton/h</td>
<td>89 °C</td>
<td>30 °C</td>
<td>300 days/year and 40%</td>
<td>6 TJ/year</td>
</tr>
<tr>
<td>Mercerize</td>
<td>12ton/h</td>
<td>75 °C</td>
<td>30 °C</td>
<td>300 days/year and 25%</td>
<td>4 TJ/year</td>
</tr>
<tr>
<td>Dyeing</td>
<td>9ton/h</td>
<td>90 °C</td>
<td>30 °C</td>
<td>300 days/year and 40%</td>
<td>6 TJ/year</td>
</tr>
</tbody>
</table>

The specific heat of water: 4.184 kJ/kg·°C

### Heat Exchanger Outcome

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste water inlet temperature (°C)</td>
<td>83.5</td>
</tr>
<tr>
<td>Supply water inlet temperature (°C)</td>
<td>30</td>
</tr>
<tr>
<td>Surface area of heat exchanger (m²)</td>
<td>56</td>
</tr>
<tr>
<td>Waste water outlet temperature (°C)</td>
<td>51</td>
</tr>
<tr>
<td>Supply water outlet temperature (°C)</td>
<td>71</td>
</tr>
<tr>
<td>Supply water flow rate (ton/h)</td>
<td>24</td>
</tr>
</tbody>
</table>

**10 TJ/year energy can be recovered by using a heat exchanger with 60% efficiency**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler efficiency</td>
<td>70%</td>
</tr>
<tr>
<td>Net caloric value of coal (Kcal/kg)</td>
<td>5,900</td>
</tr>
<tr>
<td>Coal CO₂ emission factor (t CO₂/TJ)</td>
<td>87.3</td>
</tr>
<tr>
<td>Coal saved (t/year)</td>
<td>583</td>
</tr>
<tr>
<td>CO₂ reduction (t/year)</td>
<td>873</td>
</tr>
</tbody>
</table>
## Total Cost of Waste Heat Recovery System Introduction

Unit: 10 thousand Japanese yen

<table>
<thead>
<tr>
<th>Heat exchanger (one unit)</th>
<th>Pumps, flow and temperature meters, control panel and their installation</th>
<th>Packaging and transportation</th>
<th>Custom and other taxes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

|                         |                                                 |                             |                        |       |


### With 50% subsidy

<table>
<thead>
<tr>
<th>No</th>
<th>Items</th>
<th>Total</th>
<th>Construction Period</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Cash inflow</td>
<td>5,830</td>
<td></td>
<td>0</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td></td>
</tr>
<tr>
<td>1.1</td>
<td>Saved coal cost</td>
<td>5,830</td>
<td></td>
<td>0</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
<td>583</td>
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<td></td>
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<tr>
<td>2</td>
<td>Cash outflow</td>
<td>1,684</td>
<td>1,184</td>
<td>50</td>
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<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>2.1</td>
<td>Initial cost</td>
<td>1,184</td>
<td>1,184</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.2</td>
<td>Maintenance</td>
<td>500</td>
<td></td>
<td>0</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>3</td>
<td>Net cash flow</td>
<td>4,146</td>
<td>-1,184</td>
<td>533</td>
<td>533</td>
<td>533</td>
<td>533</td>
<td>533</td>
<td>533</td>
<td>533</td>
<td>533</td>
<td>533</td>
<td>533</td>
<td>533</td>
</tr>
</tbody>
</table>

### Payback period (year)

2.2

### Net benefit

4,146

### IRR

44%
# Energy Recovery

## Potential Waste Energy (TJ/year)

<table>
<thead>
<tr>
<th>Machines</th>
<th>Waste water flow rate</th>
<th>Average temperature of waste water</th>
<th>Temperature of supplied water</th>
<th>Working days and machine operation rate</th>
<th>Potential heat energy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler scrubber</td>
<td>10 ton/h</td>
<td>52 °C</td>
<td>28 °C</td>
<td>300 days/year and 50%</td>
<td>3.6 TJ/year</td>
</tr>
</tbody>
</table>

The specific heat of water: 4.184 kJ/kg°C

### Heat Exchanger Outcome

- **1.8 TJ/year** energy can be recovered by using a heat exchanger with 50% efficiency

<p>| | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste water inlet temperature (°C)</td>
<td>52</td>
<td>Supply water inlet temperature (°C)</td>
<td>28</td>
<td>Surface area of heat exchanger (m²)</td>
<td>56</td>
</tr>
<tr>
<td>Waste water outlet temperature (°C)</td>
<td>40</td>
<td>Supply water outlet temperature (°C)</td>
<td>47</td>
<td>Supply water flow (ton/h)</td>
<td>6</td>
</tr>
<tr>
<td>Boiler efficiency</td>
<td>70%</td>
<td>Net caloric value of coal (Kcal/kg)</td>
<td>5,900</td>
<td>Coal CO₂ emission factor (t CO₂/TJ)</td>
<td>87.3</td>
</tr>
<tr>
<td>Coal saved (t/year)</td>
<td>105</td>
<td>CO₂ reduction (t/year)</td>
<td>157</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
# Investment Analysis

## Total Cost of Waste Heat Recovery System for Dyeing machines and Boiler Scrubber

Unit: 10 thousand Japanese yen

<table>
<thead>
<tr>
<th>Heat exchanger (two unit)</th>
<th>Pumps, flow and temperature meters, control panel and their installation</th>
<th>Packaging and transportation</th>
<th>Custom and other taxes</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Cash inflow</td>
<td>7,568</td>
<td>0</td>
<td>688</td>
<td>688</td>
<td>688</td>
<td>688</td>
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<td>688</td>
<td>688</td>
</tr>
<tr>
<td>1.1 Saved coal cost</td>
<td>7,568</td>
<td>688</td>
<td>688</td>
<td>688</td>
<td>688</td>
<td>688</td>
<td>688</td>
<td>688</td>
<td>688</td>
<td>688</td>
</tr>
<tr>
<td>2 Cash outflow</td>
<td>2,589</td>
<td>2,089</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>2.1 Initial cost</td>
<td>2,089</td>
<td>2,089</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2.2 Maintenance</td>
<td>500</td>
<td>0</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>3 Net cash flow</td>
<td>4,979</td>
<td>-2,089</td>
<td>638</td>
<td>638</td>
<td>638</td>
<td>638</td>
<td>638</td>
<td>638</td>
<td>638</td>
<td>638</td>
</tr>
</tbody>
</table>

Payback period (year) 3.3

Net benefit 4,979

IRR 28%


With 50% subsidy
Energy saving and emission reduction from insulation of scouring, mercerize and dyeing machines.

<table>
<thead>
<tr>
<th>Total radiation</th>
<th>Insulation efficiency</th>
<th>Working days and machine operation rate</th>
<th>Cal/joule</th>
<th>Potential energy can be saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>153,962 kcal/h</td>
<td>80%</td>
<td>300 days/year and 50%</td>
<td>4.184</td>
<td>1.8 TJ/year</td>
</tr>
</tbody>
</table>

Boiler efficiency 70%  
Total cost = ¥1660 thousand/year

Net caloric value of coal (Kcal/kg) 5,900  
The coals price is ¥10,000/ton (field survey) => ¥1,570 thousand/year can be saved.

Coal CO₂ emission factor (t CO₂/TJ) 87.3  
The cost can be payback within 2 years.

Coal saved (t/year) 107  
CO₂ reduction (t/year) 157

Cylinder Dryer Insulation Cost/piece

Washing trough Insulation cost
JCM model projects can be benefited from the financial support up to 50% of investment cost including facilities, equipment and vehicles, which contribute to reduction of CO2 emission as well as cost for installing these facilities.
Points to be considered to implement JCM model project

- Investment decision of the factories and preparation of the finance
- Agreement on the formulation of international consortium between representative participant and the factories.
- Agreement on the Allocation of Joint Crediting Mechanism (between the members of the international consortium)
- Project implementation plan and schedule
- Financing plan

Next actions

- Confirm the schedule of MoE Japan’s open recruitment for public JCM model project
- Prepare related documents
- Other things as necessary
JCM Project Preparation Flow

- Cost Estimation
- Business Model

January

Decision Making

February

- Formulation of the Consortium
- Preparation for JCM Application

May
In order to facilitate HCMC CCAP by sharing knowledge and know-how through international cooperation such as JCM, a list of outline of projects is developed under the study.

Example of project outline

<table>
<thead>
<tr>
<th>Energy Efficient Boiler</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Category</strong></td>
</tr>
<tr>
<td>Name of Project</td>
</tr>
</tbody>
</table>

**Project outline**
Promote energy saving in factories by introducing energy efficient boilers. Employing a boiler through their rehabilitation or replacement will result in a reduction of fossil fuel consumption and related CO2 emissions.

**Visual Description**
- High Efficiency
- Low cost for maintenance
- Compact
- Monitoring system

Once-through boiler

**Operation and Features**
Nippon Thermoener is a manufacturer of boilers and provides high efficient boilers, such as steam boilers, hot-water heaters, and heat medium boilers, and other energy-saving and environmentally friendly equipment and systems.

**Examples of Implementation**
Various factories such as textile, food processing, and so on.
Future City-City Cooperation Projects

Osaka City Government
Development of a Low Carbon City MOU Signing Between Ho Chi Minh City and Osaka City

1. Development of human resources
2. Sharing professional skills and knowledge on low-carbon and Environmental conservation measures
3. Creating new projects toward the realization of a low-carbon city
4. Promoting public awareness and dissemination of information on the prevention of global warming
5. Implementation of annual policy dialogues between Mayor offices toward the development of a low-carbon city in Ho Chi Minh
Dialogue between Mayor Offices

16 October 2017
Osaka City

Future City-City Cooperation Projects

- Project proposals in the field of energy
  ⇒ Introduction of solar power generation system and energy saving technology
- Capacity building for administrative staff
- Improvement of public awareness for citizens and businesses
Energy Saving Devices and Reduction of Energy Consumption

Target Facilities and Devices

Project Scale and Cost

Project Partners

Outline of Project

Purpose

- Feasibility Study (preparation for JCM model project)
  - Specifying the installation sites
  - Verifying the effect of project
  - Estimating the cost of project
  - Considering fund raising
  - Making a consensus for contract

- Manufacturing Company (solar power)
  - World Leading Solar Company

- Engineering Consultant
  - Japan’s Consulting Company

-5MW

Energy-Efficiency Project for Wholesale Market

Improving energy efficiency of Binh Dien Wholesale Market by installing solar power generation system and other energy saving devices

Solar Power Generation

-55%

LED Lights

Air Conditioner

- Project Scale
  - The initial cost of JCM Model Project is expected from 1 million USD to 10 million USD.

- Cost for Solar Power
  - 1 million USD per 1 MW
  - 5 MW is supposed to be appropriate for Binh Dien Market.
  - 5 million USD

Refrigerator

- Cost for LED Lights
  - If 13,000 pcs LED lights are replaced in Binh Dien Market…
  - 1.8 million USD
Energy-Saving Project for Water Related Facilities

Outline of Project

- **Purpose**: Decreasing energy consumption of water related facilities by installing inverters and high efficiency pumps

- **Feasibility Study** (preparation for JCM model project)
  - Specifying the installation sites
  - Verifying the effect of project
  - Estimating the cost of project
  - Considering fund raising
  - Making a consensus for contract

Target Facilities and Reduction of Energy Consumption

- **Target Facilities and Devices**
  - Water Storage Tank
  - Water Transmission Facility
  - Water Treatment Plant
  - Water Distribution Station
  - Sewage Treatment Plant

- **Reduction of Energy Consumption**
  - Pump: -31%
  - Fan: -23%

Project Scale and Cost

- **Candidate facilities** must work daily, and contribute to the reduction of energy consumption and greenhouse gas emission.

- **Cost of Installation of Basin Pump**: 500,000 USD per 1 pump

- **Project Scale**: 1 million USD – 10 million USD

- **Cost of Installation of Basic Inverter**: 100,000 USD per 1 inverter

Manufacturing Company (inverter)
- Constructor of HCMC Metro

Engineering Consultant
- Japan’s Consulting Company

Manufacturing Company (pump)
- Leading Company in JCM Scheme
Thank you very much