Seminar on Promotion of Energy Efficiency and Conservation (PROMEEC) for Major Industry in Southeast Asia

Energy Efficiency and Conservation Best Practices at PT. Krakatau Steel-Indonesia
Contents

• Company Background
• Energy Profile
• Energy Issues
• Energy Management & Conservation
• R & D and Future Planning
• Government Programs on EE&C
• Conclusions
PT. Krakatau Steel

- State Owned Company (Established: August 31, 1970)
- The first integrated steel plant in Southeast Asia
- Responsible for fulfill the steel demand domestic and abroad
- As a backbone of industrial development in the country
- Meet the national and international quality standard such as JIS, ASTM, DIN, ISO 9001:2000, ISO 14001, ISO 17025
- Production capacity: 2,000,000 MT per year
- Supported by more than 6000 employees
- Located in Banten Province, on the westernmost of the Java Island
Production Process at PT Krakatau Steel

Pellet:
Iron ore
(2,200,000 t/y)

Direct Reduction Plant

Slab Steel Plant

Hot Rolling Mill
(2,000,000 t/y)

Cold Rolling Mill
(850,000 t/y)

Billet Steel Plant

Wire Rod Mill
(600,000 t/y)
SLAB STEEL PLANT

- SCRAP
- DRI
- HBI PIG IRON
- ELECTRIC ARC FURNACE
- LADLE FURNACE
- RH-VACUM DEGASSING
- CONTINUOUS CASTING MACHINE
- SLAB
COLD ROLLING MILL

HOT ROLLED COIL → CONTINUOUS PICKLING LINE → TANDEM COLD MILL → ELECTROLYTIC CLEANING LINE → CONTINUOUS ANEALING LINE → BATCH ANEALING FURNACE → COLD ROLLED COIL

TEMPER MILL → COLD ROLLED COIL

SPLITTING/RECOILING LINE → SHEARING LINE → SLITTED/RECOILED SHEET
PT. K S - Products

- Hot Rolled Coil
- Hot Rolled Plate
- Wire Rod
- Cold Rolled Coil
- Cold Rolled Sheet
Product Applications
Energy Cost Segmentation at PT. KS

- Electricity: 60%
- Natural Gas: 10%
- Oil Fuel: 30%
Energy Cost Structure (Crude Steel) at PT. KS

- Raw Material: 54%
- Energy: 22%
- Others: 12%
- Fix Cost: 12%
Electricity Consumption Segment at PT. KS

- Iron making: 18%
- Steel Making: 6%
- Rolling Mill: 76%

Natural Gas Consumption Segment at PT. KS

- Iron Making: 6%
- Steel Making: 15%
- Rolling Mill: 79%
Distribusi Daya Listrik PT. KS

PT KRAKATAU STEEL  
Cilegon-Indonesia www.ks.co.id

KDL  
400 MVA

PLN  
200 MVA

PT KS

Steel Making  
87 %

Others  
13 %

Subsidiary Company  
5 %
Energy Issues:

- High Energy Price (especially oil fuel)
- Energy Supply Limitation (Natural Gas)
- Energy inefficiency
- Environmental Issue
## Energy Saving Potential at PT. KS Plants

<table>
<thead>
<tr>
<th>Unit</th>
<th>Potential Projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rolling Mills</td>
<td>- Fuel oil substitution</td>
</tr>
<tr>
<td></td>
<td>- Slab hot charging (1.5 \times 10^{11} \text{ Kcal/y})</td>
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<tr>
<td></td>
<td>- Waste Heat Recovery</td>
</tr>
<tr>
<td>DR</td>
<td>- Boiler fuel substitution</td>
</tr>
<tr>
<td>EAF</td>
<td>- Scrap pre-heating</td>
</tr>
<tr>
<td></td>
<td>- Oxygen lancing (9 \times 10^7 \text{ Kwh/y})</td>
</tr>
<tr>
<td></td>
<td>- Dedusting Optimization EAF 5&amp;6 (1.5 \times 10^7 \text{ Kwh/y})</td>
</tr>
<tr>
<td>Power Plant</td>
<td>- Fuel oil substitution</td>
</tr>
<tr>
<td></td>
<td>- Waste heat Recovery</td>
</tr>
</tbody>
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Countermeasures

- Energy efficiency and conservation programs
- Energy diversification / substitution
- Sufficient NG supply security
- Plant improvement and modification
- Cleaner production program
Energy Conservation Activities at PT KS

1. Examples of Options Successfully Implemented
   - Burner Control System in Ladle Drying and Preheating
   - Steam Traps & Leaks Survey, Repair and Replacement
   - Neuro Furnace Controller implementation
   - Partial Oxidation

2. Examples of Options Potentially Implemented
   - Electricity Saving by Power Reduction of Recirculating Pumps
   - Generate Power from Excess High Pressure Natural Gas through Turbine Expansion & Electrical Generator.
   - Recovering Waste Heat through Billet & Slab Transportation System Modification (Hot Charging)

3. Examples of Options Others Successfully & Potentially Implemented
   - Implementation Network ECC
   - Fuel Oil Substitution
Burners Control System for Ladle Drying and Preheating Process in Slab Steel Plant

2 heat treatment periods of the Ladle & Tundish:

1. Preheating
2. Drying

Result:

Shorter heating time, reduce fuel consumption significantly from 1244 NM3 / heat to 499 NM3/heat.
Slabs Hot Charging

Basic Concept

- Cold Charging
  - 30 °C

- Hot Charging
  - Potential Saving: 1.5 x 10¹¹ Kcal/year
  - 530 °C
Recovering Waste Heat through Billet Transportation System Modification

Goal: to minimize heat loss during transferring time from BSP to WRM by performing modification/optimization on Billet Transportation System

AIR: $T = 39 \degree C$, $V = 6 \text{ m/s}$, $\text{RH} = 65\%$

1st COOLINGBED CUTTER: $T = 900 \degree C$

2nd COOLINGBED CUTTER: $T = 450 \degree C$

COOLING BED PIPE: $T = 130 \degree C$

Billets: $t = 1 \text{ Hour}$

Insulation: 25 cm

Refractory: 8 cm
Design of Energy Control Centre Network

**ECC CONFIGURATION**

**APPLICATION**
- Lighting
- Cooling
- Heating
- Ventilation
- Energy Control
- Information System

**CONTROL**
- Server 1
- Monitor 1
- Monitor 2
- Monitor 3
- Monitor 4
- Monitor 5
- Monitor 6
- Data Transmission
- Emergency Gateway

**DATA ACQUISITION**
- Data Transmission
- Gateway 1
- Gateway 2
- Redundant Control System

**ECC COMMUNICATION SYSTEM**
- Application-BUS
- Control Application
- Optimal Controlling
- Analyzing
- Reporting
- Energy Management
- Information System
- WAN-Connect to remote system

**APPLICATION**
- Opening
- Cooling
- Heating
- Ventilation
- Energy Control
- Information System

**CONTROL**
- Server 1
- Monitor 1
- Monitor 2
- Monitor 3
- Monitor 4
- Monitor 5
- Monitor 6
- Data Transmission
- Emergency Gateway

**DATA ACQUISITION**
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- Redundant Control System

**ECC COMMUNICATION SYSTEM**
- Application-BUS
- Control Application
- Optimal Controlling
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- Reporting
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- Information System
- WAN-Connect to remote system
Neuro Furnace Controller

(Reduce Electricity Consumption at the Steel Making Plant)

Before: 669 Kwh/TLS
After: 634 Kwh/TLS
Save: 35 Kwh/TLS (5%)
HyL-3 Partial Oxidation Process (Save Natural Gas)

**OXYGEN FLOW:**
- Rate: 800 NCMH, Press. = 14 Bars
- Before: 360 Nm3/Ton
- After: 340 Nm3/Ton
- Save: 20 Nm3/Ton (5.5%)

**Process Gas Temperature**
- Before Inject O₂ (T1): 933 C
- After Inject O₂ (T2): 980 C

**Diagram Details:**
- N.G.: Natural Gas
- CO₂: Carbon Dioxide
- H₂O: Water
- CO: Carbon Monoxide
- H₂: Hydrogen
- N.G.: Natural Gas
- DRI: Direct Reduced Iron
- T1 = Before Inject O₂
- T2 = After Inject O₂

**Capacity:**
- Cap.: 1,5x10⁶ T/y

**Notes:**
- Saves Natural Gas
- Partial Oxidation Process
Total Energy Saving

- Natural Gas (saving from: Partial Oxidation, Steam leaks reparation and Ladle & Tundish Heating Automation):
  \[= 60 \times 10^6 \text{Nm}^3 / \text{y} \quad = \text{US$ 5,610,326 / y}\]

- Electricity (saving from: Neuro Furnace Controller and others):
  \[= 80 \times 10^6 \text{Kwh} / \text{y} \quad = \text{US$ 3,804,347 / y}\]

- Total Saving
  \[= \text{US$ 9,414,674 / y}\]
PARTNERSHIP PROGRAM ON EE&C FOR INDUSTRY AND COMMERCIAL BUILDING

- Partnership program is the government program on energy conservation focused on energy efficiency improvement for energy intensive industries and commercial buildings
- Government support e.g. Energy Audit (Free of Charge); Training; Technical Assistance and Seminar/Workshop
- Parties involved in the program which started in 2003 are Government, State-owned Electricity Company, Financial Agency, Industry and Commercial Building
PARTNERSHIP PROGRAM ON EE&C FOR INDUSTRY AND COMMERCIAL BUILDING

- In 3 years committed industries and buildings report to government every 6 (six) month about the progress implementation of the energy audit recommendation.
- In this year, there are 32 industries and building participate in partnership program
- Energy Audit in industries and buildings will be expanded to almost 250 objects (industries and buildings) next year under government budget.
## ENERGY AUDIT RESULT - INDUSTRY

<table>
<thead>
<tr>
<th>INDUSTRY</th>
<th>ENERGY SAVING POTENTIAL</th>
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<tbody>
<tr>
<td></td>
<td>(%)</td>
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<tr>
<td><strong>IRON AND STEEL</strong></td>
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<tr>
<td>Ispatindo, East Java</td>
<td>6.76</td>
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<tr>
<td>Roda Mas Baja Inti, South Sulawesi</td>
<td>10.75</td>
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<td>Barawaja, South Sulawesi</td>
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<td><strong>TEXTILE</strong></td>
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<td>Roda Vivatex – West Java</td>
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<td>Vastex Prima - West Java</td>
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<td>Indah Jaya Textile – Banten</td>
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<td><strong>FLOUR MILLS</strong></td>
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<td>Berdikari Sari Utama, West Java</td>
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# ENERGY AUDIT RESULT - BUILDING

<table>
<thead>
<tr>
<th>BUILDING</th>
<th>ENERGY SAVING POTENTIAL</th>
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<td><strong>COMMERCIAL BUILDING</strong></td>
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<td>Graha Pangeran, East Java</td>
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<td><strong>GOVERNMENT OFFICE</strong></td>
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<td>DGEEU, Jakarta</td>
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OVERSEAS COOPERATION ON EE&C

I. GREENHOUSE GAS EMISSION REDUCTION from INDUSTRIES in ASIA and PACIFIC (GERIAP) – UNEP

- Enhancing energy efficiency improvement for mitigating GHG emission
- Energy Audit for intensive energy industry:
  - Cement
  - Fertilizer
  - Pulp & Paper
  - Iron & Steel

II. PROMOTION on ENERGY EFFICIENCY and CONSERVATION (PROMEEC), ASEAN – ECCJ/METI JAPAN

- Promoting energy saving implementation for industry and building in ASEAN region
- Energy Audit/Energy Management, Database, Benchmarking for industry and building:
  - Commercial building (2004) : Hotel - 2 (two) five star class
Conclusion

• The energy conservation efforts have reduced energy consumption rate and production cost and at the same time contribute to create better environmental condition.
• Supported by the management and all employee, these efforts have been implemented successfully and continuously.