PT. KRAKATAU STEEL

COMPANY DESCRIPTION

PT. Krakatau Steel is the only integrated large government-owned steel plant located in the Krakatau Industrial Estate in Cilegon, Indonesia, was established on August 31, 1970 and has more than 6,000 employees. The company consists of six production plants that produce hot rolled coils, plates and sheets; cold rolled coils and sheets and wire rods with capacity 2 million, 650.000, dan 20.000 ton **per year**. The company's produces for domestic and international markets. PT. Krakatau Steel's natural gas consumption is 126,600 NCMH (64,800 NCMH as fuel and 61,800 NCMH as material input for the reforming process). Electricity is supplied by Krakatau Daya Listrik and the National Electric Company (PLN). The company has an ISO14001 Environmental Management System and an ISO9001 Quality Management System in place, and also has an Energy Policy in support of its corporate mission.

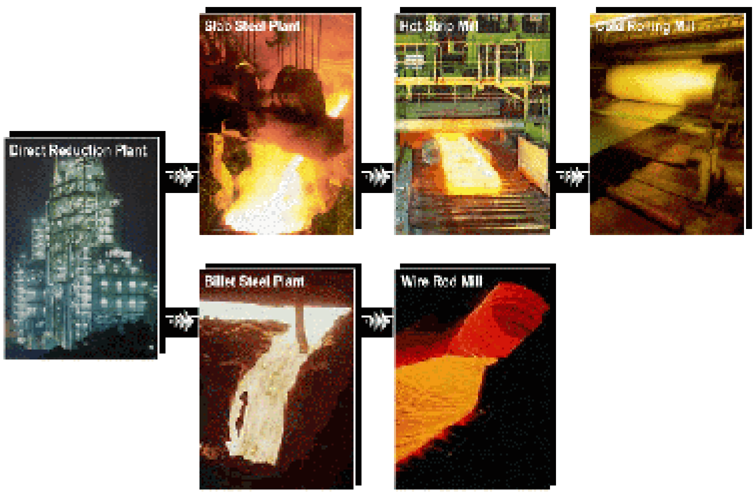
PROCESS DESCRIPTION

PT. Krakatau Steel is the only integrated steel plant in the country. Six sequential plants produce several kinds of downstream products from upstream raw materials:

- ***Direct Reduction Plant (DRP):*** This plant processes iron or pellets into irons using natural gas and water (steam), capacity 2,350,000 tons sponge iron per year.
- ***Slab Steel Plant (SSP)*** and ***Billet Steel Plant (BSP)****:* The irons are fed into electric arc furnaces together with scrap, hot brick iron, and other materials to produce slabs and billets, install capacity 1,800,000 tons and 675,000 tons respectively.
- ***Hot Strip Mill (HSM):*** Slabs are reheated and rolled into hot rolled coils and plates, capacity 2,000,000 tons per year, which are widely used for ship building, pipes, buildings, general structures, and other applications
- ***Cold Rolling Mill (CRM):*** The hot rolled coils are processed, re-rolled, and chemically treated to produce cold rolled coils and sheets, capacity 650,000 tons per year.
- ***Wire Rod Mill (WRM):*** Wire rods are manufactured from billets, capacity 200,000 tons per year, which are commonly used for piano wires, bolts and nuts, steel cords, springs, and other applications.

The following is the graphical representation of the overall production process at PT. Krakatau Steel Industrial Estate.

Figure 1 - Krakatau Steel Production Plants (www.krakatausteel.com)



METHODOLOGY APPLICATION

The draft Company Energy Efficiency Methodology was used as a basis for the plant assessment to identify and implement options to reduce energy and other materials and wastes. Some of the interesting experiences are:

- ***Task 1d – Select focus area***

The Team selected five potential focus areas and there were reasons supporting the selection of each of them. The Team held a brainstorm session whereby first criteria were agreed, such as management preference, energy reduction potential and cost reduction potential. Then each focus area was assessed against these criteria before selecting focus areas.
<u>Lesson learnt: By first agreeing as a Team on the criteria to select focus areas and only then assess each focus area against the criteria it is possible to more objectively come to an agreement on what focus areas to select.</u>

- ***Task 2d – Quantify inputs and outputs and costs to establish a baseline***

The company has an online information systems but it was difficult to obtain some historical and current data. In addition, most plants and the company have heating processes and sometimes temperatures were too high to take temperature measurements using infrared sensors. For example, due to hot temperatures it was only possible to inspect billets visually. Because of this several inputs and outputs were calculated and/or estimated using the experience of the external facilitators and the plant's Team members. The same applied to monitoring results of implemented options.
<u>Lesson learnt: If real measured data are not available it is sometimes necessary to rely on estimations and theoretical calculations.</u>

- ***Task 5a – Implement options and monitor results***

The implementation of options had to be carefully planned because it was very much influenced by the plant's schedule for overhaul maintenance activities.
<u>Lesson learnt: Consider a company's maintenance and overhaul schedules when planning for the implementation of options</u>.

- ***Step 6 – Continuous improvement***

The company considers energy efficiency as one of the components in the company's vision and mission Energy efficiency options are included in the company's annual plans before implementing them.
<u>Lesson learnt: Energy efficiency often fits in with a broader company vision of achieving excellence.</u>

OPTIONS

- The focus areas selected for the project were: (1) DRI plant steam distribution system, (2) slab steel plant, (3) Hot strip mill cooling tower, (4) DRI plant natural gas let-down station; and (5) billet transportation system.
- Five options were identified for feasibility analysis; two of them were implemented successfully; and three options require a further financial analysis. The options are summarized in table bebw.
- The two implemented options required a total investment of US$ 11,843 in 2004, resulting in annual cost savings of US$ 90,614, and an overall payback period 2 months. The three potential options to be implemented require a total investment of US$ 3,442,405, and would result in total annual cost savings of up to US$ 926,523 with an estimated payback period of 3.7 years.
- The two implemented options resulted in (1) energy reductions of 1,014 ton natural gas per year (2) steam savings of 5,447 GJ/year and (3) GHG emission reductions of 2,939 ton CO_2 per year.
- For the three potential options to be implemented, estimated reductions are (1) energy consumption reduction of 2,271 Nm^3 natural gas per year, (2) 7,464 – 17,418 MWh electricity per year and (3) GHG emission reduction 17,302 ton CO_2 per year.

Table 1: EXAMPLES OF OPTIONS IMPLEMENTED AND INVESTIGATED

FOCUS AREA/ OPTION	CP TECHNIQUE	FINANCIAL FEASIBILITY	ENVIRONMENTAL BENEFITS	COMMENTS
DRI Plant-Steam Distribution System /Steam traps and leaks survey, repair and replacement *(see case study)*	Good housekeeping	▪ Investment: US$ 3,510 ▪ Cost savings: US$ 18,307 /yr ▪ Payback period: 3 months	▪ Natural gas savings: 126 tons /yr (5,447 GJ/yr) ▪ GHG emission reduction: 369 tons CO_2/yr	Reparation steam pipe leaks, steam trap leaks and insulation on the steam distribution system
Slab Steel Plant /Burner control system in Ladle Drying and Preheating Process *(see case study)*	New technology /equipment	▪ Investment: US$ 8,333 ▪ Cost savings: US$ 72,307/yr ▪ Payback period: 0.12 years	▪ Natural gas savings: 1,112,877 Nm^3 /yr (exceed 80% saving target) ▪ GHG emission reduction: 2,216 tons CO_2/yr	Install PC hardware, Install network and develop a burner control software system
Hot Strip Mill - Cooling Tower /Electricity savings through time reduction of re-circulating pumps	New technology/ equipment	▪ Investment: US$ 122,072 ▪ Cost savings: US$ 156,270 /yr ▪ Payback period: 0.78 yr	▪ Energy savings: 3,338,820 kWh/yr ▪ GHG emission reduction: 2,417 tCO_2/yr	Electrical consumption can be reduced by using variable speed drive (or dual speed) motor
DRI Plant - Natural Gas Let-Down Station/ Generate power from excess high Pressure Natural Gas	New technology/ equipment	▪ Investment: US$ 2,500,000 ▪ Cost savings: US$ 774,144 /yr ▪ Payback period: 3 yrs	▪ Electricity savings: 7,464 - 17,418 MWh/yr ▪ GHG emission reduction: up to 12,542 tCO_2/yr	It seems to be feasible but not been implemented yet considering the Company priority on production improvement

FOCUS AREA/ OPTION	CP TECHNIQUE	FINANCIAL FEASIBILITY	ENVIRON MENTAL BENEFITS	COMMENTS
through turbine expansion and electrical generator *(see case study)*				projects
Billet Steel Plant/ Recovering Waste Heat through Billet Transportation System Modification *(see case study)*	New technology/ equipment	▪ Investment: US$ 820,333 ▪ Cost savings: US$ 152,222 /yr ▪ Payback period: 5 yrs	▪ Natural gas savings: 2,271 Nm^3 /yr ▪ GHG emission reduction: 4,758 t CO_2/yr	Option not yet implemented due to high investment and long payback period

FOR MORE INFORMATION

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