ABUL KHAIR STEEL PRODUCTS LIMITED

COMPANY DESCRIPTION

Abul Khair Steel Products Ltd (AKSP) is a newly established large metal finishing plant in Bangladesh, that produces a range of steel products, such as cold rolled (CR) coils, galvanized steel (GS) sheets and corrugated galvanized iron (CGI) sheets. AKSP was established in 1999 as a private limited company and currently employs about 650 staff, with large expatriate technical team, mostly from India. The installed production capacity of the plant is 150,000 tons CGI sheets and 300,000 tons CR coils per year. Actual production for the base year 2002 was 130,943 tons. Due to steep increase in steel prices and competition in the market, demand for their products is low and the company is operating at 50% lower than the installed capacity. As a result, their total production was only 85,000 tons in 2004. The company's production is mostly for the domestic market but is also exported to 13 countries. AKSP recently obtained ISO 9001: 2000 certification.

High electricity consumption is a major concern and for this reason top management decided to participate in the GERIAP project.

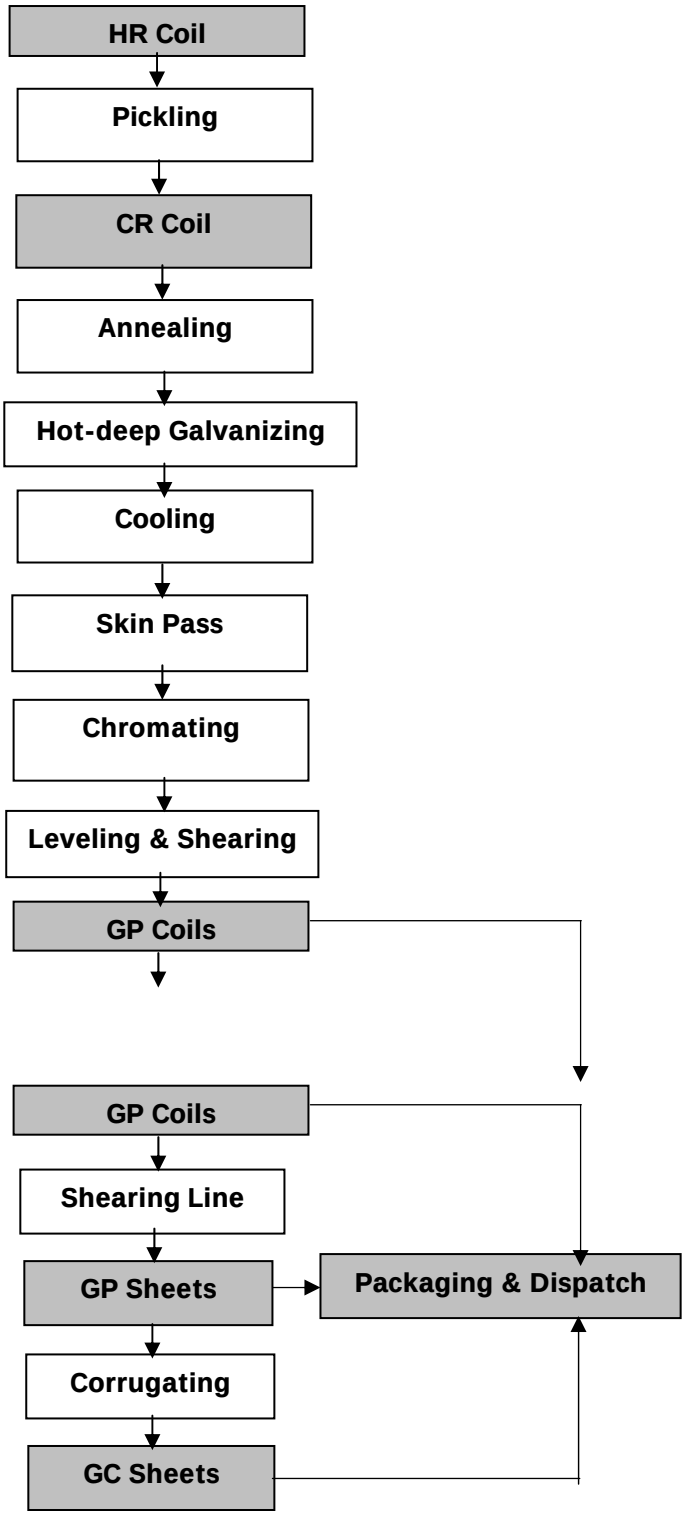
PROCESS DESCRIPTION

The plant's main raw material is hot rolled (HR) coils, which is imported from Japan, Korea, India and Russia. Major production process steps are Pickling, Cold Rolling, Annealing, Galvanizing and Corrugating. A short description of the major steps is given below and a process flow chart is shown on the next page.

- ***Pickling:*** Hot rolled coils have a layer of oxide on their surface. Pickling ensure removal of surface oxides by chemical treatment using hydrochloric acid, prior to the cold rolling process. Production lines have an edge-trimming facility and built-in features to avoid under/over pickling. For high production of strips of 1.2 mm to 6.5 mm thickness, continuous lines are used. In these lines, strip accumulators allow coils to be loaded and unloaded while the strip continues to run through the pickling section. The lines are normally operated by integrated mill operators and are mainly used to pickle strips prior to cold rolling.
- ***Cold Rolling:*** The objective of cold rolling is to improve the surface finish, to obtain smaller and more uniform thickness. Cold worked products tend to be very hard and possess great strength. The process consists of reducing thickness of hot rolled coils to desired thickness in several steps (according to a set schedule).
- **Annealing: A**fter the cold rolling process steel is very hard and the annealing process aims to improve the steel's formability properties and microstructure. Next, the annealed cold rolled steel coils are suppressed to remove wrinkles and achieve flatness depending on customers' requirements. In addition, electrical steels are given about 7-8% critical reduction to improve their magnetic properties.
- **Galvanizing:** Galvanizing is the process of electrically coating the surface of the iron with a layer of zinc. Zinc reacts with the iron molecules in the steel to form galvanized steel. The external layer is zinc, but successive layers are a mixture of zinc and iron, and the interior is pure steel. Galvanizing dramatically increases the resistance of the iron to corrosion, transforming it into a durable material.

- **Corrugating and Packaging: G**alvanized plain sheets are transferred to the converting and finishing section for cutting the sheet as per customer requirement; corrugated in the Corrugation line as a final product; and dispatched to the packaging section.

Figure 1: Process Flow Chart of AKSP



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 1a - Meeting with top management:*** Based on the meeting with top management and the completion of the Energy Management Matrix, it appeared that the company has some energy and environmental initiatives in place, but these are mostly informal. Some of the recommendations made to management to strengthen overall environmental management included to establish:
  - A well documented energy and environmental policy with clear objectives, responsibilities and targets
  - An organizational diagram for the company with clear responsibilities for energy and environment
  - Appropriate awareness, motivational and promotional schemes to encourage production staff to come up with suggestions on how to improve energy efficiency
  - A documented monitoring system that includes an information flow from production to top management
  - Improved good housekeeping practices to prevent soil and ground water contamination.
  - Development of an environmental management system with the possibility of accreditation to ISO14001 in the future

Lesson learnt: the meeting with top management is useful to identify what is needed from an energy management perspective to ensure energy efficiency improvements will continue in the future.

- ***Task 2c – Walkthrough of focus areas:*** During the walkthrough, the plant's Team, external facilitators from Bangladesh and an international consultant made several observations that immediately resulted in the some obvious options to improve energy efficiency. Some of the observations and options were:
  - There is no insulation material on steam pipe valves and fittings and insulation on some pipelines is absent. Option: insulate all steam pipelines, valves and fittings
  - There is no condensate recovery on the main pickling line. Option: install an economizer on the boiler to preheat feed water using return condensate at high temperature
  - One bore well pump is running continuously to supply water, but when water is not needed it has to be stored. Option: install a float valve controller to enable intermittent bore well operation so that water is only pumped up when it is needed
  - Cold water recycling pumps operate all the time even when the cold rolling mill is shut off. Option: turn off the main pumps on the rolling mills when the mills are off-line

Lesson learnt: the walkthrough of focus areas can generate a lot of options that would not have been identified otherwise.

- ***Task 5a – Implement options and monitor results:*** As a separate option outside of the GERIAP project, the plant is commissioning a US$ 1 million acid (spent pickling) regeneration unit, which is in its final stage of civil structure completion and hardware has already been received. The plant was designed for 2.5 ton of HCl per hour considering the production and planned expansion 3 years back. However, the plant currently operates at less than 50% of installed capacity, and therefore the regeneration unit will also be underutilized. This means that the actual payback period of the unit will be significantly longer than

estimated. The management can consider offering the excess capacity to regenerate acid from other companies to recover the investment costs faster.
Lesson learnt: Changes in market demand have an influence on production output and therefore can significantly influence the actual payback period of implemented options.

- ***Task 5a – Implement options and monitor results:*** When the company was revisited after implementation of options, company management reported that due to a steep increase in steel prices and increased competition, the market demand is low and as a result the company is presently operating at less than 50% installed capacity. As a result, energy consumption and GHG emissions had reduced since the start of the project but specific consumption and GHG emissions had increased. In such a situation it is difficult to determine the impact of implemented options because the data are influenced by a reduced capacity utilization of the plant. Specific consumption and emission data (i.e. per unit of product) were used to compare the before and after situation.
Lesson learnt: It is important to determine if there were major changes in production figures before and after the implementation of options, as this will significantly influence the changes in energy and GHG emissions. If this is the case, specific consumption and emission data (rather than absolute data) should be used.

- ***Step 6 – Continuous improvement:*** At the completion of the project the plant had not yet implemented the energy management recommendations made during the first meeting with top management. The plant can continue on an ad hoc basis to implement more energy efficiency options, but recognizes that without a certain level of energy management system it will be difficult to ensure continuous improvement.

Lesson learnt: a certain minimum level of energy management system is necessary to ensure a company will continue to improve energy efficiency in the future.

OPTIONS

- The focus area selected were: (1) Steam system, (2) Water distribution system, (3) Heat Recovery Galvanizing Furnace and (4) Electricity system
- A total of 12 options were identified:
  - 2 options (Install capacitor bank and Turn off main pumps on rolling mills when mills are off line) were implemented fully, 1 option (Leak repair and insulation improvement) was partially implemented, and 6 options are still to be implemented
  - 2 options (Heat recovery from Galvanizing Furnace and Electricity Conservation and Cogeneration) require further analysis
  - 1 option (Main Pickling Line Heat Recovery) was found unfeasible and was rejected by plant management
- For the two fully and one partially implemented options, the total investment was US$ 51,667, annual savings were US$ 249,200, and the payback period was #
- For the two fully and one partially implemented options, the total electricity savings were 48 MWh, natural gas savings were 66,360 NM^3, and greenhouse gas emission reductions were 163 tons CO_2
- As a result of the options implemented, the plant's GHG emission was reduced by 163 tons CO_2, which accounted for about 0.58% reduction in the total GHG emissions (27,947 tons CO_2 in 2002) of the company.

Table: EXAMPLES OF OPTIONS IDENTIFIED AND IMPLEMENTED

FOCUS AREA/ OPTION	CP TECHNIQUE	FINANCIAL FEASIBILITY	ENVIRONMENTAL BENEFITS	COMMENTS
Water distribution system/ Keeping main pumps on rolling mills turned off when mills are offline *(see case study)*	Good housekeeping	▪ Investment: none ▪ Cost savings: US$ 3,200 ▪ Payback period: N/A	▪ Electricity savings: 48 MWh/yr ▪ GHG emission reduction: 26 tCO_2/yr	Company management decided to have pumps turned of manually instead of with an electronic sensor
Electricity system/ Installation of capacitor bank to improve power factor *(see case study)*	Production process/ equipment modification	▪ Investment: US$ 50,000 ▪ Cost savings: US$ 240,000 ▪ Payback period: 2.5 months	▪ Energy saving: none ▪ GHG emission reduction: none	An improve power factor does not result in lower electricity consumption, but in reduced peak load demand and therefore reduced penalty fines
Recover acid for regeneration	New equipment /technology	▪ Investment: US$ 1 million ▪ Cost savings: not determined	▪ Energy saving: not determined ▪ GHG emissions savings: not determined	Option was being implemented at time of writing
Steam system/ Leak repair and insulation improvement of steam distribution system *(see case study)*	Good housekeeping	▪ Investment: US$ 1,667 ▪ Cost savings: US$ 6,000/yr ▪ Payback period: 3.5 months	▪ Natural gas savings: 63,360 NM^3 /yr ▪ GHG emission reduction: 137 tCO_2/yr ▪ Water savings	Option was partially implemented. If implemented fully annual savings could be up to US$ 66,666
Steam system / Recovering heat from condensate using heat exchanger *(see case study)*	Onsite reuse / recovery	▪ Investment: US$ 5,000 ▪ Cost savings: US$ 10,500/yr ▪ Payback period: 6 months	▪ Energy savings: not known ▪ GHG emission reduction: 243 tCO_2/yr	Option was not implemented due to concerns of acid mixing with recovered condensate which would disrupt production process

FOR MORE INFORMATION

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