

Promotion of Energy Efficiency and Conservation in Major Industries in South East Asia

EE&C Practices of Steel/Cement/Food Companies in the Philippines

Presented by:

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Introduction



The primary objective of the government's energy efficiency program is to make consumers realize that the way to compensate for and lessen the impact of the high costs of energy and electricity is by using it efficiently, judiciously and wisely. Hence, energy efficiency promotions are aimed at encouraging efficient use of all energy forms by all users.

Strategies



- Conduct Information and Education Campaign on benefits of efficient use of energy and best practices.
- Promote the use of energy efficient appliances as well as introduce energy efficient technologies.
- Provide technical and energy management advisory assistance.
- Put in place a recognition system for those who consciously apply the concepts, systems and technologies of EE&C.







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Philippine Iron & Steel Industry

- Billet Production by Electric Arc Furnace (EAF) there are 5 companies.
 - Plain Carbon Steel (Structural Steel)
 - Intermediate Class
 - High Strength Steel
- Billet Imports from Russia, Australia, Africa
- Rolling Mills produce reinforcing steel bars, wire rods, and section steels
 - Continuous type rolling (tandem arrangement, high speed)
 - Semi-continuous type rolling (reverse type or semi-tandem)
 - Non-continuous type rolling (cross-country arrangement, small scale)
- Steel Sheet Coating

-	Standard process	Pretreatment process (1)	Main process	Refining process (3)	Post-treatment process (4)	
Process	Specific process	Sintering/coke making process Iron making process		Stoel making process	Rolling process	
Pr	ocess block diagram	Iron ore To famaces in the works Fine one Sintered ore igns holder) Coal Coal Coal	Charging Dest converger Dest re- movial ling Hot-blast ing Hot-blast ing Hot-blast ing re- ing ing ing ing ing ing ing ing	generator tarbias n in the works (gau bolder) Steel mak- ing Continuous casting (area (area (area) (+Hot dip galvanizing +Electro-galvanizing +Cold rolling +Cold r	
vije	Machine & Equipment (ME)	IS-ME-101 Coal drying and preheating oquip- ment for coke oven IS-ME-102 (coke oven) Dry quenching equip- ment IS-ME-103 Sintering machine	IS-ME-201 Dehumidifier for blast furnace IS-ME-202 Heat medium type exhaust heat recovery equipment IS-ME-203 Burden distribution control system for blast furnace IS-ME-204 Furnace top pressure generator for blast furnace	IS-ME-301 Oxygen enriching device IS-ME-302 Sealed type exhaust gas recovery device IS-ME-303 Converter exhaust gas recovery system IS-ME-304 Continuous custing machine	 ME-401 Hot direct rolling mill IS-ME-402 Descaling pump IS-ME-403 Continuous slab reheating fur- nate IS-ME-404 Automatic rolling table IS-ME-405 Convection heating type heat treatment furnace for wire rod coil 	
Eacrgy Saving Technol	Operation management (OM)	IS-OM-101 Heating steam reduction method for tar decanter	1S-OM-201 Energy saving operation method for blast furnace	IS-OM-301 Recovery rate improving method for converter generating gas IS-OM-302 Ladle beating method with high temperature combustion	IS-OM-401 Operation method of heating furnace IS-OM-402 Operational improvement for rebeating furnace IS-OM-403 Operation method of annealing furnace IS-OM-404 Operation method of cold rolled cold annealing furnace IS-OM-405 Rinse water heating method of electrolytic cleaning line	
	Process (PC)	15-PC-101 Briquette coal blending method for coke oven 15-PC-102 Hot water power generation system using exhaust heat from sintered one cooling equipment 15-PC-103 Exhaust heat recovery system for sintered one cooling equipment	IS-PC-201 Pulveriaed coal injection method for blast furnace	1S-PC-301 Power generation system using exhaust heat from converter gas cooling water	IS-PC-401 Low semperature forge welded pipe production method	

Fig. 4-2-1 Distribution Diagram of Energy Saving Technology for Iron and Steel





Rolling Mill for Reinforcing Bars



Figure II-7-8 Flow of Hot Rolling Process and Energy Conservation Measures



Major Equipment

- Walking Beam Reheat Furnace using Bunker Oil
- Exhaust Heat Recovery Recuperator
- Tandem Horizontal/Vertical Rolling Machine
- Air Compressors
- Water Pumps and Cooling Towers



Walking Beam Reheating Furnace

This technology was developed because:

- It Saves Energy;
- Requires Less Manpower;
- Improved Product Quality;
- Efficient Operability



Desired Flue Gas Data

	Bunker Oil	Diesel
O ₂ %	3.0 - 4.0	1.0 - 2.0
CO ppm	400	400
Flue Gas Temp.	220 °C	220 °C
Excess Air Percent	15 - 20	5 - 10
Thermal Efficiency	84.4 - 83.9	84.7 - 84.3





Figure II-7-9 Relationship Between Air Ratio and Fuel Consumption

ENERGY CONSUMPTION PERFORMANCE

3rd Quarter of 2003 - 2nd Quarter 0f 2004

Product Line	Total Production	<i>Total Energy</i>	Specific Energy
	(MT)	<i>Consumption (LOE)</i>	Consumption
Rolling Mill	<i>222,141</i>	<i>13,383,520</i>	<i>60.25</i>

3rd Quarter of 2004 - 2nd Quarter 0f 2005

Product Line	<i>Total Production</i>	<i>Total Energy</i>	Specific Energy
	(MT)	<i>Consumption (LOE)</i>	Consumption
Rolling Mill	<i>198,408</i>	11,107,116	55.98

ENERGY EFFICIENCY/CONSERVATION MEASURES	SAND PROJECTS
	SAVINGS
	(LOE)
1. Replacement and modification of Recuperator	302,665.02
2. Reduction of idle fuel consumption. Reduce unproductive use of energy during change size and delays	164,051.00
3. Installed Additional ceramic Fiber insulation inside furnace wall of recuperative zone side.	4,595.00

ENERGY EFFICIENCY/CONSERVATION MEASURES	AND PROJECTS
	SAVINGS
	(LOE)
4. Installation of water flow meters and modification of the circulation of water at the furnace area.	2,339.42
5. Modification of design scale pit motors to reduce frequent simultaneous starting of AC motors.	67,334.80
6. Installation of thermoplastic translucent roofing sheets at mill and warehouse areas.	37,563.19



Steel Sheet Coating





Major Equipment

- There are two processing plants, namely:
 Continuous Galvanizing Line (CGL);
 - -Uses Liquefied Petroleum Gas (LPG) in burners for pre-heating sheets
 - -Bunker Fuel is used in Heating Furnace for the Galvanizing Kettle

≻Color Coating Line (CCL)

-LPG is used in the Oven and Dryers

ENERGY CONSUMPTION PERFORMANCE

3rd Quarter of 2003 - 2nd Quarter 0f 2004

Product Line	Total Production (MT)	<i>Total Energy</i> <i>Consumption (LOE)</i>	Specific Energy Consumption	
CCL	<i>29,186</i>	806, 439. 54	27.63	
CGL	38,279	<i>1,265,452.17</i>	33.06	

3rd Quarter of 2004 - 2nd Quarter 0f 2005

Product Line	Total Production (MT)	<i>Total Energy</i> <i>Consumption (LOE)</i>	Specific Energy Consumption	
CCL	26,401	719,753.70	27.26	
CGL	34,192	1,017,718.09	29.68	

Continuous Galvanizing Line kW vs kWh



kWh

Table 2						

CONTINUOUS GALVANIZING LINE

MONTHLY ENERGY CONSUMPTION							
MONTH	LOAD	DEMAND	CONSUMPTION	POWER	SURCHARGE	TOTAL AMOUNT	
OVERED	FACTOR, %	KW	KWH	FACTOR,%	P	DUE, P	₽/k\
5 - May 6, '04	44.31	381.92	125,920	99.80	6,621.64	681,185.80	5.4
/ 6 - Jun 7, '04	41.28	376.48	119,360	99.80	6,527.32	667,724.80	5.59
e 7 - Jul 6, '04	52.28	363.68	132,320	99.90	6,348.00	718,763.25	5.43
6 - Aug 5, '04	35.09	360.32	91,040	99.90	6,289.35	538,537.55	5.92
5 - Sep 6, '04	32.21	366.72	147,040	99.90	6,401.06	809,940.15	5.5′
6 - Oct 6, '04	34.4	360.48	89,280	99.90	6,292.14	546,869.50	6.13
6 - Nov 5, '04	39.75	370.08	105,920	99.90	6,145.24	743,077.70	7.02
5 - Dec 7, '04	42.78	365.76	120,160	99.90	6,073.50	817,019.10	6.80
; 7 - Jan 6, '05	28.58	325.76	67,040	99.90	5,409.30	521,287.55	7.78
6 - Feb 7, '05	52.19	356.48	142,880	99.80	5,879.68	985,413.55	6.90
7 - Mar 7, '05	51.31	340.16	117,280	99.80	5610.50	776,057.25	6.62
⁻ 7 -Apr 6, '05	43.01	356.0	110,240	99.90	5,911.44	759,223.30	6.89
TAL			1,368,480		73,509.17	8,565,099.50	
ERAGE	41.43	360.32	114,040	99.87	6,125.76	713,758.29	6.33

ENERGY EFFICIENCY/CONSERVATION MEASURES AND PROJECTS

CONTINUOUS GALVANIZING LINE	SAVINGS (LOE)
1. Utilized LPG infrared Heater and replaced motor-powered Air Blower & Electric Heater.	1,123.00
2. Furnace Damper Revision	34,944.00
3. Rationalized LPG Usage by standard number of burners fired per CRC thickness being processed.	13,428.00
4. Recirculate Hydraulic Cooling Water at Alkali Rinsing tank instead of dumping directly to drainage.	313.33

ENERGY EFFICIENCY/CONSERVATION MEASURES AND PROJECTS

CONTINUOUS GALVANIZING LINE	SAVINGS (LOE)
5. Decommision Surface Smoothener Drive.	12,629.25
6. Preheater Revision	13,635.67
7. Installed automated control of the LPG pilot burner that would automatically switch "OFF" the LPG burner during high fire of SFO burner and switch "ON" during low	30,538.00
SUB-TOTAL	106,611.25



Philippine Cement Industry

- 15 Cement Plants Nationwide
- 100,000 to 500,000 MT/yr
- 20 T/hr to 90 T/hr
- Process are mostly Dry process
- Semi-dry and Wet process still exist

Milestone

- Fuel conversion from Oil to Coal
- Finance rehabilitation in 1980's
- Cement Industry Rehabilitation Program in 1990's



Cement Industry Rehabilitation

Some developmental/rehabilitation projects adopted by some of the cement mills:

- Installation of additional equipment
- Conversion from direct to indirect firing system
- Improvement of existing facility
- Rehabilitation of small capacity kilns to achieve rated output
- Conversion of semi-dry to dry process
- Installation of pre-calciner to increase plant capacity
- Rehabilitation of clinker cooler to increase kiln capacity



Fig. 10.1. Isometric flowchart for the manufacture of portland cement by both dry and wet processes. (Portland Cement Assoc.)



Fig. 44-1 Distribution Diagram of Energy Saving Technology for Cement-Portland

DON EMILIO ABELLO ENERGY EFFICIENCY AWARDS ENERGY CONSUMPTION PERFORMANCE





Cement Plant Implemented Projects

- Modified Suspension Pre-heater with separate line calciner technology
- Installation of Vertical Mill at Raw Mill
- Installation of 5 stage New Suspension Pre-heater (NSP)
- Compressed Air Pressure Reduction 7Bar to 6.8 Bar
- Replacement of DC Motors by Variable Speed Drive for Damper Control
- Upgrade Process Automation



Cement Plant Implemented Projects (cont'd)

- Use of High Efficiency Fans and Motors at Clinker Cooler
- Repair vacuum leaks at Kiln Hood Door
- Installation of On-line Oxygen Analyzer at Calciner Exhaust to Improve Leak Management



Food Industry

- Varied production processes in relation to different Food Products and Sectors.
- (Fish, Meat, Poultry, Grains, Vegetables, Fruits, etc.)
- Major Food Industries:
- Sugar Milling, Coconut and Vegetable Oil, Grain Products, Dairy Products, Coffee and Chocolate Confectionary, Processed Fruits and Vegetables, Bakery Products, Meat Products, Fish Products



Common Equipment

- Lighting
- Chillers / Refrigerators
- Exhaust Fans
- Water Heaters
- Pumps
- Boilers
- Air Compressors



Energy Conservation Measures

- Use of High Efficiency Lighting System
- Use of High Efficiency Motors
- Efficient Combustion of Fuels
- Efficient Operation of Chillers
- Reduction of Compressed Air Leaks
- Steam Condensate Recovery

ENERGY CONSUMPTION PERFORMANCE





Processed Pineapple Co. Implemented Project

- STEAM SYSTEM
 - Insulate Bare Steam Lines and Valves
 - Eliminate Steam Leaks
 - Recover Condensate for Boiler Feed Water
 - Insulate Cooker A & J
 - Recover Heat from Cookers Condensate
 - Install Combustion Air Preheater
 - Install separate Low Pressure Steam Line



Processed Pineapple Co. Implemented Project (cont'd)

- WATER SYSTEM
 - Consolidate Refrigeration Cooling Tower Sumps
 - Reduce No. of Sprayers for Inside Fruit Elevators
 - Recycle Coolers Cooling Water
 - Recycle Coolant of hydraulic Pack
 - Reduce Water Spray Before Slicers
 - Recycle Water Sealant of Pumps
 - Recycle Cooling Water for Air Compressors and Vacuum Pumps
 - Repair Water Leaks



Processed Pineapple Co. Implemented Project (cont'd)

- POWER SYSTEM
 - Install Power Factor Correcting Capacitors at Can Plant
 - Replace Spotlights with Compact Fluorescent Lamps
 - Improve Machinery Operation Schedule
 - Upgrade Photocell Controls for Lighting
 - Install Micro-Hydro Plant at Water Treatment Plant



Processed Pineapple Co. Implemented Project (cont'd)

- COMPRESSED AIR SYSTEM
 - Repair Air Leaks
 - Install Separate Systems for Low Pressure and High Pressure Lines
 - Recover Heat from Air-compressors
 - Install Solenoid Valves for all Air Lines

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THANK YOU