

# Case studies – Sectors

## Cement

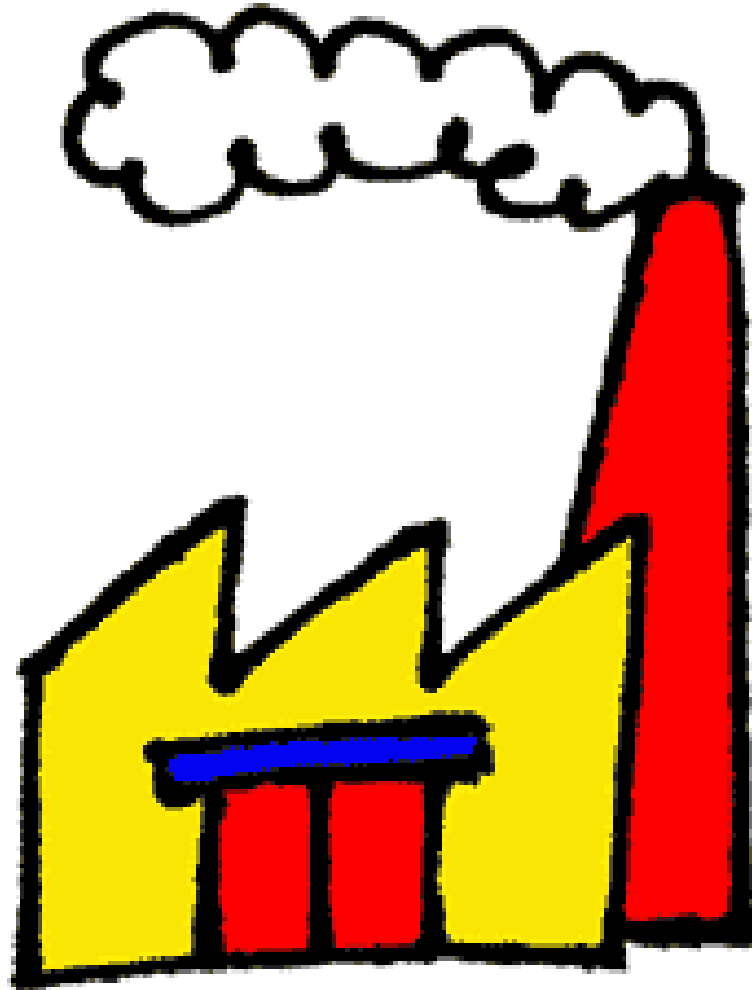
**Coromandel Cement (India)**

**PT Indocement (Indonesia)**

**PT Semen Cibinong (Indonesia)**

**PT Semen Padang (Indonesia)**

**Hutul Cement (Mongolia)**



# Case studies - Cement

**Jiangxi Yadong Cement (China)**

**Coromandel Cement (India)**

**PT Indocement (Indonesia)**

**PT Semen Cibinong (Indonesia)**

**PT Semen Padang (Indonesia)**

**Hutul Cement (Mongolia)**

**Erel Cement (Mongolia)**

**Holcim Bulacan (Philippines)**

**Solid Cement Corporation (Philippines)**

**Holcim Lanka Puttalam (Sri Lanka)**

**Lime Master (Thailand)**

**Siam White Cement (Thailand)**

**Sai Son Cement (Vietnam)**



# Case studies - Ceramics

**Bengal Fine Ceramics Ltd (Bangladesh)**

**Dankotuwa Porcelain Ltd (Sri Lanka)**

**Lanka Tiles Ltd (Sri Lanka)**

**Ha Noi Ceramic Tiles Company Ltd (Viet Nam)**



# Case studies - Chemicals

**Urea Fertilizer Factor Ltd (Bangladesh)**

**Anhui Linqun Chemical Industrial Co Ltd (China)**

**Yuanping Chemical Industrial (China)**

**Active Carbon (India)**

**Siflon Drugs (India)**

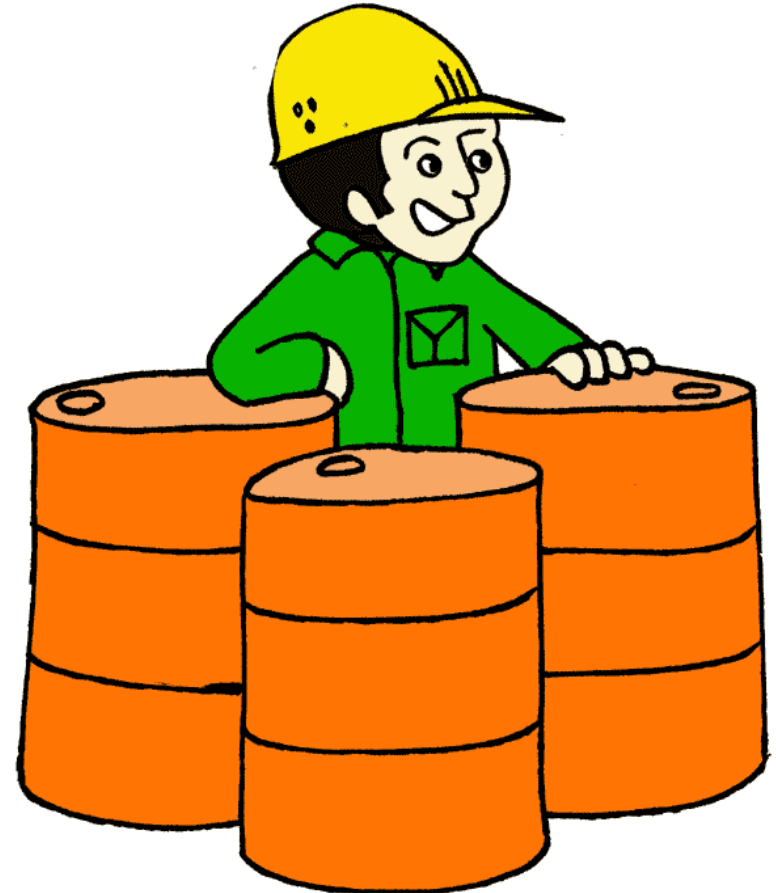
**Da-Mon Trade (Mongolia)**

**Puyat Vinyl Products Inc. (Philippines)**

**Associated Motorways Ltd (Sri Lanka)**

**Medigloves Ltd. (Thailand)**

**Asia Chemicals Ltd. (Thailand)**



# Case studies – Iron & Steel

Abul Khair Stell Products Ltd (Bangladesh)  
Shijazhuang Rion & Steel Co Ltd (China)  
Vishakapatnam Steel Plant (India)  
PT Krakatau Steel (Indonesia)  
Darkhan Metallurgical Plant (Mongolia)  
Steel Asia Manufacturing Corporation (Philippines)  
CHICO Ltd (Sri Lanka)  
G-Steel Ltd (Thailand)



# Case studies – Pulp & Paper

TK Chemical Complex Ltd (Bangladesh)

Anhui Tiandu Paper Co Ltd (China)

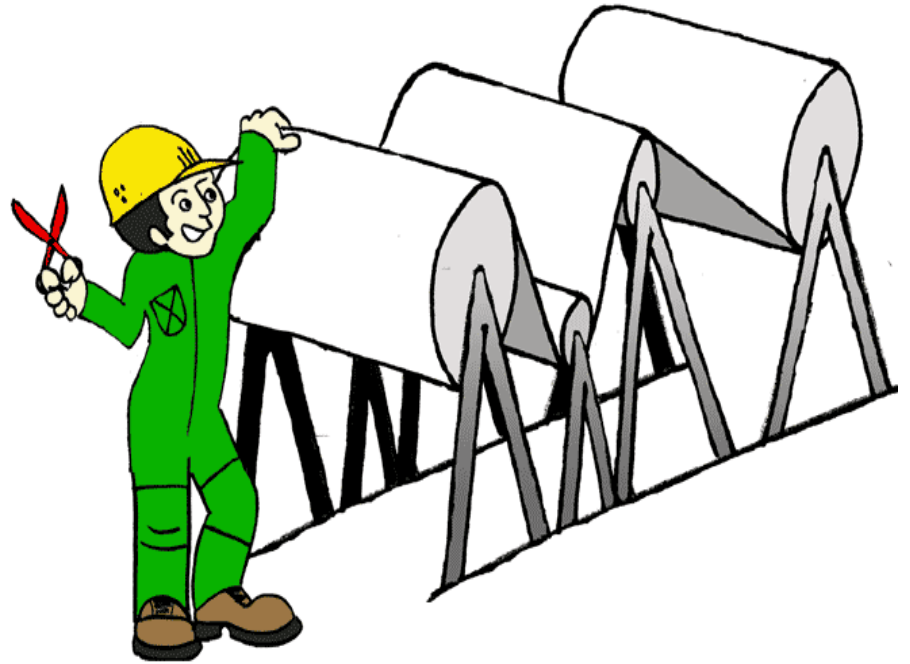
ITC - PSPD (India)

PT Pindo Deli Pulp and Paper (Indonesia)

United Pulp and Paper Company Inc (Philippines)

National Paper Company (Sri Lanka)

Viet Tri Paper Company Ltd (Viet Nam)



# Case studies – Countries



# Case studies – Bangladesh

Abul Khair Steel Products Ltd  
TK Chemical Complex Ltd  
Bengal Fine Ceramics Ltd  
Urea Fertilizer Factory Ltd



# Case studies – China

Shijazhuang Iron & Steel Co Ltd

Anhui Tiandu Paper Co Ltd

Jiangxi Yadong Cement Corporation Ltd

Anhui Linqun Chemical Industrial Co Ltd

Yuanping Chemical Industrial Co Ltd



# Case studies – India

Vishakapatnam Steel Plant

Coromandel Cements Ltd

Active Carbon Ltd

Siflon Drugs Ltd

ITC Paperboard and Specialty Paper Division



# Case studies – Indonesia

- PT. Krakatau Steel
- PT. Pindo Deli Pulp and Paper
- PT. Indocement Tunggul Prakarsa Tbk
- PT. Semen Cibinong Tbk
- PT. Semen Padang



# Case studies – Mongolia

Da-Mon Trade

Erel Cement

Hutul Cement

Darkhan Metallurgical Plant



# Case studies – Philippines

Steel Asia Manufacturing Corporation Ltd  
United Pulp & Paper Co Inc  
Solid Cement Corporation Ltd  
Holcim Bulacan Ltd  
Puyat Vinyl Products Inc.



# Case studies – Sri Lanka

CHICO Ltd

National Paper Company

Holcim Lanka Ltd Puttalam

Dankotuwa Porcelain Ltd

Lanka Tiles Ltd

Associated Motorways Ltd



# Case studies – Thailand

Medigloves Ltd

Asia Chemicals Ltd

Lime Master Ltd

Siam White Cement Co Ltd (SWCC)

Thai Kraft Industry Co (TKIC)

G-Steel Ltd



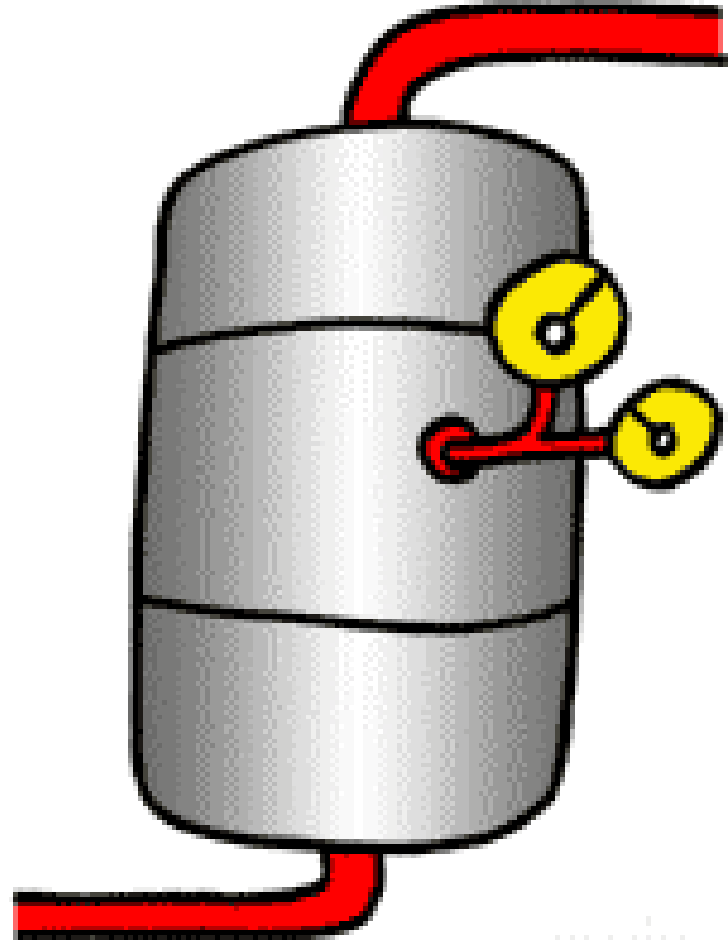
# Case studies – Vietnam

Viet Tri Paper Company Ltd  
Ha Noi Ceramic Tiles Co Ltd  
Ha Bac Fertilizer and Chemicals  
Sai Son Cement Co Ltd



# Case studies – Energy Equipment

Boiler & thematic fluid heaters  
Cogeneration  
Compressor & compressed air systems  
Cooling towers  
Electrical motors  
Electricity  
Fans & blowers  
Fuels & combustion  
Furnaces & refractories  
Lighting  
Pumps & pumping systems  
Refrigeration & air conditioning  
Steam distribution, utilization & insulation  
Waste heat recovery



# Case studies – Boilers & Themic Fluid Heaters

Replacement furnace oil with natural gas in boiler

Blowdown in boiler at high TDS levels only to reduce the number of blowdowns

Increase of condensate recovery from boiler

Installation of a de-superheater at boiler to feed steam to the paper machine at lower temperatures

Insulation, steam traps repair and condensate recovery for boiler and steam system

Replace several small boilers with one large boiler to improve energy efficiency

Install steam turbine to existing boiler to generate electricity from superheated steam

Recover flash steam from blow down to heat the boiler feed water

Replacement of wood fired boiler with high efficiency coal or oil fired boiler

Reduction of unburnt coal and coal fines in boiler by installing fines separation mechanism and low speed crusher

Flash steam recovery from boiler blow and steam air heater condensate

Improved boiler burning efficiency, firing rates and exhaust gas metering

Installation of CFB boiler and use of paper sludge as alternative fuel

Rehabilitation and/or replacement of existing boilers

Improve boiler combustion process and insulation of pipelines and building

Improvement of insulation of the boiler shell/wall

Increase percentage of biofuel (coconut methyl ester) in diesel-biofuel blend for boiler

Substitution of fuel oil with paddy husk in boiler

Improved steam system efficiency through boiler maintenance, leaks repair and pipeline insulation

Installation of insulated storage tank for collecting steam condensate water for reuse as boiler preheated feed water

Replacement of inefficient and unsafe boiler with a new boiler

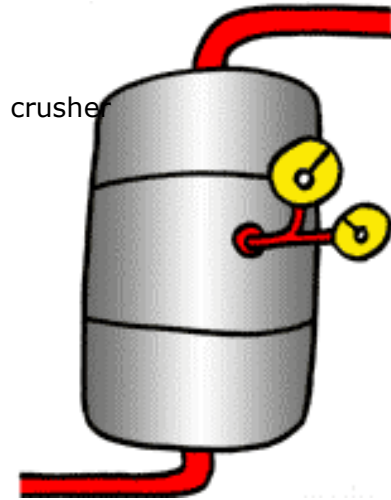
Waste heat reuse from flash tank to reduce the moisture content in the bark and sludge before it is used as boiler fuel

Installation of economizers on boilers

Install a fluidized bed combustion (FBC) external furnace for the coal fired boilers

Reduction of flue gas temperature of air heater of pulverized coal-fired boiler

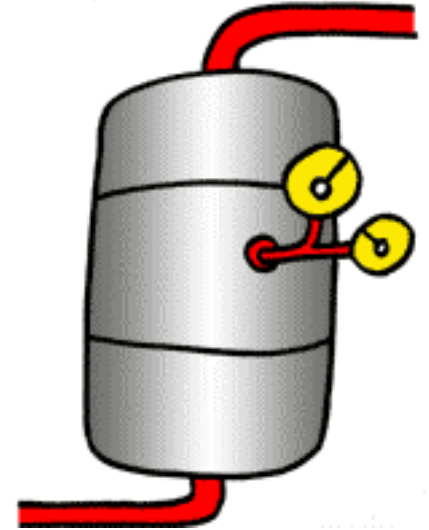
Maintenance of coal mill and fine coal feeding system



# Case studies – Cogeneration

Installation of cogeneration to provide combined heat and power

Install steam turbine to existing boiler to generate electricity from superheated steam



# Case studies – Compressor & Compressed air systems

Compressed air leak survey and repair

Electricity conservation at feed air compressors of air separation plant

Install auto drain for compressed air

Rationalization using compressed air at packing house

Compressed air leak survey and leak repair

Compressed air leak survey, leaks repair and staff campaign

Installation of interconnection between the compressors of kiln and cement mill to maximize compressor loads and efficiency

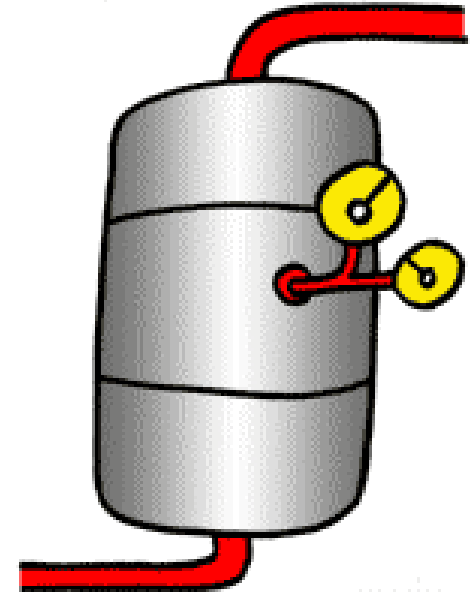
Increase time intervals and/or replace time-based with pressure differential jet pulse controls in compressed air system

Compressed air leak survey and leak repair

Replacement of inefficient compressor with two screw type compressor

Compressed air leak repair and reduction of intake air temperature

Replacement or repair pipe and filter connections to avoid compressed air leakage



# Case studies – Cooling towers

Cooling water conservation through reduced water drainage, blow down and evaporation

Repair of biocide dosing injection pump at cooling tower

Increase of concentration cycles to improve cooling tower efficiency

Adjust fan blades in cooling tower at chilled water plant for winter and summer conditions

Increased solvent recovery through installation of additional cooling tower

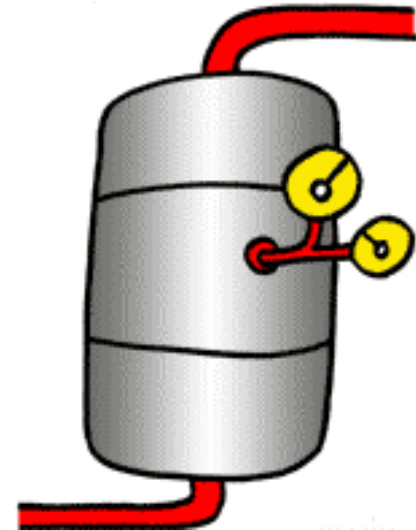
Cooling tower improvement: revised fan procedure, regular cleaning, float valve repair

Regular cleaning of cooling tower to remove algae and repair or replace float valve

Replacement of inefficient and oversized motor at the cooling tower with a downsized standard or high efficiency motor

Improvement of cooling tower efficiency through cleaning of tower fins and chemical treatment of cooling water

Install temperature sensor to switch the fan in cooling tower on when water temperature exceeds 28 °C



# Case studies – Electric Motors

Replacement of old and inefficient motors

Optimum utilization of field current in Rolling Mills to reduce electricity

Reduction of number of running cone crushers at Raw Material Handling Plant

Reduction of motor size in Limestone Primary Crusher

Change of transformer tap setting of electric panels at kiln and preheater

Installation of variable speed drive (VSD) for deaerator pump, heavy fuel oil pump and mill water pump

Replacement of inefficient and oversized motor at the cooling tower with a downsized standard or high efficiency motor

Replacement of inefficient and oversized motors at the Finish Mills with downsized standard or high efficiency motors

Installation of two-speed motors at clinker cooler fans

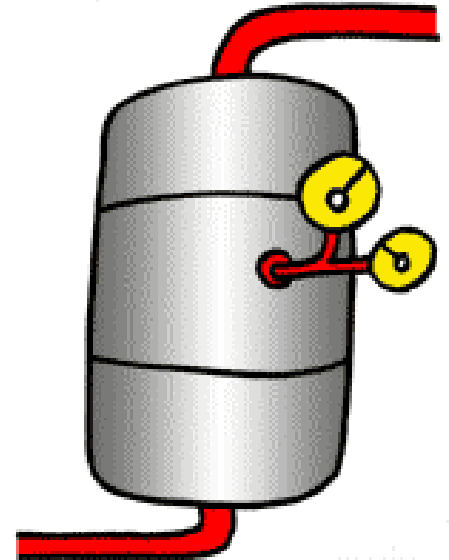
Installation of variable speed drives (VSD) for motors of reducer high pressure pump and reducer low pressure pump at Raw Mill

Use of high efficiency fans and motors for clinker cooler fans

Damper removal for fans with full open damper and installation of slip power recovery system for fans with slip ring motor drive

Installation of a separator using air steam and gravity for separating materials

Installation of variable speed drive (VSD) to control speed of the existing forced draft (FD) blower



# Case studies – Electricity

Installation of capacitor bank to improve power factor (Abul Khair Steel Products Ltd)

Installation of capacitor bank to improve power factor (T K Chemical Complex Ltd)

Installation of capacitor bank to improve power factor

Leak survey and repair of water and steam pipelines

Water conservation and recycling

Nitrogen low metes, leak survey and repair

Oxygen flow meters, leak survey and repair

Generate power from excess high pressure natural gas through turbine expansion and electrical generator

Change mode operation of tie bus to normally closed (NC) for sharing load of transformers and install capacitor bank to improve power factor

Improvement of power factor at Crusher through reduction of medium voltage and load-based regulation of capacitor operation

Reduce production delays through improvement of fuel oil quality and installation of high tension transformer for power supply

Installation of Electro Flow System to improve power factor and minimize harmonics

Recovery and reuse of drainage from wash and chlorination process

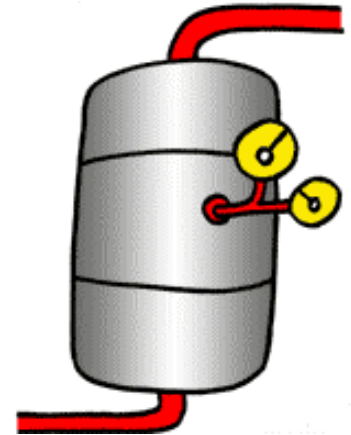
Installation of magnetic timers to turn off conveyors during no-load periods

Installation of capacitor bank to improve the power factor

Installation of a new, more effective and energy efficient Approach Flow Screen

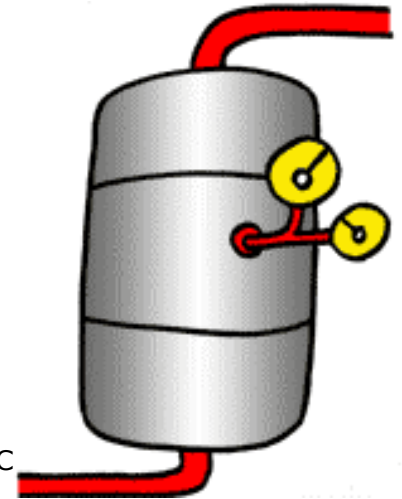
Airflow controls by installing inverters

Use larger number of smaller and lower density grinding balls in Ball Mill to reduce grinding time



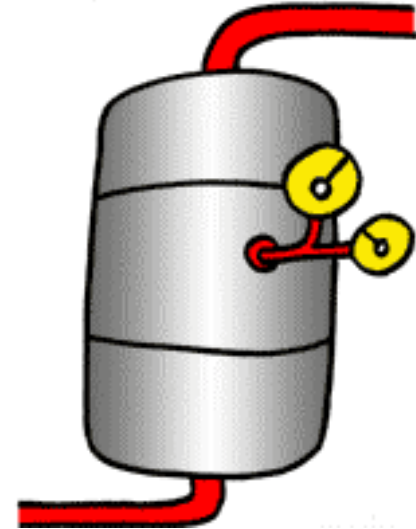
# Case studies – Fans & blowers

- Revised procedure to turn roof deck fan off in winter when it is not needed
- Adjust fan blades in cooling tower at chilled water plant for winter and summer conditions
- Reduction of speed of circulating air fan in the coal mill through replacement of AC motor with DC motor
- Increase of inlet duct diameter of circulating air fan to reduce flow velocity and pressure drop
- Reduction of velocity in coal mill outlet duct
- Prevention of false air entry across coal mill circuit
- Install variable speed drives (VSD) on 12 fans to reduce electricity use by motors
- Cooling tower improvement: revised fan procedure, regular cleaning, float valve repair
- Increase fan pulley diameter to reduce fan speed instead of using dampers
- Installation of two-speed motors at clinker cooler fans
- Use of high efficiency fans and motors for clinker cooler fans
- Damper removal for fans with full open damper and installation of slip power recovery system for fans with slip ring motor drive
- Replacement of electrostatic precipitator (ESP) fan for dust extraction with bag filters
- Install temperature sensor to switch the fan in cooling tower on when water temperature exceeds 28 °C
- Installation of a separator using air steam and gravity for separating materials
- Installation of high efficiency fan at Cement Mill Department
- Airflow controls by installing inverters
- Reduction of pressure drop across the cyclone system
- Installation of variable speed drive (VSD) to control speed of the existing forced draft (FD) blower



# Case studies – Fuels & combustion

- Convert air gas-making process into oxygen enrichment gas-making process
- Rubber shots cleaning technology to improve vacuum in turbo generator condenser
- Increase of coal mill drying chamber lifter height and angle
- Preheating of the combustion air in the rotary kiln with steam coils
- Reduce production delays through improvement of fuel oil quality and installation of high tension transformer for power supply
- Increase percentage of biofuel (coconut methyl ester) in diesel-biofuel blend for boiler
- Replacement of oil burner nozzles and recuperator tubes at furnace to reduce heat loss
- Substitution of fuel oil with paddy husk in boiler
- Substitution of heavy fuel oil for kiln with alternative fuels
- Replacement of diesel-fired kiln that uses saggars with gas-fired fast firing kiln
- Energy consumption reduction at Cement Mill
- Construct a coal storage to reduce the moisture in coal



# Case studies – Furnaces & refractories

Heat loss reduction form furnace by insulation, reduced operating burners, and maintained sager sizes

Heat recovery from furnace exhaust for reuse in dryer

Installation of gas hoods to on converter furnace to recover heat

Revised procedure to screen coal feeding to ensure homogenous combustion

Strict control of coal size to increase furnace efficiency

Preheating of the combustion air in the rotary kiln with steam coils

Modification of the furnace grate bars and coal particle size

Improved drying of coal through insulation and additional hot air duct from the coal mill furnace

Improvement of furnace oil storage and transportation through pipeline insulation and recirculation

Moisture removal form raw material using hot air before entry into kiln

Burner control system in ladle drying and preheating process

False air leak survey and repair

Kiln refractory lining with better quality chrome-free fire bricks to reduce number of kiln shut downs

False air leak survey and repair, and installation of mechanical seal on kiln

False air leak survey and leak repair in kiln

Reduce the number of kiln shutdowns and efficiency improvement

Reduce melting cycle through improved management of reasons for delays

Installation of heat resistant cloth canvass on charge and discharge door of furnace to reduce heat loss

Installation of ceramic fiber insulation inside the furnace wall at recuperative zone side

Repair of solenoid valves of two air choke units at the kiln

Change of transformer tap setting of electric panels at kiln and preheater

Repair vacuum leaks at the kiln hood door to avoid heat loss

Replacement of oil burner nozzles and recuperator tubes at furnace to reduce heat loss

Substitution of heavy fuel oil for kiln with alternative fuels

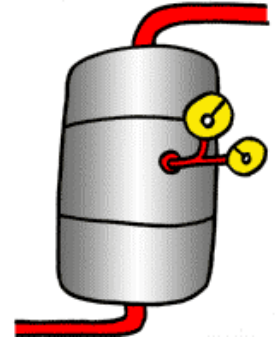
Replacement of diesel-fired kiln that uses saggars with gas-fired fast firing kiln

Installation of bag filters to recover lime powder from storage silos and reduce dust emissions

Repositioning of EAF burner to increase a consistent injection and consumption of oxygen via oxygen lance

Overall yield improvement at the Continuous Casting Machine (CCM) process area

Insulation of the kiln burning zone area



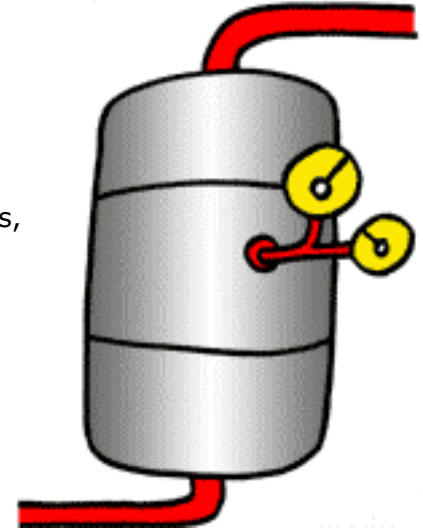
# Case studies – Lighting

Replacement of incandescent lights with fluorescent lights

Lighting improvements: fluorescent lights with electric chokes, metal halide lamps, automatic timers, lighting transformers

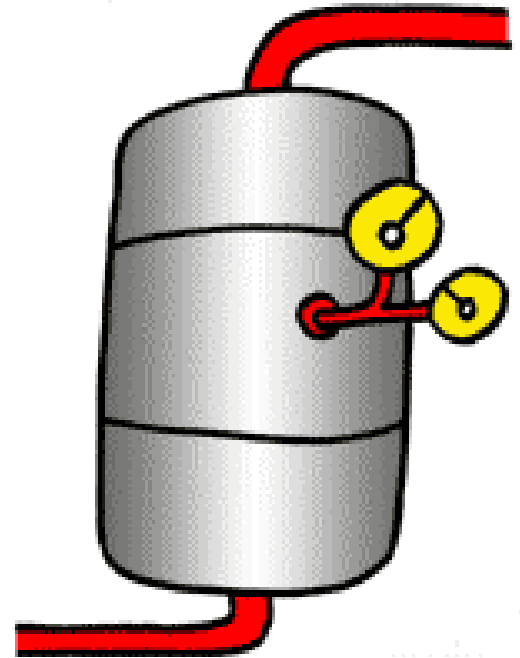
Replacement of 40-watt fluorescent lamps with 35-watt fluorescent lamps

Replacement of 40W fluorescent lamps with 36W or 32W fluorescent lamps

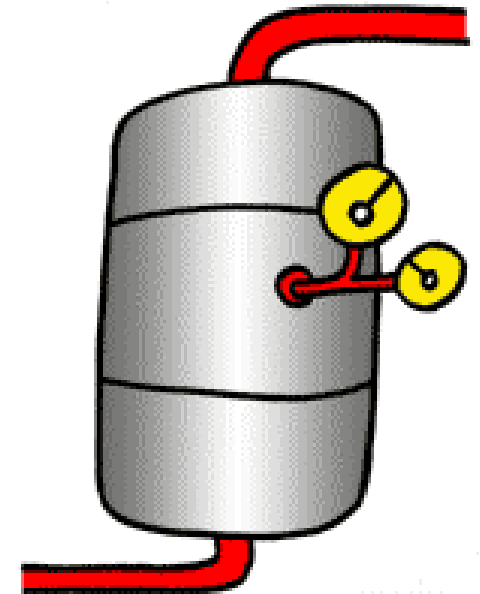


# Case studies – Pumps & pumping systems

- Keeping main pumps on rolling mills turned off when mills are offline
- Washing raw materials in cascade tanks instead of using a hose
- Water and energy conservation in water distribution system
- Repair of biocide dosing injection pump at cooling tower
- Change of transformer tap settings of electric panel at scale pit pumps
- Measurement of water holding tank volume and/or installation of water meters to monitor water consumption
- Installation of variable speed drive (VSD) for deaerator pump, heavy fuel oil pump and mill water pump
- Installation of variable speed drives (VSD) for motors of reducer high pressure pump and reducer low pressure pump at Raw Mill



# Case studies – Refrigeration & air conditioning



# Case studies – Steam distribution, utilization & insulation

Leak repair and insulation improvement of steam distribution system

Insulation, steam traps repair and condensate recovery for boiler and steam system

Leak survey and repair of water and steam pipelines

Water conservation and recycling

Insulation and leak repair of steam pipelines

Replacement of glue sphere with screw cordonnier system in steam turbine condenser

Insulation and leak repair of steam pipelines

Install lagging and repair of broken lagging at steam pipelines

Blowdown is recovered for space heating in winter season

Weld" impingement plates" for each steam inlet point at the jacketed heater to avoid heat loss

Install steam trap at air heating coils in the oxalic acid bagging line

Improved steam efficiency through insulation, capacitor banks and parallel mode steam connection

Increase of heat transfer area in the blow heat recovery system to improve heat recovery

Steam traps and leaks survey, repair and replacement

Steam loss reduction through pipe insulation, repairing steam trap leakages and steam trap management

Circulate drained water from agent tank for reuse in agent and fermentation tanks

Steam leak survey, leak repair and replacement of worn out gaskets

Improved steam system efficiency through boiler maintenance, leaks repair and pipeline insulation

Insulation of steam pipelines and tyre moulds of vulcanization/curing process in Rubber Products Division

Recovery of steam condensate and reuse as alternative source of hot water

Steam leak survey and leak repair

Installation of insulated storage tank for collecting steam condensate water for reuse as boiler preheated feed water

Replacement of damaged steam traps

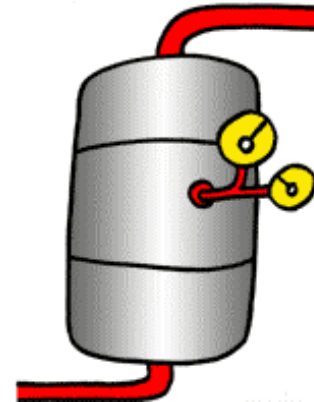
Steam leak survey and repair of leaking joints and pipes

Repair or replace desuperheating station valves to reduce the amount of steam condensate discharged

Repair or replacement of leaking steam traps

Repair leaks and maintain steam traps

Steam leak survey, leak repair and pipeline insulation



# Case studies – Waste heat recovery

Recovering heat from wastewater using heat exchanger

Heat recovery from furnace exhaust for reuse in dryer

Installation of gas hoods to on converter furnace to recover heat

Heat recovery from blow down at pulp digesters

Power generation from waste heat from clinker cooler and preheater

Heat recovery from blown gas and relaxed gas at water gas production

Recover flash steam from blow down to heat the boiler feed water

Increase of heat transfer area in the blow heat recovery system to improve heat recovery

Replacement of inefficient vacuum fans with more efficient and higher capacity vacuum fans at former machines

Recovering waste heat through billet transportation system modification

Circulate drained water from agent tank for reuse in agent and fermentation tanks

Use of waste heat from kiln for chamfered tile drying

Waste heat reuse from flash tank to reduce the moisture content in the bark and sludge before it is used as boiler fuel

Installation of economizers on boilers

Use of waste hot air from the rapid and final cooling in the vertical drier

Use of wasted hot flue gas from kiln as part replacement heat for spray dryer

Recovery of heat from hot exit clinker and reuse to preheat combustion air supplied by forced draft fan

