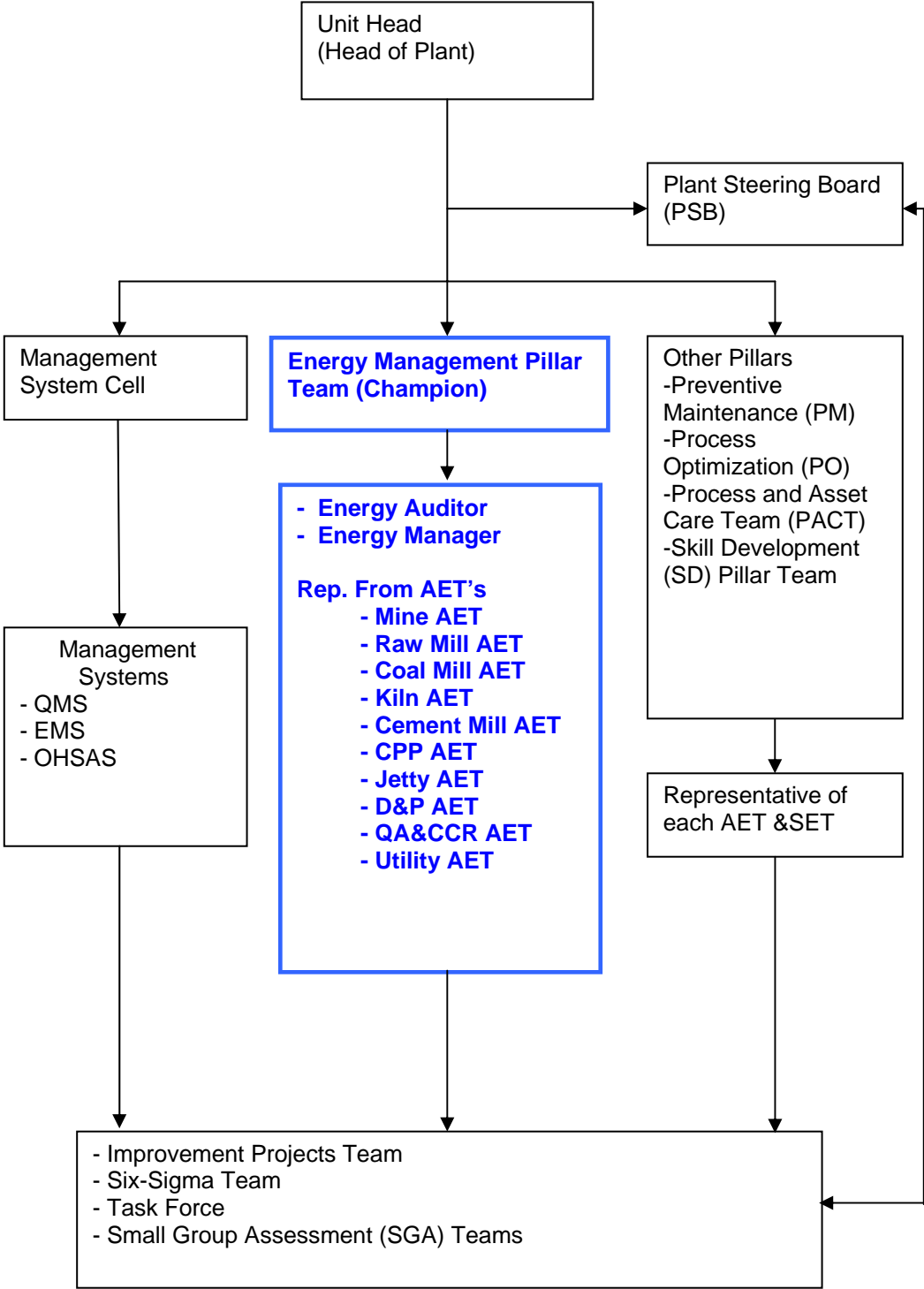




Organizational Setup for Energy Conservation



Energy Conservation Commitment, Policy, Set up & Efforts

GCW has given focus to achieve Total Quality in all respect i.e products, services, people, process, society & environment. To achieve this objective GCW started TPM journey in the year 2000. The TPM ensures 'Total Quality' in our operations. Environment Preservation, Resource & Energy Conservation are considered the vital element from the point of view of cost reduction and environment enhancement.

At GCW high degree of priority has been accorded for implementing energy saving proposals as one of the major area of cost reduction. The top management is involved in setting the energy consumption targets and reviews the same on daily / weekly/ monthly / quarterly.

The energy conservation is achieved through the process optimization & de-bottlenecking by internal six-sigma project teams and technical inputs from outside.

In order to achieve the objective of optimization & de-bottlenecking various improvement projects are identified by brainstorming in PSB meetings based on the inputs from AETs & EM Pillar. The selected projects through prioritization based on potential of energy saving are assigned to the task force/ six-sigma project implementation teams. The teams use various spastical tools of DMAIC (Define, Measure, Analyze, Improve & Control) of six-sigma approach.

The technological upgradations are carried out through the inputs from the technical team at corporate level & other manufacturers / suppliers.

The TPM follows a process ownership concept, for this purpose the whole cement manufacturing has been divided into small processes and each process is owned by a cross-functional team called Area Effectiveness Team (AET) which are supported by process & asset care teams (PACTs) for routine activities such as maintenance of machines, housekeeping, abnormality detection & correction etc. . Similarly, the support departments are divided into service areas owned by Service area Effectiveness Team (SET) & Service PACTs (SPACTs). Pant Steering Board (PSB), comprising of cross-functional experts, facilitates and monitors the performance of AETs & SETs.

There are five pillar teams, which take care of specific requirements of plant performance monitoring & improvements. Accordingly Energy Management (EM Pillar), Process Optimization (PO Pillar), Skill Development (SD Pillar), Process & Asset Care (PACT Pillar), Preventive Maintenance (PM Pillar) teams have been constituted.

The Energy Management Pillar (EM Pillar) has been assigned a specific objective to manage the energy consumption at GCW. The EM Pillar includes the energy auditor, energy manager & representatives from all the processes / AETs.

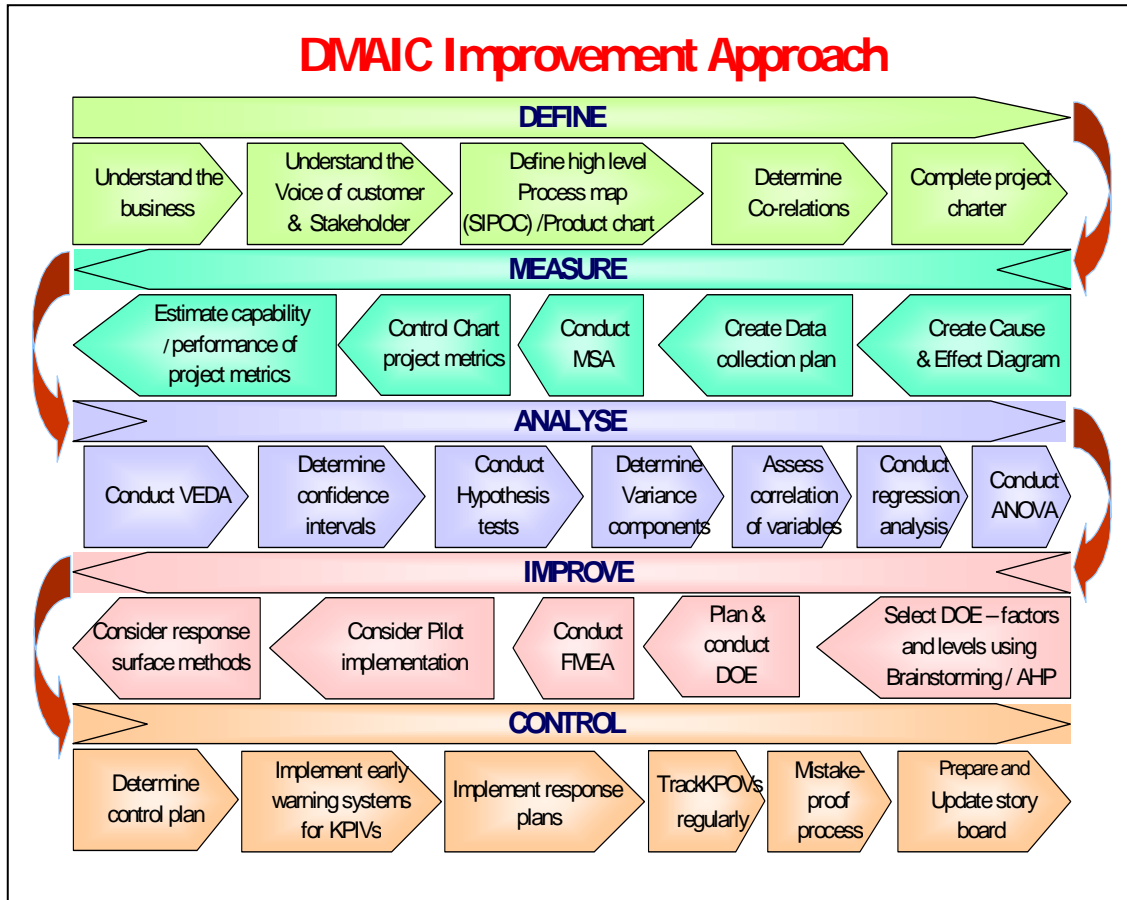
The teams are responsible for routine activities, which includes maintenance of set performance of the process. The teams also continuously identify and implement improvement projects under the guidance of PSB.

Improvements in operations require a systematic and structured approach to achieve desired results

Teams use a 5-step process "DMAIC" to attack problems:

- **D**EFINE the problem and what the customer requires
- **M**EASURE process and operation parameters related to the problem
- **A**NALYSE data and determine causes of the problem
- **I**MPROVE the process to remove the causes of defects
- **C**ONTROL the improved process to ensure that problems do not recur

The 5-step process is called “DMAIC” which uses six-sigma approach of problem solving. The DMAIC



process focuses not only the improvements but also the sustenance of the improvements achieved. Appropriate control measures & procedures are designed and put in place to ensure sustenance of the results achieved through DMAIC process.

GCW has a well-established environment management system (EMS) accredited for ISO 14001:1996. Energy efficiency related environment management projects (EMPs) are identified & implemented along with environmental improvement related projects. A well structured Management Cell along with representatives from all processes to manage & improve environmental performance.

The energy conservation at GCW is not the accident; however it is achieved by well-planned interventions through proactive involvement & commitment from employees.

Gujarat Cement Works happens to be the third cement unit of UltraTech CemCo Limited. The first cement plant of L&T was commissioned in 1983 in Maharashtra.

While setting up this unit utmost care and concern was attached to energy conservation and environment. The previous experience of L&T in cement technology was utilised to the fullest extent. Hence GCW has become one of the most energy efficient cement plant right from beginning.

With a view to achieve minimum specific energy consumption, conservation measures were considered and adopted at the initial stage itself.

(a) The following measures were taken during the design stage and the same have been implemented from the start up of the plant.

- Installation of LP cyclones.
- Installed CFG coolers for clinker cooling for better heat recuperation in both lines. CFG cooler is having different channels for air distribution. Clinker in different parts of cooler gets sufficient amount of air stream for its cooling and in this way with the minimum amount of air the maximum heat out of the clinker is recuperated. CFG cooler does not allow clinker dust to fall though it to drag chain and hence again saves valuable part of thermal energy. Secondary and tertiary air temperatures achieved in case of CFG cooler

are 1300 °C and 1050 °C respectively which are much higher than in case of conventional coolers where these temperatures remain in the range of 1050°C and 850°C respectively.

- GCW has installed 125-meter high six stage pre heaters for recovery of maximum heat from the Kilns.
- Installation of vertical mills, with external re-circulation for raw meal and coal grinding instead of conventional ball mills is an energy saving step. With external re-circulation in case of raw mill , fan flow is optimized and lesser power is consumed in handling the material.



Fig : Vertical Roller Mill at Gujarat Cement Works at Kovaya

- Installation of energy efficient separators in Raw mill, coal mill and cement mills has optimise the fan power.
 - Installation of Roller Press in cement mill for pre grinding of clinker and then only fine grinding is done in ball mill.
- (b) Installed variable speed drives for LT fans, separators and weigh feeder motors. This eliminated the need for damper control in fan application and gearbox in other applications.
- Commissioned 13 Nos. of slip power recovery system for speed control of 6.6 KV motors for fan applications and eliminated damper control. With this system the losses in liquid resistance starter are saved.
 - Installed high efficiency motors.
 - 38621 KVAR capacitors Installed in Phase – I & II for power factor improvement. This has reduced losses in the electrical system.
- (c) Installed variable speed drives for LT fans, separators and weigh feeder motors. This eliminated the need for damper control in fan application and gearbox in other applications.
- Optimization of compressed air and Water System.
 - Elimination of drives by redesigning systems at Jetty.
 - Commissioning of SPRSs (slip power recovery system).
 - Energy conservation through reducing air velocities for preheaters fans.
 - Inter locking of auxiliaries with main equipment
- (d) Conservation of heat Energy:
- To reduce fuel consumption high flame momentum burners (Duo flex burners) have been installed for coal firing in Kilns. This burner is an efficient high flame momentum burner, which due to its high turbulent burning conditions provides perfect mixing of secondary air from cooler and primary air from burner. This burner has got much better control on the flame shape by providing control of axial and radial air. Hence flame

temperature is always high which reduces the heat energy consumption by 2-3 kcal / ton of clinker produced.



Fig. View of Inlet to Duo-Flex Burner in Kiln-I

- Elimination of drives by redesigning systems at Jetty.
 - Low ash content coal is imported from South Africa & Australia. This low ash content coal has approximately 6300 kcal /ton of coal net calorific value. Due to its low ash content its ignition is spontaneous and hence avoids the wastage of fuel. GCW consumes about 12% coal per ton of clinker.
 - As a result of above measures and optimization, coal consumption has come down.
- (e) Utilization of cooler waste gases for production of desalination water:
- In the process of cement manufacturing clinker cooler exhausts hot air. This waste air was being discharge to atmosphere, which normally has a temperature of 270°C-310°C and a flow of around 9000 m³/minute. At Gujarat Cement Works this heat energy also is not being allowed to go as waste, however the heat is being utilized to run a Desalination plant for producing potable water. The Desalination unit produces clear water from seawater. It is designed to produce 2000 m³/day of clear water. The steam required for the process is generated in an unfired boiler by using the waste heat. No fuel is required to be fired in the boiler and hence desalination water is produced without any fuel consumption.
 - Approximately 22.17 million kcal per hour thermal energy is recovered from the hot air for desalination plant. The recovery of thermal energy from hot air is equivalent to 30000 tons of coal per year with a calorific value of 6300 Kcal / Kg of coal.
 - In addition to above desalination plant has eliminated the requirement of precious ground, water which is a scare in this Saurashtra region. This has also helped to improve the gound water level in surroundings and therefore eliminated the negative impact on environment.