Asian Paints Limited
Bhandup Plant, Mumbai, Maharashtra.

Company Background:

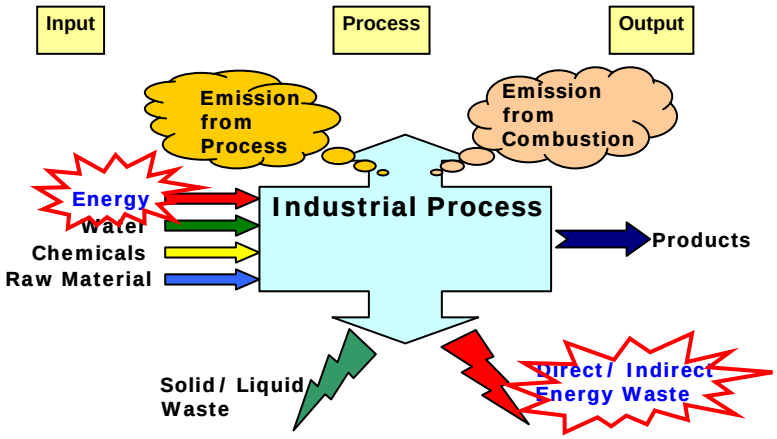
Asian Paints was founded in 1942 as a small partnership firm & now is India's largest paint company. It ranks amongst the top ten decorative coatings companies in the world today, with a turnover of Rs.25.6 billion. Asian Paints operates in 22 countries and has 28 paint manufacturing facilities in the world servicing consumers in over 65 countries. Asian Paints product range includes Decorative Paints, Industrial Paints & Automotive Paints.

The company has five manufacturing units which are located at Mumbai, Ankleshwar, Patancheru, Kasna and Sriperambdur. Each plant is headed by the Factory Manager. Bhandup plant is the oldest plant with an installed capacity of 30000 Tonnes per anum. All plants are also awarded with ISO 9000 & ISO 14000 certification.

Asian paints has won many awards & recognitions which includes rating under "200 best under a billion" by Forbes global in 2002, "Best small company in India" by Asia Money in 2002, "Golden peacock" national quality award by union labour ministry, "Best supply chain" award by i2 solutions, "Golden peacock environment management award", "Five star rating" by British safety council in 2003 & 2005.

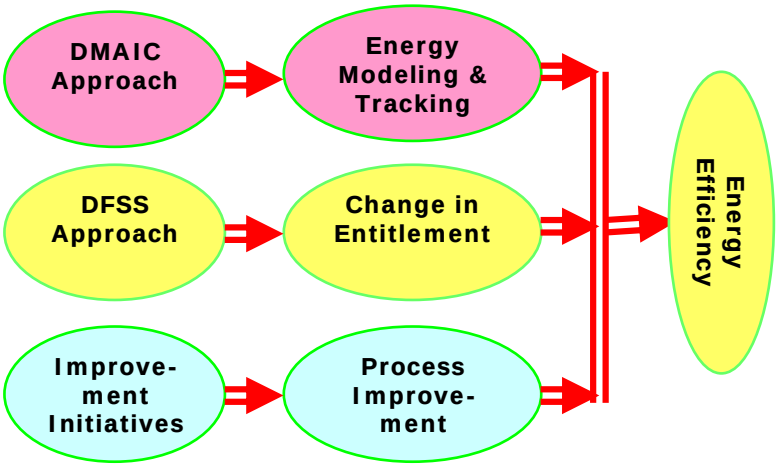
Approach to Energy Conservation:

In order to meet the challenge of cutting down the cost, maintaining high quality, eliminating waste of all kinds (like Non Value Adding activities, excess material, energy consumption) and meeting high service levels, Asian Paints has started to transform to World Class Manufacturing. This transformation has been brought about by continual improvement & focussed approach to follow Manufacturing Excellence Model. As energy cost is 16-18 % of total overhead cost, Energy is treated as major raw material and not only just an overhead expense so as to have special focus on lowering down cost.



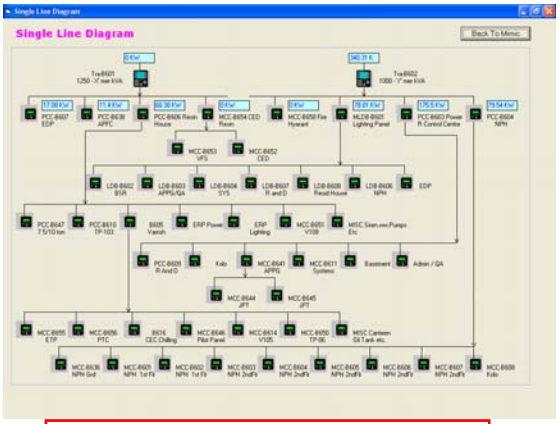
As Energy Conservation is also part of the initiative to excel the environment standards, Energy Conservation has been focus area of all manufacturing units. Further aligning of the objectives has been done by release of Energy Policy.

Three Prong Strategy is used to achieve Energy Efficiency. Energy Modeling & Tracking is done where entitlement vs. actual comparison is made and controlling the inefficiencies is the focus. Entitlement itself is revisited & recast by Technological Interventions like use of alternative fuel, developing new processes, as well as re-engineering the existing processes.



Energy Monitoring & Control:

There is an elaborate energy accounting & monitoring procedure which is granular right up to the section level. KWH meters are installed for different sections to monitor the section wise consumption. Daily KWH meter readings are recorded in a consolidated excel format to monitor section wise power consumption and total power factor.



Energy Meter Distribution

An Energy Model has been developed along with energy consultant to forecast the target energy consumption for the fortnight's production plans based on ideal condition at each process step and also for utilities.

Since the production plans are dynamic & varied in nature, an elaborate study was carried out with help of load manager to track energy consumption of different product streams depending on ideal utilization of equipment. This has helped to assess the entitlement of power consumption. Also, the relation between production volumes & power consumption gets established & "Fixed Energy" component is explicitly focused.

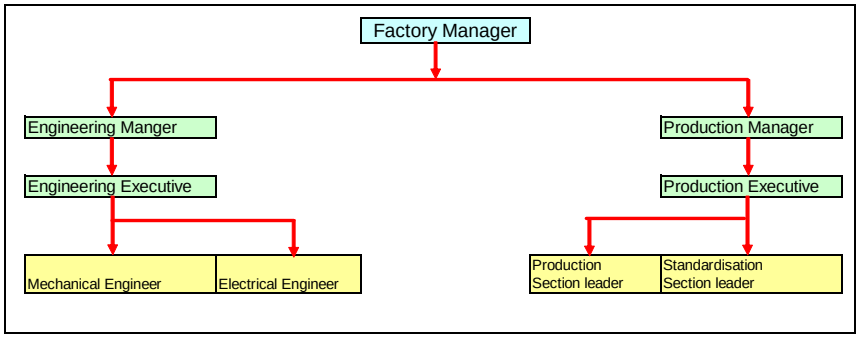
Detailed report specifying total energy consumption, actual SPC against target SPC (Overall as well as for different sections) is reviewed by ECC to find gaps & decide course of action. The ECC members meet once in a month for review.

Energy Audit:

In order to revisit the Entitlement, an extensive energy audit of the plant was carried out through energy consultant (M/s Saket Consultants, Ahmedabad) in year 2004. This has covered production areas, utilities, base loads and power distribution system to explore the opportunities of further energy conservation. Major suggestions in high impact areas have already been implemented. All the improvements are again captured in the Energy Model so as to get new entitlement for Power Consumption.

Energy Conservation Cell:

The Bhandup plant has special Energy Conservation Cell which is headed by Factory Manager. ECC is a cross functional team which has members not only from Engineering Department but also from Production Department. This helps to enhance overall control as well as to get contribution of process improvements and engineering design changes.



Energy Cell Structure

The responsibilities of ECC include:

- *Assisting & coordinating with all concerned in achieving the aims & objectives outlined in the energy policy for Bhandup plant.*
- *It deals with all matters concerning energy conservation, energy budgting, forecasting energy targets, energy monitoring & controls, reports etc.*
- *It has responsibilities to keep updated of technical developments, carry out feasibility studies, preparation of proposals, prioritization of resources and implementation of sanctioned recommendations.*
- *It also works to create awareness amongst all employees and to undertake educational, training & promotional activities.*

Energy Conservation Achievements in year 2004-05:

(Influencing change in Entitlement of Energy Consumption)

I. Incinerator flue gas waste heat recovery:

Incinerator is used in the plant to burn the solid waste as well as waste liquid as per the norms laid by Pollution control board. The ID fan capacity is of 5500 m3/hr capacity and the flue gas temperature is 260-270 deg C.

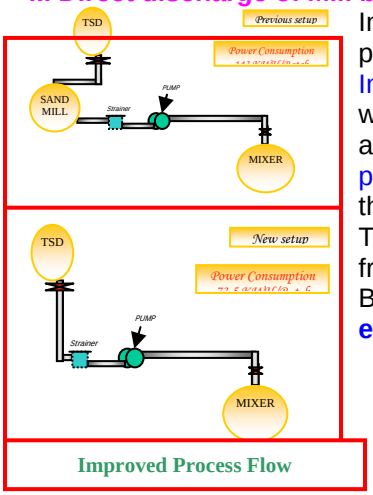
There is hot room available in the plant which is maintained at 70 deg C for storing certain raw materials. Earlier it was being heated by circulating hot water using 5 HP pump & water was heated by electric heaters of 18 KW capacities which were

Waste Heat Recovery Heat Exchanger

operated at 160 hrs per month.
Flue gas waste heat recovery system has now been installed having suction blower (3 HP), FD fan (3 HP) and box type heat exchanger where the 16000 Kcal/Hr heat is utilized from total available 370000 kcal/hr for hot room temperature maintenance. The investment done for this project is Rs. 4 lacs.

This has resulted in an energy saving of 34500 units per year. This modification has also helped to conserve the energy at National level by use of waste heat instead of electricity.

II. Direct discharge of Mill base from TSD to Mixer:



Improved Process Flow

Initially, Asian Brilliant white and Deco primer product streams were processed through TSD- Sand mill- Mixer route. Process Improvement was carried out with scientific studies in co-ordination with technology department where total dispersion of mill base was achieved in TSD itself, thus eliminating the need of Sand mill processing. Since Sand mill processing is highly energy intensive, this improvement has helped tremendously in energy conservation. The power consumption per batch of 2.5 KL size has gown down from to 143 KWH to 73.5 KWH. Thus for a yearly plan of 3580 KL Brilliant white and 2600 DCP in the year 2004-05, **the electrical energy conservation is to the tune of 169456 units.**

III. Caustic barrel heating by steam:

Earlier, caustic solution used for barrel cleaning was heated up to 90 deg C by electrical heaters of 15 KW capacities which were in use for 10 hrs a day. Electrical consumption was 150 units per day. These electric heaters were eliminated by use of steam coil where the excess steam available is being used at 2 kg/cm2.

Steam Coil Heating

The **power consumption is reduced by 45000 units per year.** This has also resulted in reduced cycle time & hence the barrel cleaning capacity has also improved. Also, as it is better to use direct fuel available instead of electricity, this has helped to conserve energy at National level.

IV. ETP Modernization:

Bhandup Plant had an old conventional ETP of capacity 35 KL per day catering to only industrial effluent. As a part of "Zero Discharge" initiative, it was decided to treat Domestic Effluent also to make it suitable for internal recycling and hence new Integrated System ETP was commissioned with a capacity of 150 KL per day. This design has advantages like more capacity, better quality of treated water which is ready to feed for RO plant, less space requirement, more reliability etc. Investment done for this project was

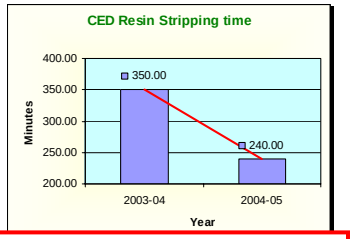
Rs. 20 lacs. It also has given advantage in the energy


New ETP Design

saving because number of mechanical equipment available in the conventional ETP have become redundant like surface aerator (5HP), transfer pump from primary clarifier to aerator (3 HP)secondary clarifier (3 HP) , sludge recycling pump (5 HP), transfer pump from secondary to primary clarifier (3 HP) etc. The new load added was that of blower (12.5 HP). Thus there is reduction in load of 6.5 HP. Since all units were being operated 24 hrs a day, the **power units saved are 116.4 per day amounting to 42475 units/ year.**

V. Reduction in stripping time of CED Resin Batches:

While processing certain resins in CED plant, stripping process consumes high power because simultaneous operation of thin tank stirrer, vacuum pump, cooling tower, thermic fluid heater and chilling plant. A process improvement project was undertaken by using DMAIC method to reduce the stripping time from 350 to 240 min.



CED Resin Cycle time

This has given power reduction of 325 units/ batch. In 04-05 **power unit saving was to the tune of 39000 units for processing 120 batches in year.**

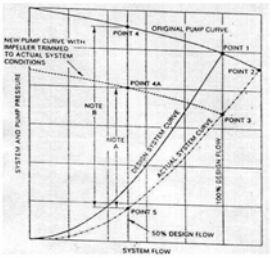
VI. FRP fan for Cooling Towers:

FRP CT Fan

There are two cooling towers in Resin Plant which run 24 hrs a day. They are used for condenser cooling and for batch cooling. The original CT fan MOC was aluminum. It was non aerodynamic design with low lift to drag ration. It was driven by 10 HP motor. The fan was replaced by FRP blades which are aerodynamically designed, having high lift to drag ratio and light in weight (1/3 rd of Aluminum fan). Investment done for this improvement is Rs. 75000/-

This has resulted in lowering the power consumption from 4. 77 KW to 3.62 KW in one cooling tower with improvement in air flow from 67694 m3/hr to 79387 m3/hr. (i.e. 23 % saving in power with 17% increase in air flow.) **The total power units saved by this modification in two cooling towers are 16500 units in a year.**

VII. Trimming of Dowtherm impeller:



Pump curves

Circulation pump designed in the dowtherm heating/cooling system of CED resin Plant was suitable for higher pressure drop but actually the frictional losses were very less compared to design pressure drop. This resulted in higher flow rate and hence power. To reduce the power consumption, the impeller of the existing pump was trimmed so that the head produced will match the actual pressure drop of the system at the desired flow rate. Thus the system started operating at point 3 instead of point 1 as designed earlier. This improvement has resulted in reduction of power by 15 KW (48 KW earlier to 33 KW current) The pump runs 60 hrs in a month and hence the **saving is of 10800 units in a year.**

VIII. Screw pumps in place of Diaphragm Pumps:

Screw Pump for Discharge

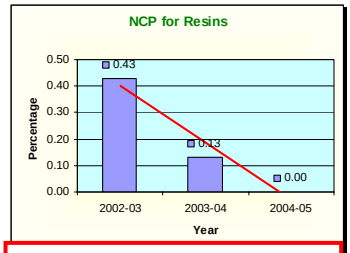
Air operated diaphragm pumps were being used for discharging the 2.5 KL paint batch from TSD vessel to Mixer. This was contributing to loss of energy during generation of compressed air as well as due to air pipe line leakages. These air operated pumps were replaced with electrically operated screw pumps.

Air consumption for diaphragm pump was 15.7 cfm which was amounting to electrical energy consumption of 2.7 KW as per existing compressor setup (17 KW/ 100 cfm) The power consumption of screw pump is 1.1 KW. The discharging time is 40 min per batch. Thus the saving is 1.06 KW per batch. The numbers of batches produced as per production plan are 2800 which resulted in a **saving of 3000 units in one year.**

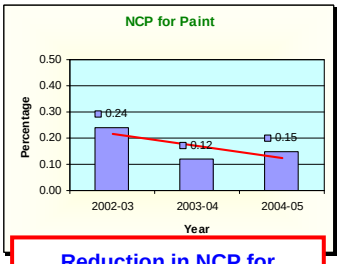
Energy Conservation through Improved Process Efficiencies:

The strength of Asian Paints' manufacturing set up lies in number of imperatives implemented to take up the global challenges. This has also helped the plants indirectly to conserve the energy within Asian Paints & outside Asian Paints at National level.

To ensure **"Zero Defects",** strong process controls and **"Right first time"** capabilities have been built up through Process Engineering Labs at lab scale & pilot scale. ISO 9000 systems are followed rigorously. **"DMAIC"** methodology is used to find the root cause and resolving the problems.



Reduction in NCP for Resins



Reduction in NCP for

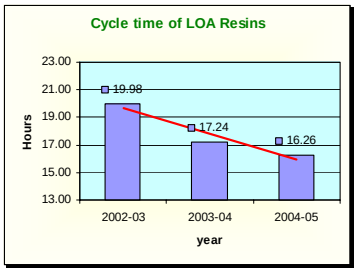
Process Engg

There has been steep decrease in the non conforming products and rework both in Paints & Resins. Thereby, automatically energy conservation is achieved.

To Target the **"Factory level losses"** scientific **"Mass Balance"** approach has been adapted. Many improvements in work practices have been implemented. Systemic approach has been taken for Capital investment for improved material handling, implementing close loop systems. Formulation efficiency has been improved through scientific standardization process. All these efforts have indirectly helped towards energy conservation because less number of batches need to be processed

Reduction in Factory Level Losses

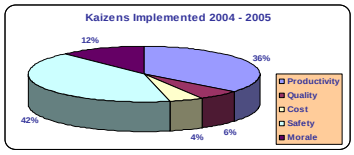
to get the same output. Also, lower material consumption results in Energy conservation & less Effluent load. The specific water consumption(KL per Ton) as well as Specific Effluent generation (KL per KL of Paint) has been brought down significantly over years



"OAE" where equipment utilization is tracked, strong focus was kept of Resin Cycle Time Reduction. DMAIC approach was adopted to establish benchmarks by through put evaluation and cycle time studies. Continuous improvement has been obtained by restructuring of operations, de-bottlenecking, better planning, sharing of best practices across plants, eliminating inconsistency & by investment.

Process Improvements like single stroke filtrations, Engg. Modifications like Pack Column & Auto Siphon systems are some of the examples. The reduction in cycle time implies reduced running of equipment & adds up to conservation of electrical energy.

"TPM" philosophy has been introduced to improve the availability of assets. Model of Equal partnership by Production & Maintenance is followed. Conducive environment has been established where all the employees are involved & engaged for continual improvement by implementing **"Kaizens".**



Kaizens of 2004-05

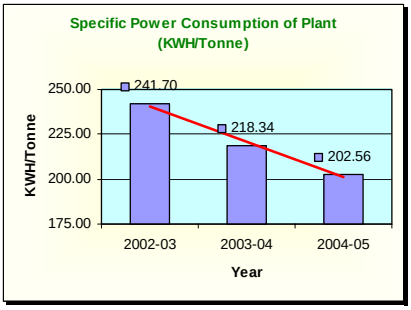
Almost 42% of implemented Kaizens have contributed to Energy conservation by improving the Productivity & Quality parameters. These were implemented by the employees in their own areas but ultimately influencing the manufacturing objectives.

Energy Consumption for last three years:

Specific Energy Consumption details				
	Unit	**2002-03**	**2003-04**	**2004-05**
Annual Paint Production	Tonnes	20148.70	21209.80	22842.50
Power Consumption	Lakh KWH/ yr	48.70	46.31	46.27
Annual Resin Production	Tonnes	5337.76	5291.77	5164.90
Annual Emulsion Production	Tonnes	2369.04	3115.63	4020.30
Annual Resin & Emulsion Production	Tonnes	7706.80	8407.40	9185.20
Power Consumption for Paint Block	Lakh KWH/ yr	19.68	20.81	23.79
Power Consumption for Resin Block	Lakh KWH/ yr	15.47	15.38	13.71
Total Natural Gas consumption	Lakh M3/ yr	4.54	4.27	3.76
Total Thermal Energy consumption	Million Kcal	3729.61	3507.81	3088.84
Specific Power Consumption of Total Plant	KWH/Ton	241.70	218.34	202.56
Specific Power Consumption of Paint Block	KWH/Ton	97.67	98.11	104.13
Specific Power Consumption of Resin Block	KWH/Ton	289.90	290.60	265.40
Specific Thermal Energy consumption of Resin Block	Million Kcal/ Ton	0.48	0.42	0.34
Manufacturing cost	Rs. lakhs/ Ton	72.28	69.93	65.47
Percentage Energy Cost	Percentage	18.11	16.62	15.73

Achievements in Energy Conservation:

(Graphical representation of Specific Energy Consumption)

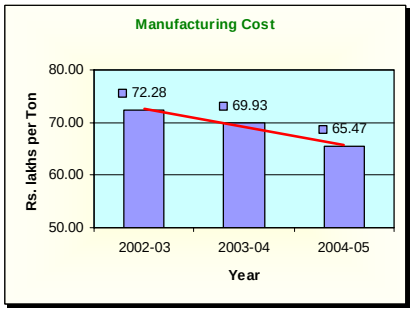


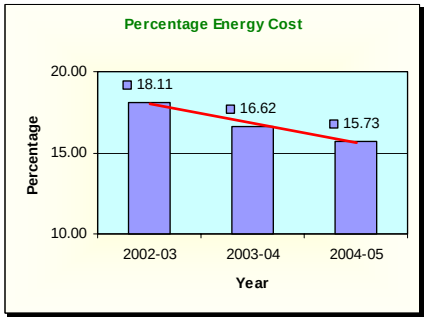
There has been consistent reduction in specific power consumption (KWH/ Tonne) over the years. Conscious efforts have been taken to implement number of process improvements as well as engineering changes.

In 2003-04 the reduction in SPC is 9.7% where as last year it is 7.3 %.

Reduction in Power SPC of Plant

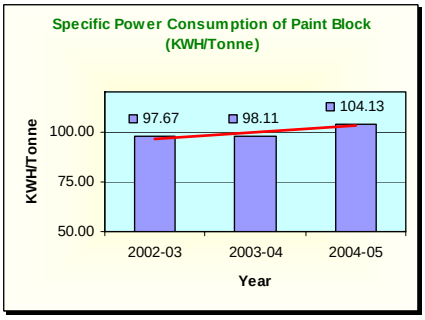
The cost of conversion has been lowered. Even with downward trend of conversion cost, the energy cost percentage is also reduced which further emphasizes the efforts taken for conserving the energy.





Reduction in Mfg, Cost of Plant

Reduction in Percentage Energy Cost

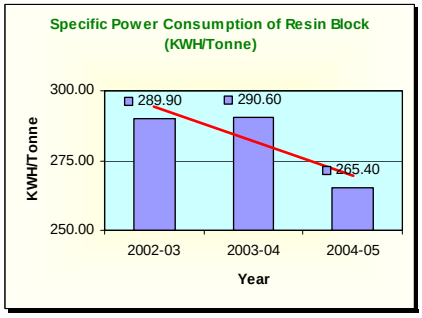


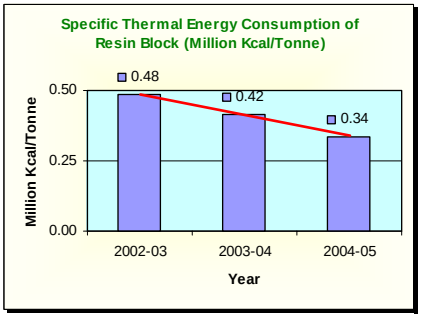
Even though there is slight increase in specific power consumption of paints, it is mainly due to changes in market demands. The demand of water base paint which is more energy intensive is steadily growing up (33% in 2002-03 to 49% in 2004-05) where as demand for less energy sensitive solvent base paint is decreasing. (46% in 2002-03 to 33% in 2004-05)

Even with such drastic change in paint product mix, there is an excellent control on power consumption.

Controlled Power SPC of Paint House

Energy requirement for resin mfg. (Both electrical & thermal) is consistently reducing over the year. Huge efforts have been taken to bring down the cycle times, improving right first time standards.

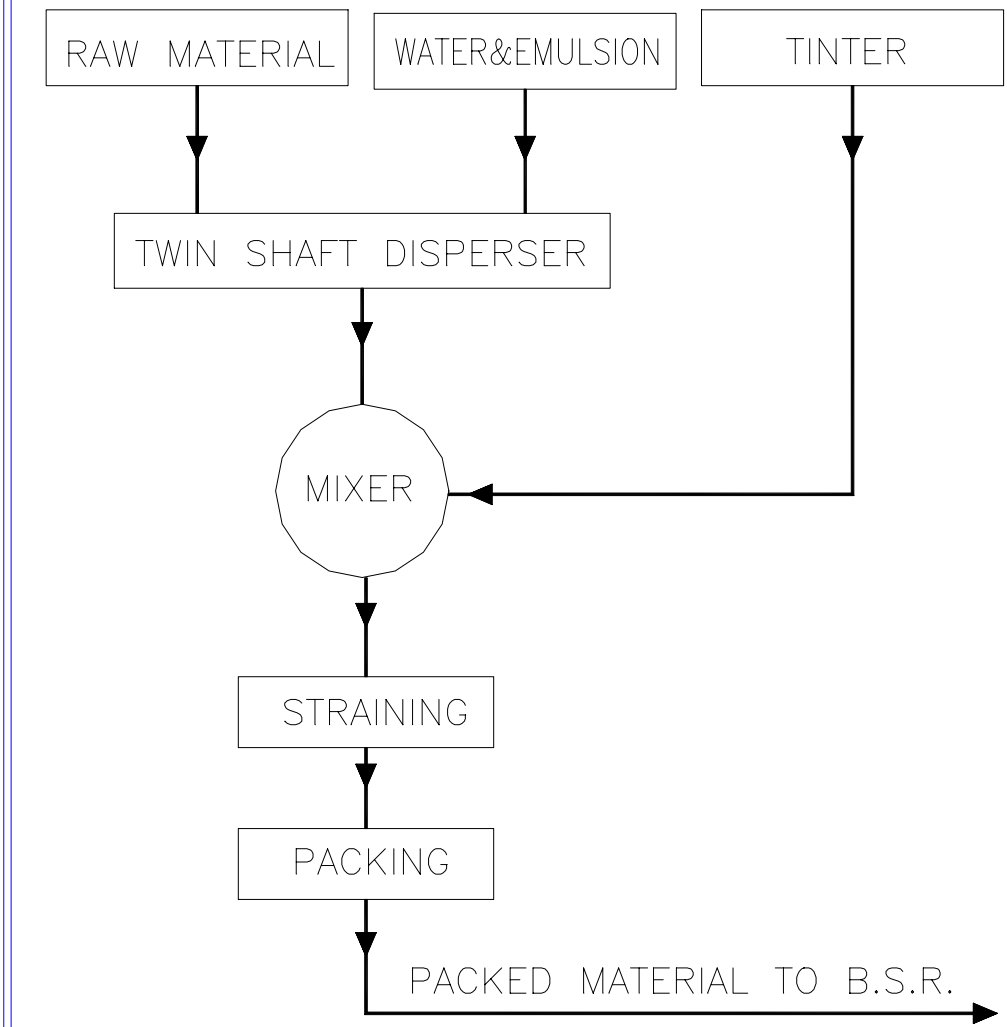




Reduction in Power SPC of Resin House

Reduction in SPC of Thermal Energy

PROCESS FLOW DIAGRAM - WATER BASE PAINTS



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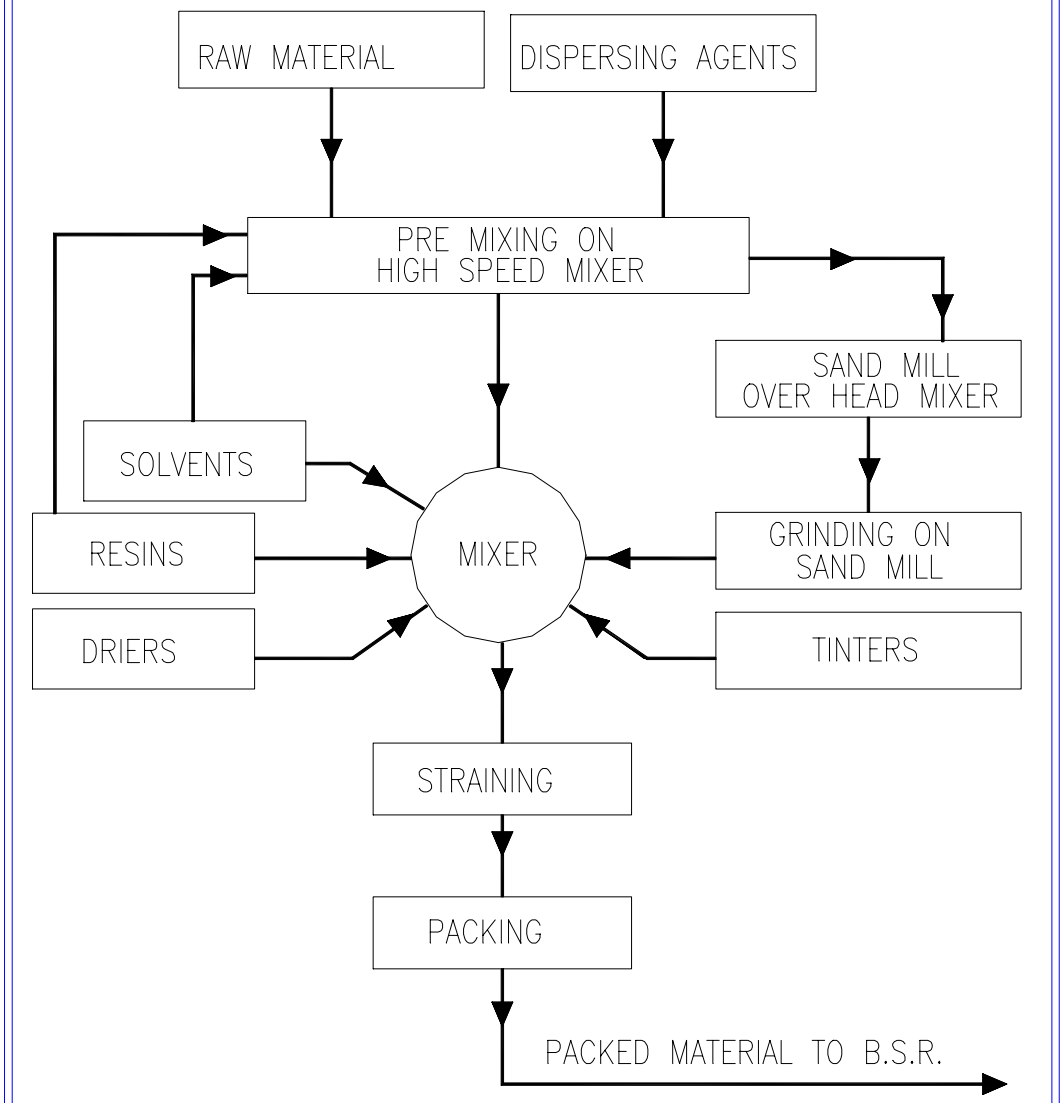
FLOW DIAGRAM FOR
WATER BASED PAINT PROCESSING

PROCESS FLOW DIAGRAM - SOLVENT BASE PAINT



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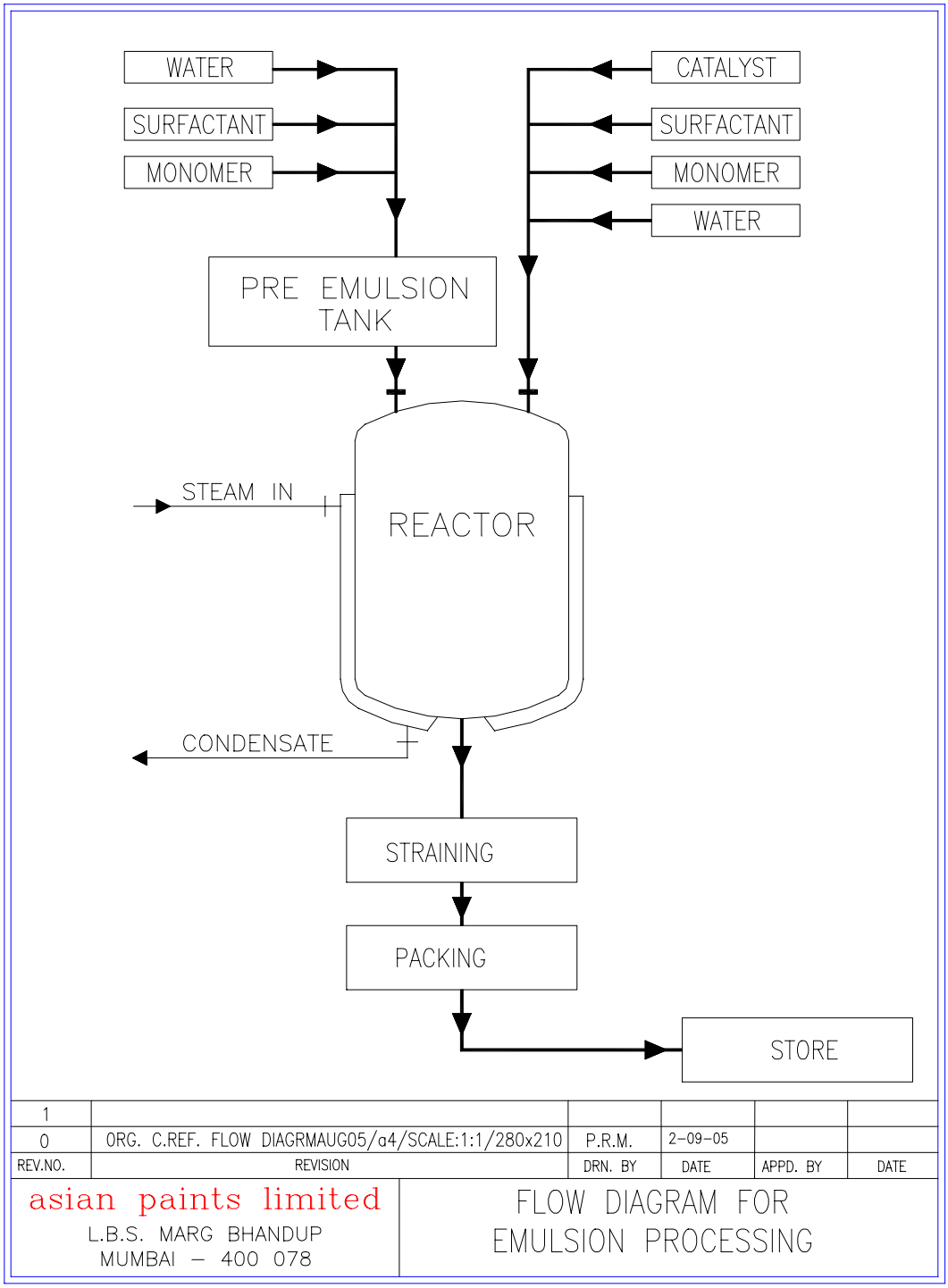
FLOW DIAGRAM FOR
SOLVENT BASE PAINT PROCESSING

PROCESS FLOW DIAGRAM - EMULSION



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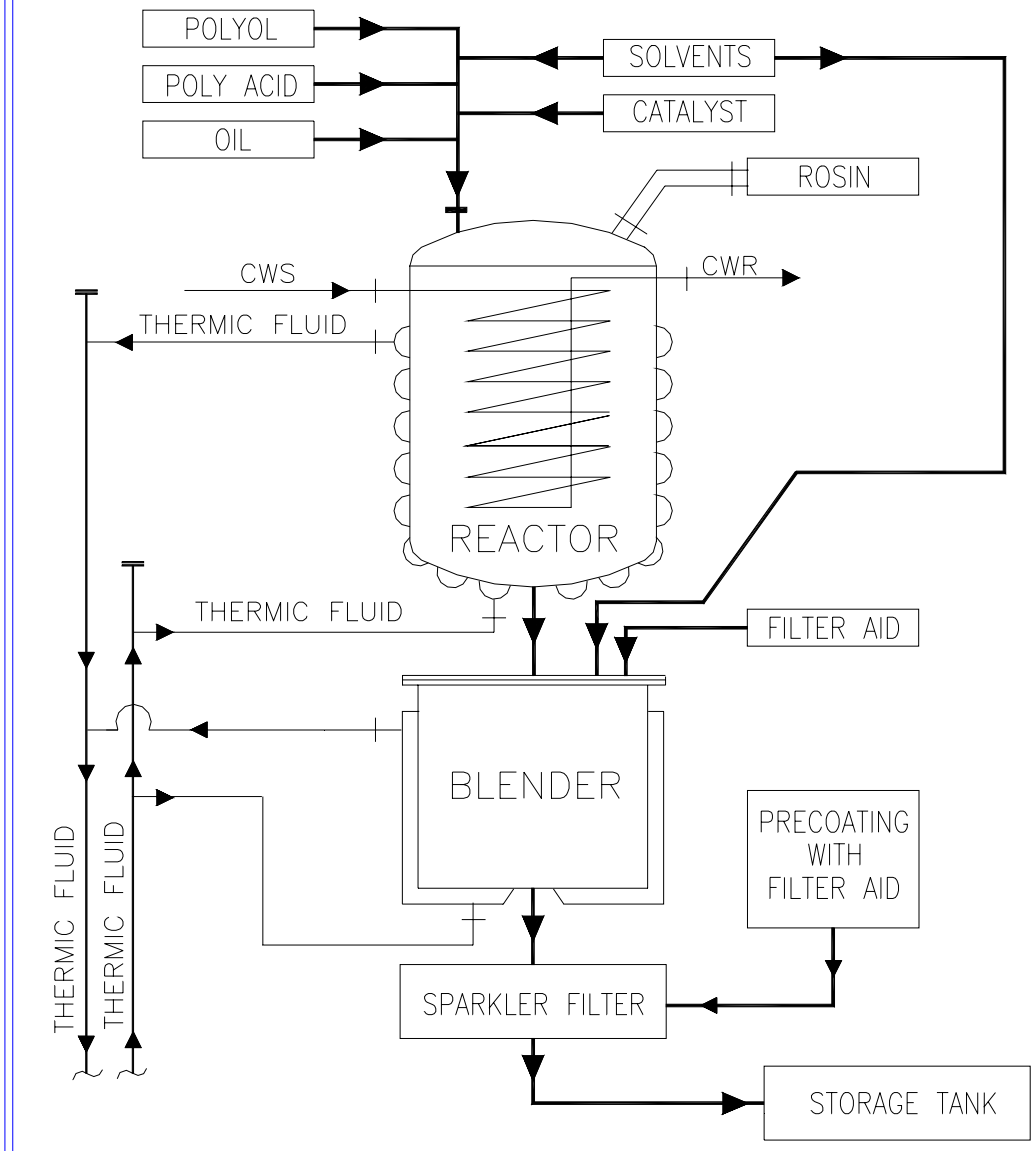
FLOW DIAGRAM FOR
EMULSION PROCESSING

PROCESS FLOW DIAGRAM - ALKYD RESIN



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FLOW DIAGRAM FOR
ALKYD RESIN PROCESSING