

Orchid Chemicals & Pharmaceuticals Limited

Kancheepuram

- Manufacturer of bulk cephalosporin range of products (antibiotics), Intermediates and Neutraceuticals with two sophisticated manufacturing facilities in India (one at Alathur near Chennai and the other at Aurangabad)
- Our Alathur facility has a work force of over 1000 and a turnover of Rs.650 crores
- Largest manufacturer of Cephalosporin products in India and one among the top five in the world
- 100% EOU with ISO 9000, ISO 14000, US-FDA, TGA and EDQM certifications

Nature of manufacturing

- Cephalosporin manufacturing is based on low temperature technology upto -70°C
- Approx. 2500 TR equivalent of refrigeration systems operated at various temperatures (+7, -10, -25, -30, -40 & -70)
- Energy cost is approx. 5% of the turnover
- Manufacturing operations are batch-wise
- A typical manufacturing process stream is as under:
Reactors → Centrifuging → Drying → Powder Processing → Cold Storage → Despatch

Energy scenario

- We have our own CPP (3 x 3.38 MW) to meet our power requirements and 4 Nos. of FO fired boilers and 3 Nos. of WHRBs to meet our thermal energy requirements (550 TPD of steam per day)
- Our fuel bill comes to approx. Rs.35 crores per annum (40% for Utility, 40% for ETP and 20% for process)
- We have been consistent in reducing the specific energy consumption by 5% every year for the last 3 years with a dedicated team working for energy conservation

Energy Conservation Approach

- Invest on new energy efficient systems
- Continual improvement in operational efficiency by innovations
- ENCON techniques adopted:
 - Soft starters in power intensive drives
 - FRP blades in cooling tower
 - Lowering condensers in distillation plants
 - Control on compressed air velocity
 - Primary pump elimination in refrigeration
 - Star connection in lower loaded drives
 - Optimization of generation voltage and frequency in CPP (11 KV, 50 Hz 10.7 KV, 49.46 Hz)
 - Optimization of refrigeration set temperature
 - 95% steam condensate recovery
 - Recycling reactor jacket water as CT make up
 - Routine air leak and insulation audits

Energy conservation by conserving water

- Orchid, being a 'Zero Discharge Unit', adds value to water by 100% recycling
- Saving 150000 KL of water/ annum by recovering water from effluent using UF and RO
- By using air cooled heat transfer equipment, evaporation loss of 75000 KL/year is avoided
- A major part of CT make up water is obtained from: Defrost water, container wash water, AHU humid water, water ring vacuum pump expel water, hot water tank overflows, reactor jacket drainings etc.
- Providing orifices before the water usage points

All the above resulted in the reduction of specific water consumption by 40 lit/kg of product

Energy conservation : Generation & Demand side

S.No.	Generation side	Demand side
1	CPP: Heat recovery enhancement by adding WHRB, RCC chimney and economiser = Rs.27 mio/annum Voltage in frequency optimisation = Rs.5 mio/annum	Star conneciton, soft starters, VFDs, capacitor banks, lighting transformers, electronic ballest = Rs.5 mio/annum
2	Boiler: RCC chimney with economiser, Dunphy burner and efficiency enhancement by 6% = Rs.6 mio/annum 95% steam condensate recovery = Rs.10 mio/annum	Regular insulation audits, leak audits, flash steam recovery, multiple effect evaporators. = Rs 2 mio/annum
3	Air compressors: Velocity optimisation, pressure drop reduction, level based traps, air temperature reduction, nitrogen production enhancement, V belt to flat belt = Rs.5 mio/annum	Leak audits, LP nitrogen usage for blanketing, transvector nozzle = Rs.1.5 mio/annum
4	Refrigeration/CT: Optimisation of set point, primary pump aversion, FRP blades = Rs.1 mio/annum	Increasing the loading % by rearranging the client reactors, insulation audits, lowering the condensers = Rs.6.5 mio/annum
5	Water/Effluent: 100% recovery of water from effluent 16% reduction in specific water consumption	Reduction of evaporation loss, reuse of waste water for cooling tower make up
	Total savings: Rs.55 mio/annum	Total savings: Rs.15 mio/annum
GRAND TOTAL: Rs.82 mio/annum		

Steam condensate recovery

- 95% of steam condensate recovery has been achieved
- Out of 550 TPD of steam production, the fresh water consumption was only 25 TPD
- With reference to 'nil' steam condensate recovery, 95% recovery, has resulted a saving of 1000 KL of FO/annum
Saving: Rs.10 million/annum

Selection of energy efficient burner for boiler

- The co-axial energy efficient burner supplied by Dunphy, UK trims the excess oxygen level closer to 1.5%
- Reduction of excess oxygen from 3% to 1.5% has facilitated the reduction of air for combustion by 6.5%
- As oxygen is trimmed, the air requirement for complete combustion gets reduced and thereby, reducing the heat loss carried away by flue gas
- Basis: 800 lit/hour of FO combustion
6.5% of total air equals to 892 kgs/hour
Sensible heat loss avoided = 35000 Kcal/hour
= 4 litres of FO/hour

Heat Recovery from Flue Gas

- Concrete chimney was erected and an economizer was introduced in the flue gas path to extract the sensible heat from 250°C to 190°C, which resulted in energy saving as under:

FO fired Boiler 180 KL of FO/annum

CPP - WHRBs 360 KL of FO/annum

Efficiency enhancement in heat recovery - CPP

- 2000-01: The overall efficiency (on heat recovery basis) at our CPP was 35.5%
- 2001-02: With WHRB the overall efficiency became 43.7%
- 2002-03: With RCC chimney and an additional economizer the efficiency reached 49.5%
- 2003-05: With our future proposal for hot water fired VAS in the HT circuit of CPP the efficiency would reach 60%

Energy conservation projects implemented during the financial year 2003-04

S.No.	Proposals Implemented	Energy saved per annum		Investment & Pay back	Cost saved Rs.lakhs/annum
		Electrical in lakh units	Thermal in KL of FO		
1	Reduction of Nitrogen Loss : In PAA plant, the N ₂ (used for blanketting) pressure was reduced from 1 bar to 200 mmWC to save 40 m ³ /hr. In PRAJ, 50 m ³ /hr loss was identified and avoided. Similarly, around 50 ~70 m ³ /hr of N ₂ loss has been identified in MPSR/Ph-21 and the same is being normalized.	4.6	-	Rs. 0.4 Lac & 1 month	12
2	Reduction of slip losses in belt power transmission: V- belt to flat belt conversion was implemented in KGK compressors, to reduce the slip losses by 2 %.	0.84	-	Rs.1.2 Lacs & 6 months	2.5
3	Reduction of water loss & LPS generation: a). An on/off valve was introduced in the water in let line to the water ring vacuum pump of Powder process plant to avoid water consumption & LPS generation during idle hrs. This has avoided 15~20 KI of LPS/day.	3.36	-	Rs 0.1 Lac & 1 month	6.5
	b).The entire plant was audited (during Aug' 03) to reduce the water losses.The water consumption was reduced by 80 ~ 100 KI/day. The reactor jacket drainings from API & Ph-21 are being used as the CT make-up to reduce the LPS by 15~20 KI/day.	6	-	Rs. 1.5 Lacs & 1 month	20
4	Reduction of energy loss in Ph-21 CT plant: After studying the CTW requirement in Phase-21, one of the two (22 Kw) CTW pumps has been switched off.	1.8	-	Nil	5.3
5	Optimisation of MPSR chiller operation: After studying the load pattern, the chiller compressors were tuned to get loaded up to 95%, and one of the compressors was stopped. Earlier, these compressors were not getting loaded beyond 70%. And only two compressors are run whenever there is no MDC processing.The principle lying behind is, the scrow compressors consume 30~40% of the full load power during unloading. Hence it is always preferred to run the scrow compressors at maximum load, so that the energy loss is minimized.	5.2	-	Nil	15
6	Compressed air plant : a). As per the characteristics of Adsorption towers used in N ₂ plant, the rate and efficiency of adsorption of water/O ₂ in ADU/CMS are maximum at reduced temperatures (nearing 20°C). Accordingly the compressed air is cooled to < 40°C before being fed to N ₂ plant and 600 Kgs/day of water is also being drained off.			Rs.1 Lac & 1 month	

Energy conservation projects implemented during the financial year 2003-04

S.No.	Proposals Implemented	Energy saved per annum		Investment & Pay back	Cost saved Rs.lakhs/annum
		Electrical in lakh units	Thermal in KL of FO		
	b) The efficiency of compressor increases by 1.5% for every 8°C reduction in the temperature of air. Accordingly, the compressed air is being cooled using CTW in the inter & after coolers, to < 50°C. Earlier, the compressed air temperature was >75°C which led to an increased power consumption.	8.4	-	2 Lacs & 2 months	12
	c).The velocity of compressed air from the compressor end to wet air receiver has been reduced from 26 m/sec to 6 m/sec by laying additional 6" & 4" pipe lines. This has reduced the pressure drop by 0.6 bar and resulted in a power saving equivalent to 200cfm of wet air (a KGK was switched off after switching on a CPT)		-		11
	d). As the velocity and temperature are reduced, the pressure drop(between the compressor end and wet air receiver) has come down from 0.8 bar to 0.2 bar and hence all the compressors are working against 7.4 bar pressure instead of 8 bar pressure. There is a reduction in amps by 10~20 units in CPT 4 (ie. from 273 to 258).		-		
7	Efficiency enhancement of Utility-1 -10°C chiller: As a result of debottlenecking the CTW flow streams in the -10°C - 50 TR chiller, we are able to stop one of the two (50 TR) chillers, inspite of handling a part of +7°C load. However, the CTW pumps' efficiency have to be improved, and CTW temperature has to be further reduced to maximize the savings.	3.36	-	2 Lacs & 2 months	10
8	Reduction of thermal energy loss: a). 2 TPD of steam has been saved by closing the steam going in to the heater of a bare FO tank used for Ecology incinerator. b).The entire steam distribution system was audited. Also, the leak spots, bare surfaces, & wet insulations were identified and normalised.	-	2	Nil	5
9	Reduction of Dry air loss: After studying the dust collection rate & air purging rate, the Dry Air purging frequency in the dust collector of Powder process plant was reduced to save 50 m ³ /hr of dry air.	0.84	-	Nil	2.4
10	Optimization of temperature set point in AHUs of API block : In Utility -3, one of the two 0°C chillers was stopped after increasing the temperature settings in (reducing the brine flow) the AHUs catering the stair case, corridor in Ph-19. The other chiller gets 25% additionally loaded.(Earlier load was 65%)	3.7	-	Nil	12

Energy conservation projects implemented during the financial year 2003-04

S.No.	Proposals Implemented	Energy saved per annum		Investment & Pay back	Cost saved
		Electrical in lakh units	Thermal in KL of FO		
11	Optimization of "generation frequency & voltage" in CPP: In CPP the "Governor control loop" has been tuned such that generated frequency & voltage are 49.6 Hz & 10.7 KV. Earlier these settings were 50 Hz & 11 KV. Since the power/load is proportional to voltage, there is a corresponding reduction in load by 150 Kw.	12.6	-	Nil	23
12	Selection of energy efficient burner: The co-axial burner supplied by Dunphy, England trims the excess oxygen % closer to 1.5 and thus, reducing the excess air by 6%, resulting in a fuel saving of 4 litre/hour	-	35	20	3.5
Total		50.7	37	Rs.28.2 Lacs	140.2

Energy saving projects to be implemented

S.No	Proposals-Brief write up	Power savings & Annualised cost savings	Investment & Pay back
1	Utility-1 -10°C chiller efficiency enhancement: the CTW pump's efficiency & CT's efficiency are to be improved(The CT fan blade angle has to be increased). For every 1°C reduction in CTW temperature there will be a considerable increase in the Refrigeration efficiency. Already the CTW line sizes have been increased.	With the present status we could stop one of the two 50 TR chillers intermittently.However it could be permanently stopped if the above said modifications are done. 55 Kw power = Rs 12 lacs	1 Lac & 1 month
2	The cost/TR in Carrier chiller is costlier than that in MPSR chiller by Rs.1.0. Hence if the carrier chiller load is shared by MPSR chiller, there will be a saving of Rs. 14 Lacs/year.	57 Kw Power saving = Rs 14 Lacs/year	5 Lacs & 5 months
3	Recovering the heat from the Crystallizer vapor & Thermo-compressing it. Saving 3 TPH of steam.	Saving 3 TPH of steam = Rs. 1.9 crores/year.	50 Lacs & 4 months.
4	Introduction of economizers in the flue gas path to recover the waste heat.This would enhance the steam production by 0.42 TPH.	0.42 TPH of steam = Rs. 25 Lacs/year.	25 Lacs & 12 months
5	Introduction of Hot well for +20 water in MPSR & segregating the return water based on its temperature.This would help us in stopping a 110 Kw compressor and the Air cooled HE fans.	110 Kw = Rs 25 Lacs / year.	2 Lacs & 1 month
6	Introduction of economizers in the flue gas exit path of WHRB of CPP 1 & 2.This would enhance the steam production by 0.5 TPH.	0.5 TPH of steam = Rs. 32 Lacs/ year.	50 Lacs & 19 months.
7	Using the Heat energy from the HT circuit of the CPP in the hot water fired VAS.	Power savings = 560 Kw = Rs 1.25 crores.	80 Lacs & 12 months.
8	Usage of old CMS for LP Nitrogen generation	A trial study(to be indigenously developed)	~
9	Providing LP wet air for vessel entry & body wash purposes. This would reduce the power consumption by 10 Kw. Sudden pressure fluctuation problems would get avoided	10 ~ 20 Kw power saving = Rs.3 Lacs.	5 Lacs & 24 months
10	Providing a 75 Kw - 4800 Cum/hr (stand by) Kay compressor for aeration purpose in the aeropac and using it instead of 2 nos. of 55 Kw compressors.	20 Kw power saving = Rs. 5.0 lacs.	3 Lacs & 10 months.
11	Using the -40°C 40 & 15 TR plants to meet the loads of -30°C- 30 TR in phase-1. Indirect chilling using a PHE would generate a stand by for -30 Chiller. (Chilling the -30 brine by -40 brine)	Savings will be quantified after implementation.	5 Lacs.
12	Maximizing the usage of -70°C 30 TR plant and minimizing the usage of -65°C plant	There will be a cost saving of Rs.6 /TR.	Nil
13	Change over to energy efficient burners in 3 4 & 6 TPH boilers.	Savings will be quantified after implementation.	25 Lacs.
	Total savings / year	Rs. 4.50 Crores	Rs.2.50 crores