RAJSHREE SUGARS & CHEMICALS LIMITED

Unit-1 ,Varadaraj Nagar,Theni District,Tamil Nadu

Unit Profile

Rajshree Sugars & Chemicals Limited (RSCL) , an ISO 9001: 2000 certified company is the flagship of the Rajshree Group of companies which has diverse interests in sugar, Industrial alcohol, Fuel grade ethanol, Power generation, Organic manure, Bio products, Textile yarn and Travel services. The group is headquarted in the city of Coimbatore in South India. RSCL unit I has an integrated industrial complex located near Vaigai Dam, Theni district, Tamil Nadu, that includes a sugar factory, distillery, power plant, organic manure production unit and an exclusive R & D establishment to produce various bioproducts for agricultural use. RSCL unit I located in Theni district crushes 2800 Tonnes of cane per day with an average recovery of 10.5 %. RSCL produces sugar of ISS grade S-30 with an ICUMSA value less than 120.

The Company was incorporated in the year 1985. The Plant with a capacity of 2500 TCD (tons of cane crushed per day), commenced operations in January 1990. Today, the Company is one of the foremost sugar producers in the country. Along the way it has set many new records in production. It also recorded the highest recovery of sugar in the state of Tamil Nadu and became the first sugar factory to have utilised the full incentive limits of 55,000 metric tones set for sugar factories licensed in the 7th plan period. The Company has made significant inroads into the export market, too. It has exported 47.75% of its production in a 2002-2003 season and 30% of its production in 2001-02. It was the first 2500 TCD sugar plant in India that has operated 300 days in a season year (1998-99) and crushed 8.42 Lakh Metric Tons of cane. Indeed, RSCL's technologically superior manufacturing complex, complemented by its trained and dedicated workforce, has gone a long way in achieving energy conservation in all its activities. Since RSCL is committed to the cause of environmental protection, it promotes the 4 R strategy of reduce, reuse, recover and recycle wastes to conserve resources and reduce pollution by adopting sound energy saving and environmental protection measures.

Energy Consumption:

Power and Thermal energy are the primary requirement for sugar processing. The raw material sugar cane is crushed in the mills and juice is extracted .The extracted juice is then pumped for further processing. The cane residue available after extraction of juice is called bagasse. This is used as fuel in the boilers (87 tons capacity & 42 Kg/cm^2 pressure) for producing steam. This steam drives the 12 MW turbo generator of the cogeneration plant. Steam at 7 Kg/cm^2 and 1.5 Kg/cm^2 is extracted from the turbo generator after generation of power for sugar processing. There has been steady decrease in the power and thermal energy consumption per quintal of sugar produced due to the implementation of the Energy conservation measures.

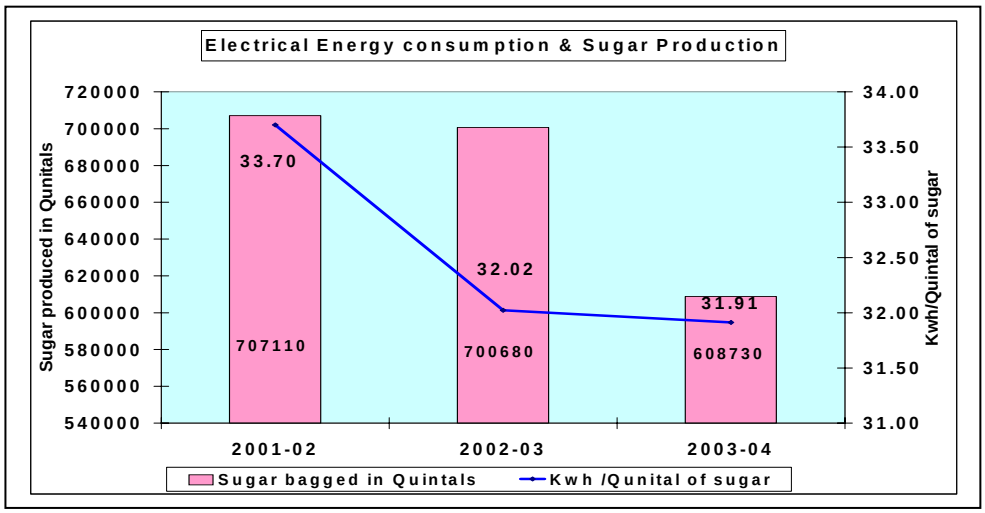
Energy data @ Raw Material - Cane

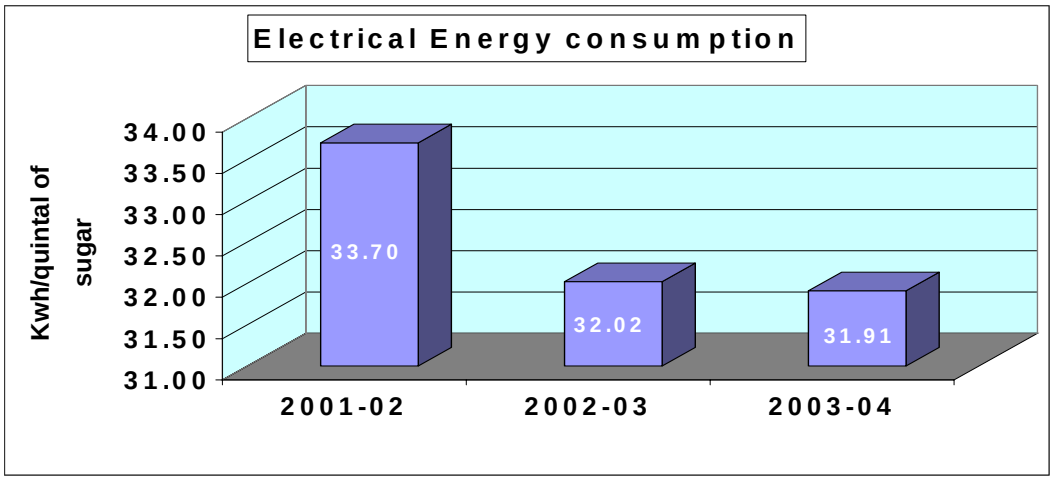
Description	*UOM*	*2001-2002*	*2002-2003*	*2003-04*
Sugar cane crushed	Tons	680177	660544	579620
Electrical Energy consumption/annum	Lakh kWh	238.3	224.37	194.25
Specific Energy consumption– Electrical	Units/Ton	35.03	33.97	33.51
Thermal Energy consumption/annum	Million Kcal	284.56	270.31	229.56
Specific Energy consumption– Thermal	Kcal/ Ton	405.46	396.61	387.29

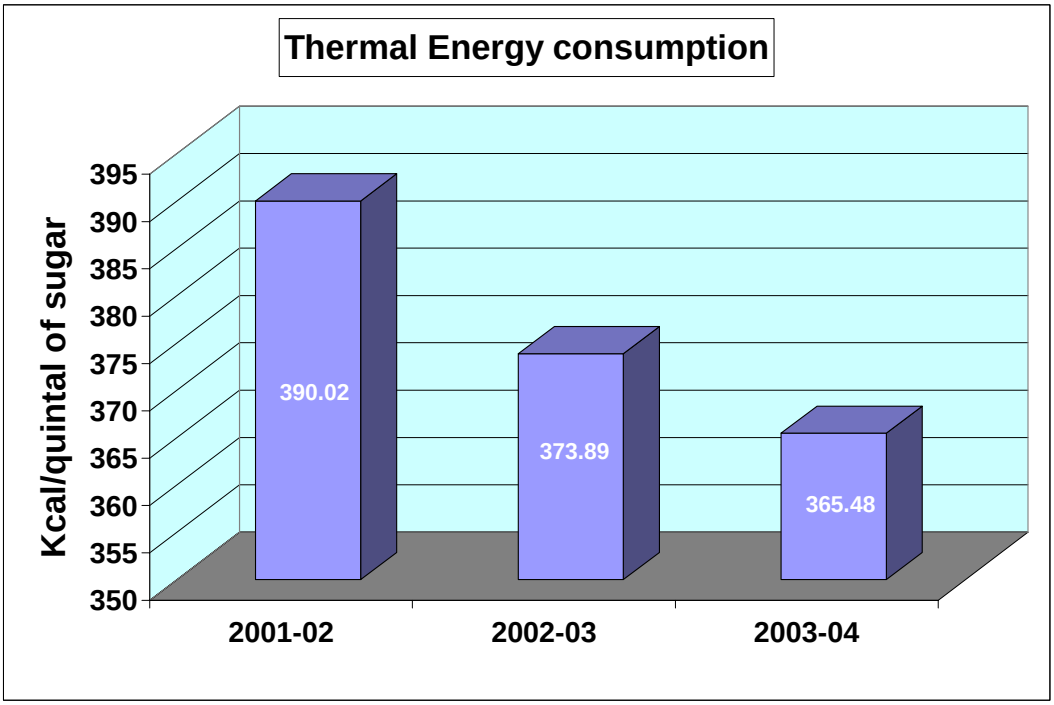
Energy data @ Product - Sugar

Description	*UOM*	*2001-2002*	*2002-2003*	*2003-04*
Sugar produced	Quintals	707110	700680	608730
Electrical Energy consumption/annum	Lakh kWh	238.3	224.37	194.25
Specific Energy consumption– Electrical	Units/Quintal	33.70	32.02	31.91
Thermal Energy consumption/annum	Million Kcal	284.56	270.31	229.56
Specific Energy consumption– Thermal	Kcal/Quintal	402.43	385.78	377.11

Year	*Electricity*		*Thermal*	
	Consumption kWh/Quintal of Sugar	% reduction over 2001-2002	Consumption Kcal/Quintal of sugar	% reduction over 2001-2002
2001-02	33.70		390.02	
2002-03	32.02	4.98 %	373.89	4.13 %
2003-04	31.91	5.31 %	365.48	6.29 %

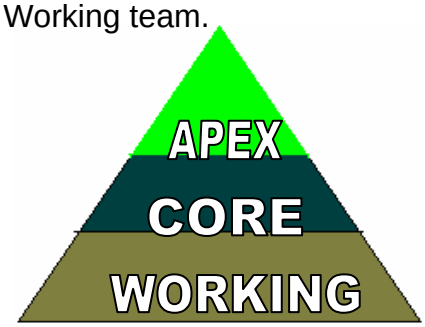






Energy Conservation Commitment, Policy and Set-up :

RSCL is committed to energy conservation and has taken up energy conservation measures as an integrated approach with its ISO 9001: 2000 activities. The EC cell has a 3-tier composition, namely the Apex team, Core team & Working team.



Apex Team :The apex team consists of the Chairperson, Whole Time Director , Director & Chief Operating Officer and the Chief Financial Officer. The apex team formulates the energy conservation policy, plans and targets. The quality policy itself has the specific power consumption target defined quantitatively. The energy manager compiles the energy data and presents it in the management review meetings held every 3 months. The performance of the energy conservation projects and the specific energy

consumption data are reviewed. Resource requirement for and alloted in the management review meetings.

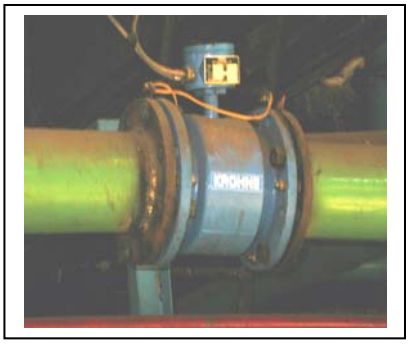
***Core Team*:** The core team consists of the unit head, HOD of Engineering Department, HOD of Production Department and the Energy manager as its members. This team formulates the specific energy consumption targets for individual cost centres of the plant namely the Mill House, Boiler house, Evaporation & Clarification, Boiling house & bagging house. The monthly data is compiled and is reviewed in the monthly review meetings

***Working Team* :** The working team consists of three groups namely Power, Steam & water.The employees and officers at the plant are the members of the teams. They carry out internal energy audit once in six months. They identify and propose the energy conservation projects. They also collect energy data with respect to each cost centres daily and compare it with the set targets.

Energy Conservation Achievements: 17 ENCON proposals have been implemented and a saving of Rs 34.97 lakhs has been achieved with an investment of Rs 38.16 lakhs .The power consumption of sugar per quintal has been reduced from 33.70 units to 32.01 units in 2002-03 and further to 31.91 units in 2003-04. Even when production was less by one lakh tons in 2003-04 in comparison with previous years of 2001-02 & 2002-03, we were able to achieve a lower specific power consumption of 31.91 units. This was possible only due to the implementation of the ENCON projects in 2003-04. Also the specific thermal energy consumption was reduced from 402.43 Kcal/quintal to 385.78 Kcal/quintal in 2002-03 & 377.11 Kcal/quintal in 2003-04.These achievements were the result of the effective functioning of the Energy Cell

Energy Conservation Projects – 2003-2004

1. Replacement of juice weighing scale with mass flow meter



Juice from the mills was collected in a strained juice tank. The Strained juice was pumped from the mills by two 20 HP pumps to juice weighing scale .The juice was weighed and discharged into the raw juice tank. The juice was then pumped to the juice heaters by raw juice pumps for further processing. After ENCON implementation strained juice from the mills is taken to the raw juice tank by gravity and the juice is quantified by mass flow meter installed at the delivery of the raw juice pump.

Operating days	60 Days
Energy savings	36720 kWh
Saving	Rs. 1.14 Lakhs
Actual investment	Rs 3 Lakhs

2. Replacement of water weighing scale with water flow meter

The condensate pumps were pumping condensate water from the evaporators to the overhead hot water tank. The hot water flows to the water scale by gravity. The water discharged by the scale was quantified and pumped to mills by 25 HP multi stage pumps for imbibition. After implementation of the ENCON proposal hot water for mill imbibition is directly pumped from the common evaporator mond condensate pump & the water flow meter quantifies the water pumped to mills.

Operating days	60 days
Energy savings	21600 kWh
Savings .	Rs 0.67 Lakhs
Investment	Rs 1.6 Lakhs

3. Installation of mist cooling system & automation of pan condenser system

Pan condenser was operating in manual mode. As the condenser system was in manual mode the nozzles of the condenser system were always open irrespective of the vapour flow from the pans and it needed 3600 m^3 of water/hour. The condenser water was cooled in a cooling tower. The cooling tower was highly energy intensive. There were 4 fans of 50 HP & 3 circulation pumps of 75 HP, 60 HP, and 60 HP respectively. Also 4 Nos. of 75 HP pumps were used in injection water system.

The pan condenser nozzles have been automated to regulate the water flow to the condensers with respect to the vapour flow .The cooling tower system has been replaced by mist cooling system

Operating days	60 days
Energy savings	330000 kWh
Savings	Rs 10.26 lakh
Investment	Rs 14 Lakh

4. Variable frequency drive for F.D fan of CVL boiler

The F.D fan was operated with a damper opening of 65 %. Variable frequency drive was installed and speed of the fan was regulated based on the boiler operations.

Operating days	60 days
Energy savings	14400 kWh
Savings	Rs 0.45 Lakhs
Investment	Rs 2.28 Lakhs

5. To arrest HP steam leakages

HP steam is leaking through defective steam valves and steam traps. These defective steam valves & traps were replaced.

Operating days	60 days
Energy savings	98220 kWh
Savings	Rs 3.05 Lakhs
Investment	Rs 1 Lakh

6. Reduction of excess blow downs in boiler

Additional Blow down was given twice a day due to higher TDS of boiler water owing to the use of conventional chemicals. Aliphatic polyamine based chemical is being used instead of conventional chemicals and additional blow downs have been avoided.

Power Saved /annum	24960 kWh
Savings per annum	Rs. 0.78 Lakh
Reduction in chemical cost	Rs. 0.48 Lakh
Total saving per annum	Rs 1.26 Lakh

7. Direct pumping of evaporator condensate to boiler deaerator

Ist & IInd evaporator condensate water was being pumped to boiler through excess condensate storage tank. The condensate water temperature was dropping from 114^{o} to 83^{o}C. Earlier we were operating two condensate pumps (15 HP, 40 m^{3}, 30 m head) and two feed water transfer pumps (25 HP, 70 m^{3,} 50 m head). Before implementing this ENCON proposal, condensate water used to be reheated from 83^{o} to103 ^{o}C by using exhaust steam. After implementation of this encon proposal Ist & IInd body condensate water is being pumped to boiler directly and the excess water is let out to excess condensate storage tank. Hence by implementing this proposal, reheating of feed water has been avoided.

The two 15 HP condensate pumps have been replaced with a 25 HP pump

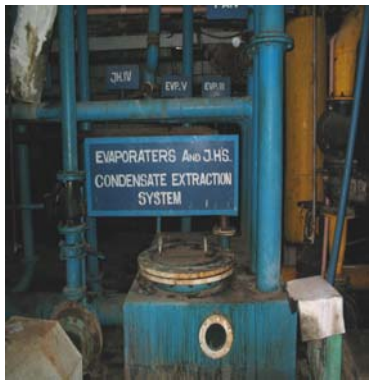
Operating days	60
Steam saved	2880 Tons
Savings in steam	Rs 1.22 lakhs
Power saved	51540 kWh
Savings in power	Rs 1.6 Lakhs
Total Savings	Rs.2.822 Lakhs
Investment	Rs 2 Lakhs

8. Optimisation of super heated wash water of "A" centrifugal station

The super heated water at 125 ^{o} C is used for curing the "A" massecuite at centrifugal. The evaporator condensate was being pumped to "A" super heater by 2"bare line & Excess super heated water was being let out in the drain. The condensate water line was insulated and the excess water letout was sealed.

Operating days	60
Steam saved	1061 Tons
Savings	Rs 0.44 Lakhs
Investment	Rs 0.48 Lakhs

9. Common condensate collection tank for evaporator and pan condensate water



Juice extracted from the mills is pumped to evaporator to evaporate the water contained in the juice. The juice is heated in juice heaters and water is evaporated in the multiple effect evaporators by steam & vapour. The condensate collected from the juice heater & evaporators was being pumped by individual pumps to over head tank. (10 pumps, 80 HP). After implementation of the ENCON proposal condensate from all evaporator & juice heaters are now collected in common mond by extending the condensate outlet line to the point where the vacuum is nullified and then the water is being pumped to the over head tank by a single 15 HP pump.

Operating days	60
Energy savings	56160 kWh
Savings	Rs. 1.75 Lakhs
Investment	Rs 2.0 Lakhs

Energy Conservation Plans & Targets

Energy Conservation Measures (Planned)	*Anticipated savings in Energy (Rs.lakhs)*	*Approx. investment (Rs.lakhs)*	*Project Commencement & Completion year*
VFD for Raw juice pump	1.2	3	2005
VFD for S.A Fan	1.41	3	2005
VFD for Feed water pump	4.84	10	2005
Distillery process water direct pumping	0.53	1	2005
Lighting Transformer	1.01	3	2004
Installation of turbogenerator instead of using steam through PRDS	62.23	70	2004

Preheating of condensing turbine condensate using flash steam	9.33	0.35	2004
Suphur burner drain steam to be connected to pan vapour line	10.37	0.1	2004
Reduction of flue gas temp new boiler stack gas	43.53	10	2004
Industrial pump house power optimisation	4.32	0.1	2004
Auto chute level controllers ,Automation of mill imbibition system & introduction of lotus roller to reduce moisture and pol loss in bagasse	59	20	2006
Total	197.77	120.55	

Environment & Safety

Corporate Responsibility for Environmental Management

- The plant has an Environmental Management Committee headed by the Director & Chief Operating Officer and comprises of key personnel in the plant. The Committee meets regularly to review the status of various aspects of pollution control measures being implemented in the plant. The unit has also initiated improvement measures to get ISO14001 certification by 2005.
- Suggestion scheme has been launched and various suggestions given by the workers and employees have been implemented in order to improve safety and protect environment.
- The unit has resolved to become a zero waste integrated agro business sugar complex and in its commitment to ensure zero discharge. Several measures have been implemented to recycle and reuse waste water to avoid effluent discharge into the environment.
- The unit complies with the various requirements and standards stipulated by Ministry of Environment & Forests, Central Pollution Control Board and Tamilnadu Pollution Control Board
- The unit has incurred environment related expenditure to the tune of Rs.16 lakhs in 2004.
- A massive plantation drive over a period of last fifteen years from 1990 to 2004 has resulted in a thick green belt around the unit in an area of 250 acres comprising about 5 lakh trees such as like Eucalyptus, Teak, Neem, Tamarind, Mango, Subabul, Amla and others with an investment of about Rs 20 lakhs
- Reduction in wastewater generation in sugar factory from 400 litres/Ton of cane crushed to 100 litres/Ton of cane crushed in 2004.
- The unit recently commissioned a new mist cooling system with automation for cooling the evaporator and pan condenser water. As a result the unit has reduced its total process water consumption by 50% and achieved a reduction of 300 m^3 of effluent from the total quantity of effluent generated.

Safety

- Involvement of workmen in Safety Management through the Safety Committee which is empowered to review accidents and initiate corrective and preventive action.
- Ensuring high standards of housekeeping in the factory premises, resulting in a *Safe* Shopfloor,
- All personnel are trained on First Aid and basics of Safety Management.

RAJSHREE SUGARS &CHEMICALS LIMITED UNIT-1
VARADARAJ NAGAR

POLICY ON HEALTH, SAFETY & ENVIRONMENT

It is the policy of **RAJSHREE SUGARS & CHEMICALS LIMITED (UNIT-1)** to design, manufacture and dispose of all materials safely and without creating unacceptable risks to health, safety or the environment. This sugar factory will;

- ® Establish and maintain programs to assure that rules and regulations applicable to its products and operations are known and obeyed.
- ® Adopt its own standards where rules or regulations may not be adequately protective, and adopt, where necessary, its own standards where rules do not exist; and
- ® Stop manufacturing or distributing any product or carrying out any operation if the health, safety or environmental risks or costs are Unacceptable.

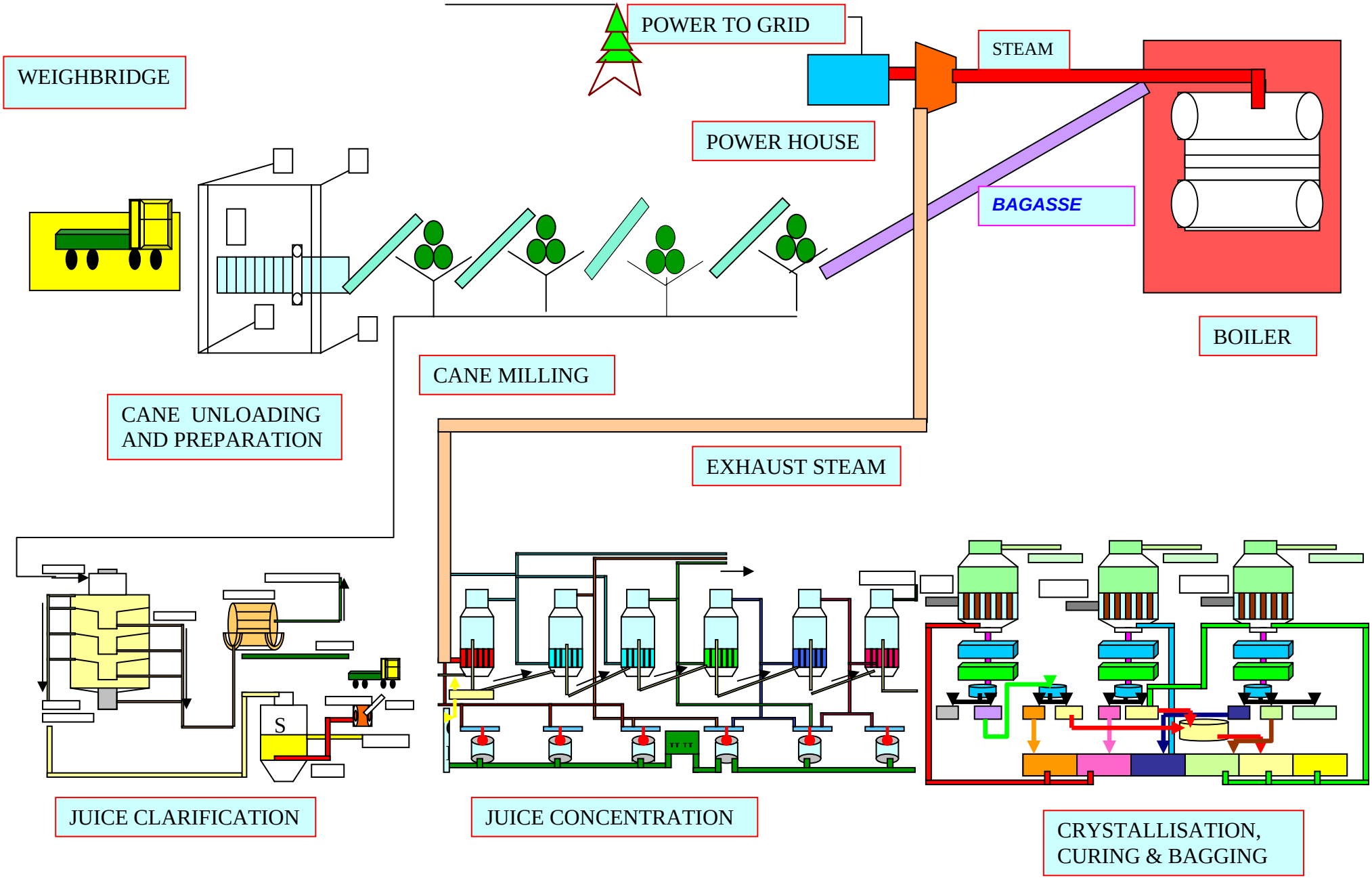
To carry out this policy, the factory will;

- ® Identify and control public health, safety and environmental hazards stemming from its operations and product.
- ➢ Conduct accident prevention programs, product safety and integrity, occupational health, safety and environmental pollution control programs to safeguard employees and the public from injuries or health hazards and to protect the company's assets ensuring continuity or operations and to protect the environment
- ➢ Conduct and support appropriate research about the health, safety and environmental effects of materials and products handled and sold by the company and share promptly any significant findings with others, such as employees, suppliers, customers, government agencies or the scientific community; and
- ➢ Work constructively with trade associations, government agencies and others to develop equitable and realistic laws, regulations and standards to protect public health, safety and the environment.
- ➢ Every employee is expected to adhere to the spirit as well as the letter of this policy. Managers have a special obligation to keep themselves informed on health, safety and environmental risks and standards and promptly advise higher management of any adverse situation, which comes to their attention.

R Varadaraj
Director & Chief Operating Officer

23rd August 2004

SUGAR - PROCESS FLOW CHART



Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : Replacement of juice weighing scale with mass flow meter

Back ground of the project

This energy conservation project was identified as part of the internal Energy Audit carried out in 2003-4.Juice from the mills is collected in a strained juice tank.The Strained juice is pumped from the mills by two 20 HP pumps to juice weighing scale .The juice is weighed and discharged into the raw juice tank.Then the juice is pumped to the juice heaters by raw juice pumps for further process

Observations made

Strained juice from the mills can be taken to the raw juice tank by gravity.Two 20 HP pump operations can be avoided.The mass flow meter has to be installed in the delivery side of the raw juice pump line to measure the juice pumped to the process

Technical & Financial analysis		
Present Energy consumption /day	612	kWh
Proposed Energy consumption/day	0	kWh
Energy savings/day	612	kWh
Operating days considered	60	Days
Annual Energy savings	36720	kWh
Excess revenue generated Rs in Lakh	1.14	
Actual investment Rs in Lakh	3	
Implementation Date	1/2/2004	

Impact of implementation:

Juice from the mill flows to the raw juice tank by gravity. The juice pumped by the raw juice pump is measured by the mass flow meter. With the installation of the PLC based juice stabilisation system the juice flow to process has been regulated and fluctuations in juice flow present with the earlier batch measurement system (weighing scale) has been avoided.The clarification efficiency has improved due to the above said system. R& M expenses of Juice weighing scale & related accessories have been avoided.

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title: Replacement of water weighing scale with water flow meter

Back ground of the project

This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.Condensate water from the evaporators is pumped to the overhead hot water tank by the condensate pumps. The hot water flows to the water scale by gravity. The water discharged by the scale is quantified. The quantified hot water is then pumped to mills by 25 HP multi stage pump for imbibition.

Observations made

The hot water for mill imbibition can be directly pumped from the common evaporator mond condensate pump, The water flow meter will quantify the water pumped to mills.We can avoid the power cost of running 25 HP pump and also the R & M expenses of the pump and its accessories

Technical & Financial analysis		
Present Energy consumption /day	360	KWh
Proposed Energy consumption/day	0	kWh
Energy savings/day	360	kWh
Operating days considered	60	Days
Annual Energy savings	21600	kWh
Excess revenue generated Rs in Lakh	0.67	
Actual investment Rs in Lakh	1.6	
Implementation Date	1/2/2004	

Impact of implementation

Operation of 25 HP imbibition pump has been stopped & power of 360 units is conserved per day. R&M expenses of Water weighing scale, imbibition hot water pumps have been avoided. Also overflow of hot water from the scale to ETP has been avoided.

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title:
Installation of mist cooling system & automation of pan condenser system

Back ground of the project:
This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.Pan condenser was operating in manual mode. As the condenser system was in manual mode the nozzles of the condenser system were always open irrespective of the vapour flow from the pans and it needs 3600 m3 of water/hour. The condenser water was cooled in a cooling tower. The cooling tower was highly energy intensive. There are 4 fans of 50 HP & 3 circulation pumps of 75HP, 60HP, and 60HP respectively. Also 4 Nos. of 75 HP pumps were used in injection water system.

Observations made :
The pan condenser nozzles have to be automated to regulate the water flow to the condensers with respect to the vapour flow .The cooling tower system has to be replaced by mist cooling system to reduce the power consumption.

Technical & Financial analysis :
The mist cooling system will have only one 120 HP pump. At the injection water station the automated pan condenser system will only need one 150 HP pump and 2250 m3/Hour water flow.

Present Energy consumption /Day	13500	KWh
Proposed Energy consumption/Day	8000	kWh
Energy savings/Day	5500	kWh
Operating days considered	60	Days
Annual Energy savings	330000	kWh
Excess revenue generated Rs in Lakh	10.26	
Actual investment Rs in Lakh	14	
Implementation Date	1/2/2004	

Impact of implementation :
5500 units per day have been conserved after implementation of the project. The mist cooling system is able to attain a temperature difference of 10-12 ^{o}C as against 6-8 ^{o}C achieved earlier by cooling towers. R & M expenses have got reduced as only two pumps are operating now as against 7 pumps & 4 Fans earlier. The pan automation system has reduced pan start up time drastically. Also pan boiling time for the respective massecuitte have got optimised.

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : Variable frequency drive for F.D fan of CVL boiler

Back ground of the project:
This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.The F.D fan is operated with a damper opening of 65 % .35% of the damper is throttled always.

Observations made :
Energy is being wasted in the way of throttling of the damper. By installing a VFC we can reduce the speed of the fan depending upon its requirement and power can be conserved.

Technical & Financial analysis :
By installing a 45 kW VFD, the damper can be removed. The motor can be operated at lesser speed, as its insulation is class-F.

Present Energy consumption /day	559	KWh
Proposed Energy consumption/day	319	kWh
Energy savings/day	240	kWh
Operating days considered	60	Days
Annual Energy savings	14400	kWh
Excess revenue generated Rs in Lakh	0.45	
Actual investment Rs in Lakh	2.28	
Implementation Date	1/2/2004	

Impact of implementation The installation of variable frequency drive for the boiler F.D fan has resulted in a power saving of 240 units/day.

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title: To Arrest HP steam leakages

Back ground of the project :
This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.HP steam is leaking through defective valves and drains

Observations made :
Steam valves –7 nos. and steam traps- 14 nos were found defective. These defective steam valves & traps are to be replaced.

Technical & Financial analysis:
The leakage through the defective valves and drains amounts to 0.6 tons of HP steam per hour.The leakage's were measured based on their line sizes and quantified as 5 % of the normal flow.The steam saved has been converted to power based on the specific steam consumption of 8.62 T of steam / MW of the cogeneration plant

Steam saved per day	14.4	Tons
Power that can be generated because of the steam saved @ 8.62 T/MW	1637	kWh
Operating days considered	60	Days
Annual Energy savings	98220	kWh
Excess revenue generated Rs in Lakh	3.05	
Actual investment Rs in Lakh	1	
Implementation Date	1/2/2004	

Impact of implementation:
Steam leakages through HP steam valves and drains have been arrested and 14.4 tons of steam is saved per day

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : Insulation of 42 Kg/cm^2 steam lines

Back ground of the project:

This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.The insulation of the HP steam line has got damaged at boiler,PRDS and Sulfur burner

Observations made:

The 8" pipe line has to be covered with 100 mm thickness LRP mattress & then covered with aluminum cladding in the following areas

1.2nd Boiler super heater header – 6 m
2.2nd Boiler steam outlet line to Distributor header-15 m
3.Steam distributor header – 6 m
4.Steam distributor header valves – 4 m
5.PRDS -12m
6.1st Boiler super heater header – 6 m

Technical & Financial analysis		
Pipe line length	50	Meter
Steam pressure	42	Kg/cm^2
Steam temperature	420	^oC
Heat loss for bare 8" pipe line	8350	BTU/Liner foot
Heat loss for 50 m	11390275	BTU/hour
Steam saved per day	3.72	Tons
Power that can be generated because of the steam saved @ specific steam consumption of 8.62 T /MW	423	kWh
Annual Energy savings	25380	kWh
Excess revenue generated Rs in Lakh	0.78	
Actual investment Rs in Lakh	0.5	
Implementation Date	1/2/2004	

Impact of implementation :

The steam saved per day after insulation of the HP steam lines is 3.72 Tons per day.

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : Direct pumping of evaporator condensate to boiler Deaerator

Back ground of the project:
This energy conservation project was identified in the internal Energy Audit carried out in 2003-4. Ist & IInd Evaporator Condensate water is being pumped to boiler through excess condensate storage tank. The condensate water temperature drops from 114 to 83 ^{o}C.
15 HP, 40 m^3, 30 m head, condensate pumps-2 nos. & 25 HP, 70 m^{3,} 50 m head Feed water transfer pump-2 nos. were in operation.

Observations made
The required water Temperature at boiler 103 ^{o}C So Water is being reheated from 83 - 103 ^{o}C by using Exhaust Steam. Ist & IInd Body Condensate water can be pumped directly to boiler & Excess water can be let out to excess condensate storage tank. By this reheating of feed water can be avoided.
The two 15 HP,40 m^3 condensate pumps are to be replaced with 100 m3 ,50 m head ,25 HP pump-1 no. For make up water 70 m3,50 m head ,25 HP pump is operated occasionally.

Technical & Financial analysis		
Evaporator condensate temperature	114	^{o}C
Condensate flow per hour	80	Tons
Condensate water temperature at Deaerator inlet when taken through the condensate tank	83	^{o}C
Steam used to raise the water temperature to 103 o c	3	Tons
Condensate water temperature at Deaerator inlet when directly pumped from evaporator	99	^{o}C
Steam saved as condensate is directly pumped from Evaporator to Deaerator	2	Tons
Steam saved per day	48	Tons
Operating days considered	60	Days
Steam saved per annum	2880	
Excess revenue generated in Lakh Rs. Through saving in steam	1.18	
Present power consumption /day	1152	kWh
Proposed power consumption/day	292	kWh
Power saved per day	859	kWh
Power saved per annum	51540	kWh
Excess revenue generated through saving in power Rs in Lakh	1.60	
Total excess revenue generated in Lakh Rs.	2.8	
Actual investment Rs in Lakh	2	
Implementation Date	1/2/2004	

Impact of implementation:
The proposal has been implemented and steam of 48 tons & power of 859 units have been conserved per day.

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title: Optimisation of super heated wash water of "A" centrifugal station

Back ground of the project

This energy conservation project was identified in the internal Energy Audit carried out in 2003-04.The super heated water at 125 o C is used for curing the "A" massecuitte at centrifugal.

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Observations made

1.The 2nd evaporator condensate is being pumped to "A" super heater by 2"bare line
2.Excess super heated water is being let out in the drain
3.The outlet line of the super heater is not insulated.
The bare lines are to be insulated by 75-mm thickness LRP mattress. The excess water drain line has to be closed.

Technical & Financial analysis		
Super heater water flow	15.	m3/hr
2nd body to super heater pump inlet radiation loss. emp drop = 113 – 105^{O} C	8	^{O} C
Steam wasted due to radiation of inlet pipeline =15*8*1/ 473.	0.317	Tons/hr
Let out excess water quantity thru drain	3.75	m3/hr
Steam loss through the let out excess water = 3.75 * (125-104) * 1/ 473	0.166	Tons/hr
super heater header loss Temp drop = 125 - 115 ^{O} C	10	^{O} C
Steam loss due to header radiation = 15 * 10 * 1 / 473	0.264	Tons/hr
Total steam conserved after insulation	0.737	Tons/hr
Number of operating days	60	
steam conserved per annum	1061	Tons
Excess revenue generated per annum Rs in Lakh	0.435	
Investment for the proposed insulation Rs in Lakh	0.48	
Implementation date	1/2/2004	

Impact of implementation:

The pipe line from 2nd evaporator to super heater, Super heater shell & super heater header have been insulated. The excess water drain line has been plugged. Hot water let out to ETP per day has got reduced by 90 m^3

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : Common condensate collection tank for evaporator and pan condensate water

Back ground of the project:
This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.Juice extracted from the mills are pumped to evaporator to evaporate the water contained in the juice. The juice is heated in juice heaters and water is evaporated in the multiple effect evaporators by steam & vapour. The juice heaters and evaporators are working under vacuum to prevent inversion The condensate collected from the juice heater & Evaporators are pumped by individual pumps to over head tank. (10 pumps, 80 hp).

Observations made: The juice heaters & evaporators are working under vacuum of 500 mm of Hg (max). The distance between the condensate collecting point to the pump suction is only 5.5 meters. So the removal of steam condensate from the evaporator & juice heater is achieved by providing the vacuum equaliser line to the pump suction. Without using individual pumps the condensate from all evaporator & juice heaters can be collected in common mond by extending the condensate outlet line to the point where the vacuum is nullified and then the water can be pumped to over head tank by single pump of 15 HP. To nullify the vacuum, a pit has to be excavated to the depth of 2 meters and the common mond has to be positioned in to the pit.

Technical & Financial analysis		
Required vacuum at Evaporator calendria	500	mm of hg
Available height from the Condensate collecting point to the ground level	5.5	Meter
Density of mercury	13.6	
Height required to nullify the vacuum	6.8	meter of WC
Additional Height required	1.3	meter of WC
Present power consumption/day	1152	kWh
Proposed power consumption/Day	216	kWh
Power conserved /Day	936	kWh
Operating days considered	60	Days
Annual Energy savings	56160	kWh
Excess revenue generated Rs in Lakh	1.75	
Actual investment Rs in Lakh	2.0	
Implementation Date	1/2/2004	

Impact of implementation: The steam condensate are collected in common mond located 2 meter below the ground level and it is pumped by 1 no 15 HP pump. 9 Nos. of pumps have been stopped. R &M expenses of pumps and monds have been avoided.

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title
Installation of centralized & pressurized lubrication system & replacement mill hydraulic "O" Rings with modified specific profiled "O" Rings for Mills

Back ground of the project
This energy conservation project was identified in the internal Energy Audit carried out in 2003- 04. The cane is crushed in the mills. The mills are equipped with hydraulic system for better extraction of juice. The failure of "O" Rings in the hydraulic cylinders & Insufficient flow of lubrication leads to the frequent breakdown and lesser extraction of juice. This causes increase in moisture content of bagasse (fuel).

Observations made: The failure of "O" Rings occurred due to rolling of the "O" ring during movement in the cylinder. The existing "O" Rings are to be replaced with modified specific profiled "O" Rings. The existing individual mill lubricators are not sufficient for pumping the lube oil in to white metal mill bearings.This led to the higher temperature rise in mill bearings .In such a condition maintaining the appropriate mill setting was not possible. A centralized & pressurised lubrication system has to be installed at mills..

Technical & Financial analysis		
Present moisture % Bagasse	51	%
Proposed Moisture % Bagasse	48.5	%
Present sugar content in Bagasse	2.45	%
Proposed sugar content in Bagasse	1.85	%
Steam Produced for the year 2002 - 2003	336207	Tons
Bagasse consumed for the year 2002 –03	171130	Tons
Fuel to steam ratio	1.96	
Steam produced for the year 2003 – 2004	315755	Tons
Bagasse consumed for the year 2003-04	153457	Tons
Fuel to steam ratio	2.05	
Bagasse saved	4905	Tons
Cost saved Rs in Lakh	5.64	
Actual investment Rs	9.4	
Year of Implementation	1/4/2003	

Impact of implementation: : The centralized & pressurised lubricator has been installed & Hydraulic "O" Rings have been replaced. Bagasse saving of 4905 Tons / annum

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : Descaling of turbo alternator condenser

Back ground of the project:

This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.The vacuum pressure at the condenser was 0.6 Kg/cm^2 as against the designed condenser pressure of 0.89 Kg/ cm^2.The specific steam consumption of the Frame-13 turbine was high at 8.3 T/MW

Observations made:

The reduction in vacuum & Increase in the steam consumption is due to the scaling in the condensers. The condenser has to be cleaned with chemicals and then by bullet shot method.

Technical & Financial analysis		
Description		UOM
Barometric reading	742.00	
Turbine Designed vacuum	640.29	mm of Hg
Vacuum maintained	431.65	mm of Hg
Difference in vacuum due to scaling	208.63	mm of Hg
Inlet cooling water temp	33.00	^oC
Outlet water temp	38.00	^oC
Hot well temp	71.00	^oC
Enthalpy of vapour at - 0.89 kg/cm2 vacuum	619.00	Kcal/kg
Enthalpy of vapour at - 0.6 kg/cm2 vacuum	629.00	Kcal/kg
Energy lost	10.00	Kcal/kg
Average flow of steam to the condenser	10.00	MT
Energy lost/ hour	100000.00	Kcal/kg
Equivalent energy/KWH	860.00	Kcal/kg
Power lost/hour	116.28	KWh
Power loss/day due to low vacuum	2790.70	KWh
Revenue loss/season(60 days)	5.2	Lakh Rs
Actual investment Rs in Lakh	1.0	Lakh Rs.
Implementation Date	1/2/2004	

Impact of implementation:

The condenser pressure is being maintained at 0.82 Kg/cm2 and the specific steam consumption has got reduced to 6.5 T/MW.

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : **Insulation of sulphur burner melter steam line**

Back ground of the project:
This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.The 2 " steam line from PRDS to sulfur burner is not insulated

Observations made:
The 2" pipe line has to be covered with 75 mm LRP mattress and then covered with aluminum cladding for a distance of 60 m

Technical & Financial analysis		
Length of the steam line	60	M
Steam Pressure	7	Kg/ cm^2
Steam temperature	180	^oC
Heat loss in 2" line	615	BTU/Linear foot
Total Heat loss /Hr	122877	BTU
Steam saved per hour	0.013	Tons
Operating days considered	60	Days
Steam saved per season	18.72	Tons
Power that can be generated because of the steam saved @ specific steam consumption of 8.62 T /MW	2171	kWh
Excess revenue generated Rs in Lakh	0.06	
Actual investment Rs in Lakh	0.20	
Implementation Date	1/2/2004	

Impact of implementation: Sulfer burner steam line insulated and 0.3 ton of steam saved

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu

Write up of ENCON implemented in 2003-04

Project Title: Reduction of excess blow downs in boiler

Back ground of the project

This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.Additional Blow down was given twice a day due to higher TDS of boiler water. Conventional treatment like phosphate & hydroxide based treatment was given as antiscalant & pH booster. The boiler water pH has to be maintained 9.5-10.5.This led to higher TDS in boiler water

Observations made

Aliphatic poly amine based chemical is to be used instead of conventional chemical,which will have the following benefits:

1.Film forming amine 2.Dispersing amine 3.Nuetralising amine

4.pH can be maintained at a lower limit of 8.5-9.5

Technical & Financial analysis		
Existing chemical (Acqua chem 240,260,281 & 360) usage/day	34.5	Kg/day
Solids present in the chemical	30%	
Total solids in boiler water due to the addition of chemicals	13.8	Kg/day
Addition of Noah with the proposed chemical eloguard	5	Kg/day
Solids present in the proposed chemical	100%	
Total solids in boiler water due to the addition of Noah with the proposed chemical	5	Kg/day
Excess total solids in boiler water due to existing chemical	8.8	Kg/day
Boiler water TDS	800	PPM
Blow down required to remove 8.5 kg/day of TDS	11	Tons/day
Reduction in Blow down by replacing the old chemical	10	Tons/day
Sensible heat in Blow down	251	Kcal/kg
Total heat of steam	770	Kcal/kg
Steam saved	3.59	Tons/day
Power that can be generated by the steam saved	416	kWh
Power that can be generated for 60days	24960	kWh
Revenue generated per annum in lakh Rs.	0.78	
Cost savings due to new chemicals Rs in Lakh .	0.48	
Total revenue generated by the Proposal	1.26	
Actual investment Rs	Nil	
Implementation Date	1/2/2004	

Impact of implementation: After usage of polyamine chemicals additional blow down at both the boilers have been avoided. Also the cost of polyamine chemical used is lesser than that of conventional chemicals cost used earlier

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title To Arrest LP steam leakages

Back ground of the project: The is energy conservation project was identified in the internal Energy Audit carried out in 2003-4.LP steam leakage's were observed in the following areas:

Deaerator safety valve,Deaerator uncontrolled vent, Distillery safety valve,Fr-2 Turbine exhaust drain valve, Pan vapour line drain valve, Pan cut over line washing steam valve & sulphur melter drain valves

Observations made:

Deaerator safety valve is to be removed and loop seal arrangement to be provided to maintain 0.5 Kg/cm2 pressure. Valve to be provided in the Deaerator vent. Distillery safety valve has to be overhauled. Leaky drain valves in the turbine drain line & pan vapour drain line has to be replaced.

Technical & Financial analysis:

Loop seal was provided for Deaerator. Valve was provided for control vent and leaky drain valves were replaced. Steam traps-14 nos. & steam valves 2 nos. were replaced. The leakage through the defective valves and drains amounts to 0.7 tons of LP steam per hour. The leakage's were measured based on their line sizes and quantified as 20 % of the normal flow.

Quantified Leakage's		
01.Frame 2-turbine exhaust Drain valve. 02 Melter drains 03. Pan cut over drains 04. Distillery safety valve 05. KCP boiler safety valve leak. 06. pan vapour line drains	0.01374 0.17022 0.05497 0.21987 0.21987 0.05497	Tons/hr Tons/hr. Tons/hr. Tons/hr. Tons/hr. Tons/hr
Total Steam leakage identified / hour	0.7	Tons/hr
Steam saved /day by arresting the leakage	17.52	Tons
Operating days considered	60	Days
Steam saved per Annum	1051.2	Tons
Cost of LP steam in Rs	41	
Excess revenue generated Rs in Lakh	0.43	
Actual investment Rs in Lakh	0.65	
Implementation Date	1/2/2004	

Impact of implementation:

The project has been implemented and 17.5 Tons of LP steam is saved per day

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : To use Evaporator Vapor for pan washing instead of Exhaust steam

Back ground of the project

This energy conservation project was identified in the internal Energy Audit carried out in 2003-4. Batch pans are washed after every strike with exhaust steam to remove sugar crystals from the pans.

Observations made

Since it is only a washing process, Exhaust steam is not needed. The washing can be done with vapor of 1st evaporator. The exhaust steam can be conserved.

Technical & Financial analysis		
Present exhaust steam consumption /hour	1.24	Tons
Proposed exhaust steam consumption/hour	0	Tons
Exhaust steam saving/day	29.76	Tons
Annual exhaust steam savings	1785	Tons
Excess revenue generated Rs in Lakh Rs.	0.75	
Actual investment Rs	Nil	
Payback period in years	Immediate	
Implementation Date	1/2/2004	

Impact of implementation Evaporator vapor is being used for pan washing instead of exhaust steam

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : To Replace the under loaded clear juice pump & syrup extraction pump with lesser capacity motors

Back ground of the project:
The 40 HP clear juice pump, pumps the clear juice from the juice Clarifier to the evaporator. The 25 HP syrup extraction pump, pumps the syrup from the evaporator to the pans.

Observations made :
Both the clear juice pump & syrup extraction pump are under loaded. They can be replaced with the 35 HP & 20 HP motors available in house.

Technical & Financial analysis		
Present Energy consumption /day	796	KWh
Proposed Energy consumption/day	726	KWh
Energy savings/day	70	KWh
Operating days considered	60	Days
Annual Energy savings	4200	kWh
Excess revenue generated Rs in Lakh	0.13	
Actual investment Rs	nil	
Implementation Date	1/2/2004	

Impact of implementation :
The clear juice pump motor & syrup extraction pump motor have been replaced with lesser capacity motors

Rajshree Sugars & Chemicals Limited,Varadaraj Nagar ,Theni(Dt),Tamil Nadu
Write up of ENCON implemented in 2003-04

Project Title : "A" Centrifugal auxiliary Motors are to be stopped during A centrifugal stoppages due to want of "A" massecuitte

Back ground of the project

This energy conservation project was identified in the internal Energy Audit carried out in 2003-4.The "A" centrifugal auxiliary motors were running idle during "A" machine stoppage time.

Observations made

There is an average stoppage of one hour per day at the "A" centrifugal station. There are 14 auxiliary equipments of 115 HP at different locations. A common master trip push button is to be provided at the centrifugal floor to switch off the auxiliary motors.

Technical & Financial analysis		
Present Energy consumption /day	52	kWh
Proposed Energy consumption/day	0	Kwh
Energy savings/day	52	Kwh
Annual Energy savings	3120	Kwh
Excess revenue generated Rs in Lakh	0.097	
Actual investment Rs in Lakh	0.05	
Implementation Date	1/2/2004	

Impact of implementation

Now "A" centrifugal auxiliaries are switched off during "A" machine stoppages