ENERGY SAVING OPPORTUNITIES
in
CHLORE ALKALI SECTOR

SOM DERASHRI

MD, AEA (BEE)

INTERNATIONAL TRAINER FOR

CEA (AEE, USA), CEM (AEE, USA), CMVP(EVO, USA)

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ISO 9001:2015 CERTIFIED

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ENERGY SAVING OPPORTUNITIES IN CA

No	PRESENT SYSTEM	PROPOSED SYSTEM	ENERGY SAVING
1	The 48% caustic lye from CEU at 90'C is being cooled to 50'C by cooling water & then stored in the tanks for feeding to Flaker & marketing tankers	Feed 48% lye at 90'C directly to Flaker to save cooling load & again heating by steam to be fed to Flaker.	1. Cooling Water 2. Energy used for reheating 48% lye from 50-60'C storage to flaker 3. Payback less than 1 year
2	The hot 48% lye from CEU is cooled by cooling water to 50'-60C & stored in tanks for marketing.	Generate hot DM water 90'C/80'C in present Ni PHE to cool the 48% lye to 81'C and use this hot water to generate chilled water in VAM 10/15'C which can be used in control room air conditioning. Further cool the 48% Lye from 81'C to 50-60'C by pre-heating the Boiler Feed Water.	1. AC load from electricity to waste heat recovery VAM for control rooms 2. BFW pre heat to save NG 3. Reducing the cooling water load 4. 3. Payback less than 1 years
3	The steam from Flaker is vented to open atmosphere at 270'C from the last stage.	To utilise the vent steam after saturating it by fogger/mist and compressing it in the steam screw compressor MVR to 3.5/10 barg for utilisation as process steam.	1. NG saving as MVR generates steam with COP of > 7 (for 3.5 barg) 2. Lesser Steam to be generated in boilers. 3. Water Conservation as now there is no steam vent. 4. Payback 1-2 years

ENERGY SAVING OPPORTUNITIES IN CA

N	PRESENT SYSTEM	PROPOSED SYSTEM	ENERGY SAVING
4	80 bar RLNG is reduced by PRV to 40 bar & then from 40 bar to 20 bar by PRV for use in Gas turbines.	Use NG expander to generate power by pressure reduction and also lower the cooling water temp going to Steam condenser and get better vacuum & more power.	1. Additional power generation without burning NG. 2. Higher power generation in condensing steam turbine due to lower condenser temperature 3. Payback period ~ 2-3 years
5	NG boilers with flue gas exhausts at ~ 180'C is a waste of energy	Condensing Boilers to have flue gas exhausts at 55'C meeting all pollution norms as there is no Sulphur in the NG	1. Saving NG 2. Saving environment – no heat exhaust 3. Payback period 1-2 years
6	Electricity board Tariff has TOU Night: 10 pm to 6 am : Rebate of Rs 0.43/kWh Peak Hours: 7 to 11 am & 6 pm to 10 pm: Penalty of Rs 0.85/kWh ED @ 15% For any load shift from Peak to Night gives benefit of (0.43+0.85).1.15 = Rs. 1.472/kWh	Exploit TOU and run higher CD during Night time & lower CD during Peak hrs to save Rs. 1.472/kWh without changing the daily output.	1. No energy saving but Energy cost reduction by TOU exploitation of nearly 10 lakhs/yr

ENERGY SAVING OPPORTUNITIES IN CA

N	PRESENT SYSTEM	PROPOSED SYSTEM	ENERGY SAVING
7	Big Cooling water pumps (> 100 kW) are being run in parallel without knowing their efficiency.	After checking the efficiency (baseline) we guarantee 5% improvement by coating at site with just 1 day after sand blasting, pre & final special anti-corrosive, ANTI-Erosive & hydrophobic USA based coating, impeller balancing & boxup	1. Improved efficiency of pump 2. Lower power consumption /higher flow per pump. 3. Enhanced pump life 4. Payback – 1-2 years
8	V belt transmission system in compressors/blowers	Sandwiched multi-layered flat belt with crowned pulleys save 5% power	1. Reduced power consumption 2. Reduced slip 3. Increased belt life 4. No black particle generation 5. Payback period less than 1 yr
9	10 bar steam is fed to cell house at 1 bar thru PRV to maintain brine temperature being fed to cell.	Install Micro turbine to generate power by production	1. Saves Power generated 2. Payback period less than 1 yr

DIRECT FEEDING OF 48% LYE AT 90'C FROM CEU TO CCU WITHOUT COOLING FOR STORAGE

48% CSL flow to CCU = 10 m3/hr
= 10*1.48
= 14.8 MT/Hr

Energy required to increase temp of 48% CSL from 60 C to 90 C in pre-heater

= 14.8*0.826*(90-60)*1000
= 366744 kcal/hr
Where 0.826 is specific heat of 48 % CSL

Running hrs. per year =7920 hr/yr
Saving in energy per year = 366744 * 7920
= 2904612480 Kcal/yr
Saving in steam in preheater =366744/656
= 559 kg/hr
Saving in steam per year = 559 * 7920
= 4427763 Kg/yr
Saving in NG per year =4427763 *0.082 (0.082 is ratio of NG to steam)
= 363076 Nm3/Hr
Rate of NG = Rs.40/ Nm3

Saving in Rs. Per Year **= 363076 * 40 = 14523040 Rs./Yr**
Investment in pipe line **= Rs 10000000/-**
Payback period **= 9 months**

GENERATE CHILLED WATER & PREHEAT BFW FROM 48% CSL @ 90'C

***Generate hot water thru existing Ni PHE & use it in VAM to Produce Chilled Water (10/15'C)**

***Raise hot water (BFW) temperature from 55'C to 80'C.**

Calculation for a 300 TPD of 48% Lye is sold in the market

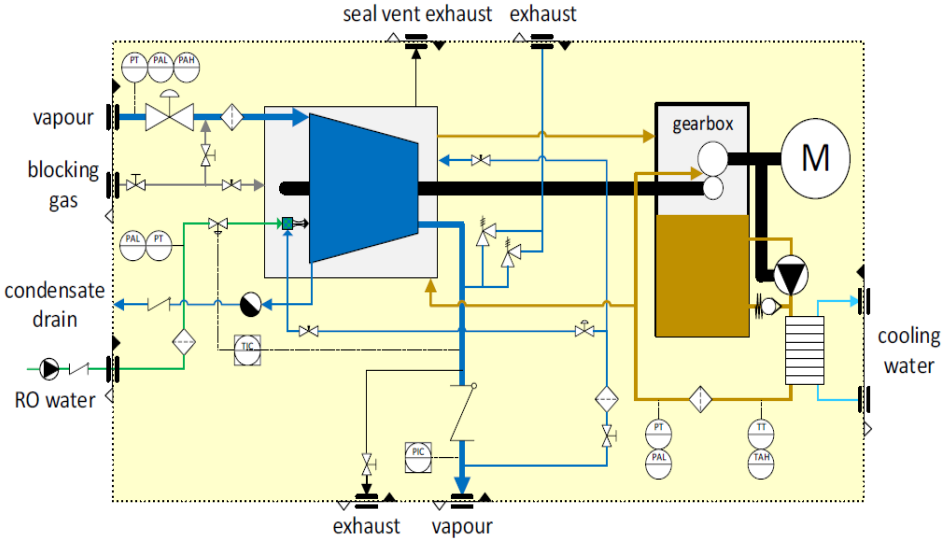
Lye volume at 48% = 300/0.48 = 625 m3/day or 26 m3/hr
Working days in a year = 350 days / year
Power rate = Rs 8.5 / kWh, Density of 48% Lye = 1.48 kg/m3, Cp = 0.826 kcal/kg'C
Heat lost by 48% lye from 90'C to 80'C = 26 x 1000 x1.48 x 0.826 x 10
= 317844 kcal/hr
This is heat gained by the hot water flowing through the VAM 90/80 'C
Mass flow rate of hot water in VAM @ 95% HE eff. = 317844x 0.95/(1x10)
= 30195.2 kg/hr say 30 m3/hr
Expected TR from 30 m3/hr 90/80 'C hot water VAM = 90 TR (7/12'C)
Expected cost of VAM @ Rs 33000 /TR = 30 lakhs
Cooling water needed for the VAM @ 1.27 m3/TR = 114 m3/hr for 6'C approach
Cooling Tower available (@6'C approach) = 26 x 1000 x1.48 x 0.826x(90-50) = 211m3/hr
Heat gain by 80'C Lye to pre heat Boiler feed water from 55'C (e condensate) to 80'C
Heat in 48%Lye 80'C to 55 'C for storage & HE eff 95% = 317844 x (80-55) x 0.95/10
= 754880 kcal/hr
The BFW available at 80'C = 754880 / (1x25) = 30 TPH
Load reduction in CT 211 – 114 = 97 m3/hr
kW saved in CT = Pump + CT Fan (97/3600) x 40 x 9.81/(0.8x0.93) + 5 = 20 kW
kW in VAM = 5 kW
Net kW saving @ 0.6 kW/TR for 90 TR = (90 x 0.6+ 20-5) x 24 x 350 = 579600 kWh/yr
Net Rs power saving@ Rs 8.5/kWh = 579600 x 8.5 = Rs. 49.27 lakhs/Yr
Coal Saved by BFW heating/yr = (Rs/kg 6/(6000 kcal/kg*0.9 (eff)) x 754880 x 24 x 350 = Rs 70.45 lakh/yr

Total Saving in VAM + BFW Heating in Rs = 120 Lakhs/yr
Investment in VAM + PHE + pump & Piping insulations etc. = 30 + 20 + 40 = 90 Lakhs
Payback Period = 9 Months

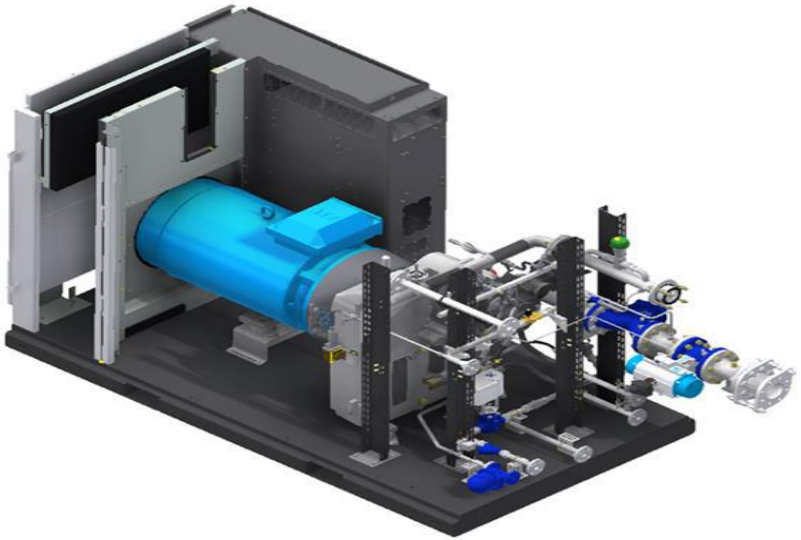
Mechanical Vapour Recompression(MVR)

Features and Benefits:

- Certified 100% droplet-free steam
  - Peace of mind for your products and processes
- Variable speed motor
  - Efficiency
  - No energy losses with varying flow profiles
- Integrated de-superheating converting almost all compressor energy into extra steam
- Improved element design with minimal rotor backlash
  - Improved efficiency - lower running costs
- Complete installation with all connecting pipes
  - Easy on-site installation
- Low-noise operation
  - High flexibility in noise-sensitive installations
- IP23-IP55 TEFC motor
  - Excellent dust protection
- Advanced electronic control
  - Connection
  - Compatible with ES system for multiple compressors
- Superior rotor coating
  - Nickel coating for protection against corrosion
  - Walk-in capability resulting in minimal backlash



Single-stage Z VSD steam compressor



Mechanical Vapour Recompression(MVR)

Vent Steam quantity from CCU

NaOH Flake Production	250	MT/Day
NaOH Flake Production	10.4	MT/Hr
% concentration NaOH flake	98	%
Pre concentrator	48	%
Post Concentration	58	%
CP of NaOH	0.72	kcal/kg'C
Water evaporated		
water at 48% NaOH	1.083	kg/kg of NaOH
Water at 58% NaOH	0.724	kg/kg of NaOH
Water evaporated in making 48% to 58%	0.359	kg/kg of NaOH
Heat in vent steam	540	kcal/kg of steam
Heat needed to evaporate	194	kcal/kg of NaOH
Flaker		
Water at 58%	0.724	kg/kg of NaOH
Water at 98%	0.020	kg/kg of NaOH
Water quantity to be removed	0.704	kg w/kg of NaOH
Heat in vent steam	720	kcal/kg steam
Heat needed to evaporate	507	kcal/kg of NaOH
Net heat being vented	313	kcal/kg of NaOH
Steam Vented	0.434	kg/kg of NaOH
Steam temp @ venting	270	C
Steam temp after de-super heating	102	C
Steam vented super heated available for compression	4524	kg/hr
Cp of steam	0.4	kcal/kg'C
water needed to cool steam to 102'C	304033	kcal/hr
Water qty needed to de-superheat steam 270'C to 102'C	497	kg/hr
Total steam @102'C available for compression	**5021**	**kg steam/hr**

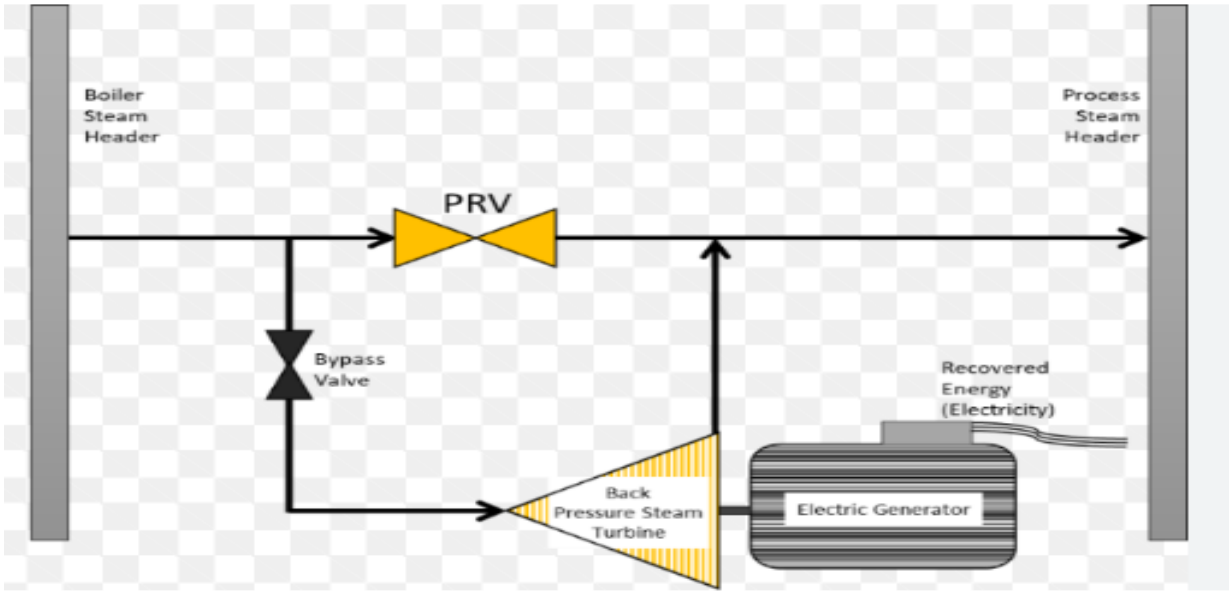
Techno-Commercial Details

Actual Conditions	**Value**	**UOM**
Max steam flow rate	**5021**	**kg/hr**
Inlet steam Pressure	0	barg
inlet steam temp	102	C
De superheating during compression	502	kg/hr
Outlet steam flow	**5523**	**kg/hr**
Outlet pressure	4.5	bara
Outlet steam Temp	158	C
Electricity input	515	kW
Enthalpy of steam	656	kcal/kg
Net enthalpy gain in compressor	554.0	kcal/kg
COP	**6.91**	**kal/kcal**
Electricity rate	**8.5**	**Rs/kW**
Steam rate	**3**	**Rs/kg**
Economics		
Saving in Steam	16570	Rs/hr
Input Power cost	4378	Rs/hr
Net Saving in Rs	12192	Rs/hr
Running Hrs	8000	Hrs/yr
Saving per year	97536794	Rs/yr
Net Saving per year by steam generation	**9.75**	**Rs.Cr./Yr.**
Expected Payback period	**1.50 - 2**	**Years**

BYE PASS PRV BY INDUCTION TURBINE 7 BAR STEAM TO 1.2 BAR

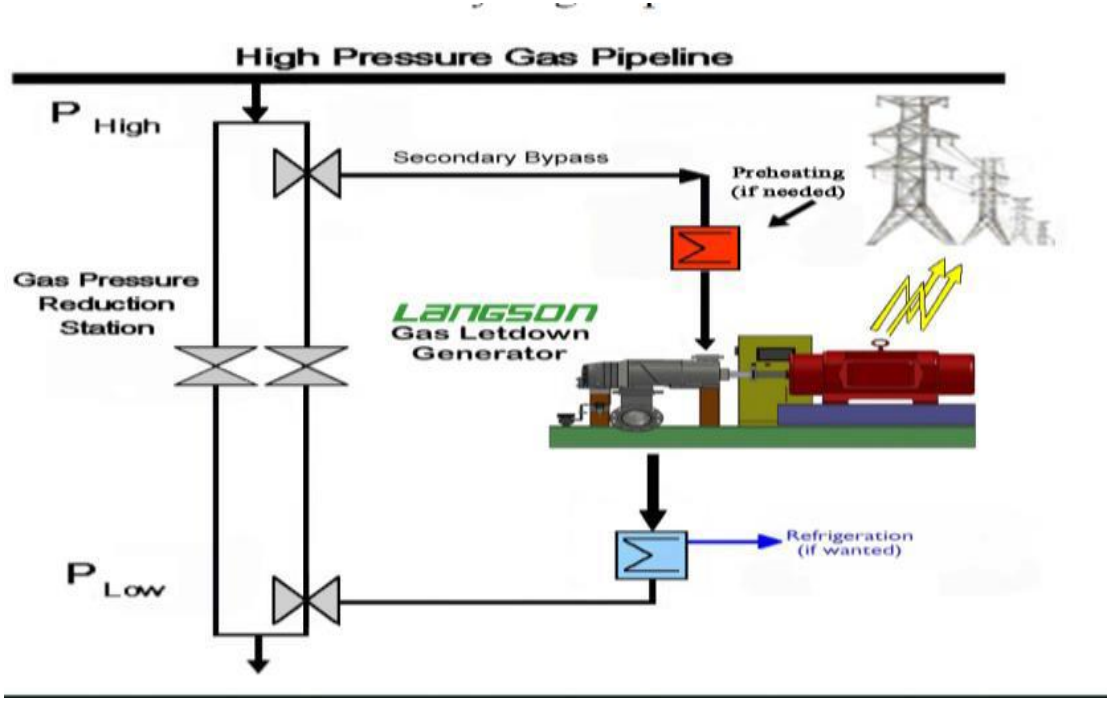
Used for Brine heating during winter 7 TPH & Summer 4 TPH.

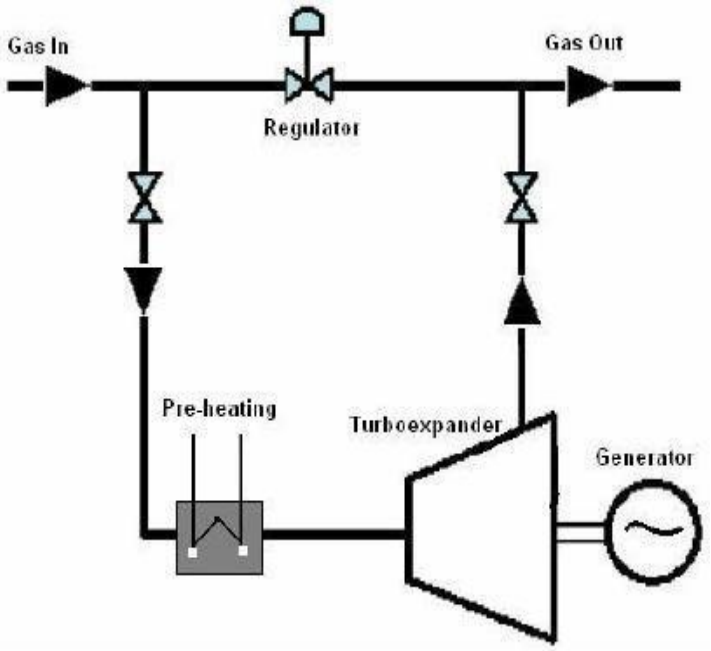
BACK GROUND INFORMATION			
Steam Parameters	**Pressure**	**Temperature**	**Flow**
Turbine Inlet Parameters	8.0 kg/cm²	175°C	7.0 tph
Extraction Parameters	0.0 kg/cm²	Nil	0.0 tph
Turbine Exhaust Parameters	1.2 kg/cm²	123°C	7.0 tph
Steam Turbine Configuration :			
Dual Entry Back Pressure ECT™ @ 12,000 r.p.m.	240 kW	IG based system	



DESCRIPTION		VALUES	REMARKS
BASIC ASSUMPTIONS :			
Electricity (kW-h) Generated through Turbine During winter		240 kW	
Number of Hours Turbine Running per Day		24 h	
Electricity (kW-h) Generated through Turbine per Day		5,760 kWh/day	
Number of Days Turbine Running During winter		90 Op. days/yr	3 Months
Electricity units Generated through Turbine During winter		518,400 kWh	
Prevaling Electricity tariff ₹/KW-h		Rs. 7.00	Consideration
Savings over Prevaling Electricity tariff During winter		₹ 3,628,800	
Steam Flow		7,000 kg/h	
Electricity (kW-h) Generated through Turbine During other months		120kW	
Number of Hours Turbine Running per Day		24 h	
Electricity (kW-h) Generated through Turbine per Day		2,880 kWh/day	
Number of Days Turbine Running During Other months		270 Op. days/yr	9 Months
Electricity units Generated through Turbine During other months		777,600 kWh	
Prevaling Electricity tariff ₹/KW-h		Rs. 7.00	
Savings over Prevaling Electricity tariff During winter		₹ 5,443,200	
Steam Flow		4,000 kg/h	
TOTAL SAVINGS		₹ 9,072,000	
ECONOMIC CONSIDERATION			
Capital Investment			
Basic price		78,50,000	
+ CGST @ 9%		Rs. 000,000	Refundable
+ IGST @ 9%		Rs. 000,000	Refundable
Total		78,50,000	
+ Transportation		Rs. 00,000	
+ Insurance		Rs. 0,000	
+ Supervison of E & C + Service Tax (18%)		Rs. 236,000	
Landed Equipment Cost		80,86,000	
+ Indicative Cost of Balance of Plant (Customer Scope) – Civil, etc		Rs. 750,000	
Total CAPEX for the Incidental Co-Gen		Rs. 8,836,000	
PAYBACK			
Gross Savings(Annual)		Rs. 9,072,000	
Total Estimated cost		Rs. 8,836,000	
Payback		0.97 Years	
Payback in Months		11.7 mths	

LNG EXPANDER 80 BAR TO 20 BAR FOR GAS TURBINE POWER GENERATION POWER PLANT.



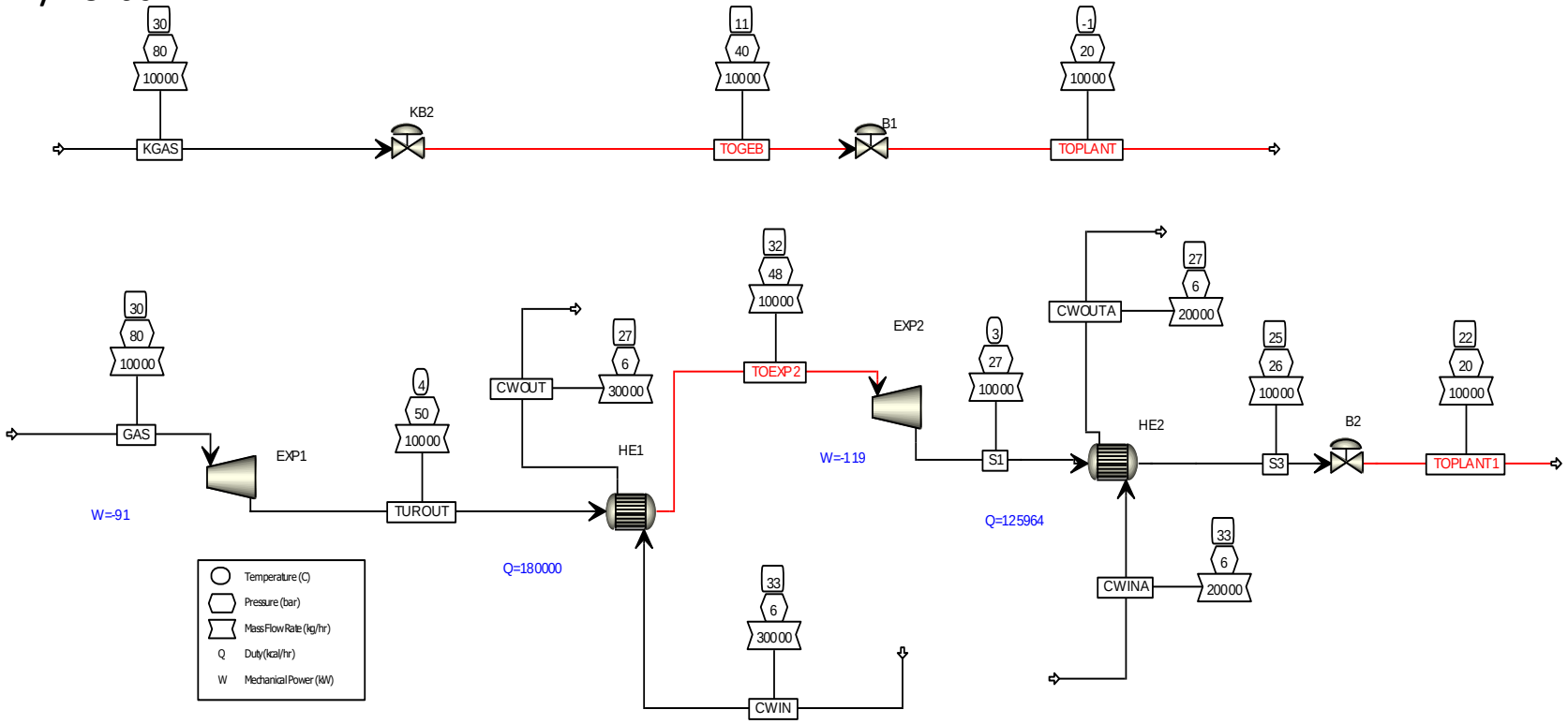


Some of the reputed suppliers of turbo expanders are as follows:

1. Honeywell,
2. LA TURBINE, USA,
3. Atlas Copco
4. Siemens
5. GE
6. LANGSON

LNG EXPANDER 80 BAR TO 20 BAR FOR GAS TURBINE POWER GENERATION POWER PLANT.

Presently, 2 stage expansion of LNG to 20 bar is as follows:
80/50 bar – thru a PRV under scope of LNG gas supplier (GAIL/RIL)
50/27 bar – internal to a DC
27/20 bar – PRV



Proposed: * Expander#1: 80 bar to 50 bar generating – 91 kW
* Expander#2 – 50 bar 30'C to 27 bar, 3 'C - -119 kW
* Total power Generation potential – 210 kW
* Reheat LNG after expander for process. Use cool effect in cooling water fed to a condensing steam turbine's condenser to get better vacuum & additional power

EXPLOIT TIME OF USE TARIFF HTP-1 IN GUJARAT TO SAVE ENERGY COST/MT

Power rebate during night hours - (10 pm to 6 am): Rs. 0.43/kWh
Penalty (TOU) during peak time – (7 am to 11 am) & (6 pm to 10 pm): Rs. 0.85/kwh
Normal tariff during 11 am till 6 pm – > 2500 kVA – Rs. 4.30/kWh
Elect duty@ 15%
The impact of shifting Load from peak hrs to night hrs =(0.43 + 0.85)x1.15 =Rs. 1.472/kWh

Adopt the following strategy:

to have slightly higher Current Density during night hrs: CD = 4.2
Reduce CD during the peak hours: CD = 3.8
Run Normal CD during normal hours: CD = 4

Particular	UOM	Value	Value	Value	Remarks
Rectifier efficiency	%	96	96	96	
No of Elements	Nos	100	100	100	Assumed
Area of each element	M2	2.72	2.72	2.72	Membrane area
Current I	kA	10.88	10.34	11.42	
Current Density i	kA/m2	4	3.8	4.2	
TOU Time		Normal tariff (6 am to 7 am & 11 am to 6 PM)	TOU Penalty (7 am to 11 am & 6 pm to 10 PM)	Night concession (10 pm to 6 am)	
Elect. Tariff HTP-1, Gujarat	Rs/kWh	4.3	5.15	3.87	TOU Penalty 0.85/kwh, Night rebate -0.43/kwh
Ucell	V	3.288	3.24	3.33	Ucell = (Uo + k * i) v, Uo = 2.42v , k=0.217 v
Cell Efficiency	%	97	97	97	Assumed
DC Power	kW	2673	2624	2722	670*Cell Voltage/Cell Efficiency

POWER BILL WITHOUT TOU CONSIDERATION AT FIXED CD

PPC	Sr	Period	Penalty Rs/kWh	Applicable Rate Rs/kWh	TOU	Duration Hrs	CD kA/m3	Production (32% CS lye) TON	DC Power consumption kWh/T	Est. AC Power consumption kWh/T	Power Bill kWh/day	Power Bill Rs/day
WITHOUT TOU EXPLOITATION AS AT PRESENT	1	Peak Tariff	0.85	5.15	7 AM TO 11 AM	4	4	6.24	2673	2785	17365	89429
	2	Peak Tariff	0.85	5.15	6 PM TO 10 PM	4	4	6.24	2673	2785	17365	89429
	3	Night Tariff	-0.43	3.87	10 PM to 6 AM	8	4	12.47	2673	2785	34730	134404
	4	Normal Tariff	0	4.3	6 AM TO 7 AM	1	4	1.56	2673	2785	4341	18667
	5	Normal Tariff	0	4.3	11 AM to 6 PM	7	4	10.91	2673	2785	30389	130671
	6	Total/ Average				24	4	37.41	13367	13924	104190	**462601**

POWER BILL WITH TOU EXPLOITATION

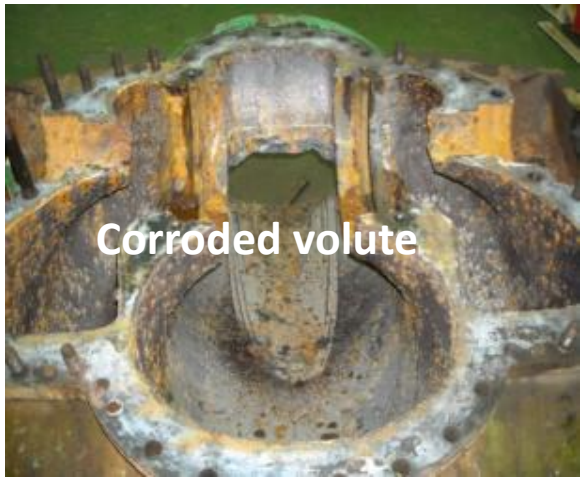
PPC	Sr	Period	Penalty Rs/kWh	Applicable Rate Rs/kWh	TOU	Duration Hrs	CD kA/m2	Prodn. 32% CS Lye Ton/day	DC Power consumption kWh/T	Est. AC Power consumption kWh/T	Power Bill kWh/day	Power Bill Rs/day
WITH TOU EXPLOITATION	1	Peak Tariff	0.85	5.15	7 AM TO 11 AM	4	3.8	5.92	2624	2734	16193	83396
	2	Peak Tariff	0.85	5.15	6 PM TO 10 PM	4	3.8	5.92	2624	2734	16193	83396
	3	Night Tariff	-0.43	3.87	10 PM to 6 AM	8	4.2	13.09	2722	2836	37134	143709
	4	Normal Tariff	0	4.3	6 AM TO 7 AM	1	4	1.56	2673	2785	4341	18667
	5	Normal Tariff	0	4.3	11 AM to 6 PM	7	4	10.91	2673	2785	30389	130671
	6	Total/ Average				24	4	37.41	13318	13873	104251	**459840**

Savings/Year > Rs. 10 lakhs , with Zero investment only by adjusting CD according to TOU TOU

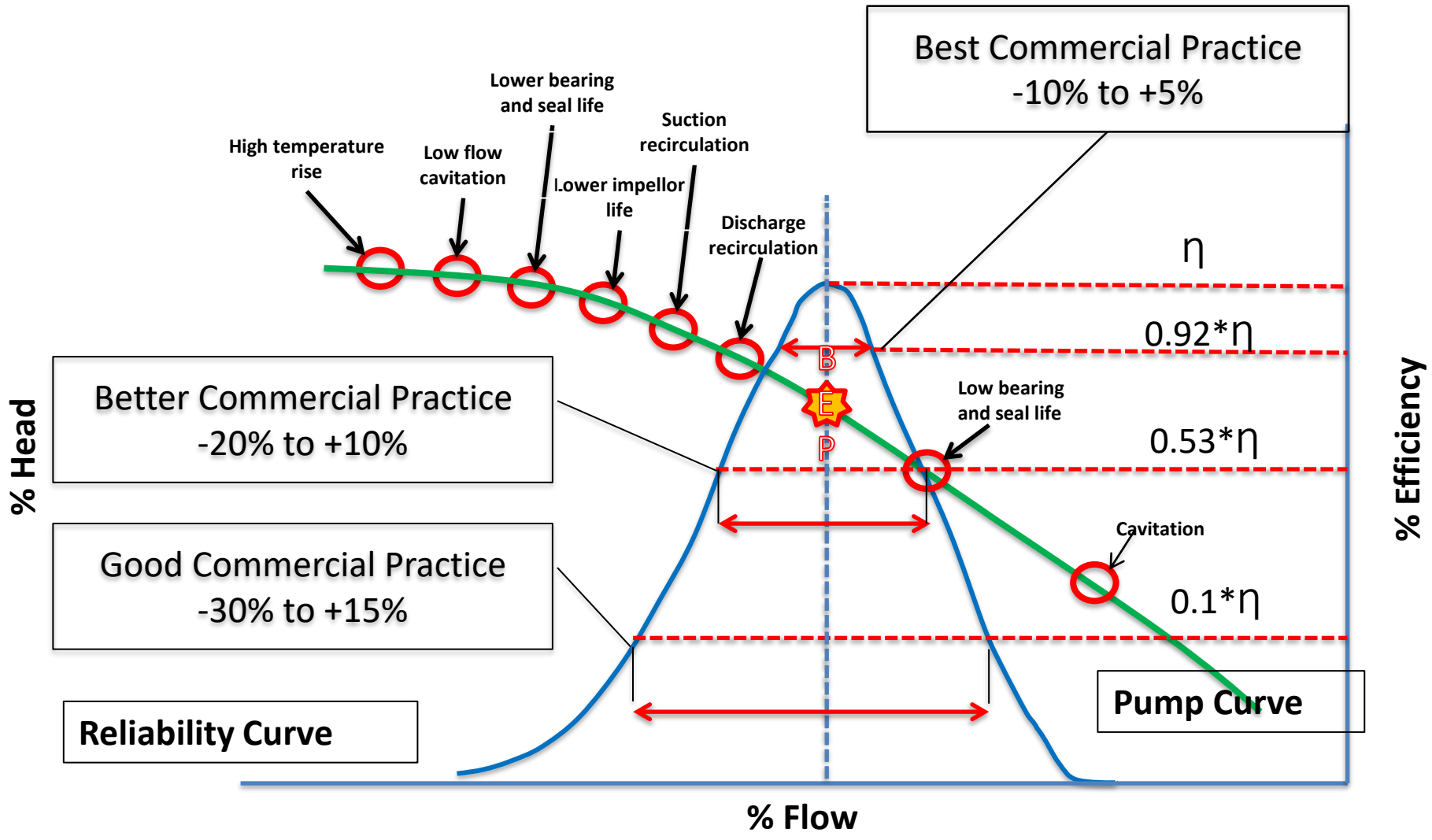
COMPONENTS OF PUMP WHICH CAN IMPACT PERFORMANCE AND EFFICIENCY

AGEING & OTHER EFFECTS ON PUMP PERFORMANCE & COATING TO IMPROVE EFFICIENCY

CAVITATION



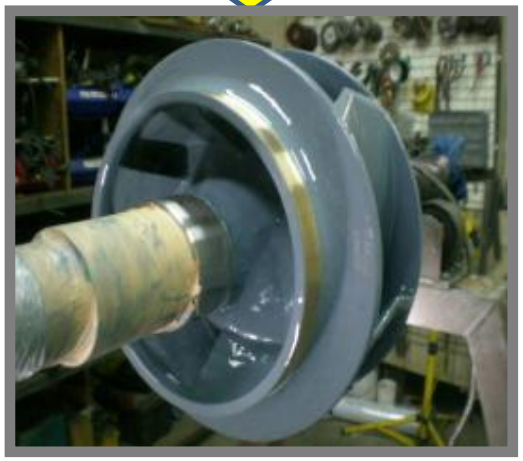
PUMP EFFICIENCY AND CRITICAL IMPACT POINTS



UPGRADING AND PROTECTING PUMP WETTING PARTS
BY
SPECIAL COATING
GUARANTEED EFFICIENCY IMPROVEMENT








PUMP COATING OBJECTIVE

- Increase Capacity (Q, H)
- Decrease Life Cycle Costs
- Increase MTBF
- Increase Pump Efficiency
- Decrease Power Consumption

(Normally after coating, the flow increases. So adjust it to the baseline to compare power saving)

- Reduced Vibration & Noise
- Decrease Maintenance

PROCEDURE FOR PUMP COATING

- **Establish base line**: Measure Flow, Head, Density before coating & calculate Pump Efficiency $\acute{\eta}_p$ % **=**

  $\{Q(m/s).H(m).\rho(kg/m3).g(m/sec2)/(1000.kW_{in}.\acute{\eta}_m)\}$. 100

- Q- Ultrasonic flow meter (TTD/Doppler)
- H – Total Head (Pump Discharge Head – Suction Head)
- kW_{in} = Power input to motor (1.732 x V x I x Pf or kW)
- Dismantle Pump* – Sand-blast wetted parts (5 bar comp air at site) – Coating (Primary & Final) – Dry Coat – Balance Impeller – Reassemble Pump* – Measure (Q, H, kW)
- **Establish Final Efficiency %**

(A min. 5% Improvement in Efficiency is Guaranteed for old pumps > 3 years)

*Dismantling & Reassembly is in client's scope

Two pumps coating in a day is possible & one day for drying & balancing

Cooling Tower No.1 (HCl) Pump No. D performance

Particulars	Before Coating	After Coating(07.07.2022)	28.12.2022
Flow (m3/Hr)	1212	1650	1672
Suction Pr. (Mtr)	1	1	1.1
Disc. Pr. (Kg/Cm2)	3.75	3.75	3.95
Power (KW)	213.8	213.8	213.23
Motor Efficiency(%)	95	95	95
Pump Efficiency(%)	**59**	**81**	**86**

Cooling Tower No.1 (HCl) Pump No. B performance (Baseline data)

Particulars	Before Coating (28.12.2022)
Flow (m3/Hr)	1216
Suction Pr. (Mtr)	1
Disc. Pr. (Kg/Cm2)	3.95
Power (KW)	223.
Motor Efficiency(%)	95
Pump Efficiency(%)	**60.19**

28/12/22

P N PATEL
Sr. M (P)

H K PAJAPATI
Mgr. (E)

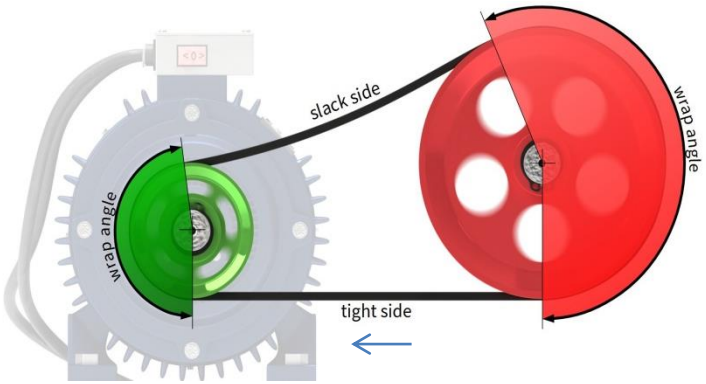
V K PATEL
Mgr. (M)

SOM DERASHRI
SIPL

IMPROVED TRANSMISSION SYSTEM

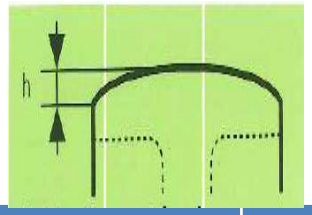
SANDWITCHED MULTILAYERED FLAT BELT FOR GUARANTEED 5% ENERGY SAVING

SANDWICH MULTILAYERED FLAT BELT WITH CROWNED PULLEYS DRIVE SYSTEM



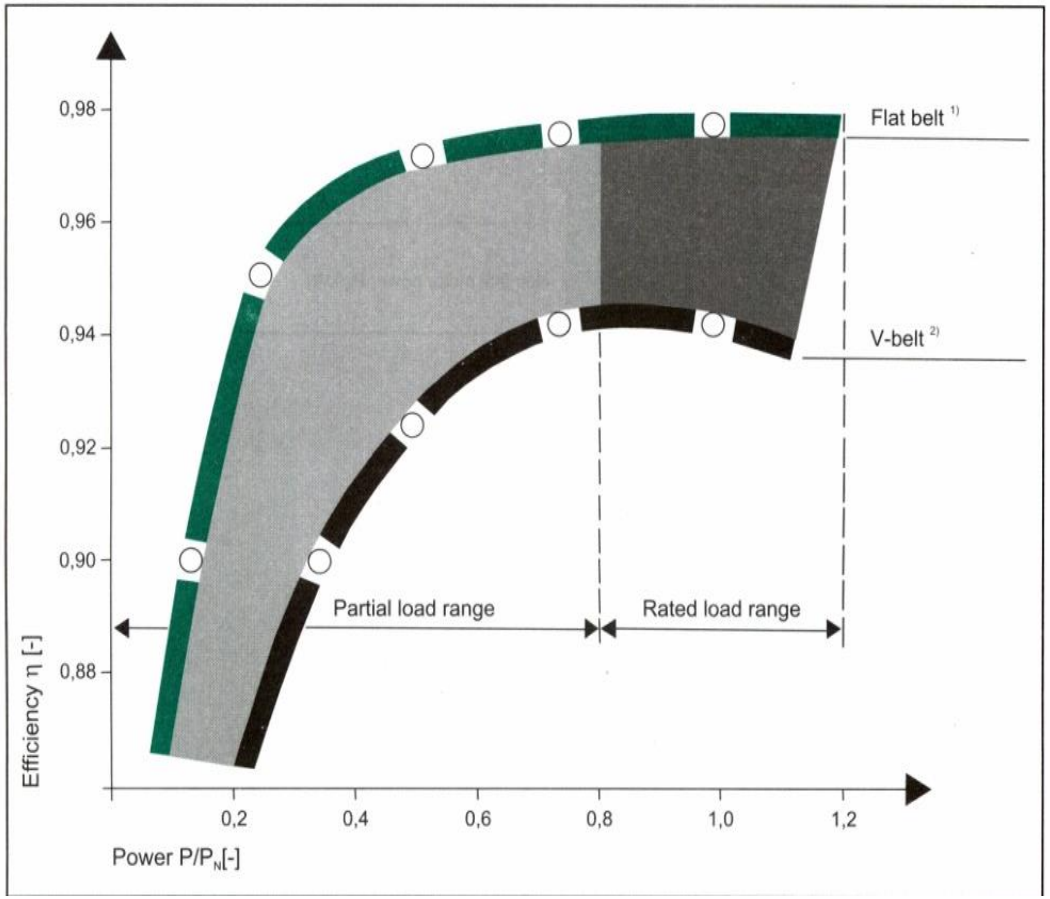
V BELT DRIVE SYSTEM WITH V GROOVED PULLEYS & MULTIPLE BELTS

V Belt vs SyGuru Sandwich Flat Belt & Crowned pulleys



Sr No.	Parameters	V Belt	SyGuru Flat Belt
1	Friction Loss	Wedging-in - Wedging-out in V groove @ 4 times RPM (1500x 4 = 6000 /minute)	Grips Crowned Pulley
2	Bending Loss	6000 times around the pulleys with thick cross section & number of belts	Thinner Cross-Section has significantly less Bending loss
3	Braking Action	Each belt has different Liner Speed (∏.D.N) as the V groove have different depths (No QC check) thus, a narrower V groove has higher belt 'D' making that belt run faster & other with low linear speed (Dangling) V belt which also imparts a breaking action resulting in Higher kW.	No differential speed as only one belt runs
4	Uneven Tension	Highest D belt takes maximum load & wears out faster & higher Slip.	Constant speed due to special MOC & lesser Slip
5	Short Life	With multiple belts only fastest running belt takes total load & results early breakdown	Guaranteed higher life compared to V belt
6	Higher Maintenance Cost	Multiple replacement & whole set is to be replaced not just the broken belt	Longer Life & Maintenance free
7	Black particle generation	Friction & wedging action results in Black particle generation in environment - unacceptable in pharma & food industry	No Black/Foreign Particle Generation eliminating chances of contamination
8	ENERGY SAVING	Higher Energy Consumption	Energy Efficient 5%+/- 2%

SYGURU FLAT BELTS EFFICIENCY COMPARED TO V BELTS



- FLAT BELT η %:
  - HIGHER AT ALL LOADS
  - UNIFORM OVER LARGE RANGE
  - 3% TO 5% HIGHER AT FULL LOADS

Sr.No.	Company Name	Equipment Name	Energy Consumed kW		% Saving
			V-Belt Drive	SyGuru Flat Belt Drive	
1	**Spic Pharmaceuticals**	Kirloskar Ammonia comp.	114.5	106.1	**7.2**
2	**IPCL, BARODA**	IR Compressor 75 Kw	62.5	60.3	**5.5**
3	**Titan Industries, Hosur**	K.G. Khosla Comp.	29.0	27.3	**5.7**
4	**Indian Oil Corpn. Belgaum**	IR Air Compressor	32.0	29.0	**9.4**
5	**Spic Pharma, Coddalore**	IR Compressor 75 Kw	65	61	**6.2**
6	**India Cement Ltd., Dalvoi**	Rotary Blower 30 Kw	21.3	19.8	**7**
7	**United Beweries, Kerala**	Kirloskar Ammonia comp. 75 Kw	57	52	**8.7**
8	**Titan Industries (Jewellary)**	Kirloskar Compressor	33.41	31.3	**6**
9	**Hindustan Coca cola Beverages, B'lore**	irloskar Amonia comp	75.7	68.5	**9.5**
10	**Reliance (RIL, Naroda)**	Gas Compressor	70	65	**8**
11	**TVS Suzuki Ltd.**	K.G.Khosla Comp	81	74.4	**8**
12	**Wokhardt Limited, Ankleshwar**	Roots Blower 50 HP	33	31	**6**
13	**DCM Shriram Alkali & Chemicals, Jhagadia**	**Ref. Compressor**	**160**	**152**	**5**
14	**NCPL, BHARUCH**	Roos Blower	37	34.0	**8**
15	**ATUL Limited, Ankleshwar**	Air Compressor	50	47	**6**
16	**Grasim Industries, Nagda**	Ref. Compressor 100 HP	63.8	61.2	**4**
17	**Aventis Cropscience India Ltd. Ank.**	Reactor, 7.5 HP	4.8	4.6	**4**
18	**Cadila Pharmaceuticals,Ank**	Ref. Compressor 75 Kw	63.8	60.6	**5**
19	**IPCA Laboratories Ltd. Ratlam**	Multi Mill, 3 HP	1.9	1.8	**6**
20	**Gujarat Guardian Ltd, Ankleshwar**	Belt Supplied for Air comp.	75	71	**5**
21	**Jubillent Organosis, Savli**	Ref. Compressor	65	60	**7.6**
22	**RIL, Baroda**	Ref. Compressor	30	28	**7**
23	**Surya Roshni, Gwalior**	Flex Blower	98	92	**6.5**

SOM DERASHRI

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ENERGY CONSERVATION ….

OUR GIFT TO NEXT GENERATION

A STEP TOWARDS NET ZERO