

ENERGY SAVING INITIATIVES

CEP

CURRENT STATUS

- Condensate Extraction Pumps of unit 1 &2 of BBGS
MODEL: EN 5J40; MAKE:WEIR PUMPS LIMITED,5
STAGE WITH DOUBLE ENTRY AT FIRST STAGE
- Motor Make: PEEBLES ELECTRIC LIMITED .6.6KV
drive with motor rated current of 85 Amps.
- MOTOR RUNNING CURRENT:70-72 AMPS; & FEED
FLOW=650-670TONS/HR ;POWER ABSORBED=700
KW.
- For Hotwell level control we have one Low Load
Control valve (linear CV) & Two High load control
valves (Equal % CV), one on line & other standby.

CURRENT STATUS

- AT FULL LOAD (i.e. 250 MW) LOW LOAD OPENING IS 100% & HIGH LOAD OPENING IS 71%.
- CEP DISCHARGE PRESSURE IS 24 BAR & PRESSURE BEFORE DRAIN COOLER IS 14 BAR i.e. 10 BAR ACROSS CV & GLAND SEAL COOLER.
- CEP DISCHARGE (24 bar) → GLAND SEAL CONDENSER → CONTROL STATION → (14 BAR) DRAIN COOLER → LP1 HEATER → LP2 HEATER (11 BAR) → LP3 HEATER → LP4 HEATER → DEAERATOR (8 BAR). (As per TERI Energy audit report)

PROPOSED MODIFICATION

- Proposal 'A' :DESTAGING BY ONE STAGE OF CEP
- Proposal 'B' :FITTING OF VFD (Variable frequency Drive) WITH MOTOR.

Proposal 'A'

PERFORMANCE CURVES AFTER DE-STAGING BY ONE STAGE

- [Proposed Pump curve.pdf](#)
- As we need to keep flow constant , flow duty point is 670 t/hr & corresponding pressure of de-staged pump will be 18 bar & power 425 KW.
- Currently, at 670 t/hr flow, pressure & power absorbed are 23 bar & 550 KW.
- Savings will be 125 KW i.e.Rs.4380000/- per year (considering unit cost to be Rs.4/KW-hr)

DETEERRANTS FOR CONSIDERING PROPOSAL-'A'

- Condensate Extraction Pump discharge goes to the different duty points & hence at a reduced pressure of 18 bar, all requirements need to be addressed **meticulously**.
- Duty points are:-
 - To deaerator which at a pressure of 8 bar.
 - To LP Bypass De-superheaters.
 - LP Turbine Exhaust cooling sprays.
 - To Glandsteam de-superheater
 - To condenser drain flashbox.
 - To condenser level instruments.

ADDRESSING DUTY POINT AT LOWER PRESSURE

- We got confirmation from Siemens regarding the suitability of existing Hotwell level control valves at lower pressure & same flow.
- We got confirmation from CCI regarding suitability of LP- desuperheater at reduced pressure.
- At LP-exhaust hood CEP discharge water is sprayed to 0.11 bar saturated steam via a 10mm orifice. Lower pressure will keep the control solenoid valve open for more time.
- For Gland steam desuperheater, water at 18bar will serve purpose as according to valve manufacturer water at a pressure of 3.5 bar more than steam pressure is sufficient. (Yarway Valve Manual)

Present running condition of CEP

- Present Running current: 72 Amp.
- Control Valve Position: 71% open
- Present flow: 650-670 T/Hr
- Dearator Pressure: 8 kg/cm²
- Power Factor = 0.85
- Power Consumed by Motor
- Power consumed during present operation =
 $\sqrt{3} \times 6.6 \times 72 \times 0.85 = 700 \text{ KW}$
- Power consumed in a year = 700 KW x 8000
Hrs = 5600000 KW Hr/year
- Power consumed in a month = 650 KW
Hr/month

Cost for Proposal A

- Proposal has been submitted by Clyde pumps for :-
 - A) Destaging job supervision job
 - B) Cost of Engineering
 - C) Cost of Spares
- Total cost of Destaging would be 8 lac.
- Considering a savings of Rs.4380000/- per year the pay back period would be slightly more than 2 months.

Proposal 'B

FITTING OF VFD (Variable frequency Drive)

- Present control in CEP is control valve and we maintain dearator level & pressure. Using MV drive, we will open the control valve to 100% and reduce the motor speed to maintain the dearator level. Present signal of 4-20 mA of dearator level which is controlling the valve will be used as process value in new controller in DCS and output signal of new controller will vary the speed to maintain DA level.
- To achieve the required flow and pressure we need to reduce the motor speed to by 12% (1313 rpm), this will reduce the discharge pressure to 16.5 kg/cm² and maintain dearator level & pressure as per process requirement.
- Power consumption using MV drive = $(0.88)^3 \times 700\text{KW} + 35 \text{ KW}$ (losses at low speed) = 512 KW;

FITTING OF VFD (Variable frequency Drive).

- Power consumed using MV drive in a year = $512 \text{ KW} \times 8000 \text{ Hrs} = 4096000 \text{ KWHr / year}$
- Power consumed using MV drive in a month = $341333 \text{ KWHr / month}$
- Energy Saving using MV drive per month = $466667 \text{ KWH} - 341333 \text{ KWHr} = 125334 \text{ KWHr / month}$
- Hence, there is about 27% of saving in CEP using VFD.

OTHER BENEFITS FOR USING VFD

- Smooth start & stop of the motor which will reduce mechanical wear & tear on motor part, enhance motor life & precise flow control using Variable Frequency Drive.
- All protection like Over current, Under voltage, Over Voltage, Short Circuit, Phase to phase, phase to ground short, Over temperature etc to motor electronically from drive which enhance motor life.
- Improved power factor, better than 0.95 all the time irrespective of load variation, saves reactive power
- Being an energy saving device, M/s CESC Ltd, Budge Budge Generating can claim 80% depreciation at very first year under income tax act 32.

FITTING OF VFD (Variable frequency Drive).

- We have taken quotation from M/s. Yantra Harvest for VFD & they offered :-
 - a) Model Harsvert-A06.6/090Amp (for 800kW motor of CEP), rated for 45°C.
 - b) Bypass panel for manual changeover for 800 KW/6.6KV.

Total Price=Rs.1,27,00000/-

- Supervision cost per drive=Rs.2,50,000/-
- Total cost including excise duty & other financial charges=Rs.1, 44, 78,000/-

VFD(Variable frequency Drive)

- YANTRA HARVEST ENERGY PVT. LTD has offered two options of purchase:-
OPTION-1 OUT RIGHT PURCHASE;
OPTION-2 PAY OUT OF SAVING SCHEME;

VFD (Variable frequency Drive)

- A – Total earning to BBGS in 24 months
 1. Energy Saving per month using 2 MV drive is Rs. 10,02,672 hence total energy saving in 24 month is Rs. 2,40,64,128.
 2. Depreciation Benefit by way of Tax Shield for 24 Month is Rs. 42,67,200
 3. Total earning to BBGS in 24 month is Rs. 2,83,31,328.
- B – Out Going of BBGS in 24 Months
 1. EMI Per Month is Rs. 6,03,250
 2. Total out going of BBGS in 24 months is Rs.1,44,78,000
- C – Net Earning of BBGS in 24 months without Investment is $A-B = \text{Rs. } 2,83,31,328 - \text{Rs. } 1,44,78,000 = \text{Rs. } 1,38,53,328 /-$

Cost for Proposal A

- Proposal has been submitted by Clyde pumps for :-
 - A) Destaging job supervision job
 - B) Cost of Engineering
 - C) Cost of Spares
- Total cost of Destaging would be 12 lac.
- Considering a savings of Rs.4380000/- per year the pay back period would be slightly more than 3 months.



Thank you