Technical paper on

“Off season overhauling, maintenance & preventive maintenance during season for better performance & profitability of the sugar plant"

There is vast scope to improve crushing rate, bagasse saving, power export & reduce stoppages, losses with modifications, rectification, modernization along with proper overhauling, maintenance & precautions & preventive maintenance of the plant with proper diagnosis & study.

Unless & until you work on following targets your plant will not be in profit in this competition & struggle in sugar industry.

1. To improve crushing rate & capacity utilization with modern equipment & techniques to reduce cost of production
2. To reduce total losses by improving milling, boiler thermal & overall boiling house efficiency & recovery
3. To reduce stoppages & down time of the plant considerably
4. To increase bagasse saving & power export
5. To reduce moisture % of the bagasse
6. To reduce the steam % cane
7. To stop the overall leakages of water, oil, juice, syrup, molasses, mesquite, sugar, bagasse etc.
8. To install most modern equipment, devices & ultra-modern units to save power, space, maintenance.
9. Maximum automation to reduce the manpower in the plant.
10. To save & reuse the water content in sugarcane in the form of vapour condensate by three stage cooling tower & CPU technology, to collect the water by rain harvesting.
11. To implement solar power unit on sugar godown to full fill internal factory, offices, colony power requirement

Mill

For uniform, smooth, constant & maximum crushing with higher milling efficiency by proper maintenance, precautions in the milling section.

1. Cane carrier slat should be welded with 3/4" x 1 feet angle after every 8 ft. to avoid slippage of the cane during higher crush rate.
2. Cane unloader should have motorized or remote control de-hooking system to reduce power, time & maintenance.
3. Cane chopper & swing type leveller hub should be welded with sharp knives of carbide tip to reduce power, maintenance & improve cane preparation & crushing rate.
4. Proper observation & precaution with separate worker with special sitting cabin to avoid foreign material like Iron, tractor disk, wooden bamboos, wire rope in the Gavan which can damage chopper, leveller, Fiberizer & mill rollers.
5. Prepared cane equalizer should be installed between leveller & fiberizer for uniform preparation & feeding to mills, boilers to improve its efficiency, bagasse saving & power export.
6. Capacitor panel should be provided to H.T Fiberizer motor to reduce current.
7. Cane preparative index should be maintained above 86+ constantly.
8. For higher crushing rate zero mill of higher size with 3 roller T.R.P.F system or 2 roller mill to improve primary extraction, results & reduce power & bagasse moisture.
9. Planetary gear box, ACVFD mill drive & rope coupling to reduce power & maintenance cost.
10. Grooving angles of mill roller 35^0 ^{50} 45^0.
11. To increase messchart groove depth & width for better juice drainage & increase crushing rate.
12. Correction of roller journal diameter & radius curvature.
13. Use of lotus roller for top & discharge for first four mills, for better juice drainage & improve crushing rate.
14. All side caps, Hydraulic ram pins & bush clearance should be within limit i.e. 0.1 to 0.2 mm.
15. All cane carrier, rake carrier, chopper knives, bolts should be tack welded or double chuck nut of nylock.
16. Roller journal & gunmetal bearings clearance should be below 1 mm.

17. For better feedability & crushing rate all the 3 rollers teeth should be hard faced with arching electrode.

18. The clearance between top roller top bearing pressure plate curvature & hyd. Ram bottom curvature should be uniform at both side (1mm).

19. If necessary for better feedability & crushing rate TRPF teeth should be welded with 3/8" SS nut at toe of the teeth to reduce slippage of bagasse which causes donally chute jamming.

20. Top roller top half bearing & wear plate clearance should be 0.5 mm maximum.

21. Mill hydraulic cap eccentricity should be in the range of 30 to 35 mm towards feed side.

22. Standard mill roller lift should be checked & corrected in the range of 12,10,10,8,6 from 1st to last mill.

23. Nitrogen cylinder pressure should be 80% of hydraulic pressure of mill for constant & uniform hydraulic pressure on top roller.

24. Roller diameter from feed-top-discharge should be in increasing order.

25. During season mill load, Hyd. pressure, roller lift & mill rpm should be checked regularly after 2 days.

26. A.C.F.C system should be D.C.S controlled, efficient, sensitive to provide uniform & constant feeding to mill.

27. Avoid cold water application in the juice tray for Stirling dropped bagasse.

28. Avoid cold water application for mill roller bearing cooling.

29. Cleanliness & use of effective mill sanitation chemicals to avoid bacteria growth.

30. To collect rotary juice washing water (2 tone/Hr) & divert it in last mill juice tray for compound imbibition.

31. Moisture reduction technology either by 2 roller dewatering mill, JPMA moisture reduction system or zenon make moisture reduction system.

32. Modern Mill auto imbibition system for optimum use of imbibition water.

33. Use of planetary gear boxes from feeder table, cane carrier to bagasse elevator for efficient power saving.

34. If necessary At the mid of big season the anvil plate bottom discharge side should be hard faced with special electrode L&T 6006 or abralloy 300

Factors affecting mill extraction & performance

1. Cane quality
2. time lag between harvesting and cutting
3. Fibre % cane
4. Cane preparation i.e. cane preparative Index
5. Mill setting & roller pitch
6. Primary extraction & pitches of the mill
7. use of modern pressure feeding devices
8. effective compound imbibition system
9. efficient juice drainage
10. Mill Hyd. pressure
11. Mill RPM & load
12. Mill Imbibition water % cane & its temperature.
13. Proper maintenance of mill
14. Strict supervision & Operating skill of workers

Preventive maintenance during season

After every 2 weeks during rotary screen cleaning following preventive maintenance should be carried out with in 45 minutes at the intervals of 12 noon so that you can arrange both shift man power with prelisted & pre-planned work

1. Checking & tightening of cane carrier & chain nut bolts if necessary
2. Checking 0f chopper knives bolts & fiberizer tips
3. Checking & tightening of inter rake carrier chain & bolts, motor gear box coupling bolts of all pumps & carriers.
4. After every 18 days rotary screen should be washed & cleaned with caustic soda.
5. After every 3 weeks scraper plates & trash plates should be tightened by half thread.
6. After 5 lack crushing chopper knives, leveller knives should be changed & fiberizer tips should be changed or rotated in 180^0 for keeping preparative Index above 85
7. If necessary at the mid of big season top scraper plates should be replaced

8. Lotus roller nozzles should be cleaned with wire or water jet
9. All motors, gear box & pump alignments & coupling bush bolt should be checked & fitted.
10. Meschart knife & groove should be checked & corrected.

Difference between TRPF & GRPF

TRPF		GRPF
1. Initial less investment	-	Initial more investment
2. Juice drainage 5 to 10 % of mill	-	Juice drainage 25 to 30 % of mill
3. Less power is required 8 to 10% mill	-	more power is required 25 to 30% of mill.
4. More maintenance cost During off season	-	Less maintenance cost during off season.
5. from existing mill power can be taken With sprockets for chain arrangement	-	Separate drive is necessary
6. Peripheral Speed of TRPF roller is 115 to 120% of mill	-	Peripheral Speed of GRPF roller is 125 to 130% of mill
7. No civil foundation is required	-	civil foundation for GRPF head stock is necessary
8. Pressure chute of 7% divergent is req.	-	Pressure chute of 7% divergent is req.
9. Pressure chute length between-	-	Pressure chute length between-
700 to 800mm		700 to 800mm

Boiler

* Factors affecting boiler efficiency & bagasse saving *

1. Uniform quantity & quality of bagasse i.e. moisture of bagasse should be minimum.
2. Cold air entry in the boiler & furnace should be avoided.
3. Optimum excess hot air.
4. Hot air temperature should be above 180° C. 20^0 C rise in hot air temp. Increases boiler efficiency by 1 %.
5. Efficient use of flue gas heat recovery devices like economiser, super heater, air heater, pre heater, HP heater etc.

6. Raw water & boiler water chemical treatment by maintaining parameters like PH, TDS, hardness, phosphate alkanity, silica etc.
7. Minimum blowdowns to reduce thermal heat loss.
8. Use of efficient & Trouble free soot blowing system at regular intervals.
9. Internal & External heating surface of the furnace should be clean.
10. Use of Hot secondary air for better combustion efficiency of boiler.
11. Proper insulation & lagging to avoid heat loss due to radiation, conduction & convection.
12. Proper boiler brick work & internal baffling for exposing more heating surface to the flue gas with more retention time.
13. Bagasse feeder jamming & interruption due to mechanical, electrical problem should be avoided.
14. Use of better fire side chemical to improve combustion of bagasse & efficiency of boiler.

BOILER AUTOMATION

- 3 Element Drum Level Control.
- Steam Pressure Control
- Combustion Control System with Speed Control for I.D., F.D. Fans & Bagasse Feeders.
- Furnace Pressure Control
- Dearator Level Control
- Dearator Pressure Control
- Attemperator Control
- Automatic Blow Down Control System
- On-Line pH, Conductivity & Silica Measurement Of Boiler Drum Water
- Start/Stop Operation Of Boiler MCC
- Safety Interlocks
- Pressure Reducing & De-Super Heating Station Control.

1. BOILER AUTOMATION SYSTEM:

We have installed three-element control system for Boiler Automation.

a) Steam pressure b) Steam Flow c) Feed Water flow

The system incorporates, which help to sense:-

a) Boiler drum steam pressure b) Deaerator pressure

c) Boiler drum level d) Deaerator drum level

e) Feed water flow f) Forced & Induced Air flow

g) Temperatures at various points.

Single sense from the above system given to PID controller. These signals are analyzed & converted to predetermined programs set points, which controls ID, FD, and Bagasse Feeder dynodrive. Due to D. C. drive at ID & FD the quantity of air and draught in the furnace is set accurately, so as to avoid incomplete Combustion excess air flame

gas temp. etc. The system works very efficiently. Power is reduced and we get highest possible efficiency of the boiler.

BOILER AUTOMATION

- 3 Element Drum Level Control.
- Steam Pressure Control
- Combustion Control System with Speed Control for I.D., F.D. Fans & Bagasse Feeders.
- Furnace Pressure Control
- Dearator Level Control
- Dearator Pressure Control
- Attemperator Control
- Automatic Blow Down Control System
- On-Line pH, Conductivity & Silica Measurement Of Boiler Drum Water
- Start/Stop Operation Of Boiler MCC
- Safety Interlocks
- Pressure Reducing & De-Super Heating Station Control.

Boiling house

Factors affecting evaporation efficiency of quadriple & evaporator station.

1. Steam pressure & temperature in the range of 1 to 1.5 kg/cm2 & 120^0 C +- 5^0C for better heat transfer to juice inside the tube (PRDS system).
2. Effective removal of non-condensable gases.
3. Proper vacuum at quadriole last 3 bodies.
4. Effective & clean heating surface of quadriole bodies.
5. Effective removal of condensate water.
6. Use of vibro scree for grit lime separation.
7. Use of most modern equipment's like semikenstener, falling film evaporators, D.C.H, V.L.J.H, dynamic juice heaters.
8. Effective vapour bleeding.
9. Use of proper & good quality process chemicals like lime, sulphur, phosphoric acid, hydrogen peroxide, viscosity reducer, anti- scelent.
10. Use of condensate heater & flash recovery system.

Necessary steps & equipment's to reduce steam % cane up 32 %

1. 10 meter height falling film evaporator station.
2. Use of Direct contact juice heaters for sulphur juice & clear juice heating
3. Use of condensate water heater for raw juice & S.J 1 heating
4. Use of Vapour line juice heater for raw juice heating
5. Use of dynamic juice heater
6. Condensate flash cigar system
7. Vertical continuous pan for B & C boiling

Set Targets of Pandurang S.S.K Ltd for crushing season-2017-2018

1. Crushing - 12,00,000 M.T
2. Bagging - 14, 40,000 Qnt.
3. Recovery – 12 %
4. Export – 6 Crore Unit
5. Alcohol production – 1.5 crore litre
6. To generate Unit – 10,00,000 solar power
7. To save Bagasse – 25,00,000 M.T

Effects of efficient overhauling & maintenance resulting in cash

1. 1 hour stoppage saving = Rs. 2 lack (200 Hours stoppage saved)
2. 1 Tone of bagasse saving = Rs.3000 /- (10,000 M.T bagasse saved)
3. To reduce 1 Unit of power consumption (saving) per tonne of cane = Rs.42,000 /- per day
4. Increase in 500 ton average crushing rate Rs. 2,00,000 /- per day
5. To reduce total loss by 0.1 % = Rs. 2,27,500 per day
6. To save 1 litre of water – 0.90 paise. Per day 6 lack & per season 11 corer liter of water is saved (Rs. 10 lack saving per season)

Thus if you run your plant efficiently by proper maintenance, rectification, changes, modification & reduce stoppages, losses, power consumption, water saving, bagasse saving. You can bring a profit to factory of approximate 6 to 1o crore per year.

Dense phase ash handling system for ESP

From ESP efficient removal of automatic separate ash in the hopper automatic Dense phase ash handling system should be installed. Which works on the principle that after as second internal ash in the hopper is collected & sent to ash silo & mixer by pneumatic air pressure line.