

INSTRUMENTATION



DEPARTMENT OF INSTRUMENTATION

Many sugar factories adopt automation for enhancing efficiency. The sugar plant automation involves integration of various instrumentation technologies. This department extends support to the sugar industry for appropriate instrumentation and automation. This involves designing the control system configuration, selection of control system components, erection and commissioning of these components and giving training and guidance to the technical staff of sugar factory for efficient performance.

The department takes efforts to improve the efficiency of process plants. Following is a brief account of the work done by the department.

RESEARCH AND DEVELOPMENT

Achievements

Mula SSK started cogeneration project in 2006, which included 80 TPH high pressure boiler (WIL make) and 16 MW TG set (Sinifon make). These were installed to meet steam and power requirement of plant at 4000 TCD crush rate and export surplus power to grid. Overall performance of this cogeneration plant was not satisfactory since the beginning. The instrumentation engineers of the Institute visited the factory and studied various control system components and their working performance. This included flow sensors, differential pressure transmitters, controllers and control valves. The recalibration was carried out on the basis of observations recorded. This resulted in considerable improvement in the operational performance of the boiler. The details are as under:

- Reduction in steam drum water level fluctuations: ± 20 mmWC to ± 7 mmWC
- Reduction in feed water flow fluctuations: 30-100 TPH to 65-85 TPH
- Rise in superheated steam temperature: 480°C to 500°C
- Rise in working pressure: 62 Kg/cm² to 67 Kg/cm²
- Increase in capacity: 76 TPH to 85 TPH

The improvement in the above parameters of the boiler resulted in increasing the load on the cogeneration power turbine from 8.5 MW to 13.5 MW.

Improvement in Working Performance of Auto Cane Feed Control (ACFC) Systems

The department guides sugar factories in improving the performance of the ACFC systems. The appropriate working of this system ensures uniform cane feeding to the mills, which helps in achieving safe and smooth crushing. This ultimately results in maximum capacity utilization with desired milling performance. Many sugar factories have appreciated the services rendered in this respect by the Institute. Sugar factories seek the help of the Institute for solving various difficulties faced by them while operating the system. The details of visits are as follows:

Sahyadri SSK

There was improper synchronization of the rake, inter and cane carrier corresponding to mill (Texmaco). This was due to the abnormal variation in the control signals pertaining to rake carrier. After detailed study of the control system components, it was found that the problem was in the power supply and process cards. The rectification of these cards was carried out. The system was brought into operation and tuned to the plant condition to achieve the desired performance.

Mula SSK

The factory experienced frequent jamming at Donnelly chute, which reduced the crushing capacity. The rectification in electronic process control cards was carried out to solve this problem. The system was commissioned and retuned to suit the plant condition. This helped in achieving proper synchronization between speed of the rake and cane carrier as per the load variations on the first mill and cane preparatory devices.

Malegaon SSK

The cane preparatory devices of the system were going under frequent variations, which was adversely affecting the crushing capacity. This was due to the effect of weakened response of the electronic components such as capacitors, resistors, ICs, potentiometers and panel mounted indicators. To rectify the problem, total rehabilitation of the system was carried out by replacing power supply and process cards, transformer, panel wiring and potentiometer. Finally the system was commissioned and tuned to suit the plant condition to achieve the desired crushing rate.



SMS Mohite-Patil SSK

There was a problem with auto/manual station corresponding to cane carrier due to which the factory had to feed the mill (Triveni) manually. The proper interfacing between this station, system and dynodrive controller was carried out and the system was brought into operation. The setting of loads on cane preparatory devices and first mill was carried out to achieve higher crushing rate.

Sant Tukaram SSK

There was a problem associated with the controllers corresponding to dynodrives implemented for rake and cane carrier motors resulting in abnormal load variations on the leveller motor. Therefore, the dynodrive controllers were replaced. The control system components of the system such as power supply cards, potentiometers, overload indicating lamps and transformer were also replaced. The recalibration of the chest pressure transmitters of first mill and fibrizer turbine was done. The routing and laying of the signal and control cables was done. The system was commissioned and tuned according to the load variations on the first mill and cane preparatory devices to achieve the maximum crushing rate.

Purna SSK

The transformer and electronic cards of the system burned out due to the high voltage. These cards were replaced alongwith transformer, dynodrive controller (rake carrier), auto/manual station and panel wiring. The recalibration of the chest pressure transmitters of first mill and fibrizer turbine was completed. The system was tested, commissioned and tuned to the plant condition to achieve higher crushing rate.

Effective Modifications in Imbibition Water Flow Control System

Sahyadri SSK installed the imbibition water flow control systems for both the mills (Texmaco and Buckau Wolf) in 2000-01. The imbibition water flow was controlled through control valves on the basis of the measurement of chest pressure of the penultimate mill turbine. But these systems were not performing satisfactorily and they were totally out of operation during 2007-08 crushing season. It was found that the problem was due to multi-loop controllers and control valves. Taking into consideration the importance of imbibition water flow control systems, modifications were suggested to the factory. It was suggested to control the imbibition water flow by employing variable speed drive to imbibition water

pump. The factory installed dynodrive to one of the imbibition water pumps (Texmaco mill) during 2008-09 crushing season. The necessary modifications in the control system components were carried out and then this was commissioned and tuned to achieve effective imbibition. The working performance of the control system was found satisfactory.

Similarly, the modifications of the imbibition water flow control systems in Purna SSK and Mula SSK were carried out successfully.

These efforts resulted in the following benefits to the factories:

- Consistency in bagasse moisture.
- Reduction in bagasse pol %.
- Improvement in the combustion efficiency of the boilers resulting in additional bagasse saving.

Calibration as per ISO-9000

Many sugar factories have gone for ISO certification, which necessitates carrying out the calibration of gauges, indicators, recorders, scanners, transmitters and controllers related to various process parameters and preparation of calibration reports having international traceability for these instruments. Considering the need of the sugar industry the department carried out the calibration of standard instruments from a NABL accredited laboratory. These standards are traceable to the international standards.

Following sugar factories availed of these services and a total 703 instruments were calibrated.

- Bhaurao Chavan SSK (Unit 1 and Unit 2),
- Mula SSK
- Datta Shetkari SSK, Shirol
- Kisanveer Satara, SSK,
- Manjara Shetkari SSK,
- Chhatrapati SSK,
- Sant Tukaram SSK,
- SMS Mohite-Patil SSK,
- Vaidyanath SSK
- Vitthalrao Shinde SSK

Measurements of Boiler Parameters to Detect Causes of Inefficient Boiler Operations

Boiler is an important equipment in a sugar factory and its performance directly affects the crushing rate and quality of sugar. The department studied the causes of inefficient boiler operations by periodically observing various boiler parameters such

as steam pressure and temperature, flue gas draft and temperatures at different points, feed water temperatures, CO₂ % and O₂ % in the following sugar factories:

- Sangamner Bhag SSK (4 boilers)
- Kisanveer Satara SSK (4 boilers)
- Purna SSK (3 boilers)
- Sahyadri SSK (2 boilers)

Based on these observations baffle leakages, MDC/ wet scrubber problems, jamming in underground air ducting, leakages in economizer bypass damper were identified. These factories will carry out the rectification work of boilers in ensuing off-season.

EXTENSION AND ADVISORY SERVICES

For improving the status of instrumentation in 38 sugar factories 70 visits were made. In addition, 1402 instruments of 40 sugar factories were rectified, standardized and commissioned at the factory as well as Institute site. The details of this work are as under:

Instrumentation and Automation Related Work Involved In Various Projects

The department helped distilleries and factories in preparation of technical specifications for appropriate instrumentation and automation required for boiler automation. It also studied P&I diagrams and suggested changes. These studies together with approval of instrument data sheets and panel drawings, inspection of various instruments PLC/DCS, and SWAS were carried out in the following factories:

- S.S.Vasatrao Kale SSK (Distillery project)
- Kisanveer Satara SSK (Distillery project)
- Sagar SSK (New sugar plant)
- Sonhira SSK (Co-generation project)
- Malegaon SSK (Co-generation project)
- Grain-O-Tch Ind. Ltd (Grain based distillery project)

Mill House Instrumentation

Total 1229 instruments related to mill house instrumentation systems were rectified, standardized and commissioned in following sugar factories

- SMS Mohite-Patil SSK
- Mula SSK
- Malegaon SSK
- Sahyadri SSK
- Vaidyanath SSK

- Sant Tukaram SSK
- Purna SSK
- Datta Shetkari SSK, Shirol
- Manjara Shetkari SSK
- Chhatrapati SSK

This included ACFC system, IWFC system, juice/ imbibition water flow meters, pressure transmitter, pressure indicator, speed indicator, auto/manual stations, dynodrive controllers, load indicator, pressure/ temperature gauges and steam flow meters.

Power House Instrumentation

Total 180 instruments related to power house instrumentation systems such as steam flow transmitters, steam flow indicator cum totalizers, digital temperature indicator, pressure /temperature gauges were rectified, standardized and commissioned in the following sugar factories.

- Someshwar SSK
- Mula SSK
- Godavari Sugars Pvt.
- Majalgaon SSK
- Vaidyanath SSK
- Sant Tukaram SSK
- Purna SSK
- Datta Shetkari SSK, Shirol
- Makai SSK
- Chhatrapati SSK
- Manjara Shetkari SSK

Boiler House Instrumentation

Total 402 instruments related to boiler house instrumentation systems were rectified, standardized and commissioned in the following sugar factories.

- Someshwar SSK
- Shankar SSK, Sadashivnagar
- Godavari Sugars Pvt.
- Manjara Shetkari SSK
- Vaidyanath SSK
- Mula SSK
- Rajgad SSK
- Majalgaon SSK
- Rameshwar SSK
- Sant Tukaram SSK
- Purna SSK
- Datta Shetkari SSK, Shirol
- Makai SSK
- Chhatrapati SSK

This included steam and feed water flow meters, multi-point temperature indicator, pressure/



temperature gauges, drum level transmitter, microprocessors based controllers, control valves, draft gauges and flow recorders.

Boiling House Instrumentation

Total 339 instruments related to boiling house were rectified, standardized and commissioned in the following sugar factories.

- Godavari Sugars Pvt.
- Purna SSK
- Vaidyanath SSK
- Makai SSK
- Anuradha Sugars Pvt.
- Manjara Shetkari SSK
- Mula SSK
- Majalgaon SSK
- Sant Tukaram SSK
- Chhatrapati SSK
- Datta Shetkari SSK, Shirol

This included sugar leak detectors, steam flow transmitters, steam flow indicator cum totalizers, pressure/vacuum/compound/temperature gauges, digital temperature indicator, pressure transmitter and pressure controller.

Laboratory Instrumentation

Total 197 instruments of the following sugar factories were rectified and standardized.

- Bhaurao Chavan SSK Unit-1
- Bhaurao Chavan SSK Unit-2
- Purna SSK
- Makai SSK
- SMS Mohite-Patil SSK
- Rajgad SSK
- Anuraj Sugars Pvt.
- Adinath SSK
- Lokmangal Agro Ind. Pvt
- Vitthalsai SSK
- Shankar SSK, Waghawada
- Chopda Shetkari SSK
- Nira-Bhima SSK
- Nasik SSK
- Vitthalrao Shinde SSK
- Manjara Shetkari SSK
- Dudhganga Vedganga SSK
- Agasti SSK
- Terna SSK
- Dr. Babasaheb Ambedkar SSK
- Parner Taluka SSK
- Purna-Barashiv Hanuman Udyog Pvt.
- Saswad Mali Sugars Pvt.

- Vikas SSK
- Pannageshwar Sugars Pvt.
- Sharangdhar Sugars Pvt.
- Coper Cooperative, Gujarat

This included brix hydrometers, pol tubes, thermometers, pH meters, polarimeters, TDS meter, muffle furnace, electronic balance, oven, spectrophotometer and microscopes.

Distillery Instrumentation

Total 55 distillery process instruments of the following sugar factories were rectified, standardized and commissioned.

- Vaidyanath SSK
- Purna SSK
- Manjara Shetkari SSK

This included steam flow transmitter, temperature indicators, pressure controller, flow indicator cum totalizer, universal calibrator, magnetic flowmeter, pressure and level transmitters.

Scientific Instruments Used in Various Laboratories of the Institute

Scientific instruments from various departments of the Institute were rectified and standardized. These included temperature controller, conductivity meter, pH electrode, dead weight pressure gauge tester, flame photometer, electronic balance, tensile testing machine, polarimeter, microscopes, oven, pH meter and spectrophotometer.



Students working in Instrumentation laboratory