

**Sub:** Publishing of Technical Bulletin in electronic form on the KPCL website

**Ref:** IOL of CE(KERP) No.A1L/Systems/Website/20 dt.22.04.2020

Date of submission : 29.05.2020.

Type of document submitted : File in pdf from ( 1+5 pages )

Details of activity : Problem solving by modification to phosphate dosing system of RTPS -Unit-5 boiler.

Period /date of activity : October 2004

Activity conceived/initiated/  
performed by : Krishna Bhat, AEE(M)- upgraded  
EC No.06-1773

Division of working at the  
time of implementation of  
referred activity : EEBM-2 division, responsible for boiler maintenance  
of Unit-4,5,6 & 7 boilers.

Performance improvement  
achieved : • Avoided probable shut down of the unit for about  
10 days & loss of generation of about 50MU.  
• Modified system introduced in other boilers  
(Unit-4, 6 & 7 of RTPS) for future use during  
similar eventualities.

Present post of working : Executive Engineer (Mechanical)

Present place of working : EE(MSP)Y, YCCPP, Yelahanka.

Contact details : Krishna Bhat,  
EE(M), EC No.05-1773,  
O/o EE(MSP)Y, YCCPP, Yelahanka  
e-mail: eemspyccppkpcl@karnataka.gov.in  
Mobile:8277396830

# PHOSPHATE DOSING SYSTEM

## 210MW - RTPS-U 5

### 1.0 INTRODUCTION:

Recommended boiler water limits in RTPS Unit -1 to 7 boilers are as below:

Parameter	Normal operating value	Tripping/ alarming value	Remarks
Phosphate residual	5 to 10 ppm	< 2 ppm	Unit to be taken out of service to avoid acidic corrosion.
pH at 25 <sup>0</sup> C	9.1 to 9.8	< 8	Unit to be taken out of service to maintain alkalinity
Silica	< 0.02 ppm	> 0.02 ppm	Unit can be continued to run at restricted load as per Silica curve and with heavy blow down (CBD) resulting in loss of cycle efficiency.

To maintain above water chemistry parameters, boilers at RTPS are provided with HP dozing (phosphate dozing) facility, which enables to doze required quantity of tri-sodium phosphate into boiler drum.

### 2.0 TECHNICAL DETAILS IN BRIEF:

The HP dozing system consists of acid preparation tanks, dozing pumps and piping up to boiler drum. During the normal running of the boiler, the dozing /system pressure needs to be more than the drum pressure to admit the chemical into drum system through nozzles provided in the distribution header inside the drum. To maintain the dozing pressure above the operating drum pressure, positive displacement pumps (1W+1Standby) are provided. The quantity & period of dozing will be as per the system requirement which is normally guided by periodic report from shift chemist.

### 3.0 PROBLEM REPORTED/ NOTICED:

In the year 2004-05, RTPS Unit-5 was continuously running for more than 30 days with all other system working normal. It was reported by the chemical section that, pH level of the steam & boiler water was continuously decreasing and silica in drum water was continuously increasing and further they were not able to dose the required quantity of phosphate into the boiler drum to control the parameters within the recommended level.

Following follow-up actions were taken to identify the system problem:

- Both the dosing pumps were checked for healthiness and found to be normal & developing requisite pressure.
- Safety valves provided in the dosing system were checked for correct operation & found to be healthy.
- Entire dosing line from pump discharge up to inlet isolation valve near boiler drum was checked for suspected chokage. The line was cut at regular distances/ bend locations to identify any blockage in the pipeline. No blockage was noticed in the pipeline up to boiler drum.

It was suspected that the dosing distribution header inside the drum has been choked. De-choking of the line inside the drum was not possible as it required shut down of the unit. However it was reported by chemical section that, pH value is continuously decreasing and we may have to forcibly trip the Unit. Taking out the unit shut down for attending the above problem was estimated to take around 10 days, as it involved following activities:

- Boiler cooling down period (3 days)
- Opening of boiler drum after cooling (1 day)
- Removing of the drum internals for inspection (2 days)
- Inspection & rectification of phosphate dozing header (2 days)
- Re-fixing of the drum internals after completion of work & boxing up of the drum (2 days)

But due to severe grid condition, decision to takeout the unit shut down for such a long period was not an easy task. After detailed deliberations it was concluded that, immediate dosing of phosphate into the system is the only solution to continue the unit running. In view of this, CE(O&M)T instructed to explore the possibilities of dozing phosphate into the system through some other point in the feed water system without affecting the system performance. We were given a time of 24 hours to come up with a solution to the problem. The main essential requirement for dozing the phosphate was to ensure that it is fed into the feed water only & not to steaming area (phosphate converts into flake form if it comes in contact with steam).

#### **4.0 ACTION PLAN:**

After thorough study of the feed system including economizer, it was preliminarily decided to explore the possibility of dozing phosphate into the feed system through economizer link pipe to drum. It was also decided to utilize the economizer vent line which is connected to the economizer link pipes from the top. For this purpose, suitable modification to the dozing line was necessary.

Accordingly the dozing line was modified as briefed below:

- As economizer vents could not be operated when boiler in running condition, two numbers of additional valves were installed in series to the with a TEE provision in between the existing set of valves & new set of valves.
- Separate line was laid with suitable pipe (higher thickness to cater highest pressure line in the boiler feed system) and one NRV (Non- return Valve) from the TEE in the economizer vent line & up to existing dozing line at the left side of the drum.
- The inlet valve near the boiler drum in the existing dozing line was kept closed
- The existing line was cut at suitable location & newly laid line was joined to the existing line with a TEE.

**Note:** Refer the FIGURE for detailed understanding of the modifications.

The above modification work was taken up on war-footing & completed within 10 Hours, utilizing the services of existing maintenance labours.

After completion of the pipeline modification works, dozing pumps were taken into service, keeping the economizer vent vales in open condition. (At 8 PM)

A close watch was kept on dozing tank level to confirm the flow of phosphate into the drum system. After about 2 hours, initial positive sign of reduction in the dozing tank level was noticed, which confirmed the successful dosing of phosphate into the system.

After continuing for about 6 Hours, drum water pH started improving, which further confirmed the effective dosing of phosphate (at 2AM).

Next day morning, the dosing system was declared as back to normal with normal parameters of drum water, saturation steam & super heater steam.

## **5.0 CONCLUSION:**

By conceiving, initiating, carrying out above modification in the system & successful implementation of the same within the prescribed time limit, probable shut down of the Unit for long period of about 10 days during summer was avoided resulting in avoiding loss of generation of about 50 MU & grid stability.

Unit was in running condition with the above modified dosing line for about 6 months, till the next scheduled overhaul of the boiler. During the next inspection of the drum internals during the Annual Overhauling of the boiler, it was confirmed that the dosing header inside the drum was completely choked as suspected & the same was rectified and put back into

normal service. However the modified line was also kept as standby source to use during any such eventualities in future.

Subsequently, similar modification in the dosing system was carried out in Unit - 4, 6 & 7 boilers also, during next shut down, to use during any such eventualities.

This feedback was also forwarded to M/s. BHEL Trichy, with a request to communicate to other customers for knowledge sharing purpose. The effort of KPCL engineers was highly appreciated by Field Engineering Service (FES) of BHEL, Trichy.

