

Provision of Standby Control system for minimizing Unit down time due to Brake problems at 240 MW Gerusoppa Power House.

Prakash Kumar.S
Executive Engineer(E)
Gerusoppa Project

Bharath Nayak
Asst.Exe.Engineer(E)
Gerusoppa Project

Narendra Naik.S
Junior Engineer(M)
Gerusoppa Project

Motive:

This article is published mainly to share one of the reliable & cost effective maintenance modifications done at Gerusoppa power House in-line with MD's directions for development / implementation of in-house continuous performance improvement methodologies.

"The more you share, the more you receive to share"

Prelude:

Gerusoppa Power House 4 x 60 MW Generating Units were constructed & commissioned in 2001-02 with BHEL supplied machines and auxiliaries. One such auxiliary system being Generator Braking system – provided for stopping of machine and jacking of rotor during connected maintenance activities. Each Unit houses 9 Nos. Double acting 40T Cap. Brake cylinders with Pads and a control panel to regulate air flow to cylinder. Brakes operate with Pressurized air. After every unit shut down action, Brakes will be applied to bring machine to halt and again released before next start up sequence. This is the prerequisite for every operation action and has direct impact on Generation/Outage. i.e., *without releasing the brakes, it is not possible to Cut-in the Units.*

Present Setbacks / Troubles in Brake System & Improvement Methods:

Two nos. of NUCON make 2 / 5 way pneumatic valves have been utilized in the existing BHEL control panel. It performs three actions viz., Brake apply, Brake release and Reset. Since 18 years, they are serving with an average duty cycle of 3 to 4 operations per day.

Since last two years, frequent problems were being faced in Brake operations, mainly sluggish release action due to seal failures / wearing of piston in pneumatic valves. Trouble shooting used to take considerable time because of the usage of two valves in the system. Every time, both the valves had to be dismantled, serviced and put back to the system. The spare valves exhausted with no support from OEM (Nucon Make) as the product

is obsolete now and no matching valve is available in the market. ***Retrofitting by new valves required changes in existing manifold & pipelines also.***

With such issues, Brake release operation was highly affecting Unit starting operation sequence. Units got delayed by 30-45 Minutes at many instances. Minimum half an hour was required for maintenance staff to reach site for attending the problem. Gerusoppa being a Peak demand meeting Station, minimizing the Brake release related issues had to be dealt on top priority. At the same time, ***discarding /retrofitting of the existing Brake control panel completely was not viable technically & economically*** since it has the provision of rotor jacking pipelines also.

Hence, it was decided to keep the existing Brake control panel as it is for routine brake operations and to develop a separate standby control panel with ***minimum valve controls in most economical way*** such that this panel serves in emergency condition only .i.e when the existing brake control system mal functions/gets faulty. Complexities like reset function in the existing panel have been taken care in the new standby panel by providing only one valve instead of two.

Implementation-Scheme:

Fig.1 shows existing brake control provided for each Unit. Two valves (encircled) are main Pilot valves which control apply/release actions, mal-operation of which results in abnormal operation. These valves are mounted to a specific manifold which has pathways for circulation of air

Fig.2 shows modification works done in the Panel for provision of new standby Brake control mechanism. 3 Nos. of needle valves were provided for immediate switching over of the system. With the operation of valves, standby control system takes over and release/apply actions can be performed from remote control room.



Fig.1 Unmodified Brake Control Panel(EarlierSystem)

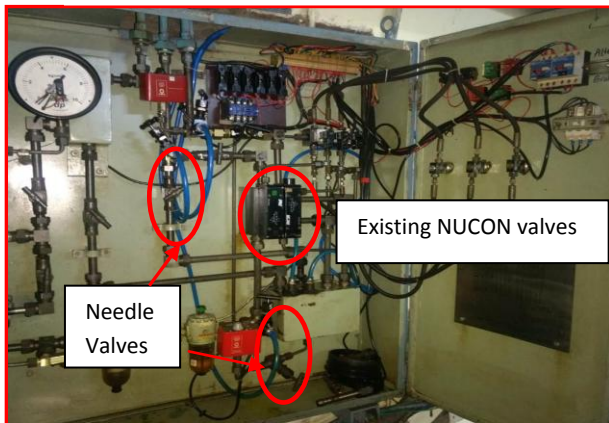


Fig.2 Modified Brake Control Panel

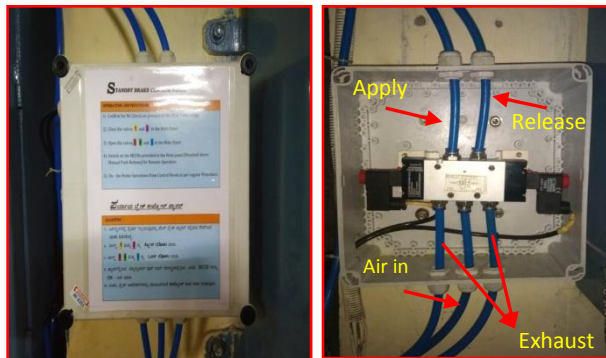
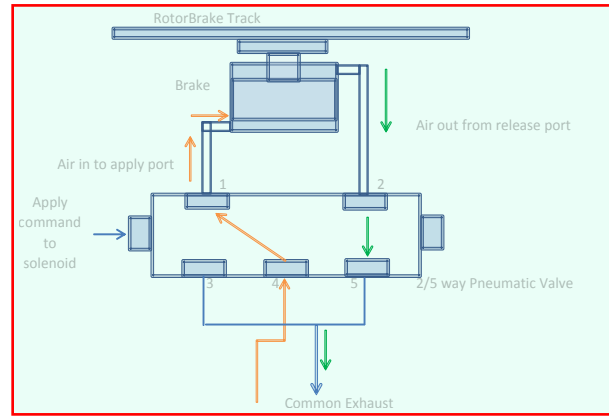


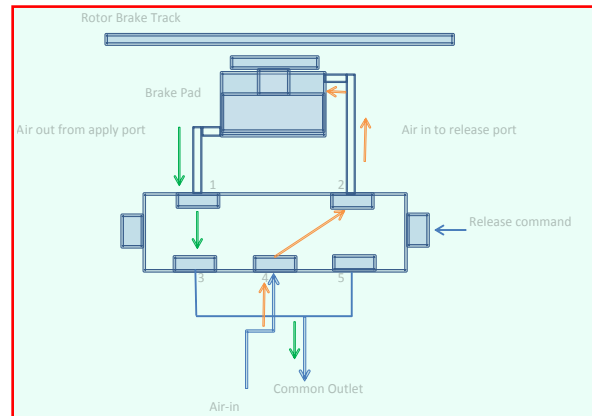
Fig.3 Standby Brake Control Panel

Fig.3 shows working model of Standby Brake control system. It envisages 1 No. 3/2 way solenoid operated valve. It has one common air inlet port and two outlets – one for Brake apply line and another for Brake release. Depending on command from control room, relevant ports get connected and the operations are performed. Operation with drawing explained in Fig.4 & 5.



Brake Apply Operation

Pressurized Air ready in Port 4 connects to Port 1 when apply command is enabled to solenoid coil. The air pushes cylinder piston upward causing Brake apply action. Simultaneously Port 2 gets connected with port 5 which is exhaust port and the air stocked in the piston top area gets escaped to atmosphere.



Brake Release Operation

Pressurized Air ready in Port 4 connects to Port 2 when release command is enabled to solenoid coil. The air pushes cylinder piston downwards causing Brake release action. Simultaneously Port 1 gets connected with port 3 which is exhaust port and the air stocked below the piston area gets escaped to atmosphere.

Following items have been utilized for implementation of Standby control system .

1. One No. 3/2 way pneumatic Valve with Solenoids for enabling remote operation
2. PU Pipes required length for Pressure Lines (7 Kg/CM²) - Advantage of Using PU –easily fixable.
3. Gate/Needle valves 3 Nos.-for isolating existing system.
4. Housing Cabinet
5. MCCBs for Control supply of Solenoids.
6. Essential hardware like QR Couplers, Tee, elbows etc.,

Advantages of the Scheme:

- Immediate release of Brakes is possible
- Quick troubleshooting / Assessment of Brake pad related issues and restoration
- Reduced down time (Almost Nil) related to Brake release issues.
- Only a single pilot valve is required which is readily available in the market. OEM dependency avoided.
- Low cost - Redundant system (Appr.Rs.20,000.00)

Economics at a glance:

- Present Generation Tariff @ Gerusoppa – Ps.183.81 (Rs.1.8381)/Unit
- Minimum of Half an Hour Generation Loss is equivalent to: 30000 Units X 1.8381 = Rs 55000.00 in terms of revenue to the Corporation (Considering 1 No. 60 MW Unit).
- A Single Brake release issue will take minimum 30 minutes to attend, including Conveyance of Maintenance Engineers. Operation Staff can immediately change over the Brake control System to this standby system before the arrival of maint. Staff and Unit can be synchronized without any delay.

Such 3 to 4 incidences have occurred at Gerusoppa Power House since provision of the system and it has turned out to be a worthy implementation developed by in-house team of KPCL Employees.

Team:

Padmanabha.D.Bhat EE(M)
Bharath Nayak AEE(E)
Narendra Naik S JE(M)
Veerendra M Sr.Tech
B.Ramesh Asst.Opt

