

Replacement of Distributed Control System of TG -4 and Provision of these Parameters on the System near the Manager Using Networking Facilities

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1. Specific Field of Project and Introduction

The project relates to commissioning of Distributed Control system (DCS) of all the parameters related to Turbo Generator (TG) -4 of capacity 67.5 MW in Thermal Power Plant (TPP) of Vizag Steel Plant in Visakhapatnam of India. This machine being located far off from the Manager it is difficult to view these parameters. Same is being monitored over telephone with the help of operator in TG-4. Networking concepts and configurations were utilised and the parameters were displayed on a system which is available near the Manager. By this conversation with the operator shall be avoided.

2. Motivation for the Project

In Thermal Power Plant of Vizag Steel Plant there are 6 Boilers and 5 TGs to generate power of 315 MW capacity. DCS of all the 6 Boilers and TGs 1, 2, 3 & 5 are based on Max DNA systems made by M/S BHEL. TG 4 is still operating on obsolete system named Procontrol of M/S BHEL. As the configurations, hardware and softwares of Max DNA systems are already familiar it is proposed to replace system of TG - 4 with M/S BHEL make Max DNA systems.

Later corresponding screen is to be developed on the Human Machine Interface (HMI) available near the Manager of the plant who is at 300 m away. Necessary rights were provided on the HMI named as Operator Working Station (OWS) located near the Manager. Corresponding IP addresses were provided on this OWS and the networks are to be interfaced such that the data corresponding to the parameters of TG-4 is available to the Manager.

This will be advantageous to the Manager and the operator of TG-4. There conversations are minimized. The trends of these parameters can also be configured so that the value monitoring at any instant is possible to the Manager.

3. Problem Statement

Procontrol of M/S BHEL, a product supplied in the year 1996 has become obsolete and there is no support from the Original Equipment manufacturer. This system consists of so many special electronic modules based on Processors, EPROMS in addition to simple Input and Output modules. There are so many electrical components for power supply interrogation and for these modules. Communication is

through Electronic Buses and sub Buses. All these buses are monitored utilizing electronic modules. All the parameters are displayed on a system operating on individual indicators and recorders. Bare minimum facilities were available to the operator on this system supplied then. The operations are done utilizing push button stations on hard-wired back up panel. Parameters are viewed on individual indicators and recorders for the parameters as follows.



It is being difficult to maintain this DCS without spare support from OEM. There are several modules which will monitor and control important parameters like speed, power, position of control valve of the governor of TG-4 without which its generation can become zero MW. The capacity of TG-4 is 67.5 MW generating an income of Rs 130 lacs per day. By providing data of TG-4 on the system near Manager Intangible advantages are achieved for the Manager and the operator.

4. Aim of the Work

Aim of this project is to replace the obsolete DCS of TG-4 in TPP with latest available open architecture and make it user friendly to operator as well as maintenance engineer.

- Dismantle the old panels and Hard-wired backup panel of Procontrol of M/S BHEL and erect the corresponding new panels of Max DNA system of M/S BHEL.
- Install required HMIs for display and control of the parameters of TG-4.
- Set-up necessary hardware and software components.

- Build mimics as required by the process and provide rights for security.
- Provide TG-4 parameters on the system near the manager for viewing.
- Provide the trends of all the parameters on the system near the manager.

All the parameters of TG-4 are checked for correctness and necessary log sheets are prepared for the convenience of the operator.



5. Title of the Project

Replacement of Distributed Control System of TG -4 and provision of these parameters on the system near the manager using networking facilities.

6. Methodology

MAX DNA system is capable to replace the old Procontrol system. The features of the system are fully utilized and made compatible with operational requirement and maintenance point of view. The parameters of TG-4 are subdivided into 5 groups for the support of the memory by processor and process requirement. Each group is managed by one processor. Processor is called as Distributed Processing Unit (DPU) version 4F. DPU is self contained microprocessor based rack mounted unit occupying a single slot in remote processing unit cabinet using an 8 wide max PAC backplane. It is designed to operate Input Output modules and communicate with other devices such as SCADA, PLC and remote terminal units. DPU 4F is operated in redundant mode so that bump less transfer of actions were made. The whole system is operated on redundant communication with 2 LANs. Each DPU 4F will take care of certain number of parameters depending upon its memory capacity. The operating system being loaded on DPU 4F is micro soft based windows CE.net real time multi tasking system. DPU 4F of each group are named as primary and secondary. There is a provision of soft/hard takeover of secondary DPU from primary and vice-versa. Also automatic changeover of secondary is possible in case of failure of primary due to power or communication problems. Each group shall have different IO modules as per process requirement listed as follows.

It starts from 4 representing TG-4.

1. 4TSE-TP2 for TSE and CLCs named as CJJ01
2. 4EHTC for Electro hydraulic turbine control named as CJJ02
3. 4TP1 for Turbine Protection named as CJJ10
4. 4ATRS for Automatic Turbine Run-Up system named as CCA01, 02
5. 4OLCs for open loop controls named as CCA11, 12

Different Input/ Output modules are in use depending upon the signal.

Max DNA applications are mainly Max Vue and Max DPU tools for clients to access data and manipulate.

Others like storian are for historic trend data.

Max DPU acts as a server collects information stores it and ultimately transforms the information to the appropriate Max station elements.

Software backplane suits include the following core applications.

- Max RRS Registration and Routing connectivity clients with providers of information .Clients read write & subscribe.
- Max LSS local Startup Server for providing max station home keeping functions such as storage for other processes and a set of simulation function.
- RTG Real Time Gateway required with system using DPU Bus Modules provides an interface between the DBM and SBP. RTG provides immediate data, trend data, alarm data.
- Max station and DPU communicate with one another via max NET which is a fully redundant 10/100Mbps Ethernet network using industry standard TCP/IP protocol for communication between clients and servers.

Two initialization files stored in C:\Custom\Database have special system wide importance for identifying DPU and workstation resources to their applications or to the N/w.

- DPU list.ini
- WKS.in

DPU list.ini is a text file containing the names & IP addresses of all DPU'S including virtual DPU is the system.

Domains are connected to reduce the network traffic with appropriate IP addresses.

Security levels are set as follows.

- 0 GUEST
- 1 LAB DATA
- 2 TECHNICIAN
- 3 OPERATOR 1
- 4 OPERATOR 2
- 5 SUPERVISOR
- 6 TUNER
- 7 ENGINEER1
- 8 ENGINEER2

9 BYPASS

In network domains maxstations may also be configured as proxy servers. For OPC application it can be used as either server or client.

Max DNA works as client/ server architecture. S/W backplane distributed communication infrastructure software provides data to the clients.

Max VUE & Max DOU tools are clients accessing providers for data. Max STORAIN plays the role of provider as well as client.

Max DPU acts as a server collects information storing it and ultimately transforming it to appropriate Max Station clients.

Various apps are as follows.

- Point Browser-Creates the tree selection of DPU's.
- Health log- Provides the status of listed DPU'S
- DPU alarms-Fetches alarms from listed DPU'S
- DPU events-Fetches events from listed DPU'S
- Time sync-Determines DPU's to check time error &sync.
- Max DPU tools- Lockup of IP Address/Security Download.
- Database summarize- Scope of DPU'S to get summaries.
- Download Freeze Check- List available to unfreeze.

7. Parameters on Remote Station



8. Conclusion

Thus the max DNA system for Turbo generator is commissioned in November 2017 successfully.

An unique feature called islanding scheme due to which plant continues to generate power though there is fault in the grid is incorporated and tested up to load throw of 25 MW. Finally all the parameters of TG 4 were given to shift manager who is 300 m away using network technology.