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GRID SIDE SYNCHRONIZING BY USING PLC PROGRAMMING AND MATLAB SIMULINK ANALYSIS

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Abstract - This *project paper is of Thermal power plants controlling by plc ladder logic and synchronizing of different units of a plant . Thermal power plant consist of many important equipment such as boiler ,coal conveyer belt ,ash handling plant ,cooling system etc which are required for the generation of power. These equipment requires continuous inspection and monitoring .this paper outlines the automation of boiler &coal conveyer Automation leads to greater efficiency &reliability .The automation is achieved by using PLC .Analysis of thermal power plant is achieved with help of MATLAB simulation. Different sensors are used for measuring the temperature of boiler, coal input and turbine action for generation, these sensors sent required data by continuous monitoring to plc controlling program. In this project we outlining ease of controlling and synchronizing the thermal plant by ladder logic programming using plc for a plant and power analyzing of different unit of plant by using mat lab simulation.*

Key words: Programmable Logic Controller (PLC)[1], ladder logic diagram[2] ,Power Plant[3], mat lab simulation[4],Control room[5] etc..

1. INTRODUCTION: At initial stages of power generation and its distribution to consumers is very complex and required of continuous attention of men and their role is very crucial .though under the supervision of once the chance of making mistakes in various sector is quite observable. In order to make the work getting done in perfect and safe environment we need some devices jointly with technology, where getting job done with ease[1].

so considering running of a thermal plant under superior supervision such it eliminate the faulty condition in generation and protects the equipment such that boiler, coal conveyor ,ash handling ,generated steam handling, synchronizing of different units ,by using of Programmable Logic Controller (PLC) with ladder logic diagram. and also analyzing the amount of power that has been being generated ,delivered to load from feeders.

Now a days, it has become a necessity to maintain synchronism because the system is expanding day-by-day and these results in installation of larger machines so in this project we are making synchronism of different units of plant taking NTTPS as example with plc.

1.1 OBJECTIVE: In order provide continuous supply of power to the load centers and making to find the fault and clearing it in low time so that it can establish continuous supply. mainly securing the quality of supply , by removing the causes of discontinuity by plc ladder logic and establishing the much more sophisticated synchronization . Analyzing power being used through mat lab simulation.

1.2 What is PLC?

PLC is Programmable Logic Controller PLC is a software that acts as a controlling mediator or treated as signaling acting between the field and scada. SCADA (Supervisory Control and Data Acquisition) applications are created as a main tool for performing management.

1.3 NEED FOR PLC:

Hardwired panels were very time consuming to wire , debug and change. developed to offer the same functionality as the existing relay logic systems. programmable, reusable, reliable. could with stand harsh

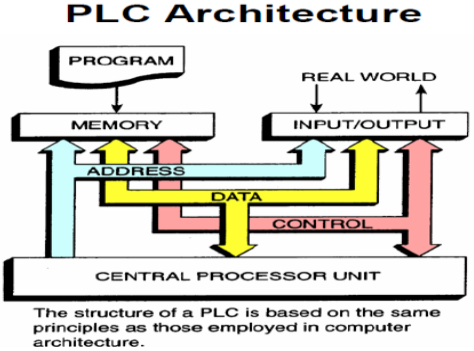


Fig -1: PLC Architecture

Discrete Input

A discrete input also referred as digital input is an input that is either ON or OFF are connected to the PLC digital input. In the ON condition it is referred to as logic 1 or a logic high and in the OFF condition maybe referred to as logic o or logic low.

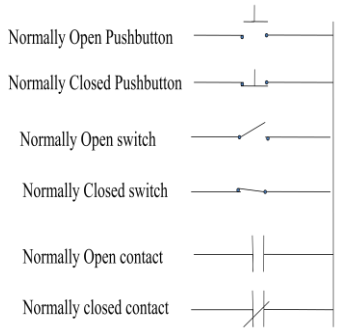
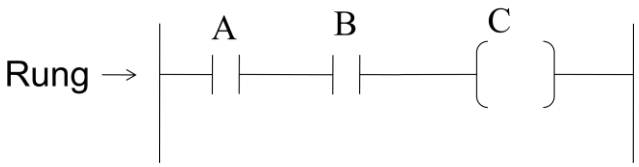


Fig -2: Types of switches

1.4 AND OPERATION



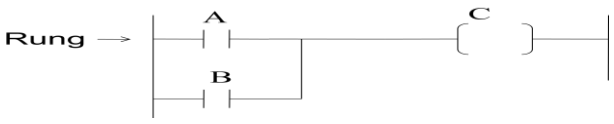
A	B	C
0	0	0
0	1	0
1	0	0
1	1	1

Chart -1: And operation

A and B are switches C -OUTPUT

output comes when A and B are 1

1.5 OR OPERATION:

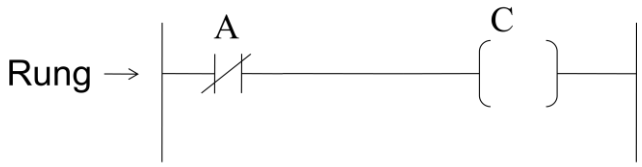


A	B	C
0	**0**	**0**
0	**1**	**1**
1	**0**	**1**
1	**1**	**1**

Chart -2: OR operation

OUTPUT C comes or glows for 1 for A or

1.6 NOT OPERATION:



A	C
0	**1**
1	**0**

Chart -3: Not operation

so initially at switch on .

2. EQUIPMENT THAT ARE NEEDED TO CONTROL OR AUTOMATION :

1)coal conveyor 2)boiler

3) turbine action 4) supply to load

2.1 COAL CONVEYOR AUTOMATION: coal is fed as input to the thermal plants. there will be continuous need of coal for giving temperature to boiler for steam production. the needed coal is conveyed to combustion chamber through conveyor belts . the coal is monitored through IR sensor, proximity sensor, humidity sensor and temperature sensor in the operation of Siemens PLC.**ladder logic for automation coal with time constant to reach the combustion chamber.

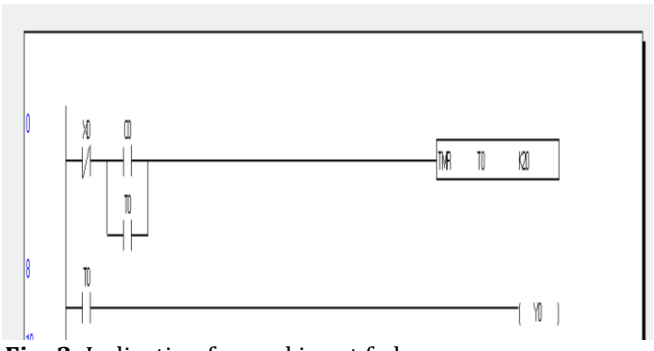


Fig -3: Indication for coal input fed

2.2 AUTOMATION OF BOILER:

In boiler we need continuous monitoring of water level and temperature. Here monitoring with sensors is very much advantages because monitoring of temperature continuously manual is dangerous due to high temperatures and not safe for human life. Monitoring of temperature and pressure with using their respective sensors acting as feedback to plc one can easily notice the ongoing changes and sufficient action regarding it.

ladder logic for automation of boiler with time constant for generation of steam signal of coal is fed time steam generation.

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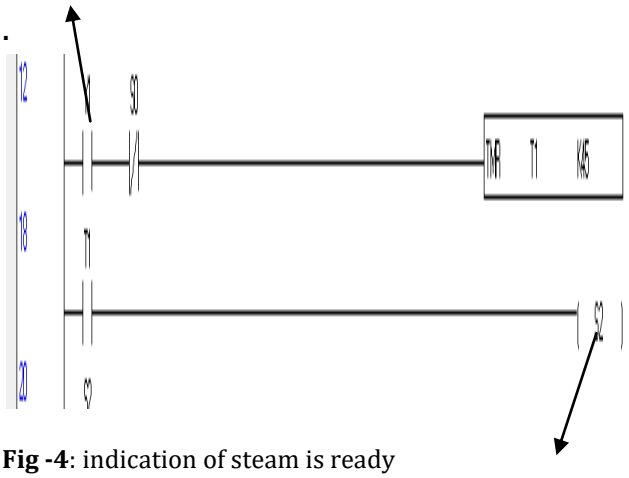

Fig -4: indication of steam is ready

2.3 AUTOMATION TURBINE WORKING:

As above ladder gives signal output as steam is generated. That steam ready for flowing on to turbine blades .mostly different types of turbines are used depending on steam flow. This turbine shaft is coupled to generator. The generator can supply power at synchronous speed. to get into synchronous speed some time is required for the generator. The below is implementation of ladder logic.

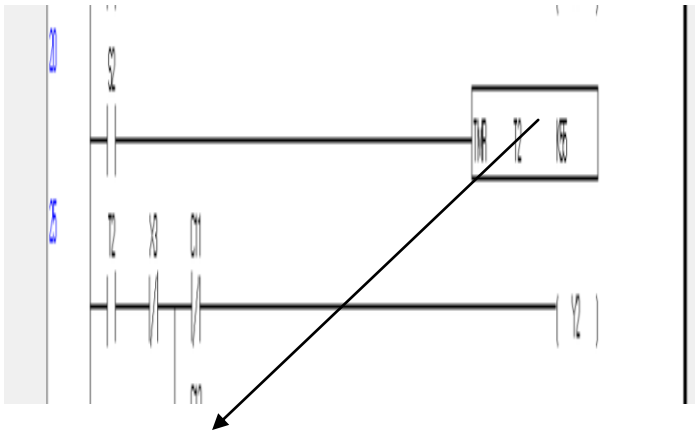

Fig -5: ladder logic for generation automation with time constant time required for getting into synchronous speed.

2.4 SUPPLY TO LOAD: Power that has been generated at synchronous is now supplied to load centers with normally closed switches in ladder logic .through with these normally closed switches one can easily disconnect load from feeder during servicing or at faulty operation. the below logic diagram shows the connection of feeder to load centers[2].

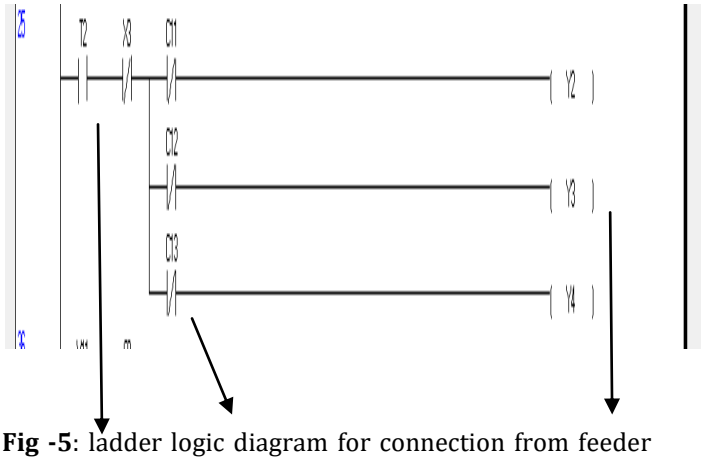

Fig -5: ladder logic diagram for connection from feeder to load feeder circuit breakers load centers

3. LADDER LOGIC DIAGRAM OF SINGLE UNIT (NTTPS) USING PLC.

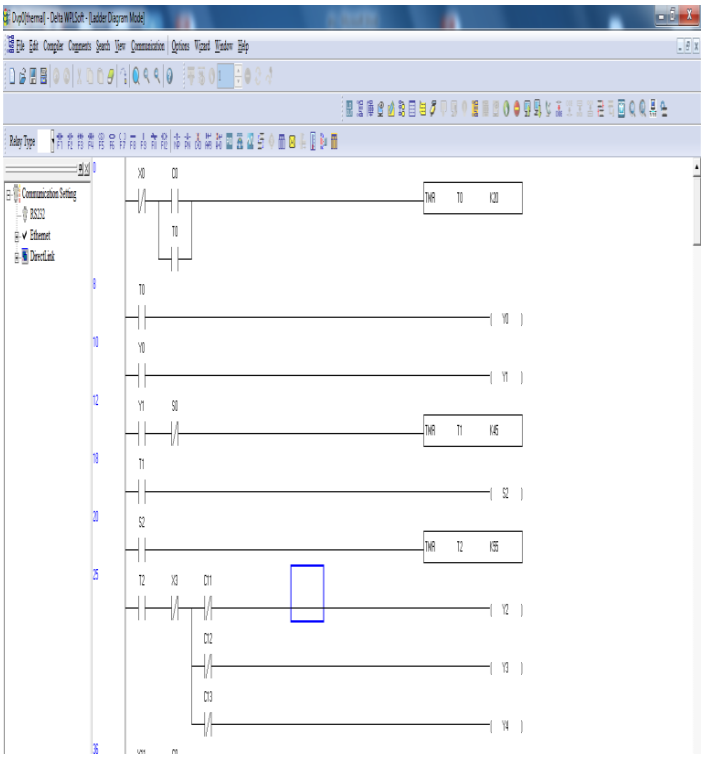

Fig -6: complete unit circuit control using plc

From the above figure is implementation of single unit of a thermal power plant. this project is to implement complete power generated units at NTTPS of Andhra Pradesh. So trying to implement remaining 7units {6*210mw,1*500mw,1*800mw}.Though 800mw is not yet started we had running that unit and synchronized with other units too[3].

from fig1 we controlled unit by each equipment protection. it has been simple mode of circuit that show the unit operation safely having ease of control towards generation.

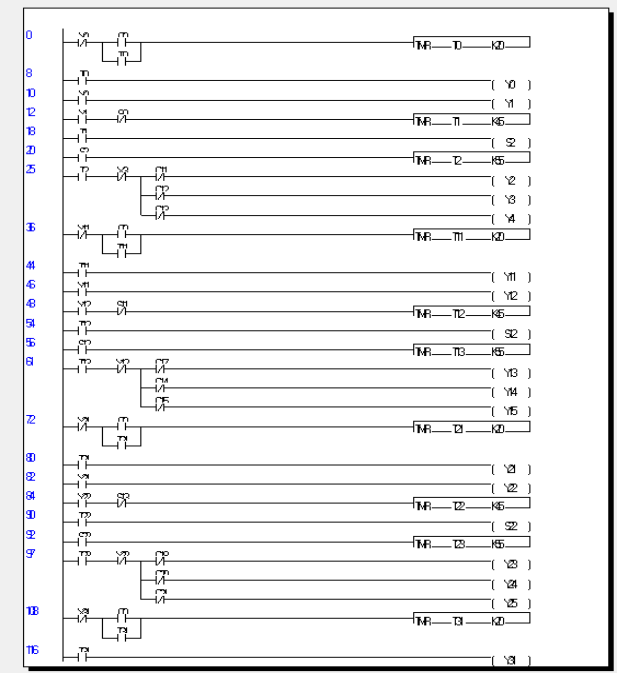

Fig -6.1: ladder logic diagram total nttps units implementation:

In above ladder logic circuit diagram of 8 units we made controlling at each where equipment for its safe operation and we also synchronized those eight units for good load scheduling[4].

figure is showing successful load scheduling of units with two of units are in shut down condition generating the power required by the load centers.

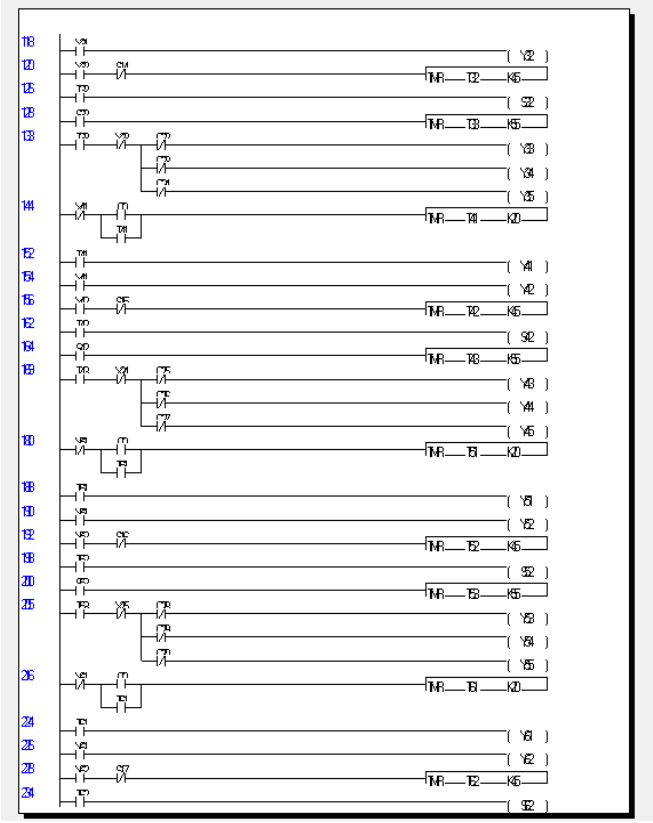

Fig -6.2: ladder logic diagram total nttps units implementation

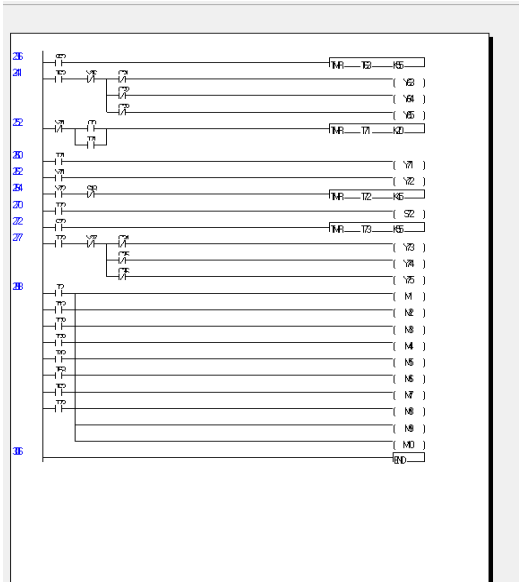

Fig -6.3: ladder logic diagram total nttps units implementation

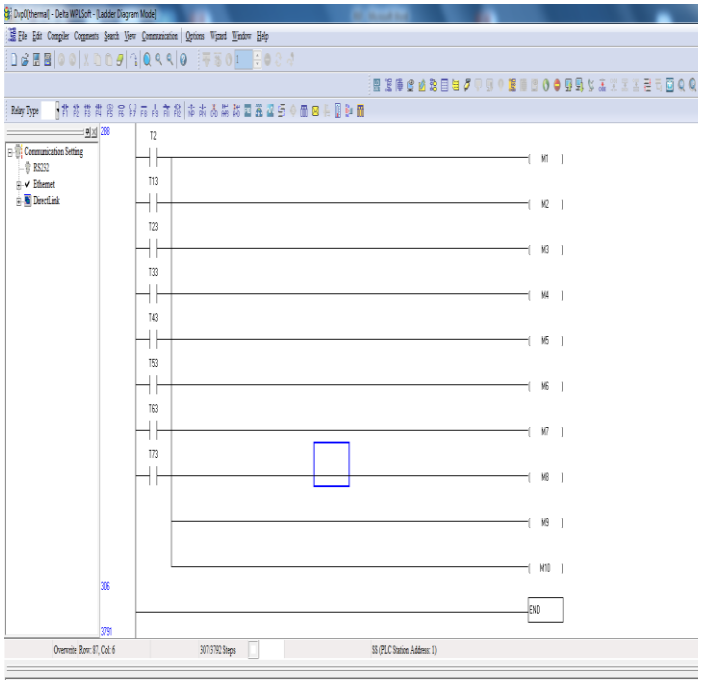

Fig -7: logic of eight units synchronizing circuit in plc software.

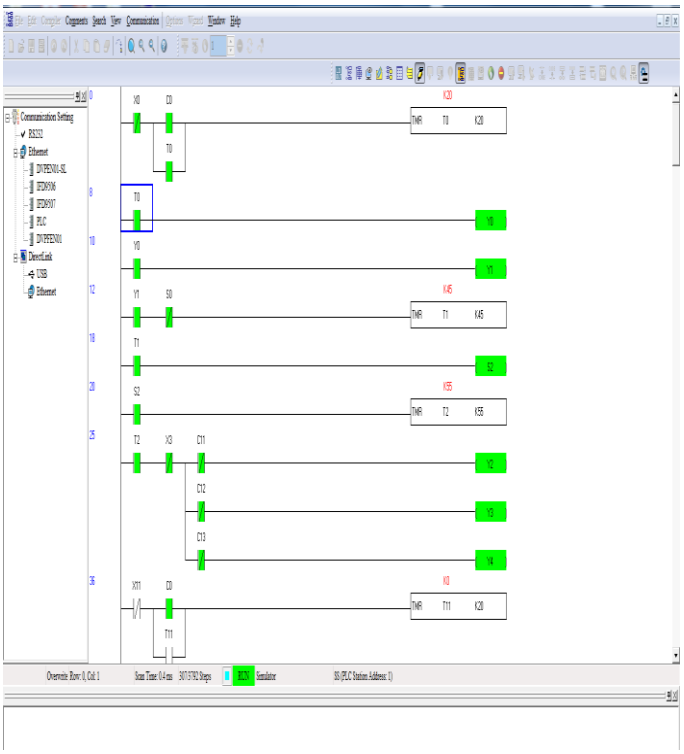

Fig -8: output result of a single unit in plc software

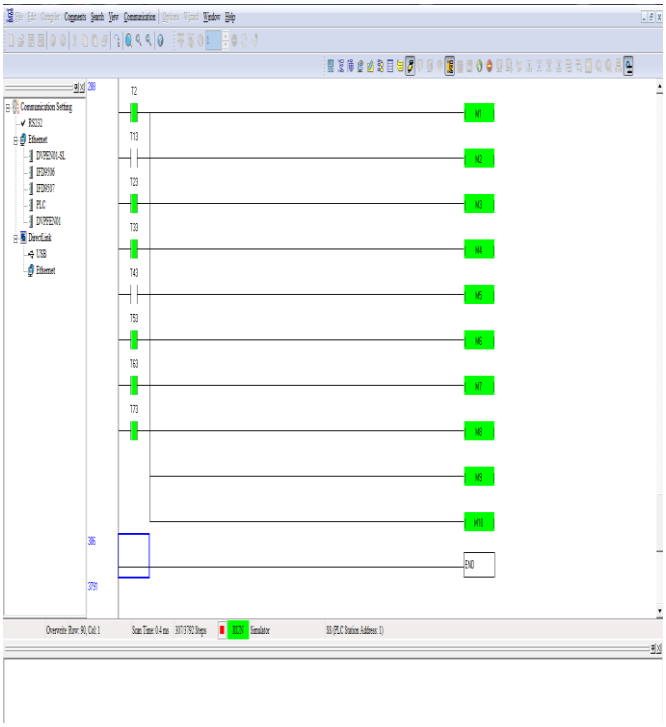

Fig -9: output result of a All unit in plc software

4. MATLAB ANALYSIS& SIMULATION:

Thermal plant has been implemented using plc ladder logic. the plant can be safely operated with each equipment being operated and monitored continuously. Now the part of power being generated[5] in the units and its distribution to load centers is being analyzed through math works software. A simple circuit is constructed for 8 units of NTTPS. This circuits shows the basic generation and its distribution to load centers with monitoring of it real and reactive power. And also viewing total load taken[6].

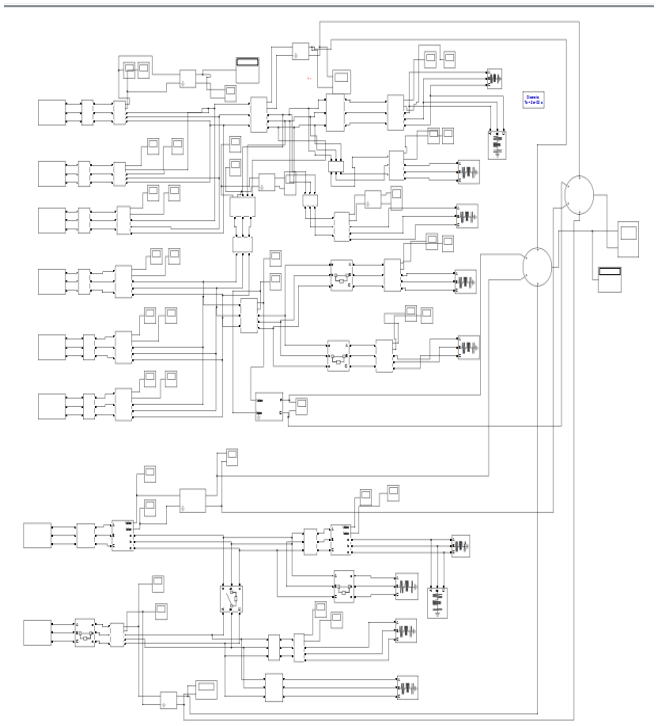

Fig -8: *eight units of* Narla Thatharao Thermal Power Station (NTTPS).

From the figure first six units of 210mw have been synchronized sticking to the basic laws of synchronism. Remaining two are 500mw and 800 mw they are shown of supplying to industrial purpose. With both of them are synchronized.

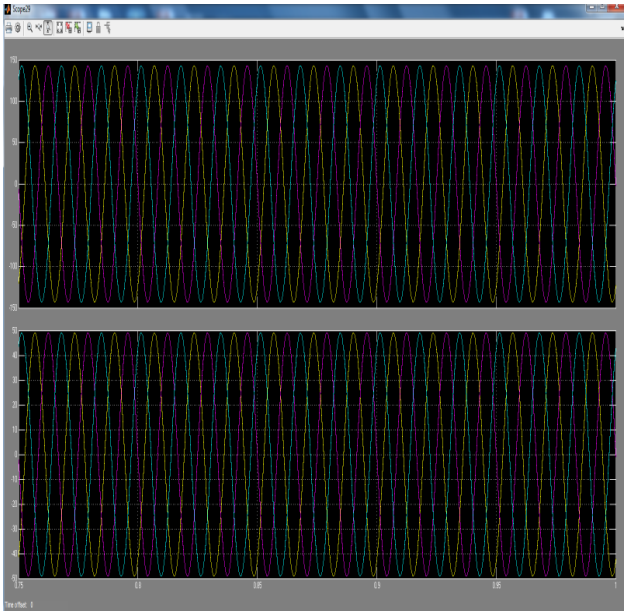

Fig -10: VOLTAGE and CURRENT of 500 mw unit

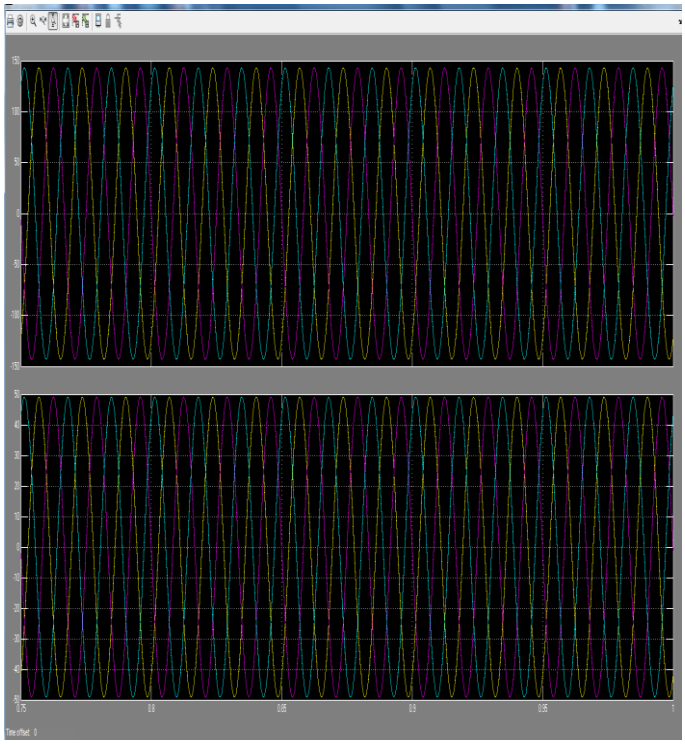

Fig -11: result of total real and reactive power taken by load centers

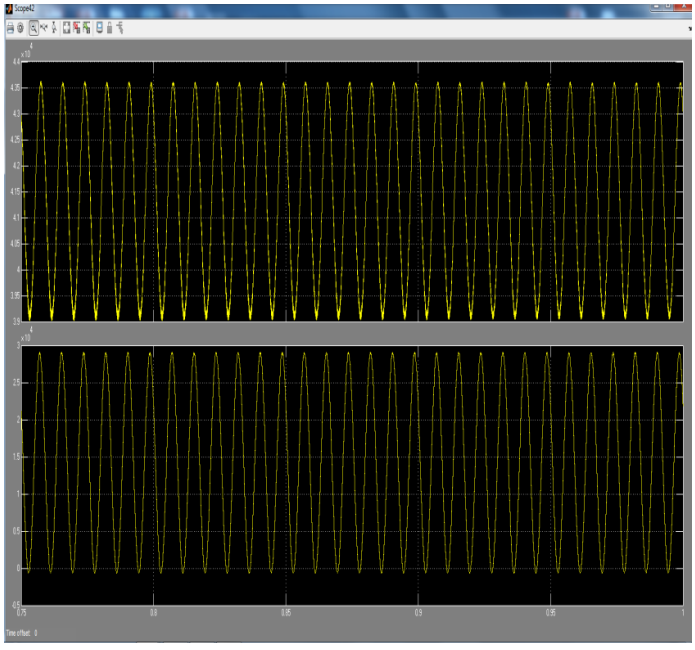

Fig -12: simulation results showing the analysis of NTTPS with its load scheduling.

5. FUTURE SCOPE:

For further advancement of project, the project can be implemented more efficiently by integrating both matlab and plc .With this the controlling is made more reliable And security of the plant has been increased being more advantageous to the plant operator.

The plant operator can control more easily from any place any time with online view by using ETHERNET connection. And with further advanced the plant can be more efficiently viewed in scada implementation for plant integrating with plc and matlab combination .where one can observe plant working easily and safely.

6. CONCLUSION:

In this Paper ,we obtainted continuity of power supply with low time of clearing of disturbances, further clearing of fault with ease by programming it plant operation in plc implementation and analyzing through mat lab simulation. Finally it all made the operation and control of plant with in safe region of operation by using plc software and math works.

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BIOGRAPHIES:

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