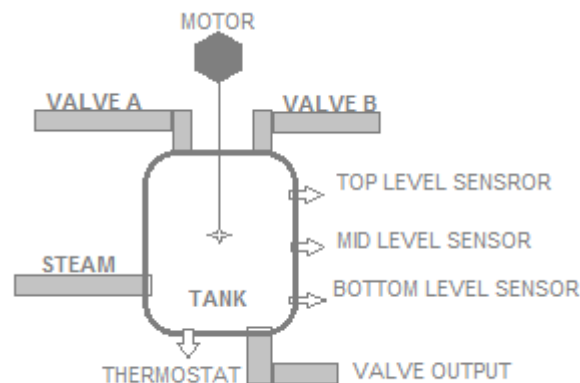


## BATCH REACTOR PRIORITY CONTROL IN DCS USING SIMATIC MANAGER AND SIMULATION USING SIMIT

### Aim

- To create a distributed control system for a Batch reactor using Simatic Manager and to create a Operating station for it
- To simulate the CFC of Batch reactor using SIMIT software

### Task:



- At start the Valve A should open till the liquid level reaches mid-level sensor.
- After that the Valve B should open and the liquid should fill the tank till it reaches top level sensor.
- After reaching the maximum capacity the motor should use a star-delta starter. With star for 3 secs.
- Followed by the steam should flow into the tank till the thermostat gives output of 70degree Celsius.
- Now all the motor and steam should close and Valve output should open. This will drain the whole batch.
- This process should be repeated.
- Dynamics of the Process is given by

$$\dot{h} = -0.1h + u$$

$$\dot{t} = -0.1t + u$$

### Software required:

1. Simatic Manager
2. SIMIT SF

## Procedure:

1. Create a new project in **Simatic Manager** and add a process cell to the directory tree. After that **Simatic 400 station** to the process and open its **hardware**.
2. In new Hardware configuration window, do the following steps
  - Add a **Rack-400 UR2ALU-H coated**
  - Add a redundant power supply **PS 407 10A coated**
  - Add a new version of **CPU 410-H** with a different IP address (**not machine IP**)
  - Create New **Ethernet** and **PROFIBUS** with the CPU
3. Now add a **IM 153-1** from **ET200M**. This will allocate a controller for the program.
4. Add Digital Inputs and Outputs to the **ET200M** controller. And Edit the symbols used.

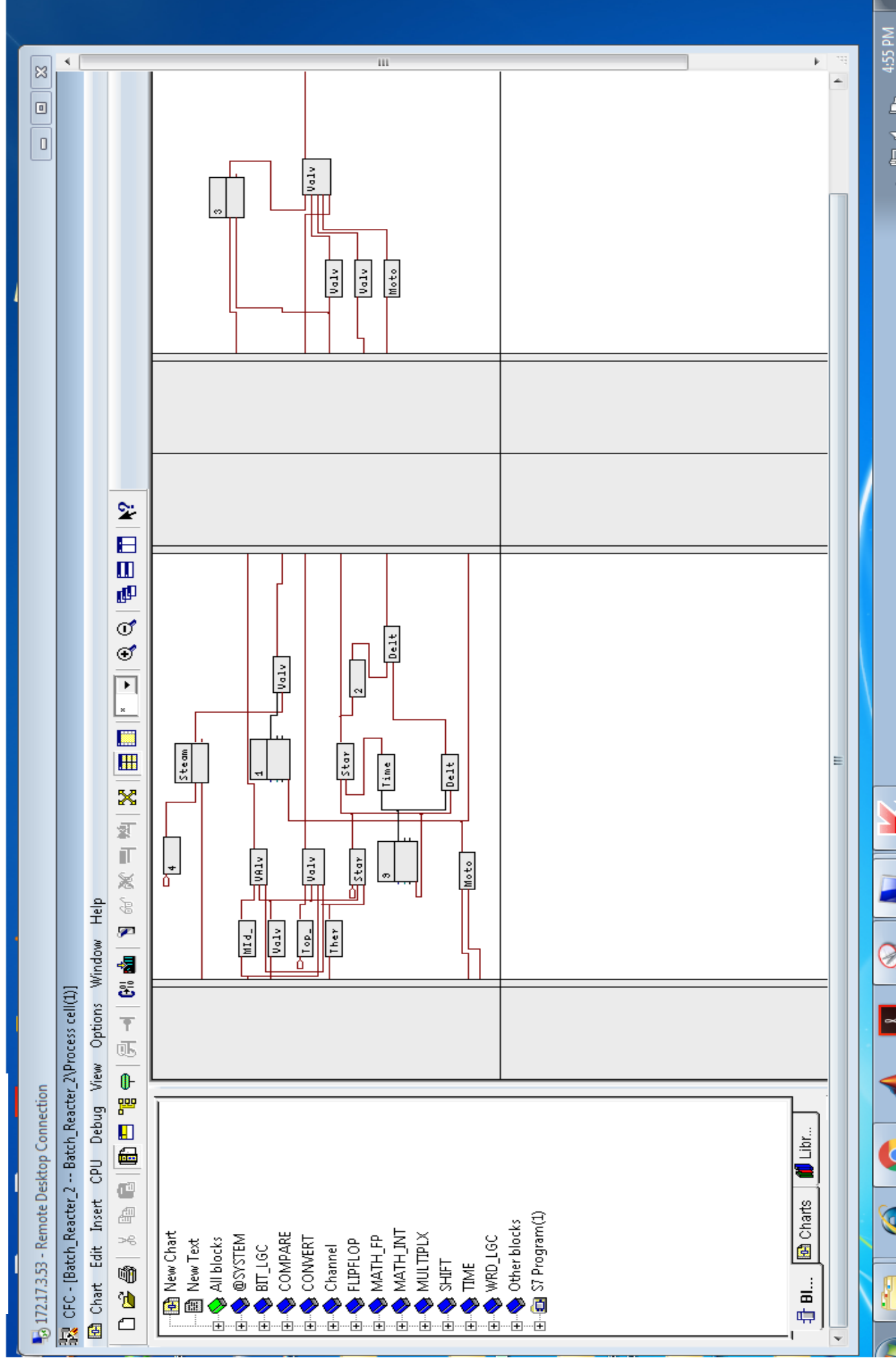
The symbols used here are,

I bit	INPUTS	Q bit	OUTPUTS
I 0.0	Bottom_Level	Q 0.0	Valve_1
I 0.1	Mod_Level	Q 0.1	Valve_2
I 0.2	Top_Level	Q 0.2	Valve_Output
I 0.3	Thermostat	Q 0.3	Valve_Steam
		Q 0.4	Motor
		Q 0.5	Star
		Q 0.6	Delta

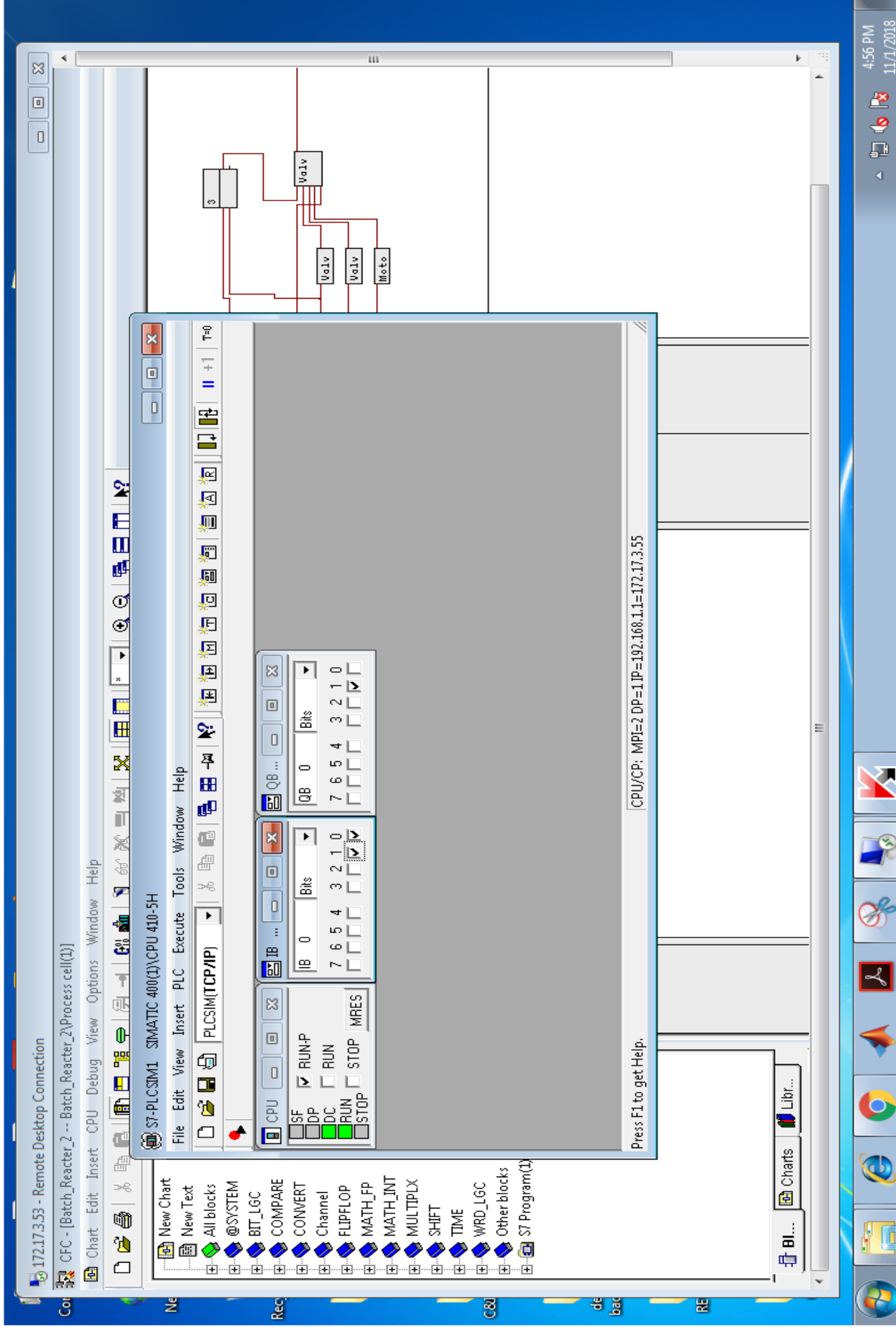
5. Save and Compile the configurations.
6. Open **Emulator** in Simatic Manager and Run it. The download the Hardware Configurations.
7. Open **plant view** and Create a **Hierarchy folder** and followed by the **CFC**.
8. In the CFC program the logic.
9. And then compile and download it. The output could be seen in the emulator.

CFC in next page and follwed by emulator output.

# CFC Logic

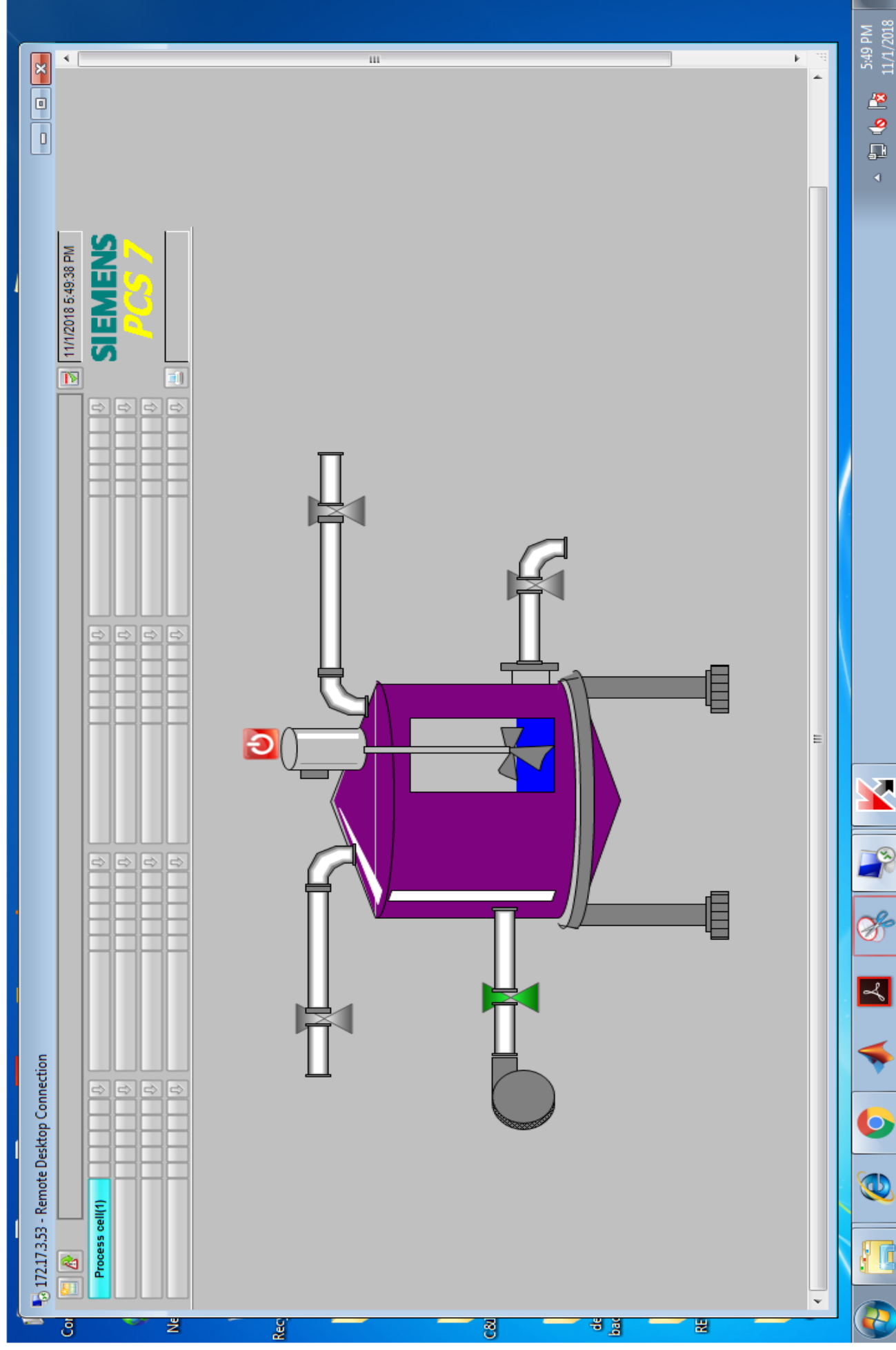


# Emulator Output



10. Next step is to create an **Operating Station**. Add **PC station** in **Component view** directory tree and open Configuration.
11. Add **IE general** from CP-industrial Ethernet followed by latest version of **WinCC** from HMI.  
**Note: Give the Machine IP while giving IP in IE-general**
12. Close the Emulator and Compile and Download the configurations.
13. Now open Connections in Component view and download selected stations from **PCS7**.
14. Open and run emulator and download **SIMATIC 400** in connections.
15. Add **picture** in Plant view. And change the address to internal.local.
16. Now compile OS with the connections given to Ethernet.
17. Open Picture and change the address in  
TagManagement>>TCP/IP>>Unit>>Address to PLCSIM.TCPIP
18. Open Graphics Designer and design the operator station.
19. After completing the design, Run the **CFC again** and **the Picture**.  
Now outputs can be verified in WinCC Runtime.

# Operating Station Output

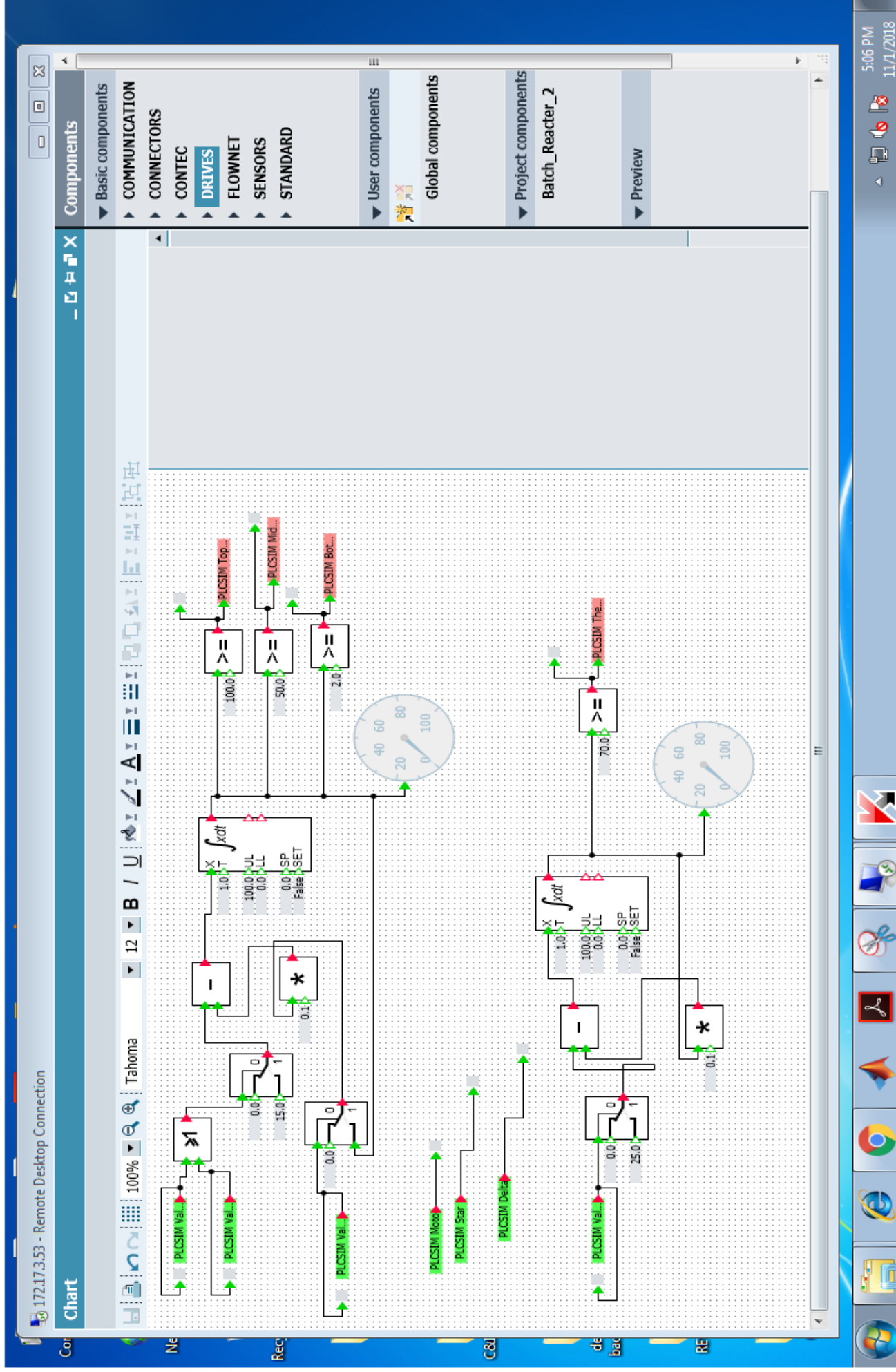


20. Next step is to simulate the program in SIMIT. First create a project in SIMIT with coupling in PLCSIM.
  21. Export the Symbols from Simatic Manager and save it in (.asc) file. Now import that symbols in couplings in SIMIT project.
  22. Formulate the dynamics equation in the SIMIT chart. And assign Output and Input to the PLC using Signals.
  23. After completing the program run the emulator in Simatic manager and run the SIMIT chart.
- The program and followed Output of SIMIT

**Inference:**

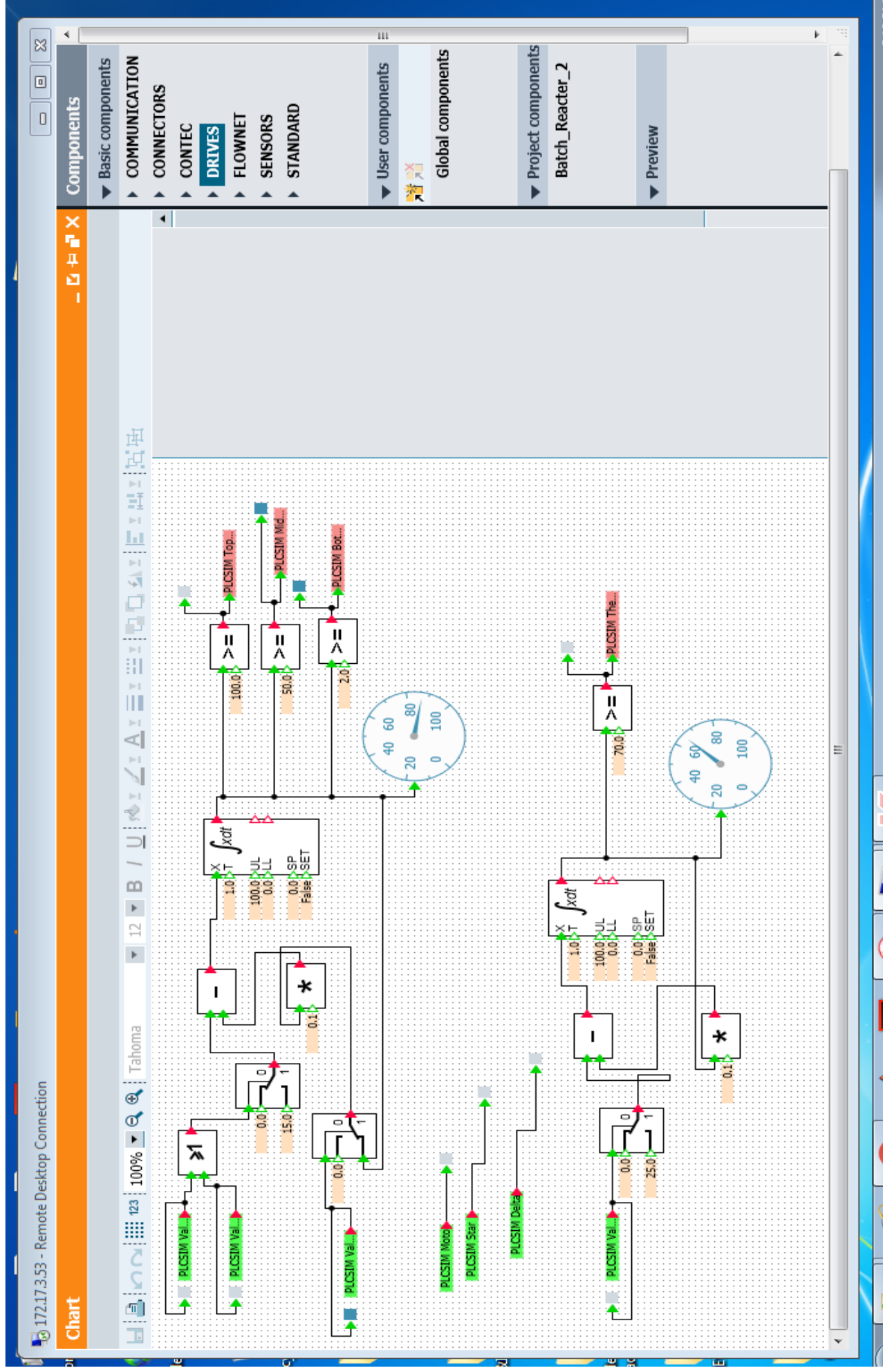
From this experiment, the automation of processing plants and processes are studied and its complexity is noted. The Designer, Developer and Operator will work in different context and all their jobs are experimented in this exercise.

# SIMIT CHART

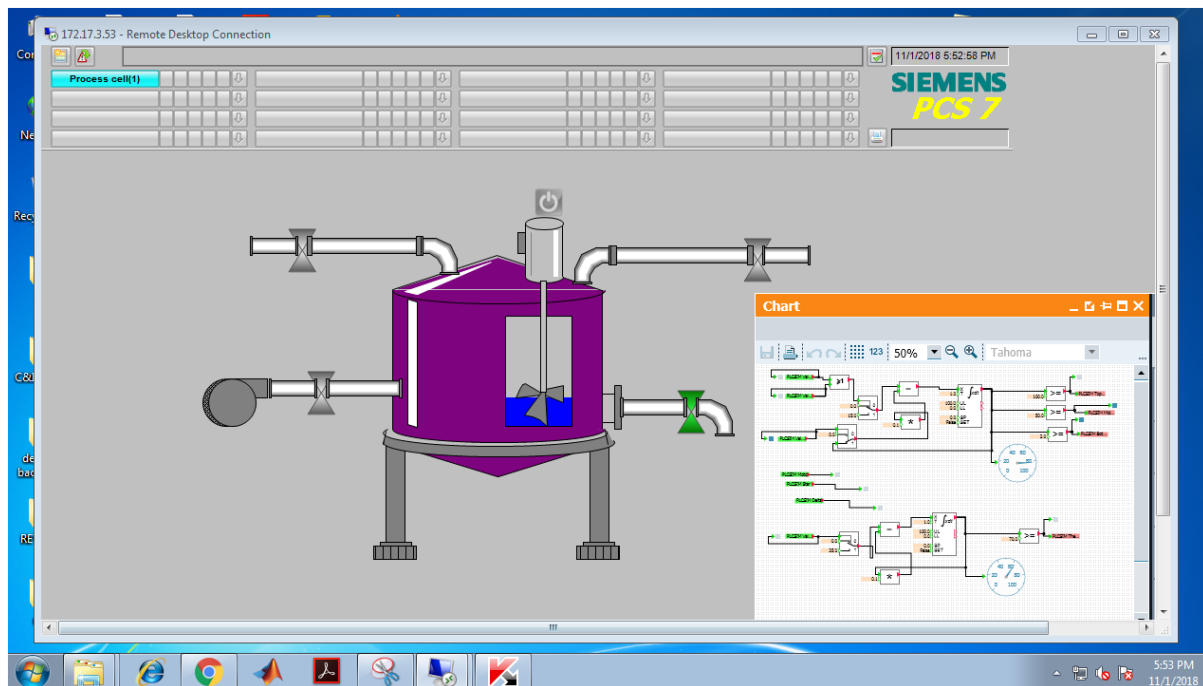




# SIMIT RUNTIME



## FINAL OUTPUT



### Result:

The distributed control system for a Batch reactor is created using Simatic Manager and its outputs are verified.