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by Taylor Hoskins

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1. Research

Industry 4.0 is the fourth industrial revolution. It adopts the standards of industry 3.0, with the addition of computers and automation. It refers to the intelligent networking of machinery and processes for the industry, bringing together digital and physical through cyber-physical systems.

(Jerzy Duda, 2021)

Industry 4.0 is enhanced through the internet of things. Smart sensors, software and processing abilities allow for the systems to be connected through the network and they can communicate with each other. It allows for analysis of real time data, which can be used to carry out self-diagnostics and can be personalised to each customer's needs. Figure 1 below shows the main considerations of industry 4.0

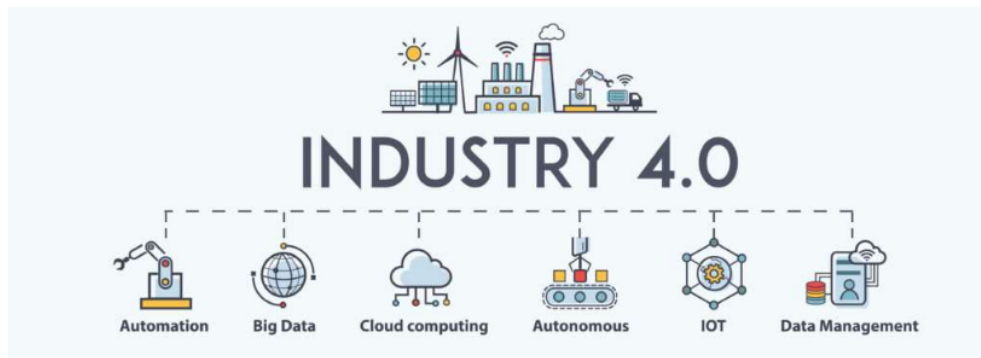


Figure 1

(dat4zero, 2021)

Machine to Machine (M2M) connectivity where machines are able to connect to each other through a network, using telecommunications and informatics that use the data to run automated operations without the manual assistance of humans. M2M can either be wired or wireless and is hardware based.

M2M is a foundation within the Internet of things, and the technologies of M2M were mainly adopted in manufacturing and industrial settings. It allows for point to point-to-point communication between sensors, machines, and hardware. (Quinn, 2015)

For simple circuits, the M2M connections can work in a way where there is a master and slave machines, which transmit data from one place to another.

M2M communications can be used in a wide range of applications. Remote monitoring is a very popular application. It allows for real time data to be collected from the device, which can

be used to be used for monitoring and control purposes. Data can be displayed via a HMI screen and used to produce real time vales, graphs and fault find.

Other examples of applications are shown in figure 2.



Figure 2

(Shea, 2019)

M2M connections allow for industrial manufacturing systems to carry out remote monitoring. If the sensors and chips monitoring information detect an issue, they can communicate this information, which will allow users to spot and resolve the issues quicker. (CPV Manufacturing, 2020)

M2M allows for asset tracking technologies. This allows sensors to track inventory, provide real time data of the products such as temperature or condition. Another advantage is cloud computing technologies. This allows data to be accessed anywhere, as well as allowing maximum amounts of data to be stored within cloud storage.

(CPV Manufacturing, 2020)

2. System Overview and Operation

The CIM System is a system that is made up of subsystems that control specific stations on the rig. The system contains sensors and actuators which release wagons and bits when requested. Each subsystem is connected through Profinet and is connected to a master PLC which allows data to be shown real time through a master HMI. Figure 3 shows an overview of the complete system.

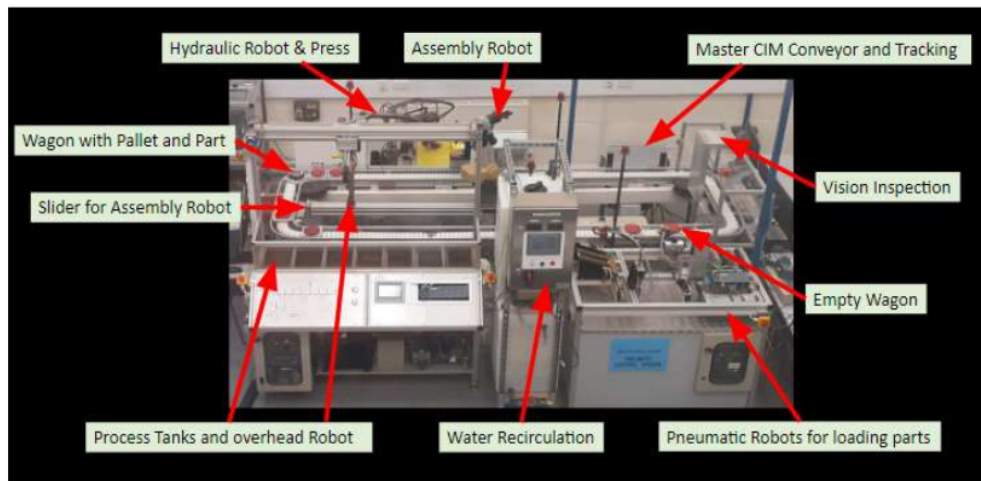


Figure 3

The subsystems included in the CIM System are:

- Master – PLC101
- Pneumatic Station – PLC102
- Vision Station – PLC102 [PLC 101](#)
- Process Station – PLC103
- Hydraulic station – PLC104
- Assembly Robot – PLC106
- Water Recirculation – PLC105

The CIM system is made up of actuators and sensors which are used for identifying the wagons at each station.

These are tagged to the Main CIM screen on the HMI and the counters and pilot lights can display at which point the wagon is at each station. Figure 4 shows the Main CIM screen on the HMI. It can control the CIM and Conveyor from the HMI and relay information such as the set point and process variable.

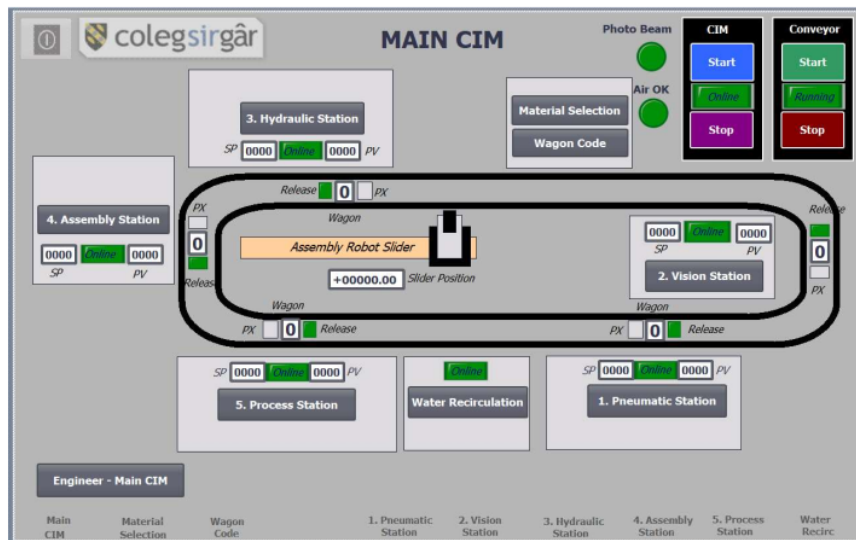


Figure 4

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Each wagon has a binary pattern on it which relates to specific reasoning. For example, if the wagon passes the pneumatic station, and it is loaded with a pallet. A specific binary code will be given to the wagon, and this will update the SP and PV.

The Master PLC contains a power supply, profinet switch and cables, S7-1511 safety CPU, and safety input and output modules. The 1500 PLC is compatible with VOT and therefore can be used for this function.

The Pneumatic station can load empty wagons with parts. The PLC controlling this station has an extra digital module and a relay output module. The station contains a handle manipulator robot which can rotate and grab handles and storage which has 2 channels which are able to hold and release handles, pallet manipulator robot and storage, stamp storage and a solenoid bank. It also contains a proximity switch. A push stamp piston and a push pallet piston are used to load parts.

The vision Station contains a vision sensor, which is used to inspect the parts in different stages and then the finish product. Once vision inspection is complete, it can be removed by the assembly robot if necessary. The station has profinet connections, which relay the information to PLC101.

The process station will stop the wagon at the station and remove the work piece if it is identified. It contains a pneumatic gripper which can travel left and right and scaled via laser and encoder sensors. It has its own HMI133 and process tanks. A motorised valve is used for the tanks.

The assembly station will identify the SP and PV of the wagon. It contains an assembly robot and slider and an assembly robot control panel which contain relays. The panel contains an RS432 module which connects the robot to PLC106, with an extra digital module.

The product is stored at the hydraulic station. It contains a gripper, hydraulic pipes, solenoid bank, rotary pistons and an analogue position sensor, manual switches and its own HMI134. The station contains a profinet switch and an analogue module for position feedback.

A flow diagram is shown in figure 5 of how the CIM system works.

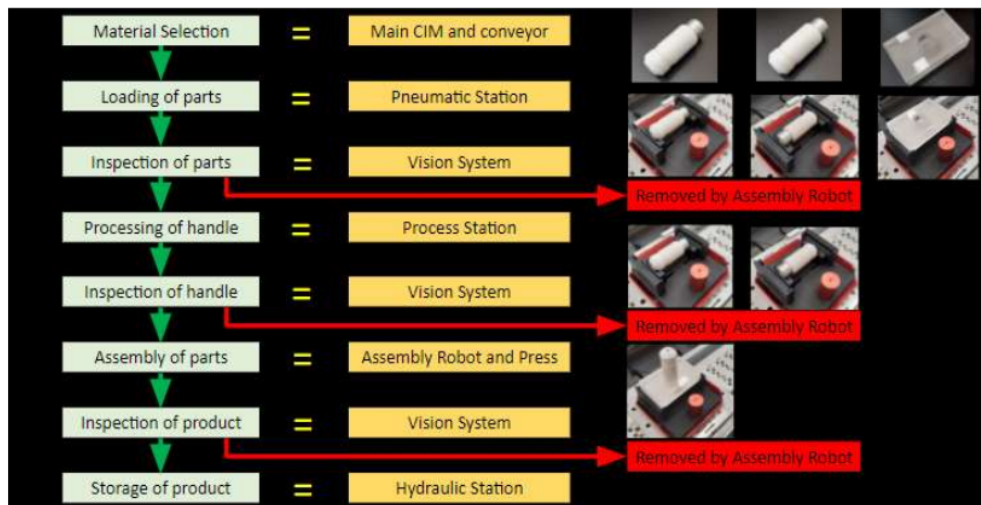


Figure 5

Figure 6 shows an overview of the M2M connections in the system. For Profinet, PLC101 is used as a master and the others are used as slaves. This enables the slaves to send data to the master PLC, and for the master 101 to get data from the required PLC using M2M connections. HMI 131 is used to control and display the data from PLC101. VOT can also control the system from data in PLC101.

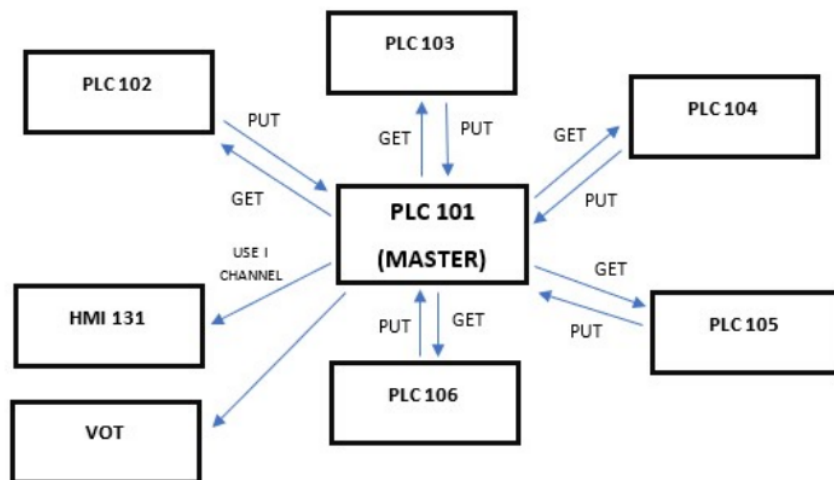


Figure 6

3. Health and Safety, Maintenance and Reliability Requirements

A risk assessment has been carried out on the system to identify the hazards within the system. It also allows for the user to see how well these hazards are controlled and allows for a clear direction for what needs to be done to improve safety.

No	Risk	Description	Probability	Severity	Actions to minimize risk
1	Lack of Guarding	No Guarding around the current conveyor belt which could cause injury if someone was to get too close.	Moderate	High	When using the CIM system, the user is currently monitored to minimize risk of exposure to danger. Further action required.
2	Trip Hazards	Possible trip hazards could come from large amounts of cables and components used within the system.	Moderate	Moderate	All cables kept neatly and within trunking. All components in casing.
3	Conveyor Jamming	If components/material were in a close proximity of the conveyor, they could cause possible jamming which would affect the system and cause a danger.	Low	Moderate	Emergency Stops all around system for quick and close access.
4	Rotating Robot Arm	Robotic arm within the system can move from left to right and its arm is rotational, which could cause harm if near a user.	Low	Low	Arm placed behind conveyor. Does not move within distance of walkway.
5	Loading of parts	The CIM System loads parts onto the conveyor which could come off or potentially get misplaced and cause jamming	Low	Low	E-stops near in case of Emergency of jamming.
6	Control Panel with electrical Components	The control panel contains electrical components which could be damaged if exposed to moisture/human touch.	Low	Low	Components within an IP Enclosure.
7	Electric Shock	Electric components within the system, come with a risk of Electric Shock.	Low	High	Most components are below 24V which would not create a hazard.
8	Access to system	Potential risk to user if they are not competent in using the system. Could cause harm to themselves or break the system.	Moderate	Moderate	Only competent/supervised users can use the system to reduce risk. The room is locked when not used to eliminate unauthorised access.
9	Access to program	Unauthorised access could cause issue if downloaded to PLC. Interlocks could be removed from the program which could cause damage to system	Low	Moderate	No unauthorised access to the program is given. Master copy is kept by lecturer. When students download their system to the PLC they are supervised.

					Passwords within the program and VOT.
10	Overheating/Fire Hazard	With electrical components, there is risk of overheating.	Low	High	The system is turned off when not in use. When in use, fire extinguishers are within room in case of emergency. Low voltage equipment less likely to cause a spark.

Figure 7

The system must conform to regulations to be used and produce a safe working environment for users. Some regulations that the system follows are:

- The Health and Safety at Work Act 1974.
- The Provision and Use of Work Equipment Regulations 1998
- The Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 1995
- The Workplace (Health, Safety and Welfare) Regulations 1992

E-Stops, interlocks and IP enclosures are examples of how these regulations are followed.

To make the system safer, and conform to these regulations, a few things could be implemented. Further action is required on the guarding of the system. Currently the system doesn't have guarding around the conveyor, which has potential to cause harm to the user and the system, as it could cause jamming or force.

If full guarding is not a feasible solutions, due to cost or urgency, then the 'Personal Protective Equipment at Work Regulations 1992' could be adopted and users made to keep hair out of their face, or wear protective equipment such as overalls, etc.

The system should only be accessed by authorised users. To ensure this, an extra lock box could be added which contains the power supply, so that it can only be turned on by an authorised person. This also allows for a safer working environment.

The system is maintained and upgraded regularly as and when needed or when new technologies come out that could improve the system. Faults can be indicated to the user through pilot lights and real time data sent through profinet connections. As part of the maintenance, the system and components are checked when fault data comes in and is then investigated. Sensors can be calibrated on the system.

4. System Design Adaptation

Various modifications were carried out to upgrade the CIM system and become more up to date with Industry 4.0 standards. The modifications focused on sharing data between the slaves and master PLC so that PLC101 was able to be connected to the HMI and show data from each PLC, within the whole system.

Settings on the program were adapted so that VOT was able to be used. To minimize unauthorised access, when setting up the VOT, it was made password protected, so that you could only access the system when the password was entered correctly.

The current profinet connections on the system were utilised for communication. To transfer data, put tags were added to PLC103 on the data block named 'PLC101' and Get tags added to PLC101, on data block 'PLC103'. To map this data, function blocks were added to the "Map data from PLC" data block in PLC103, with a MOVE function. The tags created in PLC were moved to PLC101.

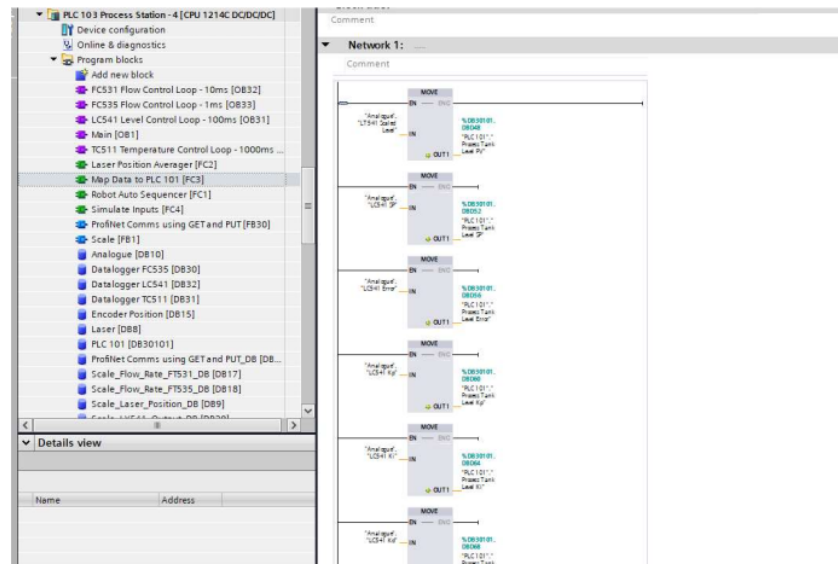


Figure 8

This process was done for the temperature, level and flowrate systems and they were each put on separate networks, for ease of reading. On the HMI connected to PLC101, the relevant screens were identified and tags for these screens were now changed to the new tags created and data was able to be displayed now from PLC101 connected to the HMI. Figures 26-30 show this.

Upgrades were added to HMI screens, showing the 'Commands' and 'Feedback' of each system. Pilot lights were added to display if in action. These were tagged to each PLC for monitoring purposes.

The VOT was used to access the system remotely, using the CIM program created in TIA Portal. A series of HMI screens were added on 'View of things' on the master PLC101 in the program. This allows the user to control and monitor the CIM system through a website.

The main screen created was a CIM screen. This was done by imitating the original HMI CIM screen on PLC101, using a combination of text boxes, shapes, and text, which act as buttons, lights and counters for monitoring and control.

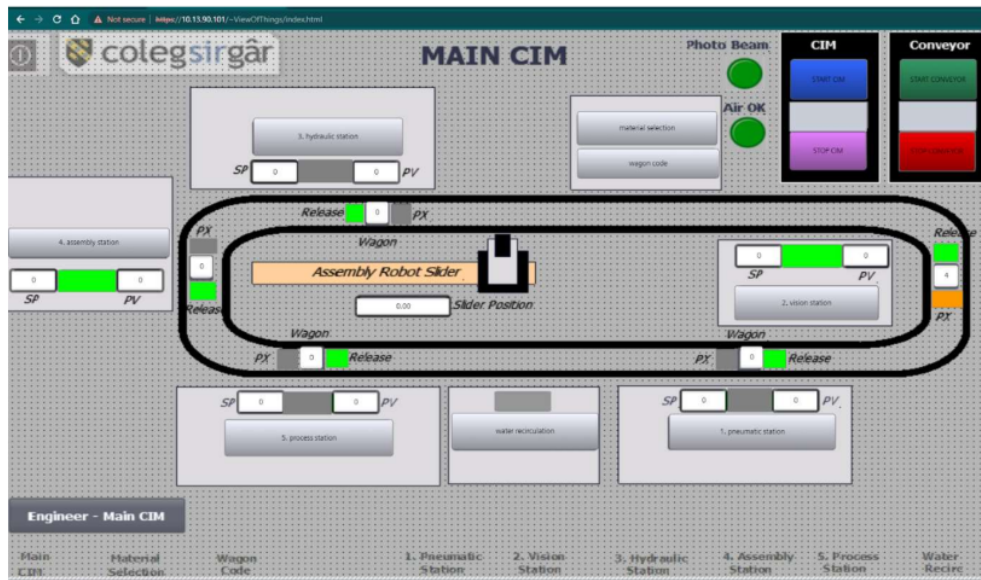


Figure 9

The VOT was tested in small groups, using a modified program which could control the CIM system. Several tests were carried out of the VOT feature and they were tabulated, as shown in figure 10. The system was able to be turned on/off and controlled via the website. All tests passed, except for the slider for position, which was not fully functioning.

Test Table				
Description	Expected	Actual	Pass/Fail	Evidence (Figure No)
Start CIM from webpage	CIM start from webpage, pilot light turns green.	CIM start from webpage, pilot light turns green.	Pass	46
Stop CIM from webpage	CIM start from webpage, pilot light off	CIM start from webpage, pilot light off	Pass	45
Start Conveyor from webpage	Start Conveyor from webpage	Conveyor starts from webpage	Pass	47
Stop Conveyor from webpage	Stop Conveyor from webpage	Conveyor stops from webpage	Pass	48
Enable Online from HMI	Contact will close on PLC Program	Contact closes on PLC Program	Pass	49
Start CIM identifier	Light will go green when active	Light goes green when active	Pass	46
Start Conveyor identifier	Light will go green when active	Light goes green when active	Pass	47
All PX switches identifier change colour when active.	Block changes Grey to orange	Block changes Grey to orange	Pass	48
Release identifier should change colour.	Block Green to red	Block Green to red	Pass	48
Wagon position works	Relevant numbers are shown	Relevant numbers are shown	Pass	50
A slider position value is entered; Webpage & HMI should match.	HMI and webpage value showing same value.	HMI value: 286.51, Webpage Value: 286.51	Pass	52
1. Pneumatic Stations VOT Button on main CIM	Press button, which takes you to pneumatic stations page.	Button takes you to pneumatic stations page.	Pass	53
Return to main CIM from Pneumatic Stations button.	Page returns to main CIM page	Page returns to main CIM page	Pass	61
2. Vision Station VOT Button on main CIM	Press button, which takes you to vision station page.	Button takes you to vision station page.	Pass	54
Return to main CIM from Vision Station button.	Page returns to main CIM page	Page returns to main CIM page	Pass	61

3. Hydraulic Station VOT Button on main CIM	Press button, which takes you to hydraulic station page.	Button takes you to hydraulic station page.	Pass	55
Return to main CIM from Hydraulic Station button.	Page returns to main CIM page	Page returns to main CIM page	Pass	61
4. Assembly Station VOT Button on main CIM	Press button, which takes you to assembly station page.	Button takes you to assembly station page.	Pass	56
Return to main CIM from Assembly Station button.	Page returns to main CIM page	Page returns to main CIM page	Pass	61
5. Process Station VOT Button on main CIM	Press button, which takes you to process station page.	Button takes you to process station page.	Pass	57
Return to main CIM from Process Station button.	Page returns to main CIM page	Page returns to main CIM page	Pass	61
Water Station VOT Button on main CIM	Press button, which takes you to water station page.	Button takes you to water station page.	Pass	58
Return to main CIM from Water Station button.	Page returns to main CIM page	Page returns to main CIM page	Pass	61
Wagon Code VOT Button on main CIM	Press button, which takes you to wagon code page.	Button takes you to wagon code page.	Pass	59
Return to main CIM from wagon code button.	Page returns to main CIM page	Page returns to main CIM page	Pass	61
Material Selection VOT Button on main CIM	Press button, which takes you to material selection page.	Button takes you to material selection page.	Pass	60
Return to main CIM from Material Selection button.	Page returns to main CIM page	Page returns to main CIM page	Pass	61
Slider on HMI screen used to remotely move the robot.	Use slider to move the position of the robot	System unresponsive. Did not move with slider.	Fail	n/a

Figure 10

5. Conclusions and Recommendations

This project has allowed a better understanding of the concepts of instrumentation and Integrated Automation Systems. Modifications added to the system have allowed it to become far more advanced than the original prototype. Profinet connections have been able to be utilised for the master PLC to 'get' data from the slave PLC's in the system, as well as allowing the slaves to 'put' data to the Master PLC101. By utilising M2M connectivity, the HMI and VOT can monitor and control the whole system, via PLC101, which has many benefits to the CIM system. The system can now process more real time data, be accessed remotely, and can control and monitor data from five different subsystems, instead of just one.

The health and safety and risks of the system, were widely considered and drawn up in a risk assessment table, containing information of the severity of the risks involved in the system. After conducting a risk assessment, it was determined that the safety of the CIM system was pretty good. However, there are some Safety recommendations. A whole system guard, enclosure and safety features such as a lock box, would improve the safety of the system and free up users time from monitoring others when carrying out work on the system. Lone working can be more encouraged.

The system was made password protected when adding modifications, so that when using the VOT, only authorised users who knew the password, could access, and monitor the system.

VOT testing was able to be conducted and a test table and evidence were provided to show the system working. The user is now able to access the system remotely, such as from home, and can control and monitor this via the VOT online. This feature allows the system to be much more advanced and encourages new discovered features/ modifications to be added as part of the IOT advancing.

A recommendation for the program would be to conduct more testing of the HMI screens and VOT function once more modifications were added. The HMI was upgraded to include command and feedback pilot lights, as well as extra buttons. A new conducted test table and evidence to prove this, would allow for a better system as it can be proved to be fully functioning at providing more feedback from the system.

Another recommendation to the program would be to add buttons on the engineer HMI screens to go back to the main CIM screen. Currently, there are no buttons on the HMI, and this was identified when testing the system. The user is unable to get back/off the screen when testing online and this will prove an issue if needing to use this practically.

Another recommendation would be to change the connections of the E-Stops. The E-Stops currently turn off the whole system when pressed. Providing a safety PLC for the E-Stops to travel through will allow for a much safer system, which can be controlled and solve the original problem.

The system is much more developed than it was previously and advances with industry 4.0 standards.

6. Team Working

Team work was carried out within small groups in order to test the VOT with TIA portal in order to monitor and control the CIM system within G8. This was carried out in groups of three. It was decided that my program would be used to test the VOT feature as it contained the most up to date modifications and as a group, we would be able to test more functions to see a working control and monitoring system.

Each group took it in turns to connect to the CIM system. One role was to go onto the VOT website and carry out the tests/monitor the program. This was done by pressing buttons such as 'start CIM' and monitor the outcome.

My role was to monitor the program in TIA Portal on 'Monitor Mode.' The monitor mode enables the user to see whether the program is working correctly/able to help solve problems if they occurred. Figures 64-72 capture the rungs when tests are carried out.

The last team member oversaw the testing. It was decided to create a test table on excel and record the outcome of each test, with details of expected and actual results. The test table can be found as figure 10. We worked together in deciding whether each test was a 'PASS.'

We worked effectively as a team to spread out the workload and carry out the task efficiently.

7. Citation List

An Avnet Company, 2019. *Farnell*. [Online]

Available at: https://ie.farnell.com/iiot-m2m-communications?ICID=I-CT-TECH-RES-CLA-SEP_21-TC-000017

[Accessed 10 April 2022].

CPV Manufacturing, 2020. *CPV Manufacturing*. [Online]

Available at: <https://www.cpvmmfg.com/news/m2m-solutions-in-manufacturing/>

[Accessed 18 April 2022].

dat4zero, 2021. *dat4zero*. [Online]

Available at: <https://dat4zero.eu/what-is-industry-4-0/>

[Accessed 17 april 2022].

Eitel, L., 2020. *Digi-Key*. [Online]

Available at: <https://www.digikey.co.uk/en/articles/machine-to-machine-networks-for-automated-machine-functions>

[Accessed 9 March 2022].

Jerzy Duda, A. G., 2021. *Industry 4.0 A Glocal Perspective*. 1st ed. s.l.:Taylor & Francis.

Marr, B., 2019. *Youtube*. [Online]

Available at: <https://www.youtube.com/watch?v=yKPrJJSv94M>

[Accessed 10 April 2022].

Quinn, J., 2015. *IoT Evolution*. [Online]

Available at: <https://www.iotevolutionworld.com/m2m/articles/401782-remote-monitoring-management-solutions-harness-m2m-communication.htm>

[Accessed 12 April 2022].

Shea, S., 2019. *Tech Target*. [Online]

Available at: <https://www.techtarget.com/iotagenda/definition/machine-to-machine-M2M>

[Accessed 10 April 2022].

Wireless Logic Ltd, 2021. *Wireless Logic*. [Online]

Available at: <https://www.wirelesslogic.com/understanding-iiot/>

[Accessed 12 April 2022].

8. Appendix

2. Pneumatic Station - Layout

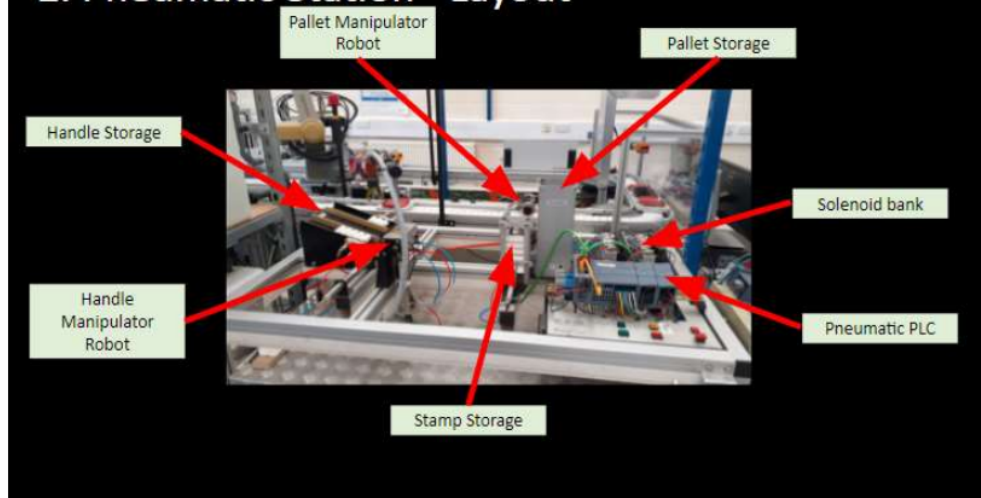


Figure 11

3. Vision Station - PLC 102

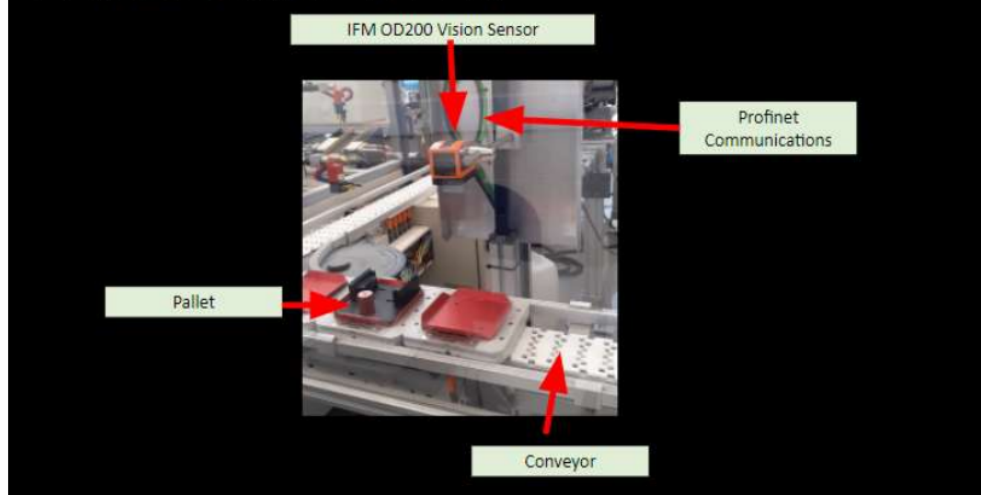


Figure 12

4. Main (Master) - PLC 101

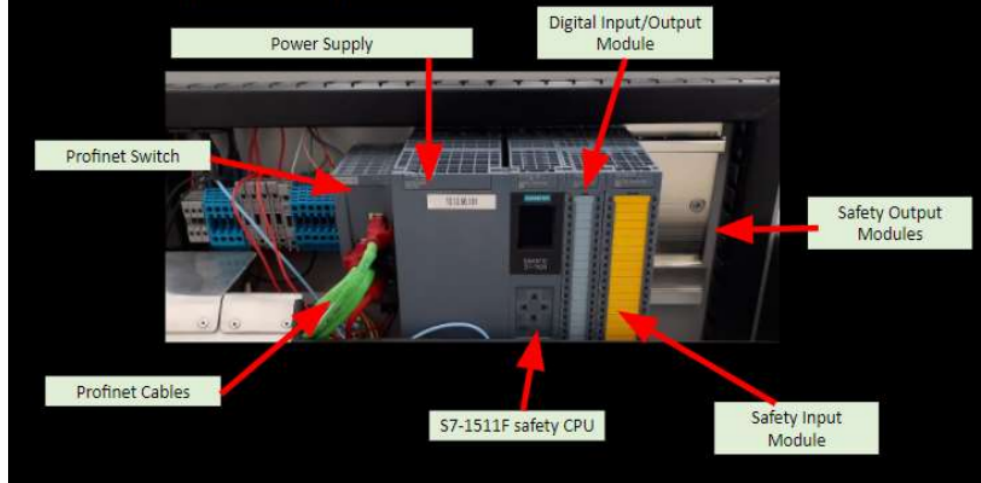


Figure 13

5. Hydraulic Station - PLC 104

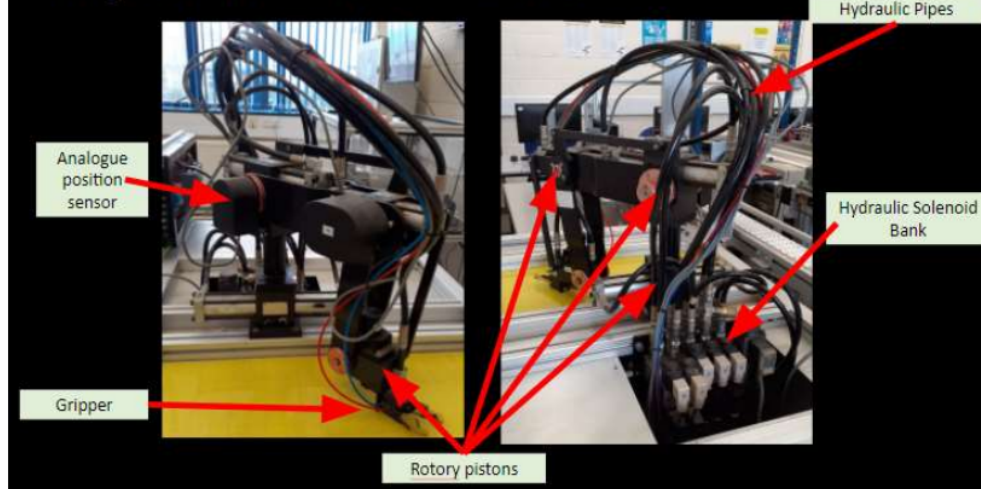


Figure 14

7. Assembly Robot and Slider - PLC 106

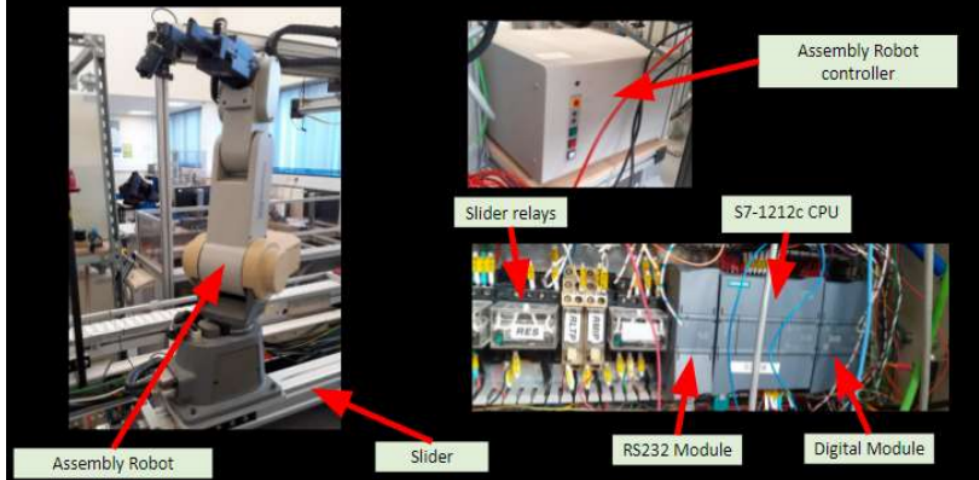


Figure 15

8. Process Station - PLC 103

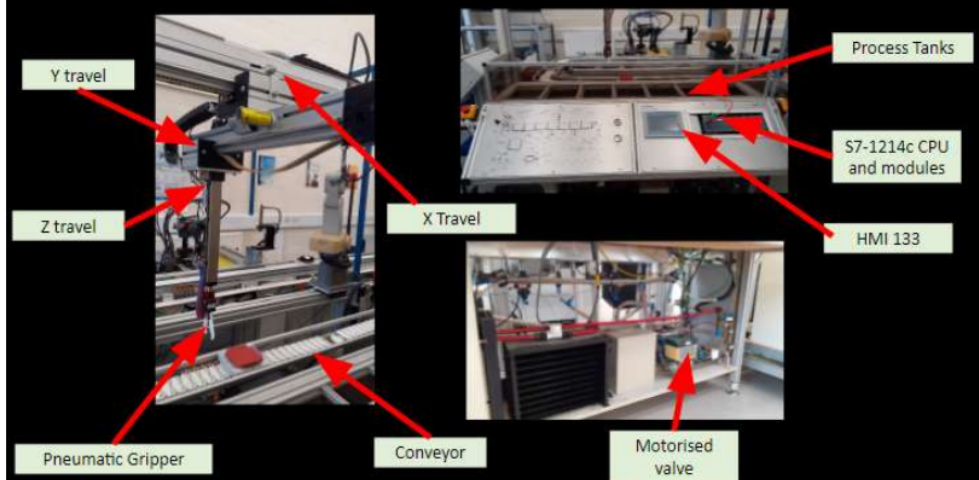


Figure 16

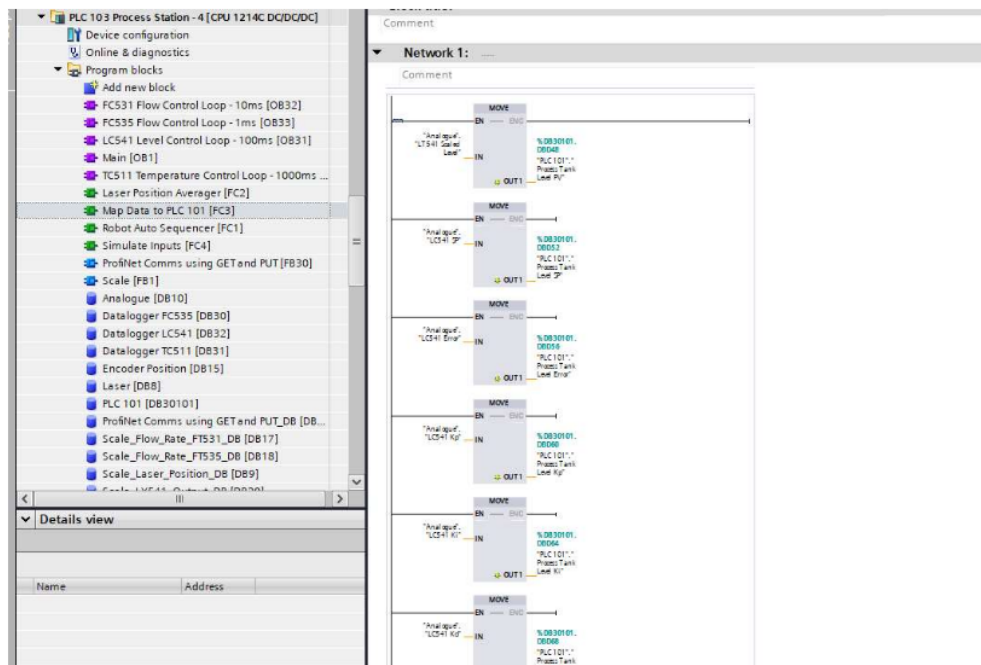


Figure 18

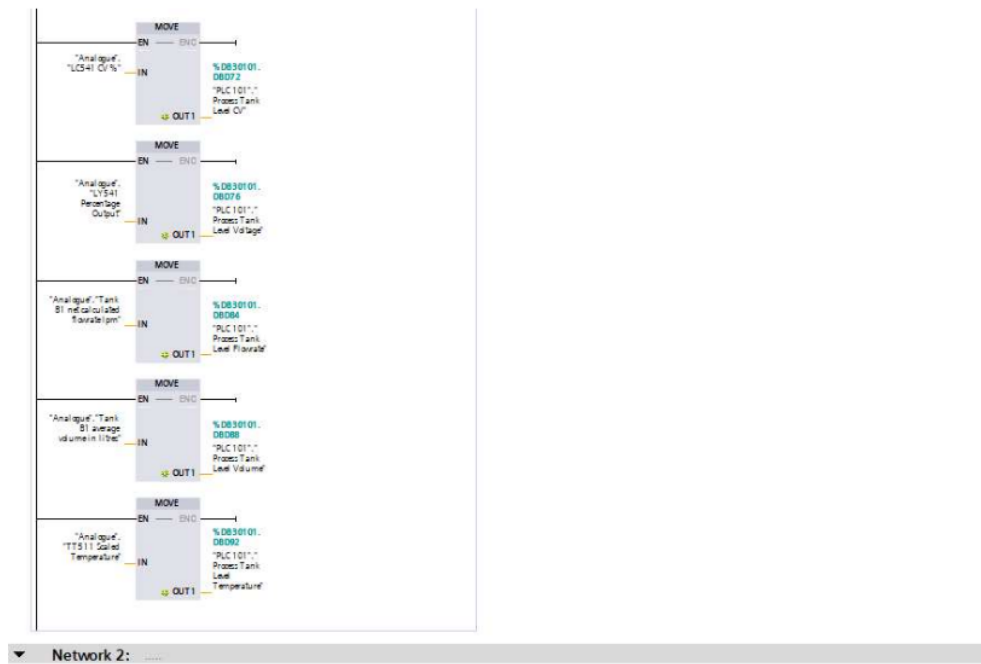


Figure 19

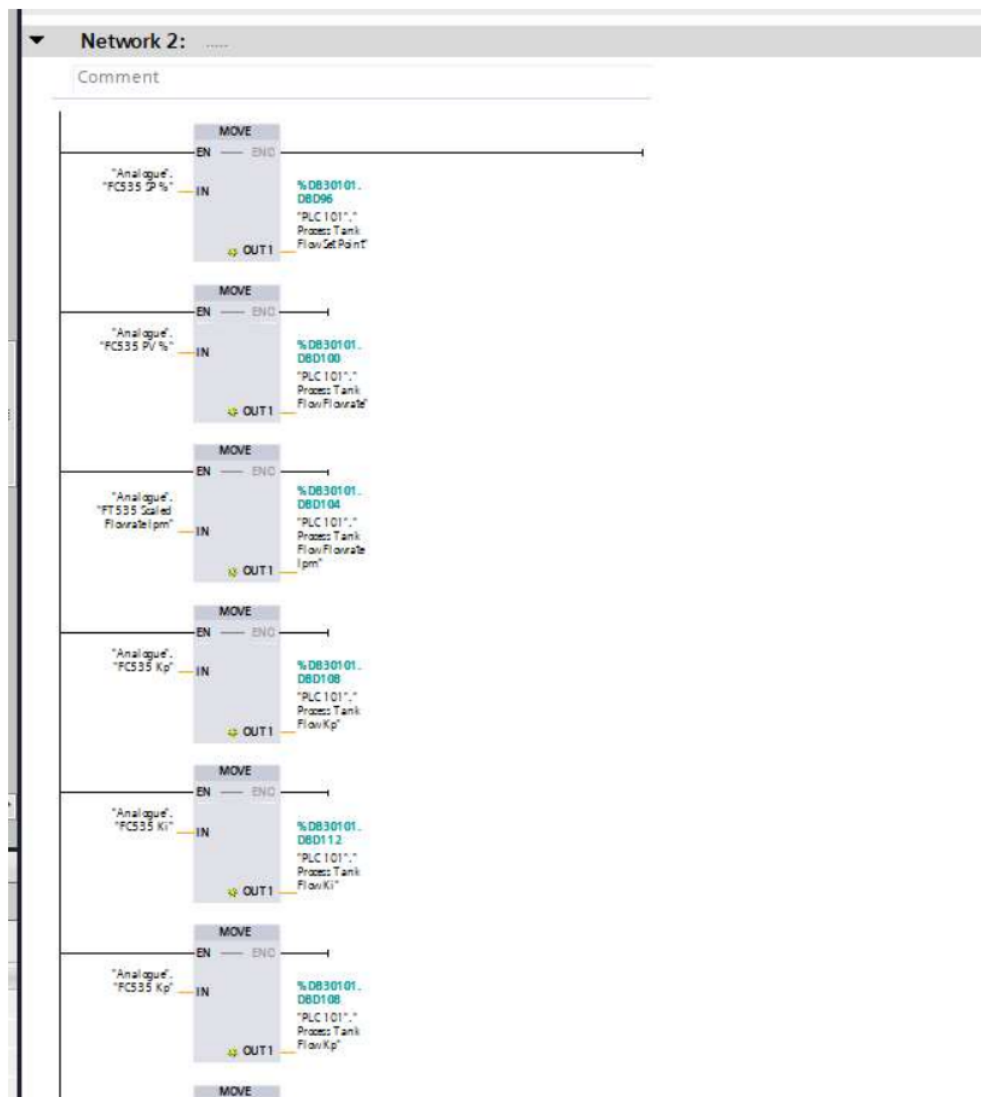


Figure 20

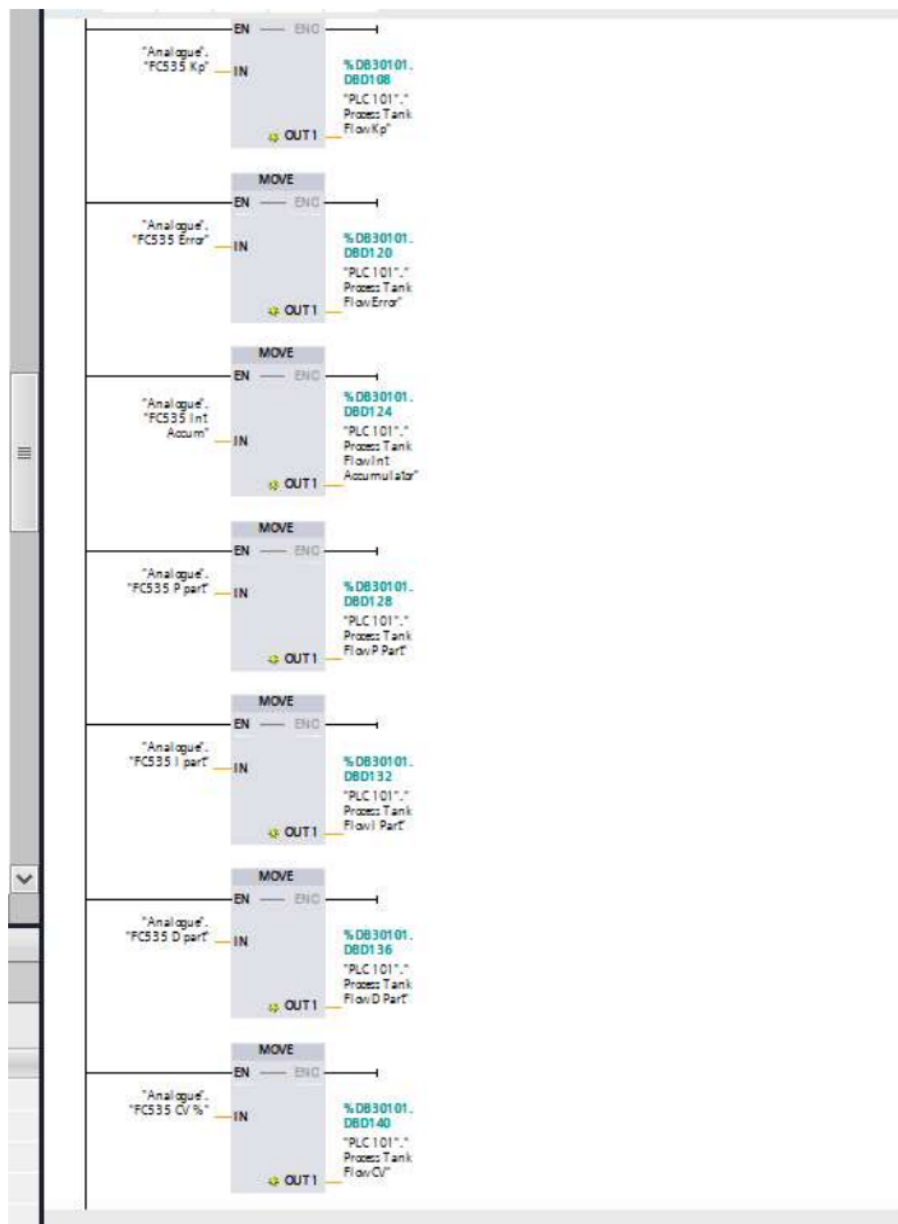


Figure 21

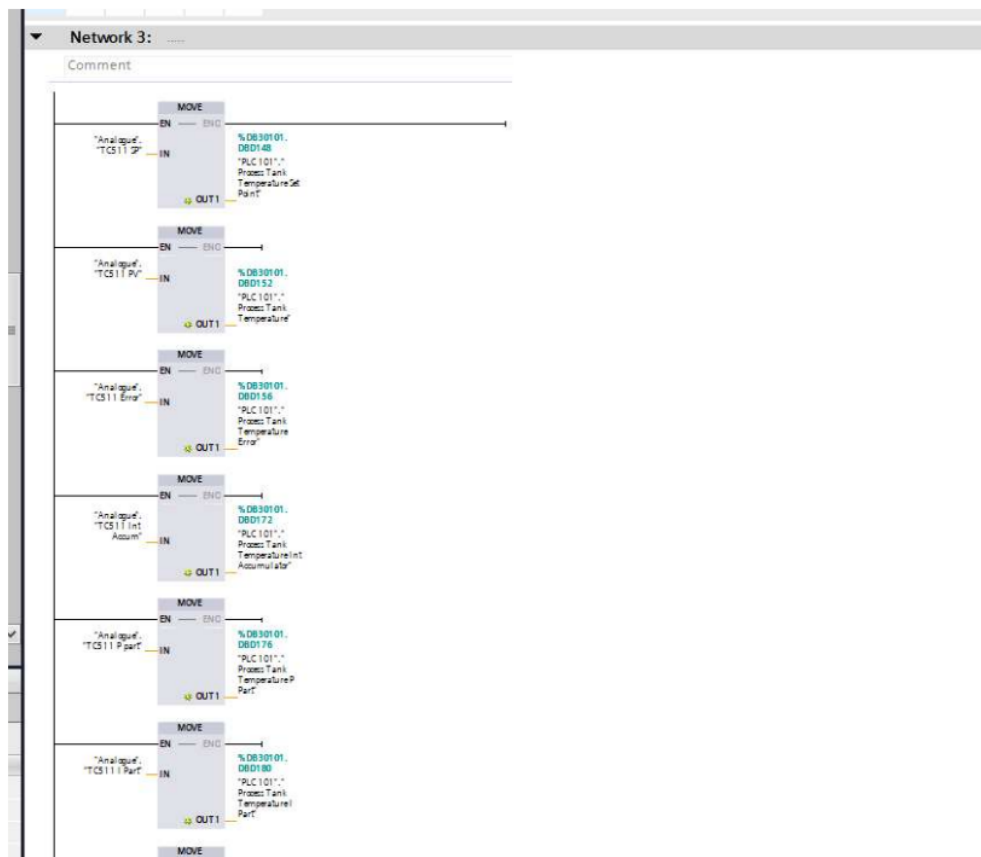


Figure 22

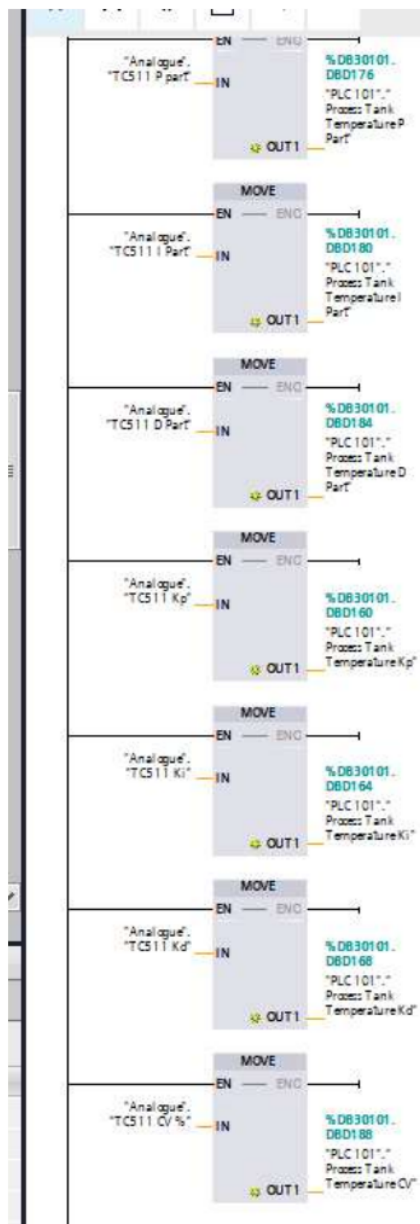


Figure 23

PLC 101 (snapshot created: 11/12/2019 6:26:03 PM)

Name	Data type	Offset	Start value	Retain	Accessible...	Visible...	Visible in...	Setpoint	Comment
Put Word 7	Word	46.0	16#0						
Process Tank Level PV	Real	48.0	0.0						
Process Tank Level SP	Real	52.0	0.0						
Process Tank Level Error	Real	56.0	0.0						
Process Tank Level Kp	Real	60.0	0.0						
Process Tank Level Ki	Real	64.0	0.0						
Process Tank Level Kd	Real	68.0	0.0						
Process Tank Level CV	Real	72.0	0.0						
Process Tank Level Voltage	Real	76.0	0.0						
Process Tank Level Data Logger	Real	80.0	0.0						
Process Tank Level Flowrate	Real	84.0	0.0						
Process Tank Level Volume	Real	88.0	0.0						
Process Tank Level Temperature	Real	92.0	0.0						
Process Tank Flow Set Point	Real	96.0	0.0						
Process Tank Flow Flowrate	Real	100.0	0.0						
Process Tank Flow Flowrate Ipm	Real	104.0	0.0						
Process Tank Flow Kp	Real	108.0	0.0						
Process Tank Flow Ki	Real	112.0	0.0						
Process Tank Flow Kd	Real	116.0	0.0						
Process Tank Flow Error	Real	120.0	0.0						
Process Tank Flow Int Accumulator	Real	124.0	0.0						
Process Tank Flow P Part	Real	128.0	0.0						
Process Tank Flow I Part	Real	132.0	0.0						
Process Tank Flow D Part	Real	136.0	0.0						
Process Tank Flow CV	Real	140.0	0.0						
Process Tank Flow Data Logger	Real	144.0	0.0						
Process Tank Temperature Set Point	Real	148.0	0.0						
Process Tank Temperature P Part	Real	152.0	0.0						
Process Tank Temperature Error	Real	156.0	0.0						
Process Tank Temperature Kp	Real	160.0	0.0						
Process Tank Temperature Ki	Real	164.0	0.0						
Process Tank Temperature Kd	Real	168.0	0.0						
Process Tank Temperature Int Acc.	Real	172.0	0.0						
Process Tank Temperature P Part	Real	176.0	0.0						
Process Tank Temperature I Part	Real	180.0	0.0						
Process Tank Temperature D Part	Real	184.0	0.0						
Process Tank Temperature CV	Real	188.0	0.0						
Process Tank Temperature Data Lo.	Real	192.0	0.0						
Put Real 38	Real	196.0	0.0						
Put Real 39	Real	200.0	0.0						
Put Real 40	Real	204.0	0.0						

Details view

Name	Offset	Data type
Get Bit 0 - clock test bit	0.0	Bool
Process - Go Online	0.1	Bool
Process - Pick Handle CH1 0.2	0.2	Bool
Process - Pick Handle CH2 0.3	0.3	Bool
Process - Place	0.4	Bool
Process - Simulate	0.5	Bool

Figure 24

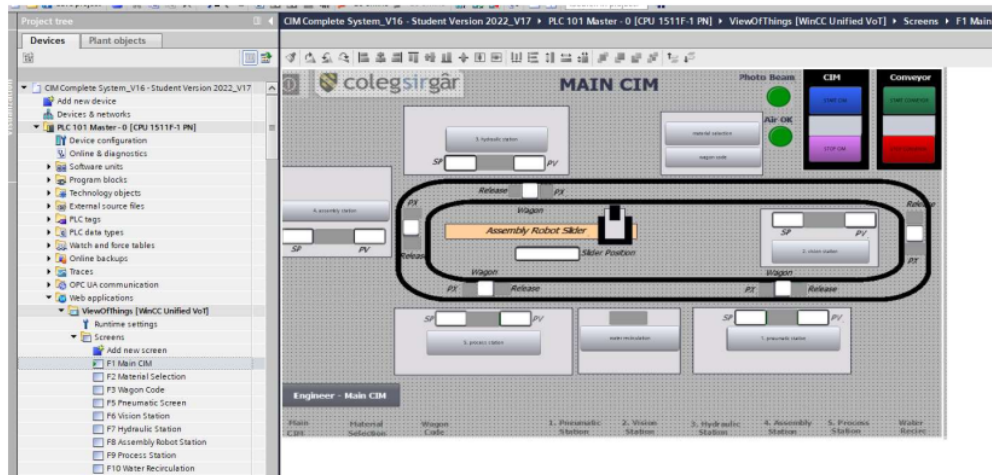


Figure 25

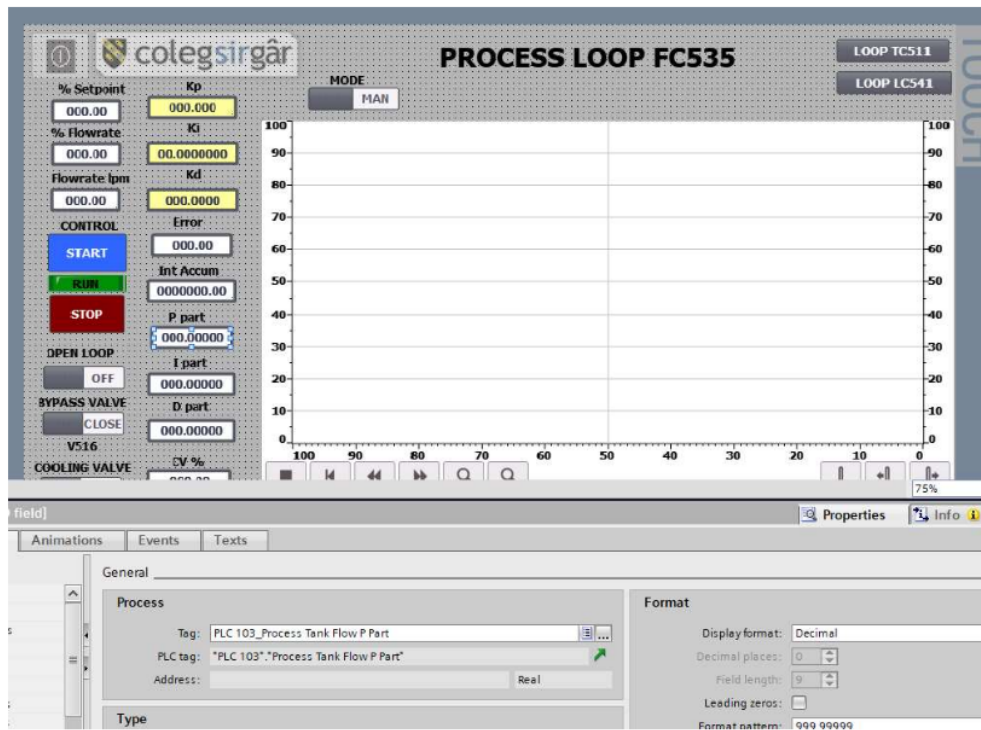


Figure 28

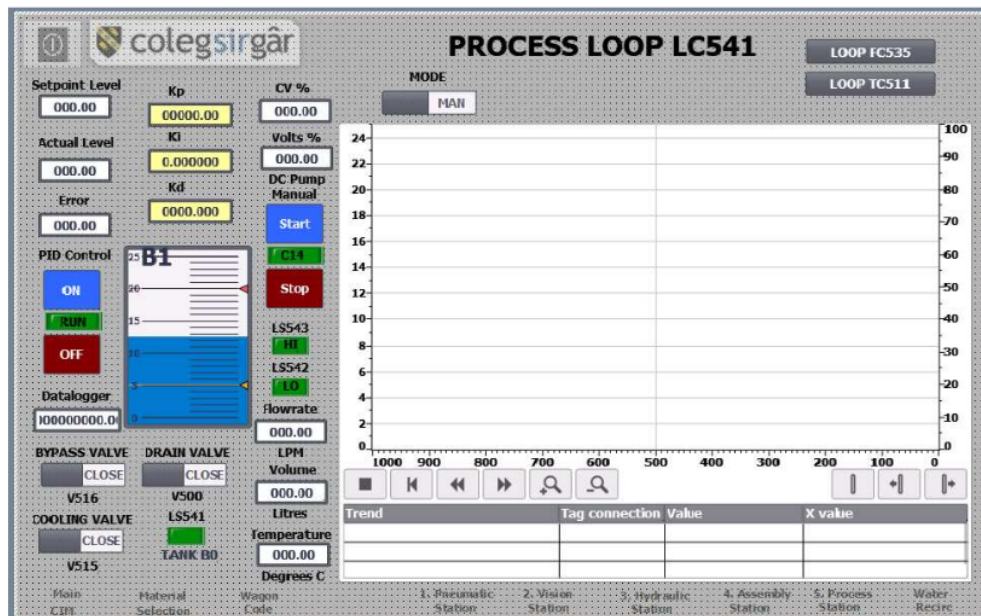


Figure 29

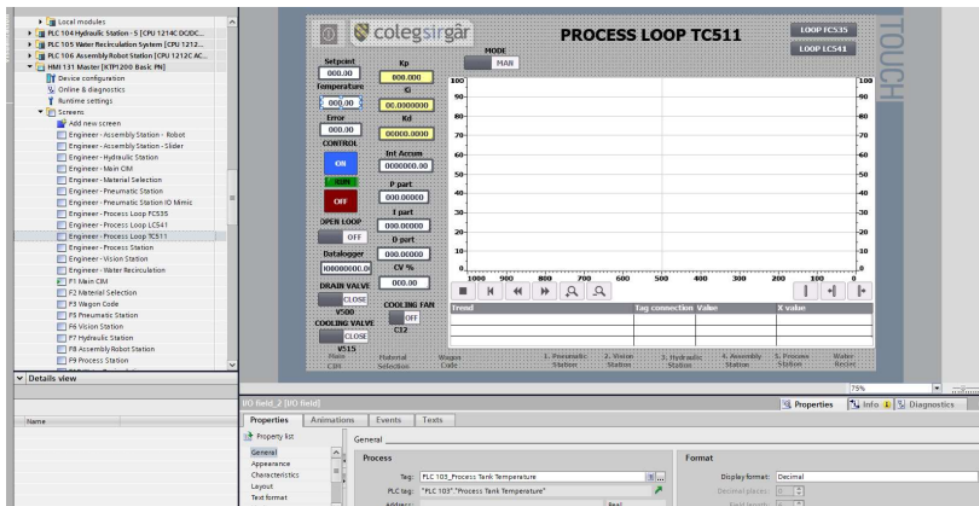


Figure 30

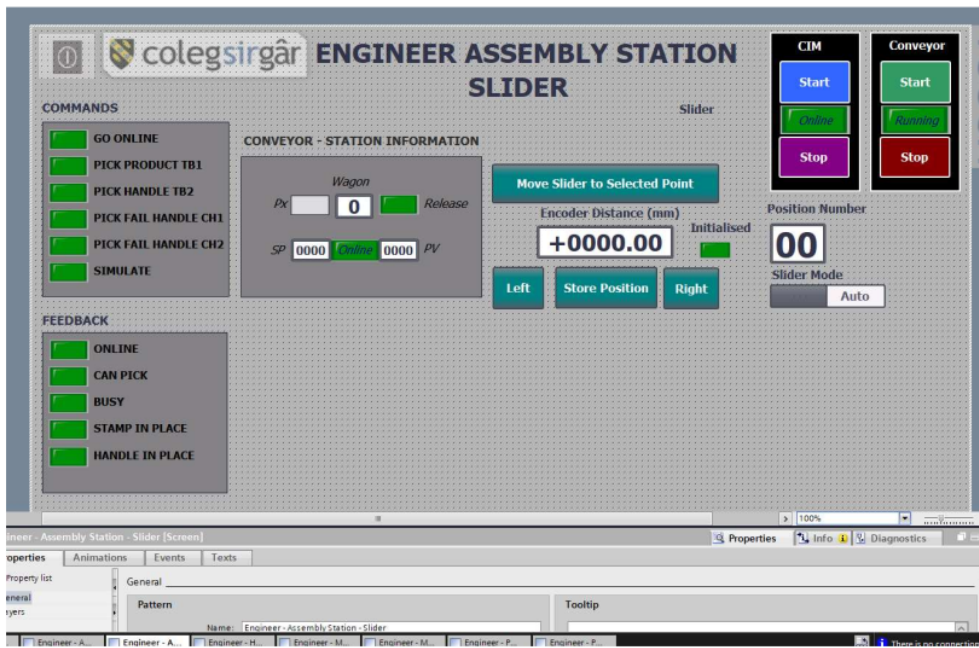


Figure 31

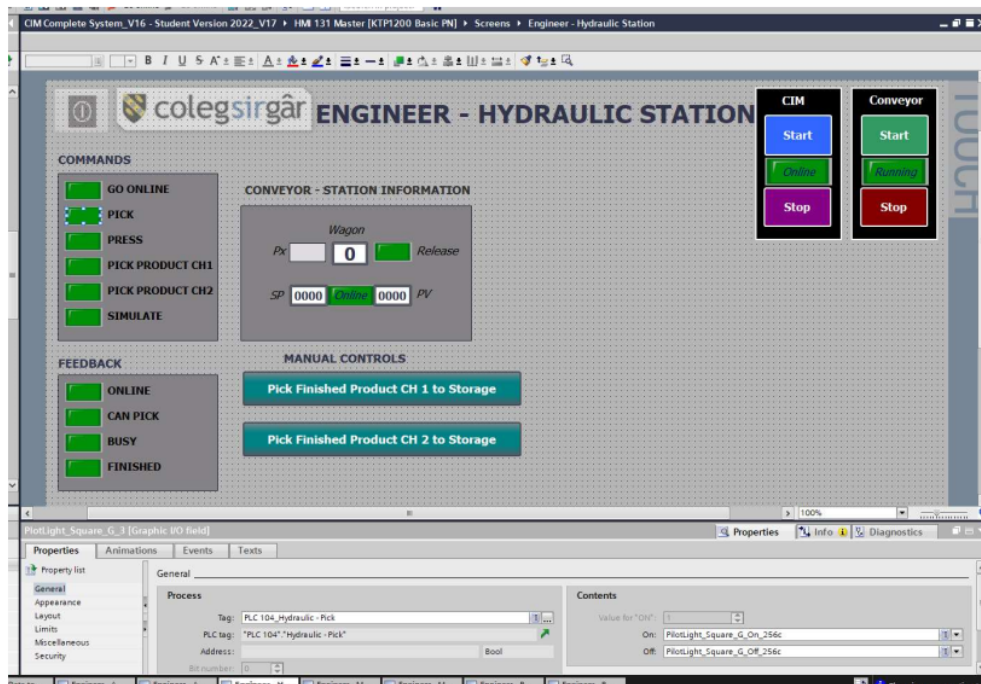


Figure 32

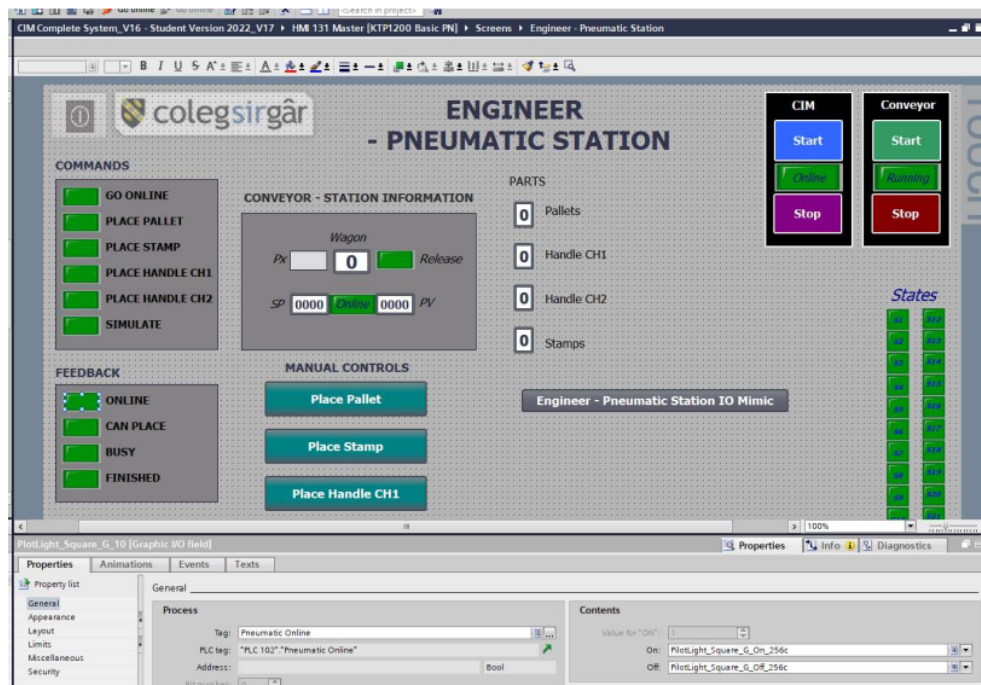


Figure 33

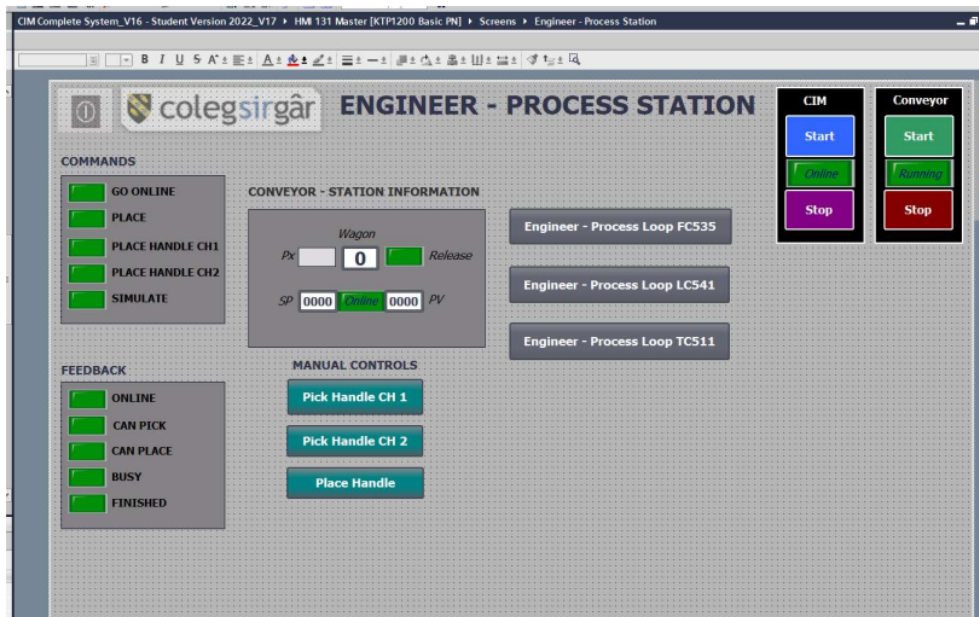


Figure 34

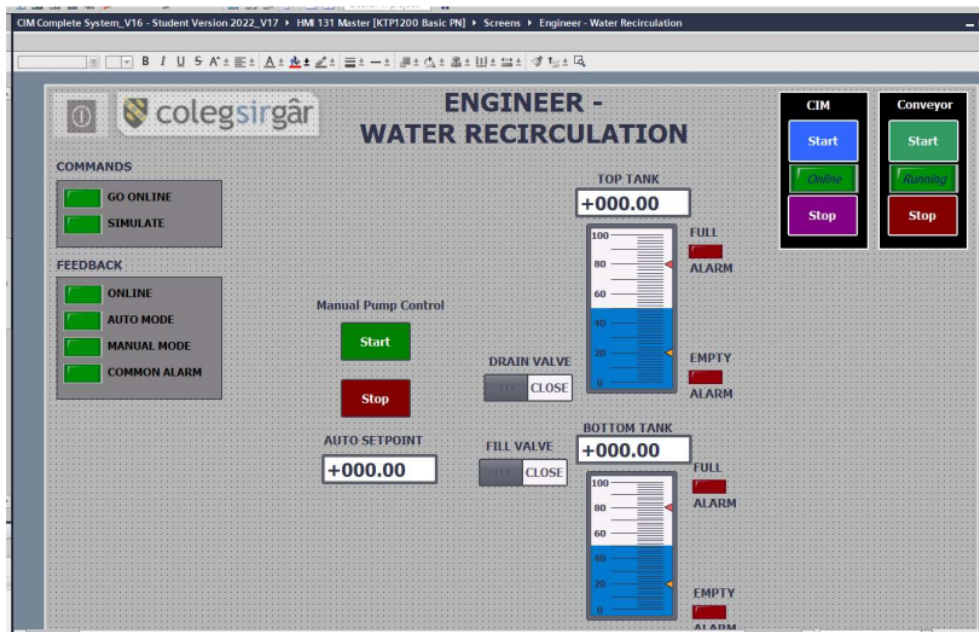


Figure 35

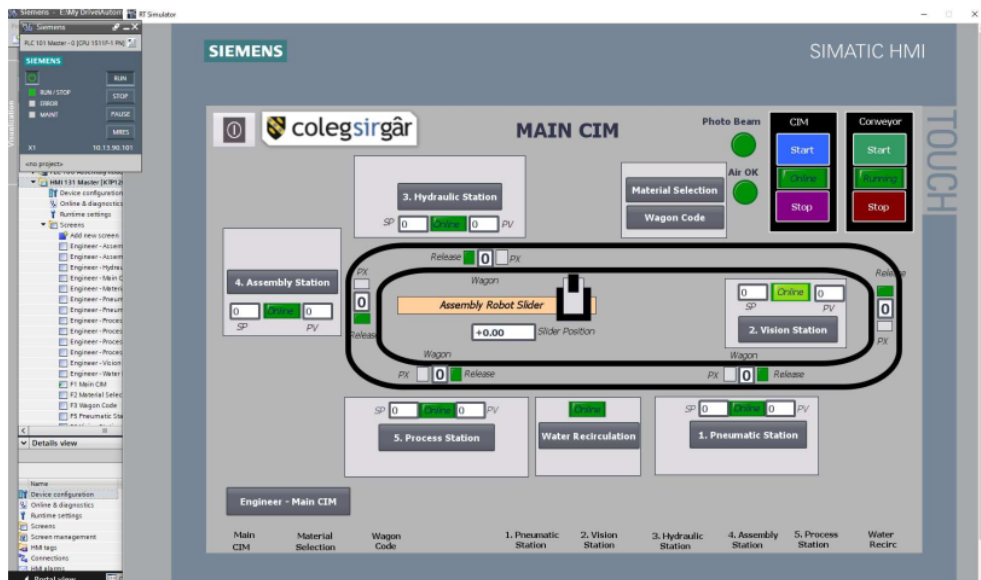


Figure 36

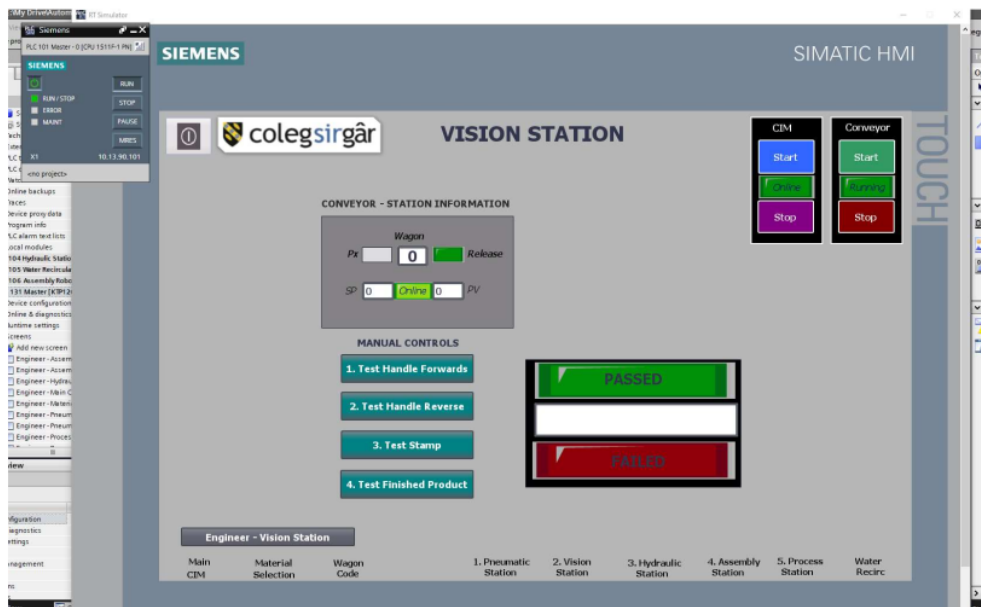


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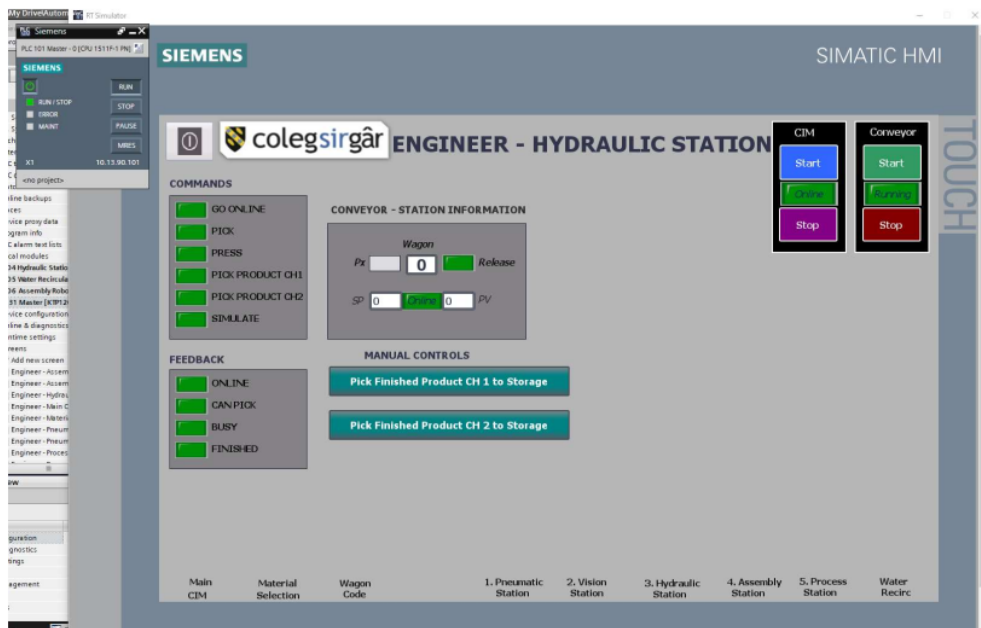


Figure 38

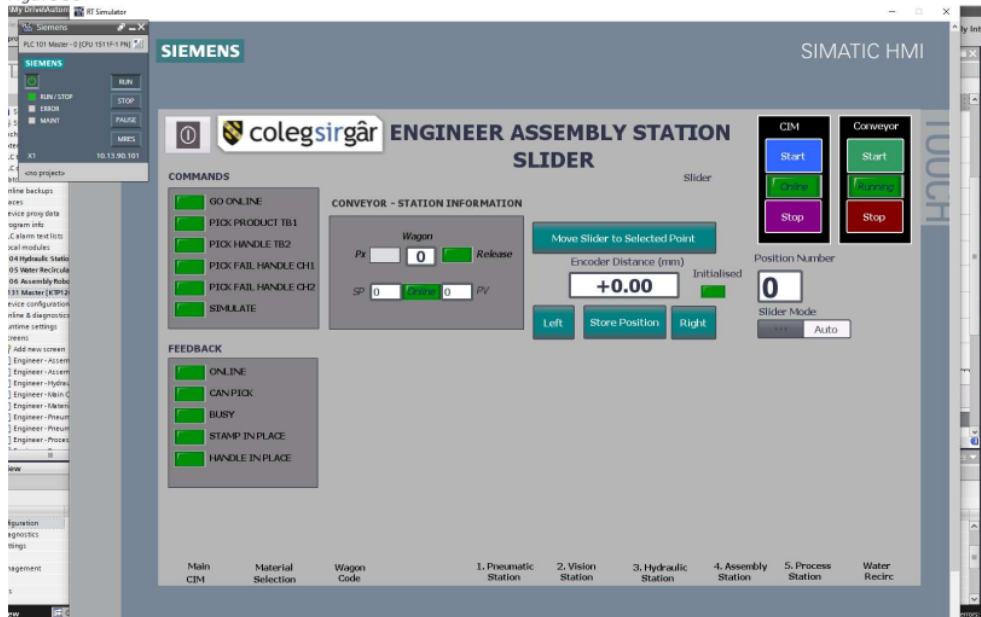


Figure 39

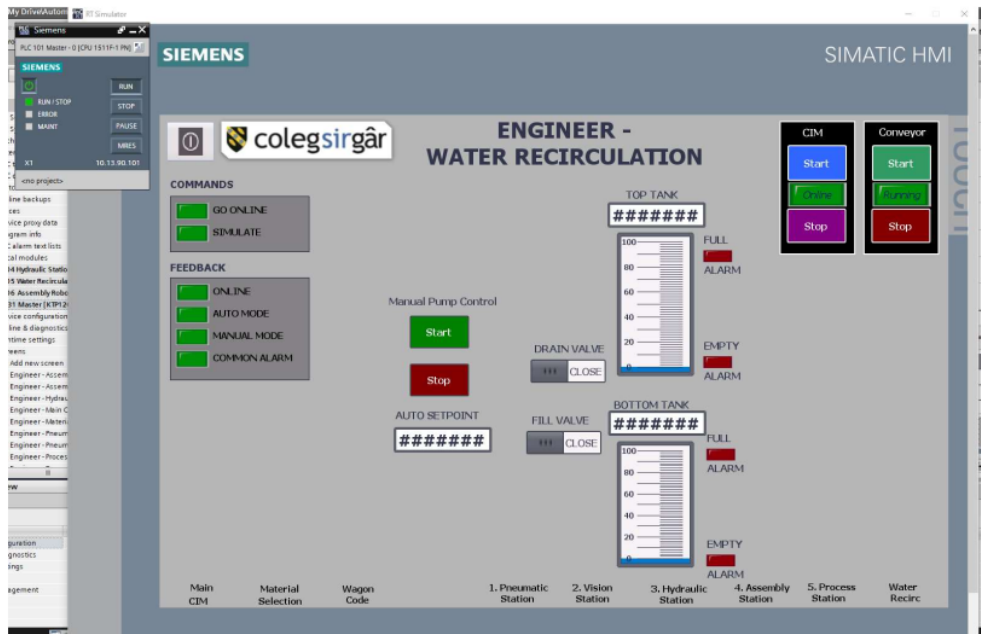


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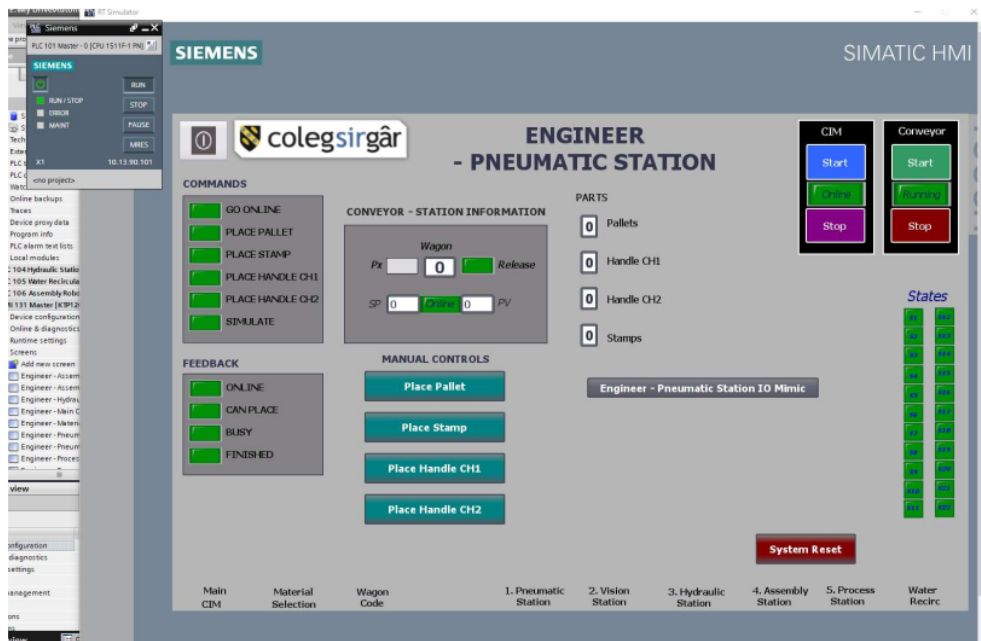


Figure 41

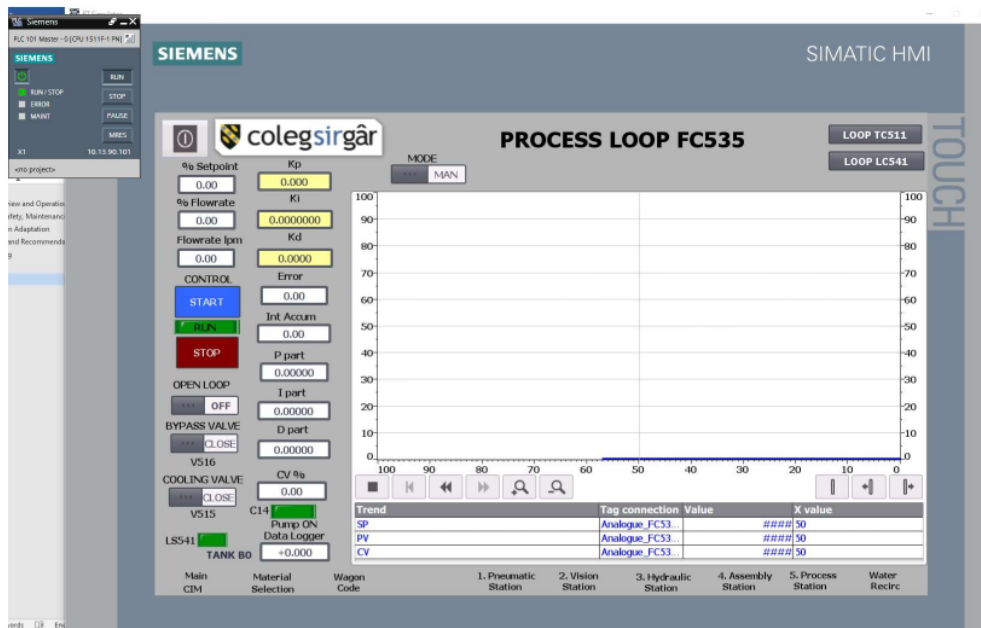


Figure 42

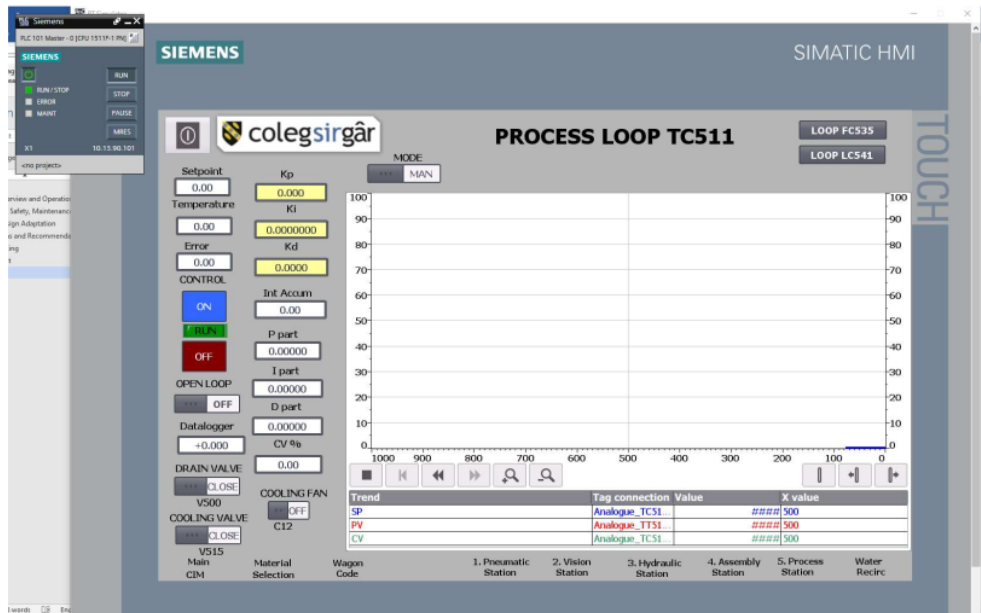


Figure 43

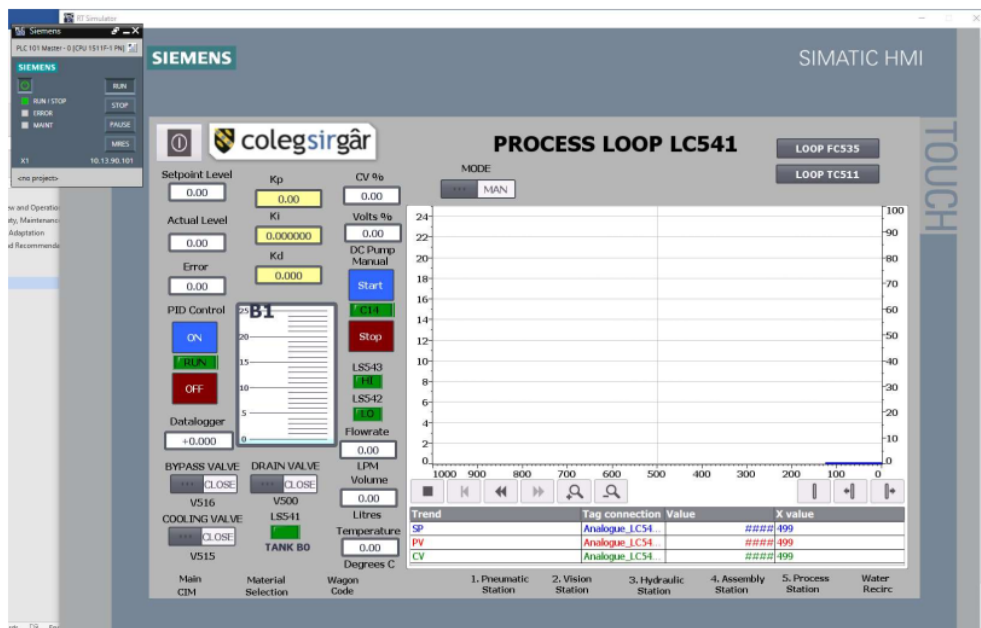


Figure 44

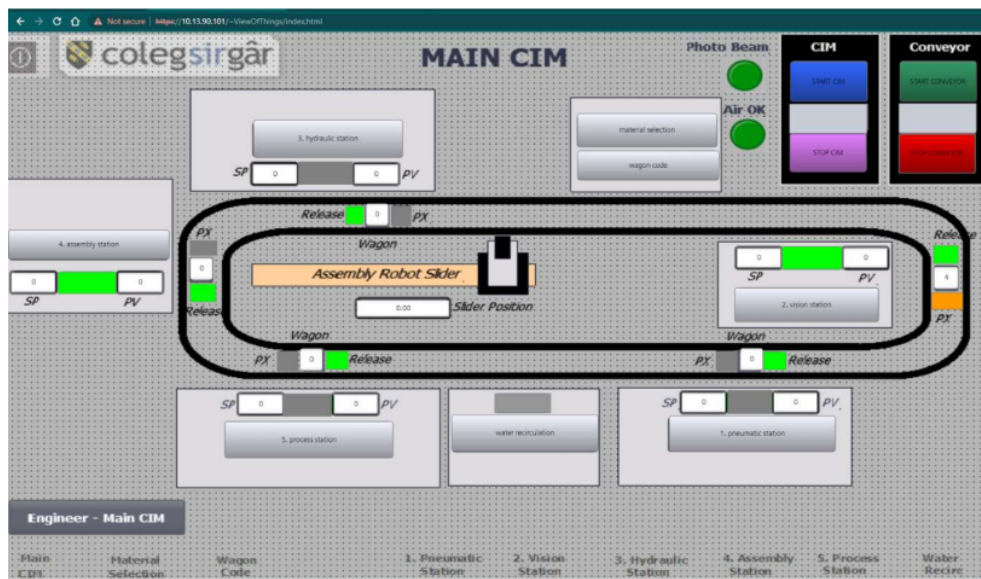


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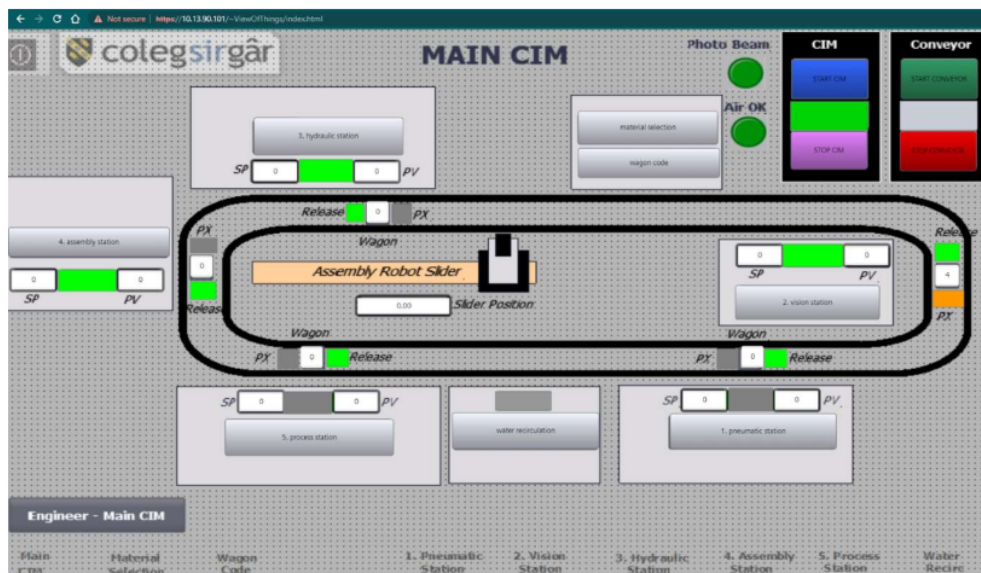


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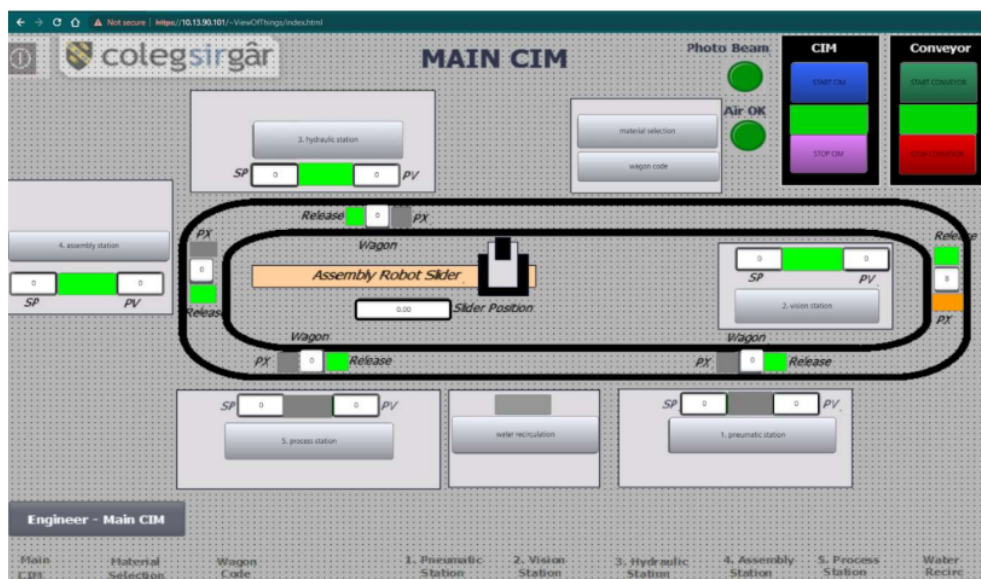


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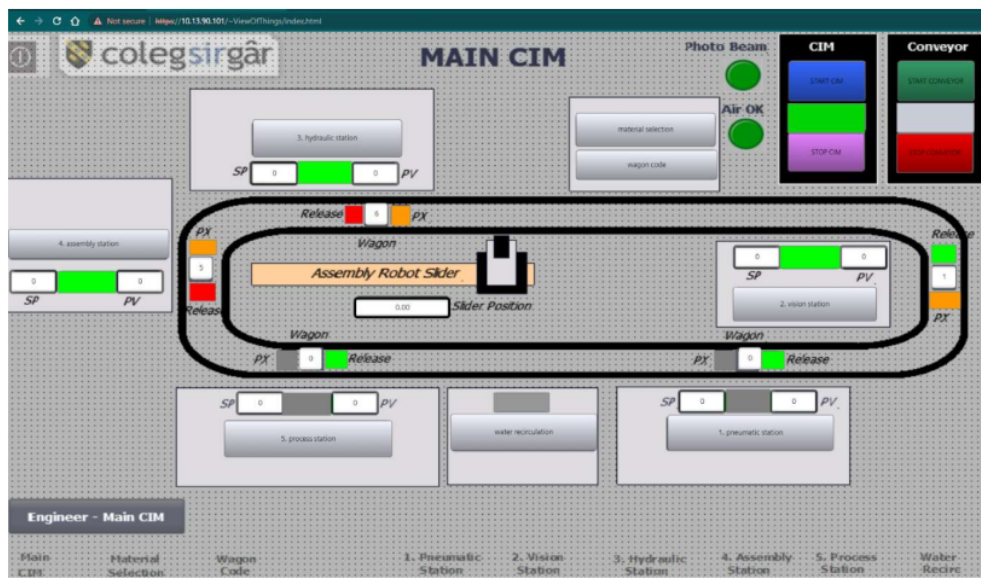


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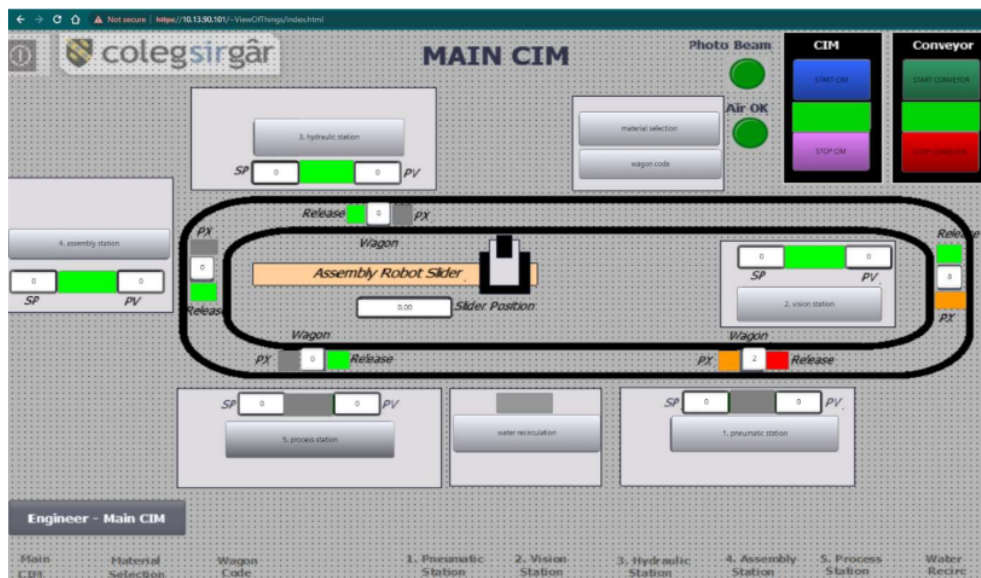


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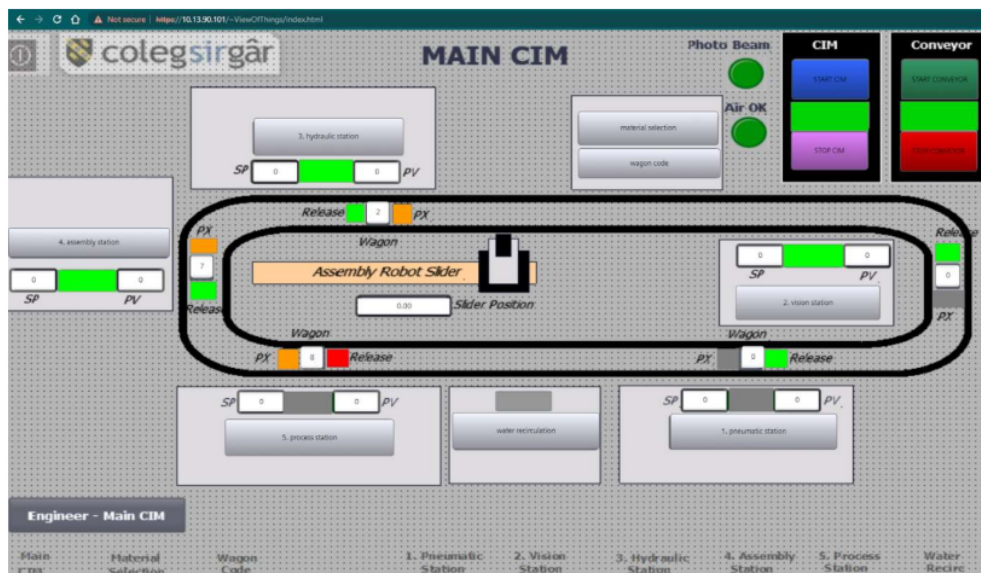


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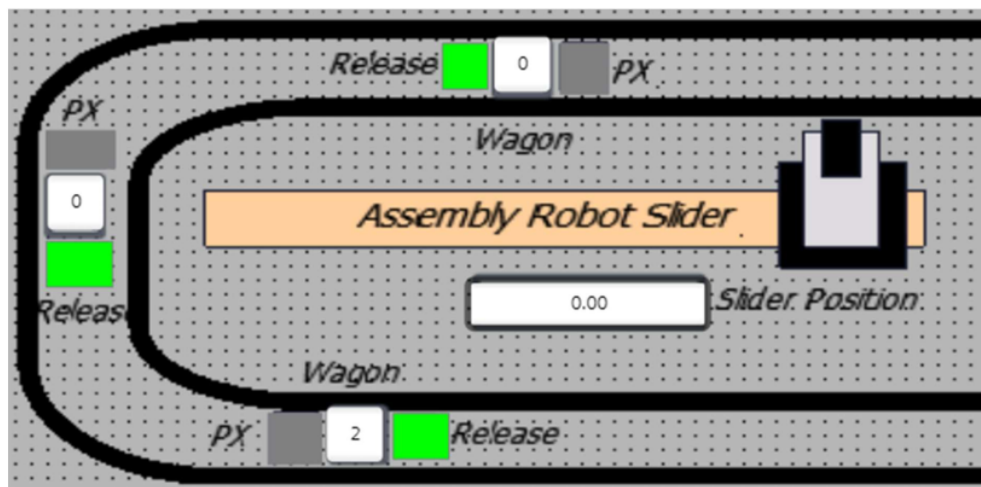


Figure 51

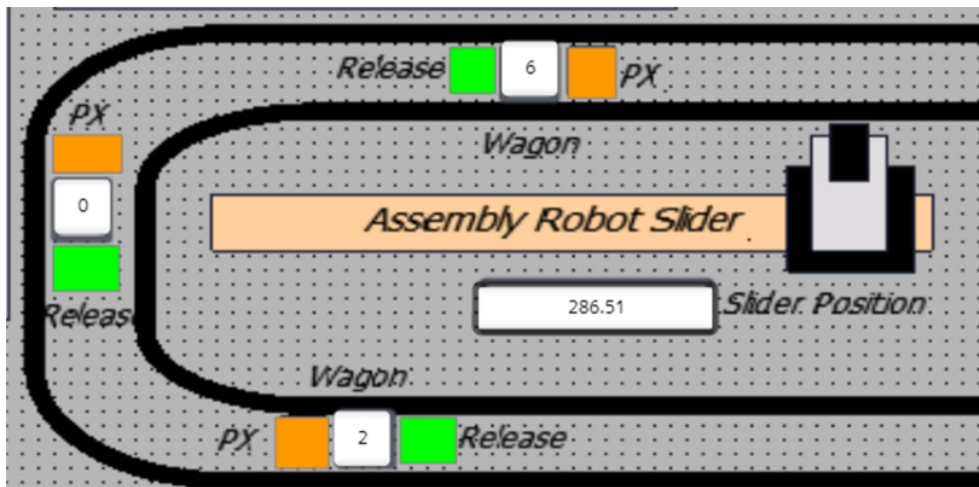


Figure 52

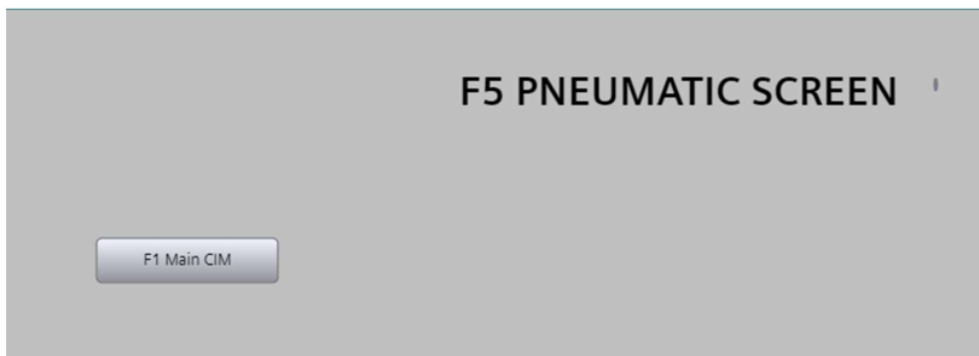


Figure 53



Figure 54

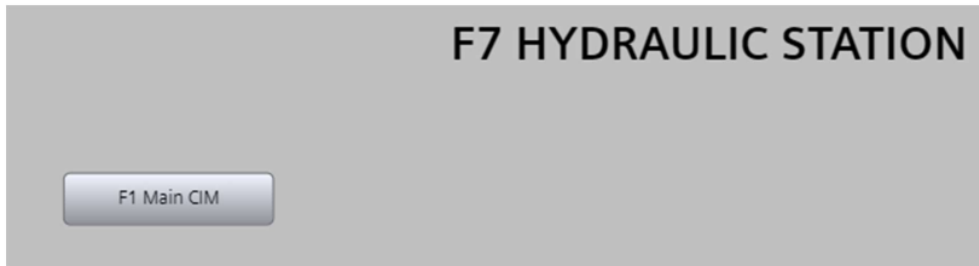


Figure 55

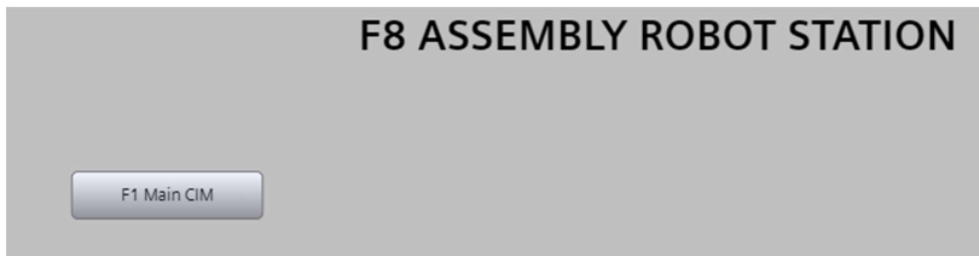


Figure 56



Figure 57

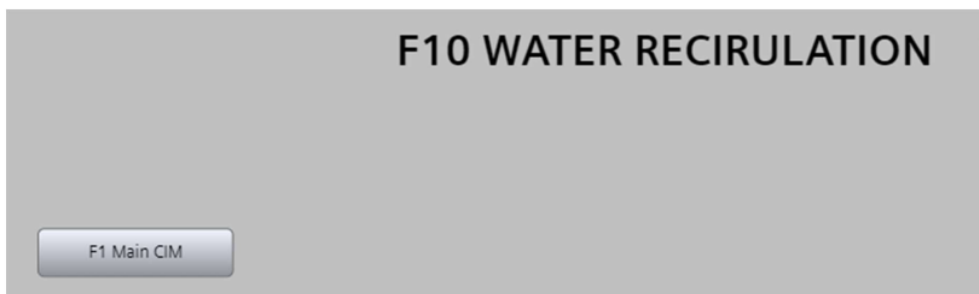


Figure 58

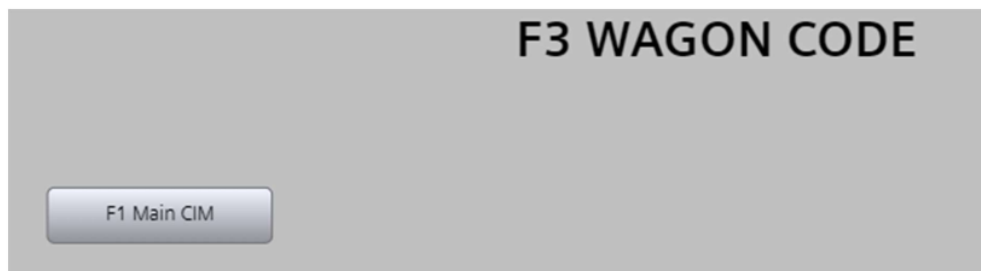


Figure 59

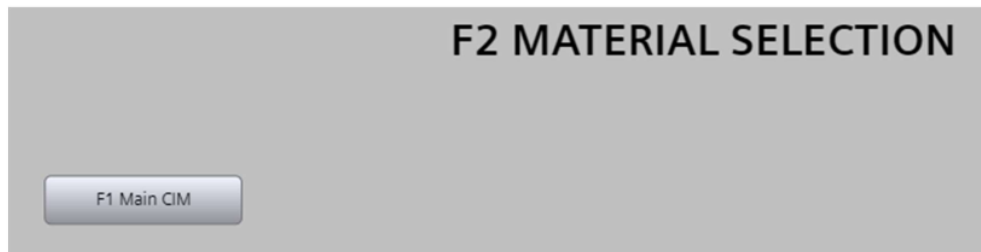


Figure 60

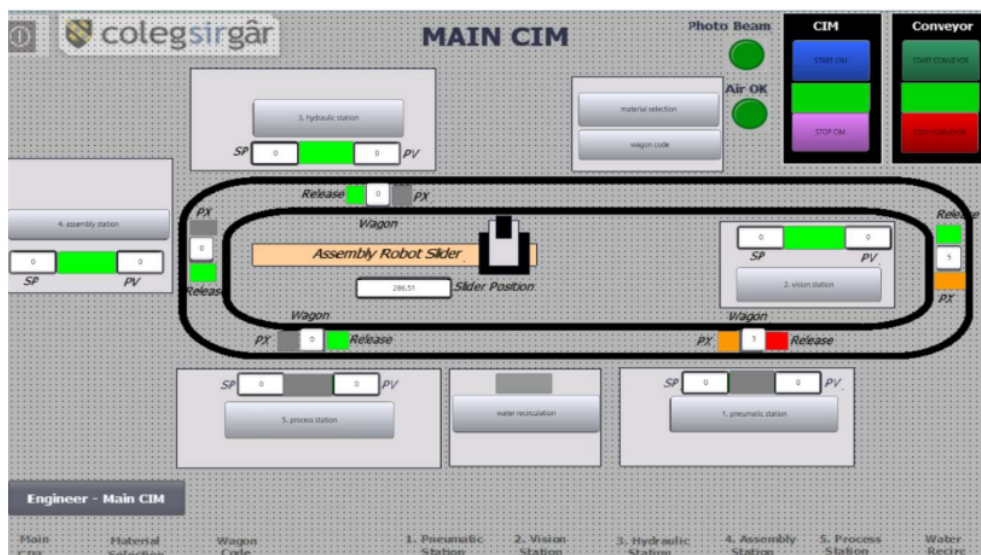


Figure 61

CIM Complete System_V16 - Student Version 2022_V17 ▶ PLC 101 Master - 0 [CPU 1511F-1 PN] ▶ ViewOfThings [WinCC Unified VoT] ▶ HM tags			
HMI tag	PLC tag	PLC data type	HMI data type
"Assembly Wagon Number"	"Assembly Wagon Number"	Int	Int
"CIM Run"	"CIM Run"	Bool	Bool
"Hydraulic Wagon Number"	"Hydraulic Wagon Number"	Int	Int
"PLC 106"."Assembly Robot Slider Distance"	"PLC 106"."Assembly Robot Slider Distance"	Real	Real
"Pneumatic Wagon Number"	"Pneumatic Wagon Number"	Int	Int
"Process Wagon Number"	"Process Wagon Number"	Int	Int
"Release Wagon @ Assembly Station"	"Release Wagon @ Assembly Station"	Bool	Bool
"Release Wagon @ Hydraulic Station"	"Release Wagon @ Hydraulic Station"	Bool	Bool
"Release Wagon @ Pneumatic Station"	"Release Wagon @ Pneumatic Station"	Bool	Bool
"Release Wagon @ Process Station"	"Release Wagon @ Process Station"	Bool	Bool
"Release Wagon @ Vision Station"	"Release Wagon @ Vision Station"	Bool	Bool
"Vision Wagon Number"	"Vision Wagon Number"	Int	Int
"Wagon @ Assembly Station INPUT"	"Wagon @ Assembly Station INPUT"	Bool	Bool
"Wagon @ Hydraulic Station INPUT"	"Wagon @ Hydraulic Station INPUT"	Bool	Bool
"Wagon @ Pneumatic Station INPUT"	"Wagon @ Pneumatic Station INPUT"	Bool	Bool
"Wagon @ Process Station INPUT"	"Wagon @ Process Station INPUT"	Bool	Bool
"Wagon @ Vision Station INPUT"	"Wagon @ Vision Station INPUT"	Bool	Bool
Web_Commands.Start_CIM	Web_Commands.Start_CIM	Bool	Bool
Web_Commands.Start_Conveyor	Web_Commands.Start_Conveyor	Bool	Bool
Web_Commands.Stop_CIM	Web_Commands.Stop_CIM	Bool	Bool
Web_Data.Finish_Station_Online	Web_Data.Finish_Station_Online	Bool	Bool
Web_Data.Finish_Station_PV	Web_Data.Finish_Station_PV	Int	Int
Web_Data.Finish_Station_SP	Web_Data.Finish_Station_SP	Int	Int
Web_Data.Hydraulic_Station_Online	Web_Data.Hydraulic_Station_Online	Bool	Bool
Web_Data.Hydraulic_Station_PV	Web_Data.Hydraulic_Station_PV	Int	Int
Web_Data.Hydraulic_Station_SP	Web_Data.Hydraulic_Station_SP	Int	Int
Web_Data.Hydraulic_Station_Wagon_Number	Web_Data.Hydraulic_Station_Wagon_Number	Int	Int
Web_Data.Pneumatic_Station_Online	Web_Data.Pneumatic_Station_Online	Bool	Bool
Web_Data.Pneumatic_Station_SP	Web_Data.Pneumatic_Station_SP	Int	Int
Web_Data.Pneumatic_Station_PV	Web_Data.Pneumatic_Station_PV	Int	Int
Web_Data.Process_Station_Online	Web_Data.Process_Station_Online	Bool	Bool
Web_Data.Process_Station_PV	Web_Data.Process_Station_PV	Int	Int
Web_Data.Process_Station_SP	Web_Data.Process_Station_SP	Int	Int
Web_Data.Vision_Station_Online	Web_Data.Vision_Station_Online	Bool	Bool
Web_Data.Vision_Station_PV	Web_Data.Vision_Station_PV	Int	Int
Web_Data.Vision_Station_SP	Web_Data.Vision_Station_SP	Int	Int

Figure 62

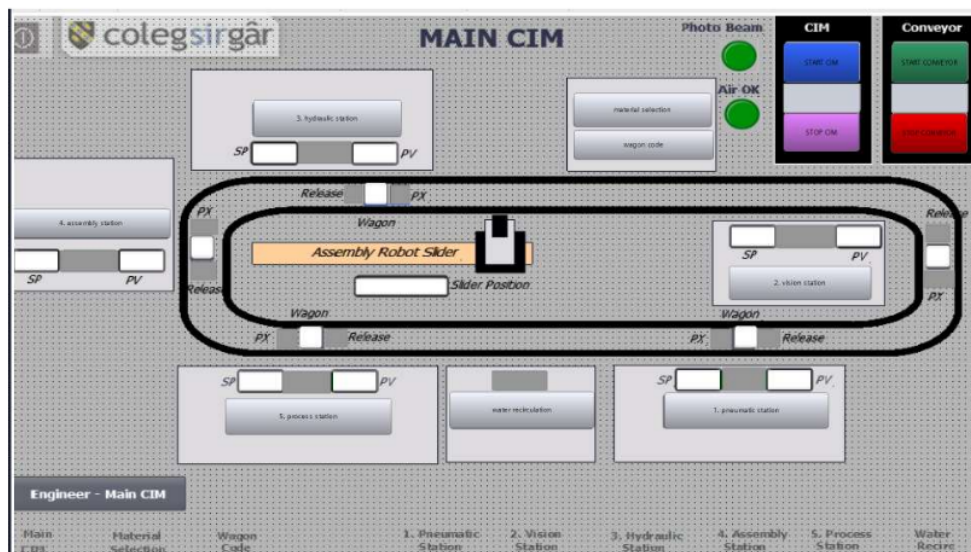


Figure 63

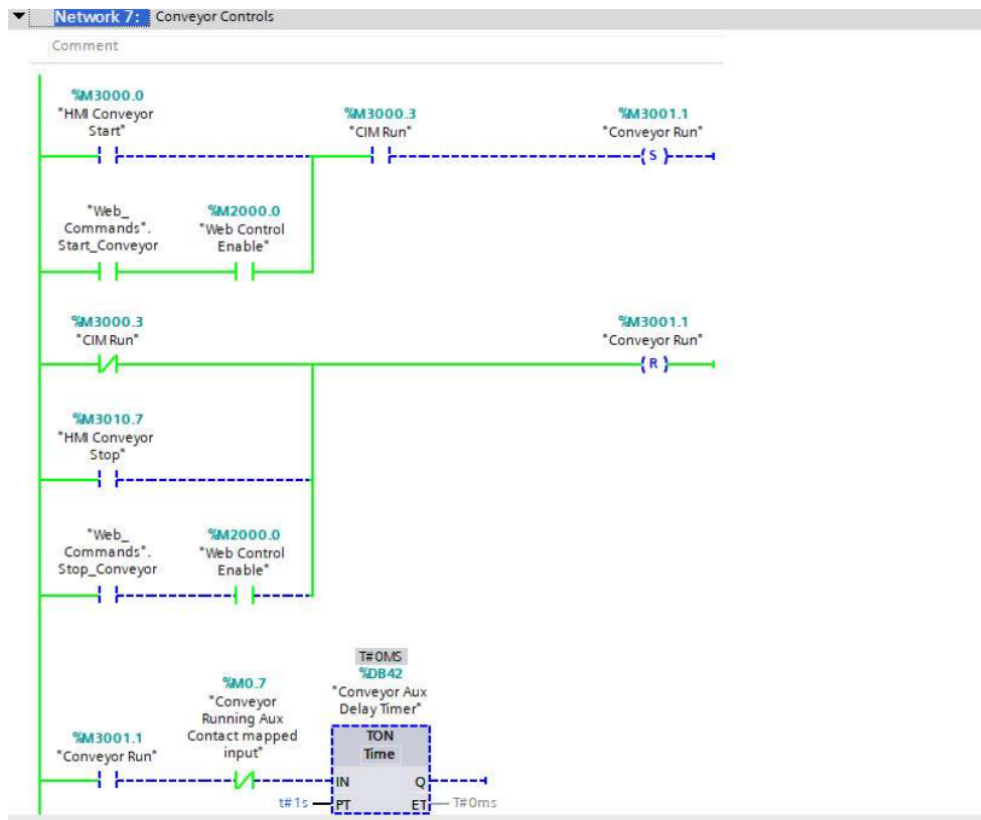


Figure 64

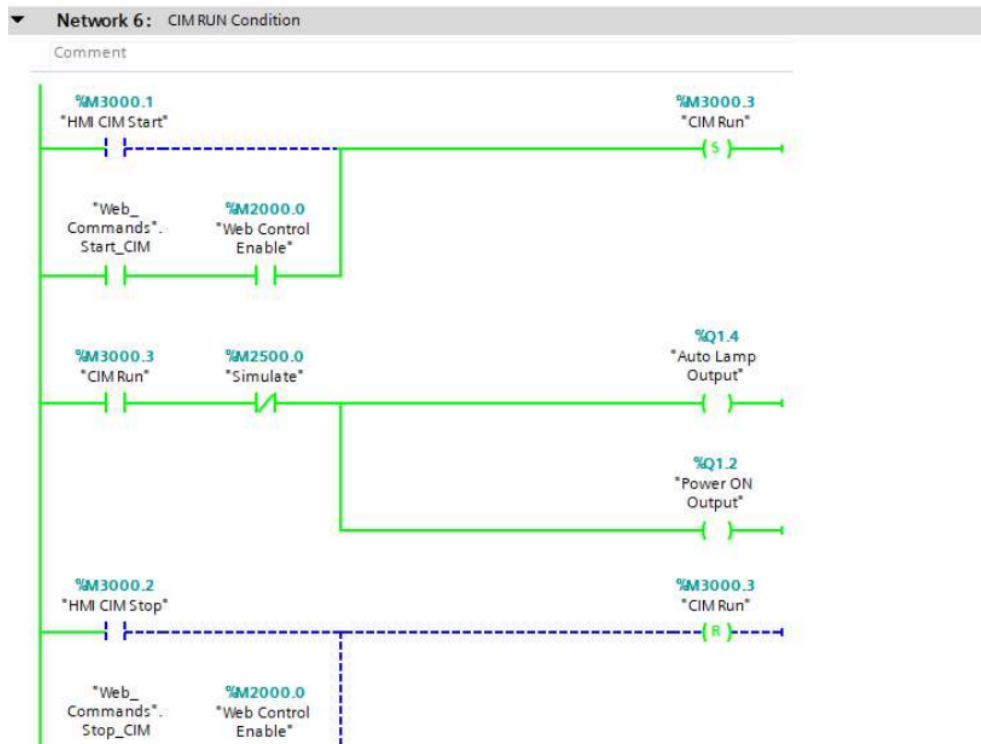


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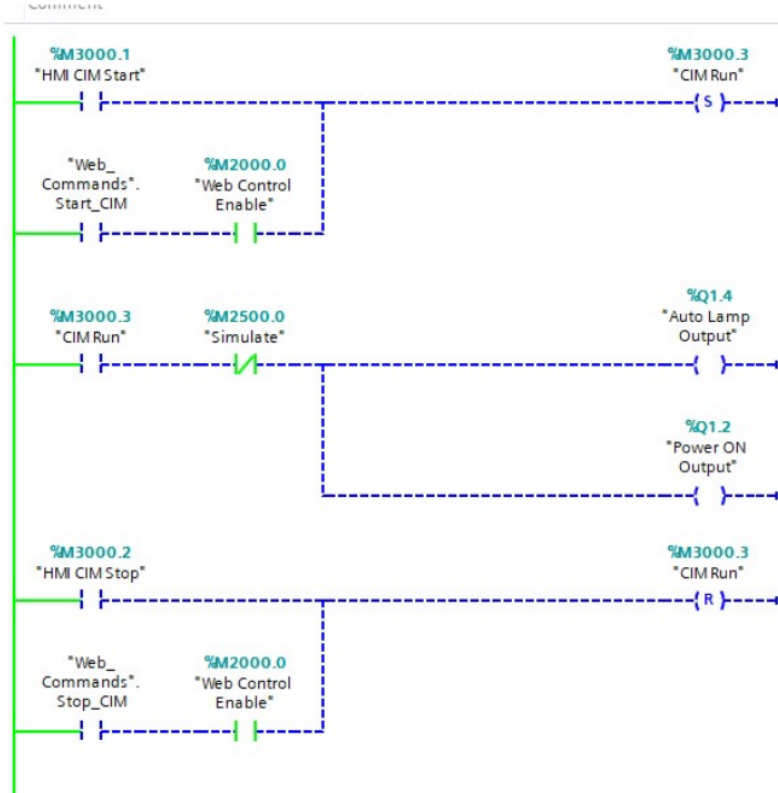


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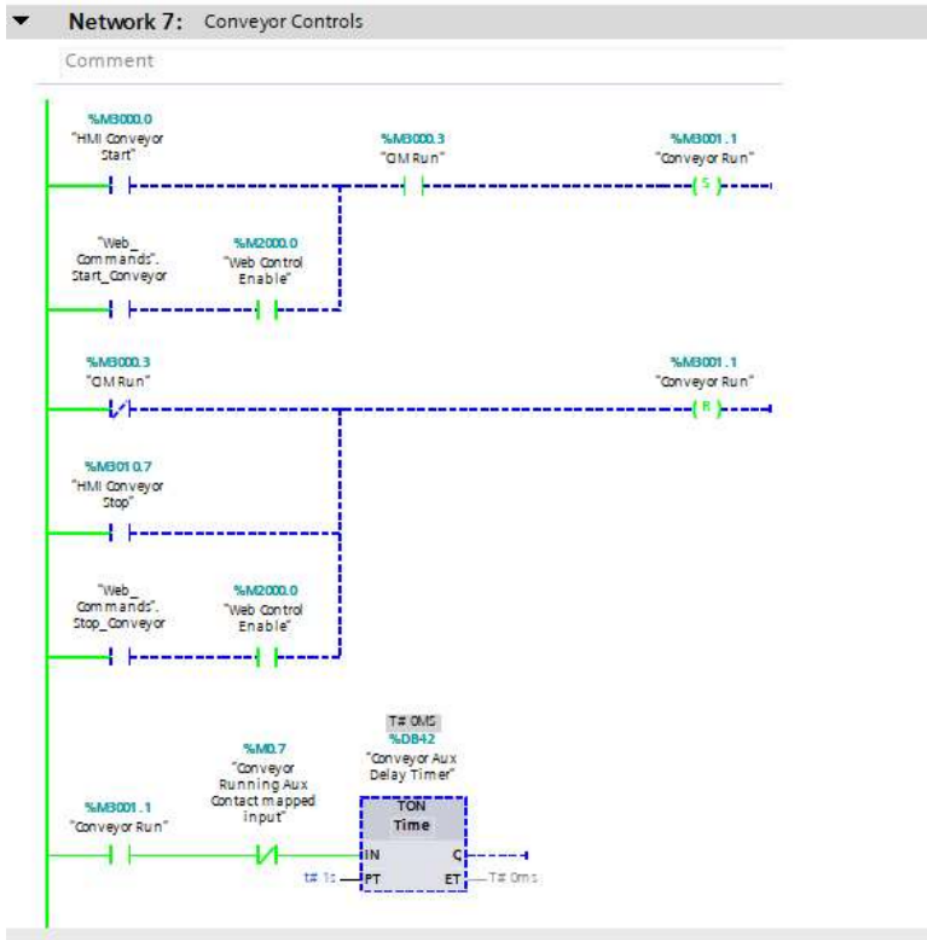


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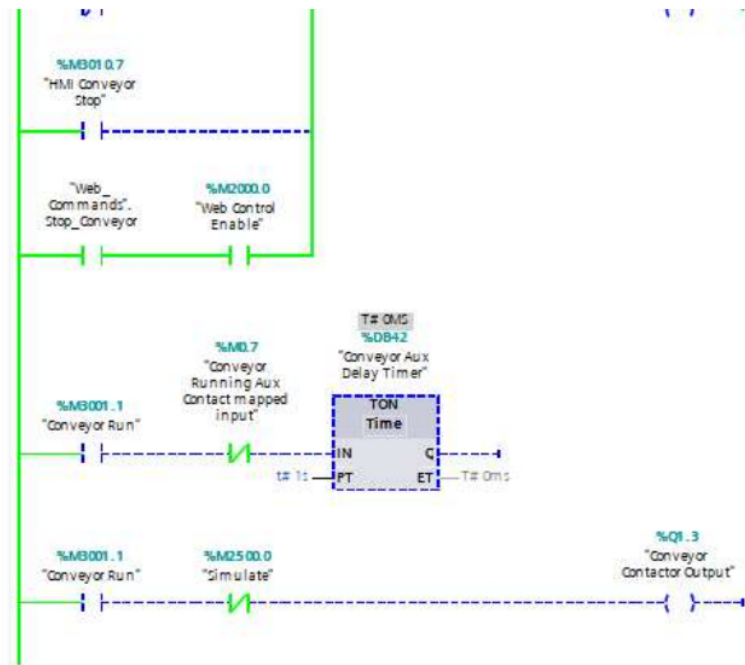


Figure 68



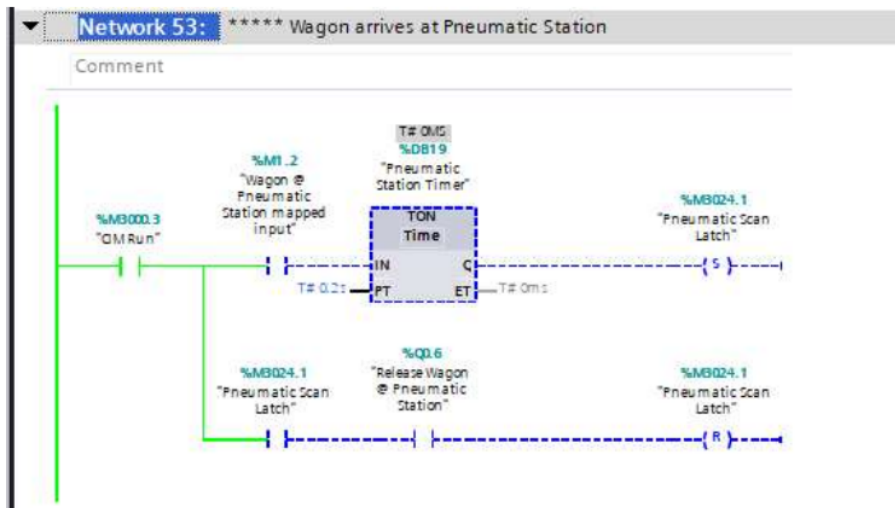


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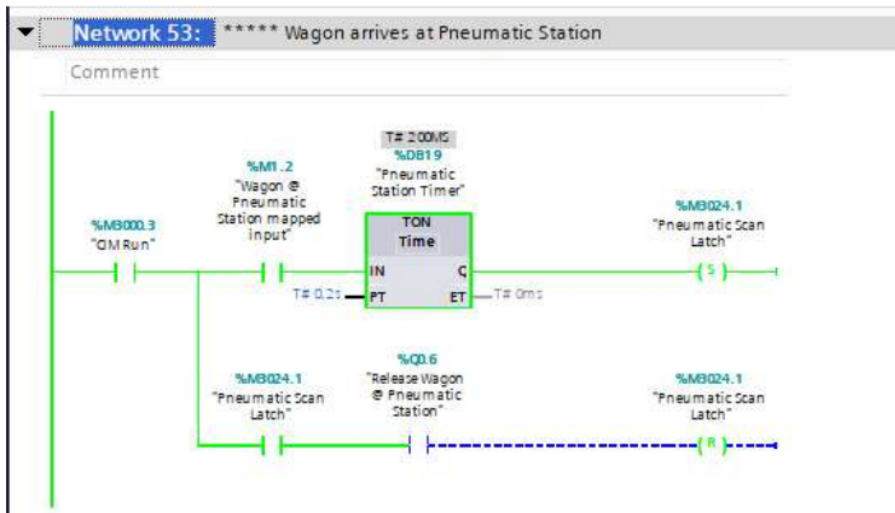


Figure 72

FINAL GRADE

GENERAL COMMENTS

Instructor

77 /100

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Text Comment. PLC 101

PAGE 6

QM Paragraphs should be fully justified text as required in the brief

PAGE 7

QM Spelling
Spelling error

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GRADING FORM: NEW CSG-RUBRIC

TAYLOR HOSKINS

77

1. ENGAGEMENT WITH LITERATURE



Very good evidence of reading from a good range of sources, cited and listed correctly using the Harvard method. 15/20

15

2. KNOWLEDGE AND UNDERSTANDING

- | | | |
|---|--|-----------|
|  | A good section on system overview and operation that shows clear evidence of knowledge and understanding. This is also evident in the section on safety and maintenance. 14/20 | 14 |
|---|--|-----------|

3. COGNITIVE AND INTELLECTUAL

- | | | |
|---|--|-----------|
|  | Excellent assessment of risk, very good testing with clear table of results linked to evidence. Very good conclusions and recommendations. 16/20 | 16 |
|---|--|-----------|

4. PRACTICAL APPLICATION

- | | | |
|---|--|-----------|
|  | Very good evidence of practical working carried out to a high standard including the data transfer, HMI mods and the VoT work. 16/20 | 16 |
|---|--|-----------|

5. TRANSFERABLE SKILLS

- | | | |
|---|--|-----------|
|  | The report is well presented, structured and written. However, the format is not quite correct. Good evidence of team working. 16/20 | 16 |
|---|--|-----------|