# 2024888

*by* Ethan Rigby

**Submission date:** 26-Apr-2022 11:49PM (UTC+0100)
**Submission ID:** 177415930
**File name:** 19740_Ethan_Rigby_2024888_179606_1076281003.pdf (15M)
**Word count:** 3738
**Character count:** 22286

| | |
|---|---|
| **Course:** | HNC Electrical and Electronic Engineering |
| **Module:** | SGEE4005 Instrumentation and Integrated Automation Systems |
| **Assignment:** | 2. Integrated Automation System |
| **Name:** | Ethan Rigby |
| **University number:** | 2024888 |
| **Date submitted:** | 26/04/2022 |
| **Word count:** | **2714 words** |

Sections should be numbered according to the brief

# Table of Contents


Research ..... 4

What is industry 4.0 ..... 4

Benefits to integrated manufacturing systems ..... 4

Enhanced data usage ..... 4

Internet of things (IOT) ..... 4

Cloud computing ..... 5

Smart manufacturing ..... 5

Cognitive computing ..... 5

System Overview and Operation ..... 6

Pneumatic system ..... 7

Water recirculation ..... 8

Process station ..... 9

Vision station ..... 10

Assembly station ..... 11

Hydraulic station ..... 12

Hardware devices ..... 14

PLCs and HMIs ..... 14

Communication module ..... 15

Robotic arms ..... 15

Vision station camera ..... 17

Wagon coding and material identification ..... 17

Program software ..... 17

Health and Safety, Maintenance and Reliability Requirements ..... 18

Maintenance and reliability requirements..... 19

System Design Adaptation ..... 20

PLC communication ..... 20

Enhanced PLC station indication..... 20

Moving PLC tags ..... 21

VOT remote HMI ..... 21

Conclusions and Recommendations..... 23

Team Working..... 24

Citation List..... 25

References ..... 25

Appendix..... 26

Sections should be numbered according to the brief

# Research

Paragraphs should be fully justified text as required in the b

## What is industry 4.0

Industry 4.0 is the next step in upgrading the global industrial standards and more advanced technologies around the principles of automation and cyber-physical systems (CPS). By increasing analysis of machinery and storage of data, systems can be made flexible and highly efficient for any process or change in processes. (Barbero, 2017) Correctly cited

## Benefits to integrated manufacturing systems

### Enhanced data usage

Machines, devices and, sensors to be connected via quicker and highly reliable communication systems that store data to vast degrees forming a virtual representation of the plant. This results in the higher transparency of data allowing self-diagnoses made through faults and possibly self-repairs reducing the reliability on human interaction. Citation Needed

### Internet of things (IOT)

As part of creating the new desire across industry smart factories require machinery around the plant to be equipped with sensors that monitor every action of the machine. this *Capital letter* information is transmitted using an IP address and gets stored and shared across every other machine and software necessary to their function. the information taken from the sensors are uploaded to the internet in banks which can be stored and shared across industries to be used as examples and replications for other applications. (ibm, 2021)

## Cloud computing

As part of data storage, the cloud is a new and highly advanced solution to many of data saving problems. Data needs to be saved across every industry in volumes that are impossible to deal with. The use of cloud allows industries the opportunity to save data, use it, share it, and link it across many aspects of the company to track the full nature of productivity. (ibm, 2021)

## Smart manufacturing

Over the past 30 years the world has become more internet based every day. Industry has been slower to follow the idea of internet usage. This is due to the complexity and lack of understanding of the full functions it possess. The upgrading of industries to enhance smart manufacturing is a procedure that will embellish upon the capabilities of artificial intelligence, advanced data storage and usage, web-based control and many more features. (instrumental, 2022)

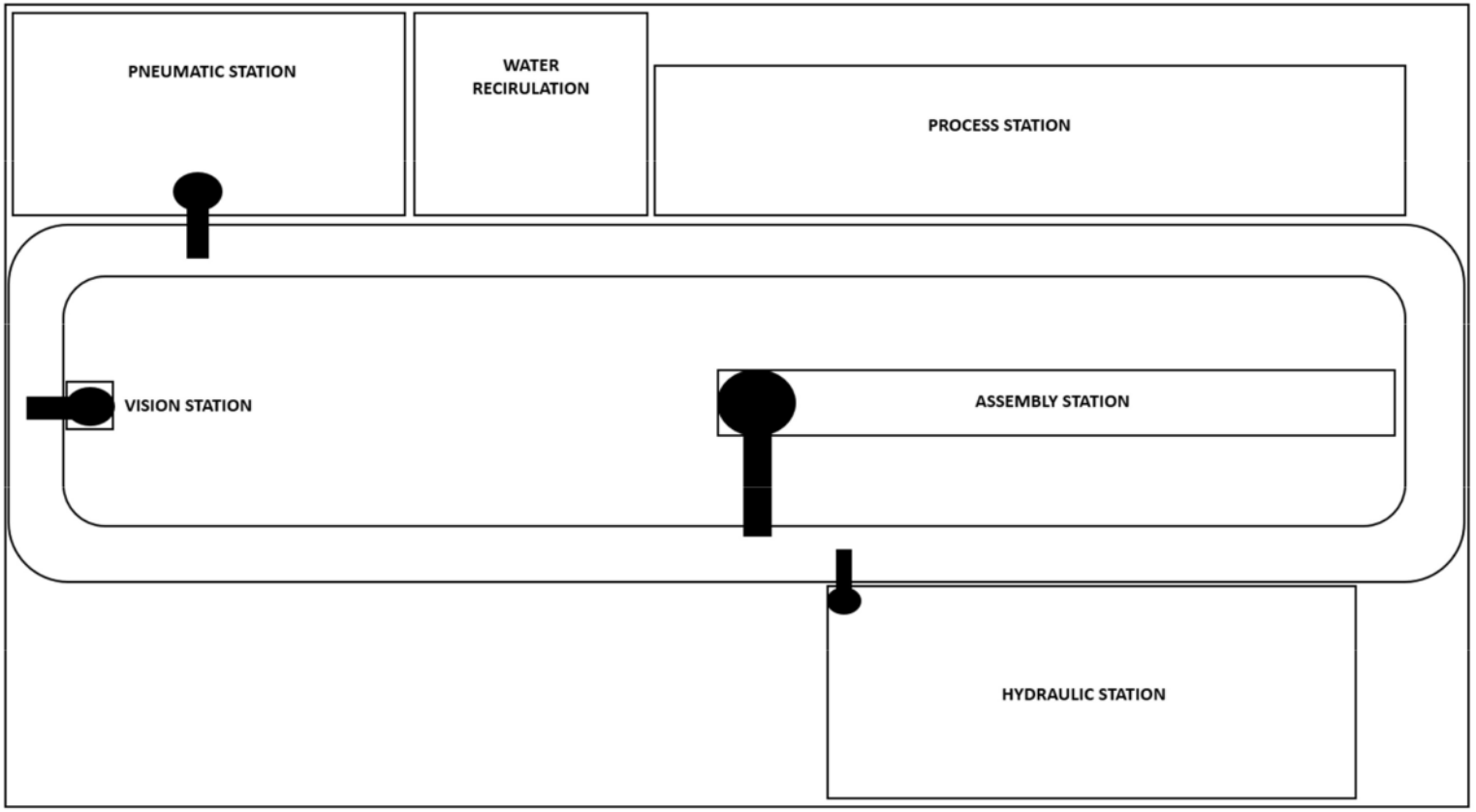
## Cognitive computing

Cognitive computing is a huge artificial intelligence development that provides a computer to think as a human would to complete a task with minimal instruction. The idea that computers can think is becoming an ever-increasing reality as industry 4.0 reveals the possibility of computers creating their own thoughts (Qu, et al., 2021) . the advantage of such futuristic technology could result in the complete automation of plant processes and eliminate the need for humans to conduct work on complex machinery where possible human error could cause breakdowns. This technology will play a huge role in the nuclear power sector of industry.

*The brief also asked you to consider M2M communications*

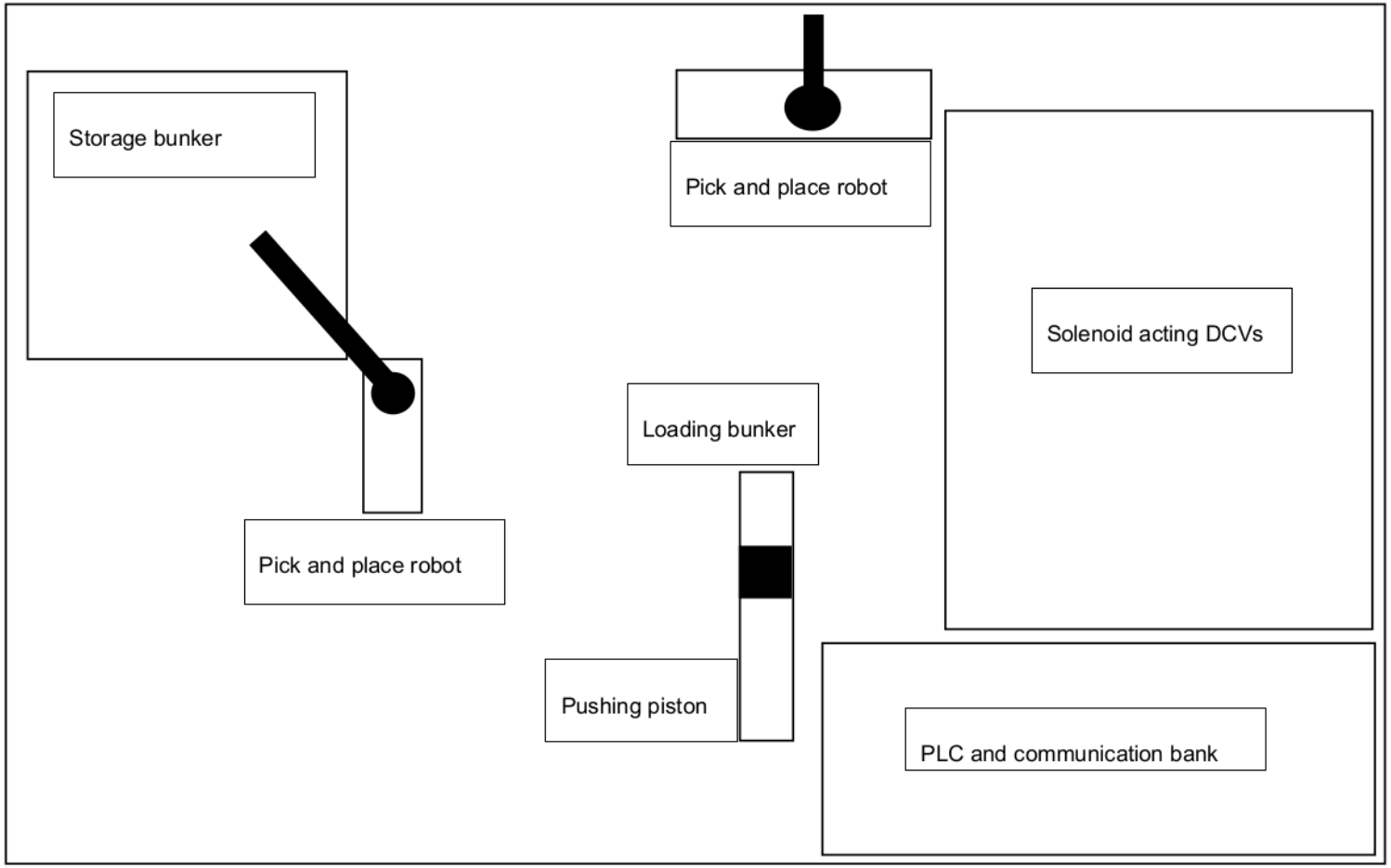
*These diagrams are too large, they should be more detailed and placed in the appendix. Also, switching between portrait and landscape throughout the report is awkward for your reader.*

## System Overview and Operation

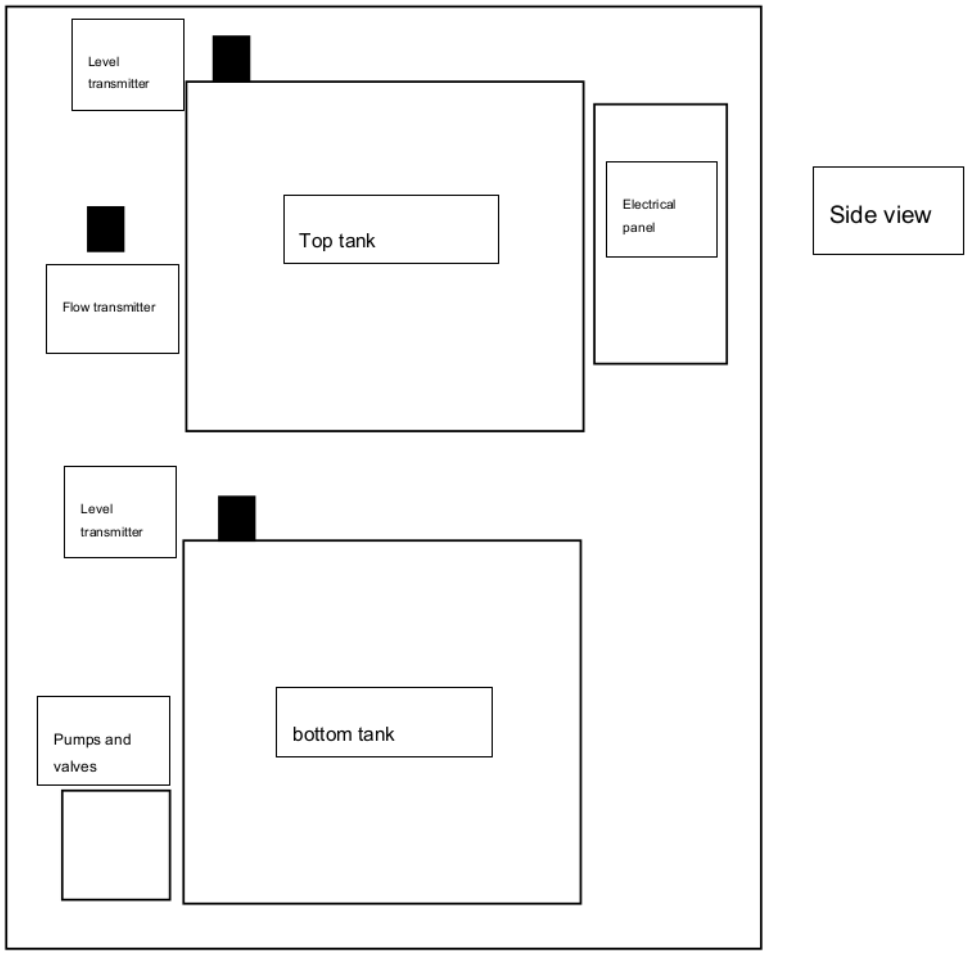



*Diagrams should be figured numbered*

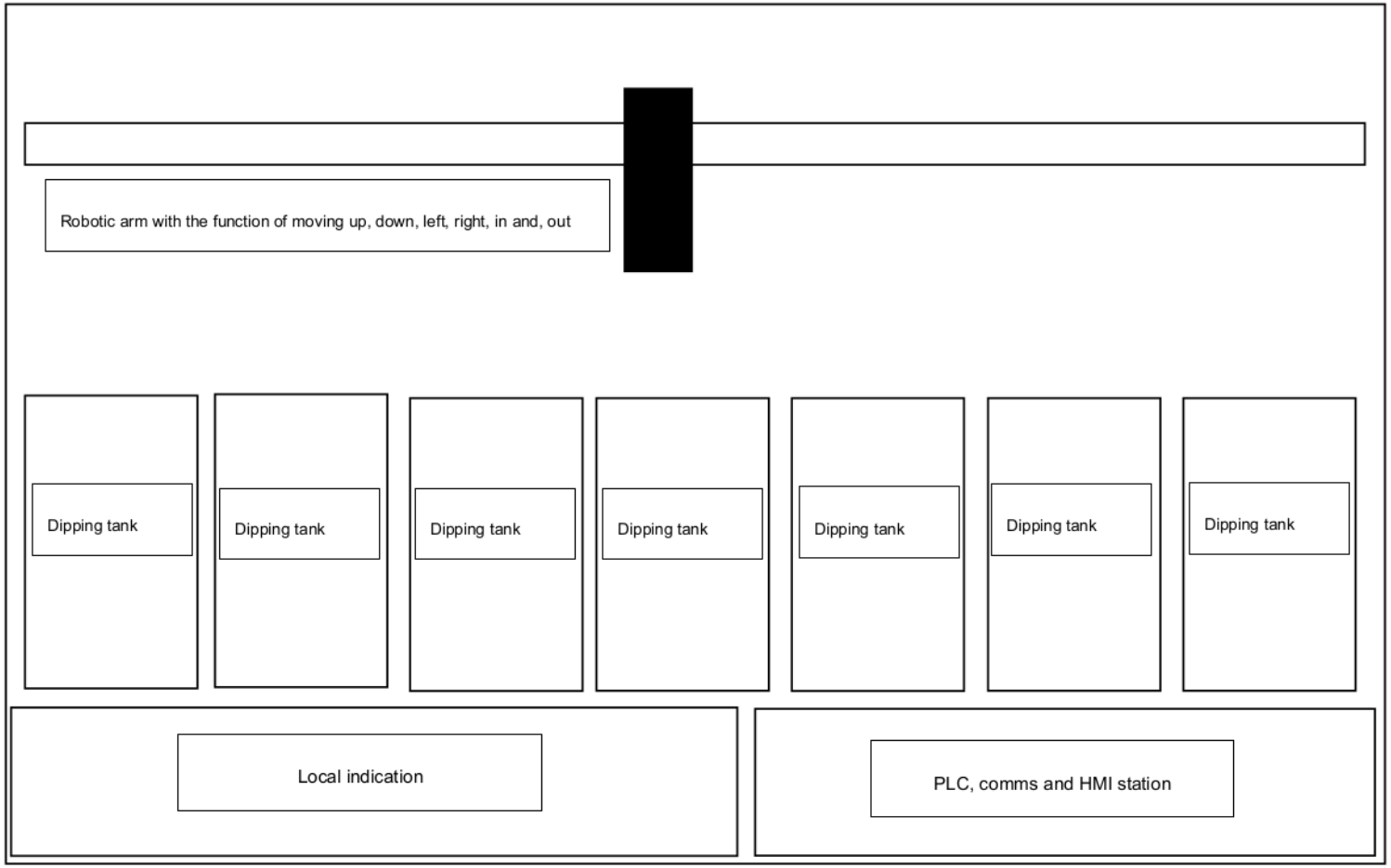
## Pneumatic system



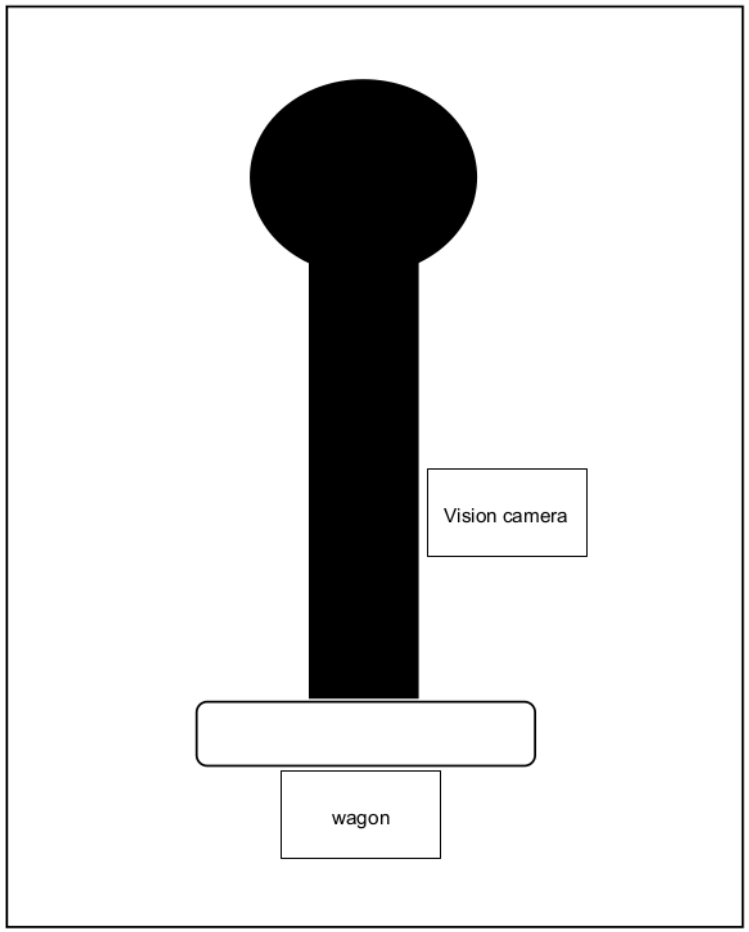
## Water recirculation



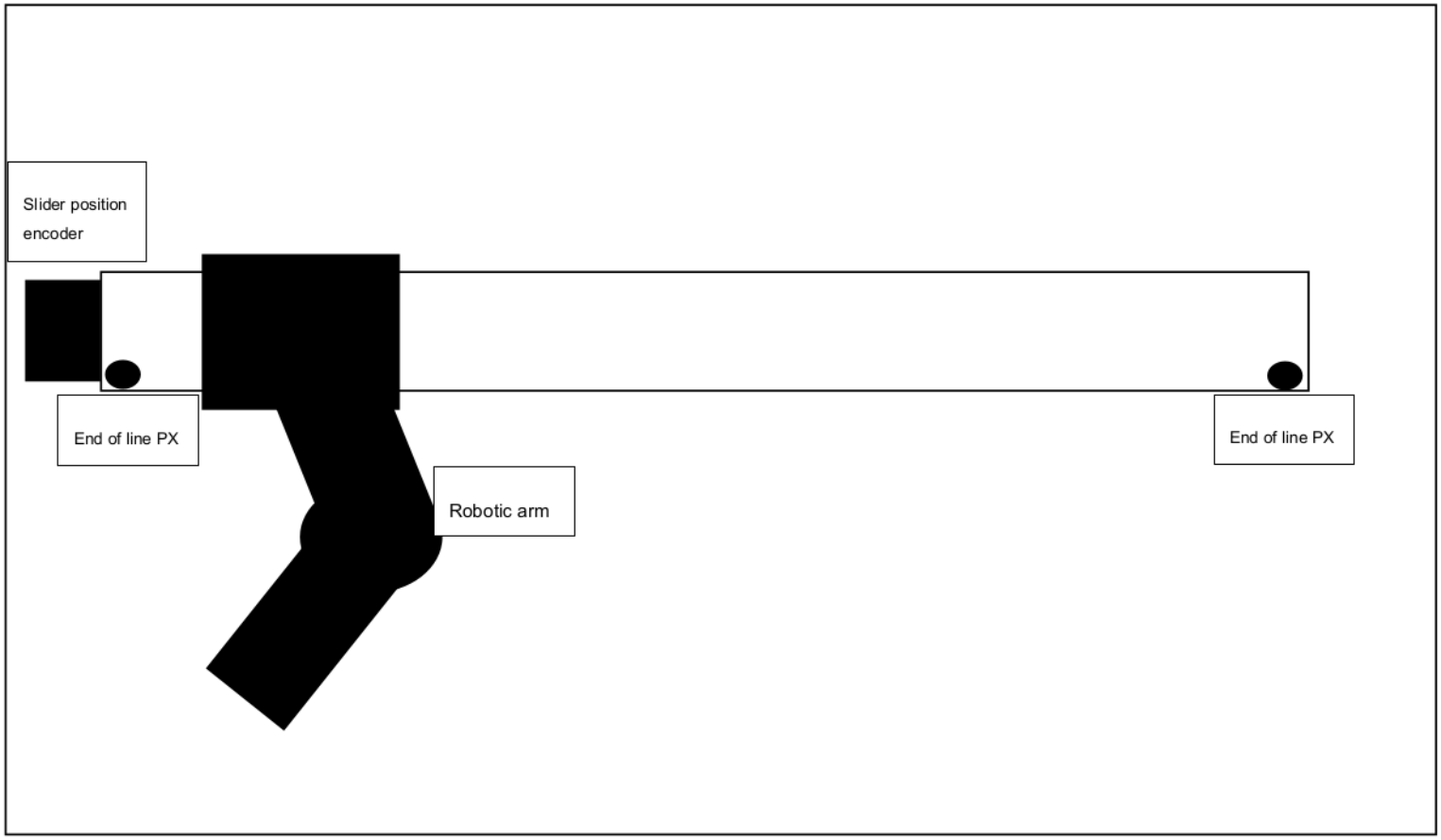
## Process station



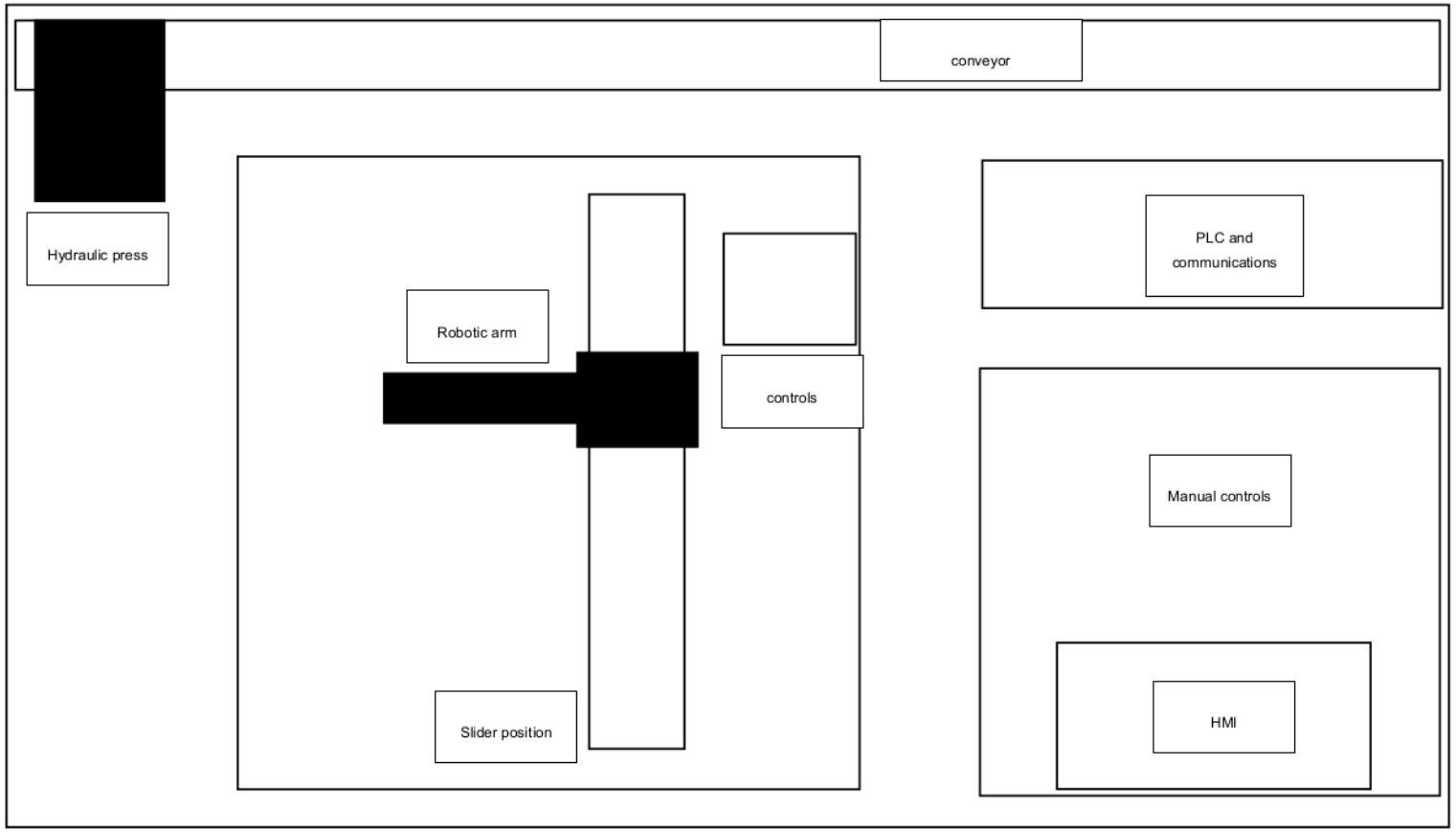
## Vision station



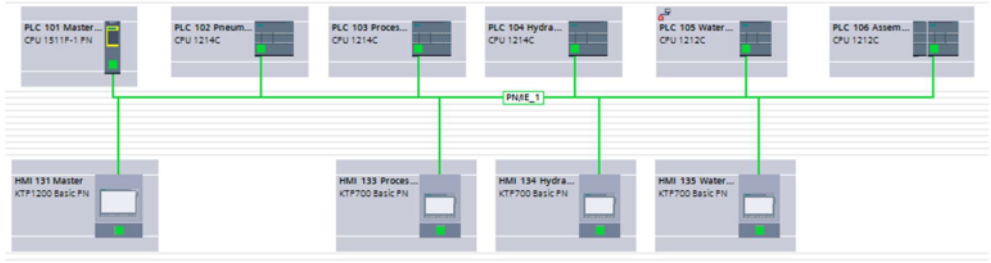
## Assembly station



## Hydraulic station



Each of the station above are shown in more detail in Figures 87-101




*Explain this figure*

*Why landscape?*

## Hardware devices

### PLCs and HMIs

The CIM system is constructed with the use of six stations, each station carries out a separate process to form the final product. Each major system possesses its own unique PLC as seen in figure 29. These systems need to be able to communicate with one and other for the system to run smoothly. The master PLC101 controls each station and tells it when it needs to function. Without this the process will be out of sync.

Three HMI screens exist to control and monitor the actions of three of the major systems, this includes the Hydraulic station, Water recirculation system and, Process station. Every other station is shown in the main HMI screen.

The PLCs used in the CIM system are as follows:

| PLC name | PLC model |
|---|---|
| PLC 101 Master | S7-1500 (CPU 1511P-1 PN) |
| PLC 102 Pneumatic Station | S7-1200 (CPU 1214c) |
| PLC 103 Process Station | S7-1200 (CPU 1214c) |
| PLC 104 Hydraulic Station | S7-1200 (CPU 1214c) |
| PLC 105 Water Recirculation | S7-1200 (CPU 1214c) |
| PLC 105 Assembly Station | S7-1200 (CPU 1214c) |

*the bottom 2 are 1212c PLCs*

## Communication module

Punctuation Error

*this is a network switch*

Across every stations PLC a communication module has been fitted, this communication module is the siemens 'SCALANCE XB005' (as seen in figure 86). This Hardware device is used to link each PLC together as seen in the diagram above. This module links the PLC with the use of ethernet cables

## Robotic arms

There are four types of robotic arms used across the CIM system, each of them has their own function and a specific method of operating. The table below shows the robotic arms combined with their method of function.

| Location of robotic arm | function | Method of power | description | Model |
|---|---|---|---|---|
| Process station | Transfer product through a series of liquid filled chambers | Electric motor run | This robotic arm has the ability to move across all 3 axes, this is specifically necessary to transport the products through the station required. | -V20-T2-24D1-12 |
| Hydraulic station | Moves bottom material onto wagon | Hydraulic | This robot works using hydraulic pressure that is controlled through DCVs. The robot has 3 axes of movement in order to rotate, puck, place and move product into place. | HYD-2800<br>*what is a DCV?* |
| Assembly station | Assembles materials so they can be pressed together | Electric motor run | Using 3 axes of movement this robot assembles the materials onto each other. Position measured using encoders to ensure accuracy when assembling materials. | MOVEMASTER EX |
| Pneumatic station | Moves materials into bunker then onto wagon | Pneumatic power | Through the use of 2 axes these robotic arms transport materials from storage bunker onto wagons for further process | PHD 8420 02 701 |

### Vision station camera

the camera used for the vision station is the IFM 02D222 object recogniser.  This device can be linked to the ethernet communication modules to share its information and be used within a PLC application. The recogniser scans the object beneath it and results in the program being made aware of the exact material that is in the station at that time.

### Wagon coding and material identification

Punctuation Error

The CIM system conveyor has five locations in which the wagons positions are identified and displayed, each wagon has its own unique binary code that is indented at the bottom of each waggon (as seen in figure 105). At each of the five points around the conveyor there are 5 proximity switches, each of these switches activate in different orders depending on which cart is over them. The binary number is calculated, converted and displayed on the CIM screen.

For the CIM system to work automatically regardless of the order of materials enter the station the vison station provides a four-digit code that describes what materials are on the wagon and in what order they are in. as the materials go around the system and the wagons are tracked this number is updated with the code that represents the product after each station completes their designated job. This code is seen in figure 106.

### Program software

The software used on the program for the CIM system is siemens TIA portal V17. The new updated version of TIA portal allows for a range of cybersecurity and protection for the program and restricting those who can enter it.

Online web access has been added to allow online access through the use of a browser, the correct IP address given to the PLC and a password that is settable by the use

## Health and Safety, Maintenance and Reliability Requirements

| Facility / Activity | Identify the hazards | Who/what may be harmed | Risk likelihood | Severity of harm | Overall risk | Existing control measures | Recommendations/ further action required |
|---|---|---|---|---|---|---|---|
| Process station | Hazardous and acidic solutions | Personnel who come into contact with solutions | 3 | 2 | 6 | Short guard 1-foot hight | New guard that covers whole of area surrounding solutions that are accessible by people. |
| Emergency stop buttons | When pressed whole system shuts down possibly stopping processes halfway through motion causing materials to drop | Process could be damaged by the action of the falling objects | 3 | 2 | 6 | N/A | Safety PLC should be incorporated to stop either just the location in which the emergency stop was activated, or stop the area in which the e-stop was pressed and return every other station back to its home position after action in progress is complete. |
| CIM system moving parts | On all open sections of conveyors and mechanical moving machines there is very little | People could be injured by the moving machinery if hands enter the area | 4 | 3 | 12 | Some guarding and a laser that if broken shuts down the machine | Laser could be passed under or over therefore isn't capable of full protection. Full guarding should be applied around the whole CIM |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | **protection preventing access** | | | | | | **system and if opened machine should shut down fully.** |
| **PLCs and communication modules** | **Dust or water accesses the PLC or comms module resulting an electrical breakdown** | **Damage to system resulting in total process shutdown** | **2** | **4** | **8** | **N/A** | **All electrical equipment as far as practical should be in containment of an electrical panel.** |

## Maintenance and reliability requirements

All instrumentation needs to be recalibrated across the CIM system to ensure the accuracy of the process. This has been thought about through the design of the program. Within the process station 3 screens exist that provide detail around the flow control, level control and temperature control. The HMI screens FC535, LC541, TC511 provide the errors, CV, PV, Ki, setpoint etc of each of the systems making the location of faults and calibration easier.

Added indication around the commands and status of PLC tags as explained in the system adaption section results in the efficient maintenance and diagnoses stages of possible faults. Without the indication on the HMI fault finding on the PLC itself would take time resulting in the loss of production.

# System Design Adaptation

## PLC communication

Communication between PLCs is vital for the complete function of the CIM system, without communication between PLCs stations across the system could fail resulting in a total stand still in the process. Each station has their own unique PLC to provide the function necessary for the system to work (as shown in figure 29). Therefore, Profinet counters have been added to the CIM engineers HMI screen on each station that's constant counting proves the station PLC is still in communication with the master PLC. This upgrade is shown in figure 79 and 80

## Enhanced PLC station indication

On each HMI screen there are many states of the system that provide benefit on being displayed. To provide the most user-friendly system this information has been added to each HMI station screen. From PLC102-106 status indication and command indication has been added to the HMIs. Taken from each PLCs designated data blocks the command signals and the status signals are displayed in separate boxed to organise the screen and making it user friendly. The steps for adding the indication blocks and applying the correct PLC tags can be seen from figure 32-56

To test this system a simulation program was written enabling the function of the HMI screen and program without the requirement to communicate with the PLCs. Through the use of this function each screen was tested proving the indication across each HMI screen activated as intended, the tested HMI upgrade screens can be seen in figure 81-85

## Moving PLC tags

Within HMI103 three screens are located (FC535, LC541, TC511) these are part of the process station PLC103. Each of these screens posse's multiple values such as KI, KP, CV, PV etc. these values are created and stored in only PLC103 under the data block 'analogue' as seen in figures 59, 60 and, 61. To share the tags with the master PLC the analogue data block signals need to be applied to a 'MOVE' function block and saved as real data in both PLC103 data block in PLC101 and PLC101 data block in PLC103 (as seen in figure 73-76). Both data blocks in PLC 101 and PLC 103 need to be identical ensuring both PLC101 and PLC103 will provide the HMI screens with the exact same values.

By simulating PLC101 and the HMI the values on all three process screens values show as zeros, if the tags to the HMI screens were incorrect, they would show as question marks. This proves that the transfer of the PLC tags was successful and now the data is communicated through both PLC101 and PLC 103. Figures 66, 72 and, 78 show the simulations of each of these screens showing the tags work.

## VOT remote HMI

VOT screens were created as part of a team to develop an online HMI screen that can be accessed on a web browser using the correct IP address and password. These screens allow remote access therefore eliminating the need for a physical HMI screen. This is a new feature in the new development into industry 4.0.

Screens were created on VOT in PLC101. A screen grab of the main CIM screen was taken and inserted as an image on the VOT screen as a template. Every button, indication lamp and value box are put over the location marked by the template (shown in figure 3). Each of the tags across all the button, indication lamp and value boxes are identical to those of the CIM main screen itself.

Testing of the VOT screen is done when PLC 101's online, when the web address gets applied, and the IP address of the PLC and password activated the CIM system can be controlled online. Testing of this system is showing in the test table above with the evidence coming from figure 1-28

| Test Table | | | | |
|---|---|---|---|---|
| Description | Expected | Actual | Pass/Fai | Evidence |
| Start CIM from webpage | CIM starts when button is selected on VOT | CIM started when button pressed | Pass | figure 2 |
| Stop CIM from webpage | CIM stops when button is selected on VOT | CIM stopped when button pressed | Pass | figure 1 |
| Start Conveyor from webpage | conveyor runns when button on VOT is pressed, so long as CIM has started. | conveyor run when button pressed (only when CIM was activated) | Pass | figure 3 |
| Stop Conveyor from webpage | conveyor stops when button on VOT is pressed, if CIM is turned off then conveyor shoould also stop. | conveyor stopped when button pressed (also deactivated when CIM switched off) | Pass | figure 4 |
| Start CIM identification light | Light will go green when active and grey when deactivated | light went green when CIM started | Pass | figure 2 |
| Start Conveyor identification light | Light will go green when active and grey when deactivated | light went green when conveyor started (only when CIM was active) | Pass | figure 3 |
| All PX switches identifier change colour when active (grey to orrange) | when cart was over the sensor identification light on VOT goes from grey to orrange | each cart correctly displayed at each station when on it | Pass | figure 5 |
| All PX switches identifier change colour when deactivated (orange to grey) | when cart leaves sensor identification light on VOT goes from orange to grey | when cart entered PX light went from grey to orange | pass | figure 6 |
| Wagon identification numbers show when at a station | when each wagon reaches a station the number of the cart shows on VOT | when cart left PX light went from orange to grey | Pass | figure 6 |
| slider value shows on VOT when slidder is moved on HMI | slider value should match on both VOT screen and HMI screen when moved into position. | Hmi value: 286.51 \| Webpage Value: 286.51 | Pass | figure 7/8 |
| move to 1. Pneumatic Station from main CIM screen | when selected on CIM screen should redirect to 1. Pneumatic Station | when pressed redirected to 1. pneumatic station | Pass | figure 9 |
| Return to main CIM from 1. Pneumatic Station | return to CIM station from 1. pneumatic station | when pressed returned back to CIM station | Pass | figure 17 |
| move to 2. Vision Station from main CIM | when selected on CIM screen should redirect to 2. vision station | when pressed redirected to 2. vision station | Pass | figure 10 |
| Return to main CIM from 2. Vision Station | return to CIM station from 2. vision station | when pressed returned back to CIM station | Pass | figure 17 |
| move to 3. Hydraulic Station from main CIM | when selected on CIM screen should redirect to 3. hydraulic station | when pressed redirected to 3. hydraulic station | Pass | figure 11 |
| Return to main CIM from 3. Hydrualic Station | return to CIM station from 3. hydraulic station | when pressed returned back to CIM station | Pass | figure 17 |
| move to 4. Assembly Station from main CIM | when selected on CIM screen should redirect to 4. assembly station | when pressed redirected to 4. assembly station | Pass | figure 12 |
| Return to main CIM from 4. Assembly Station | return to CIM station from 4. assembly station | when pressed returned back to CIM station | Pass | figure 17 |
| move to 5. Process Station from main CIM | when selected on CIM screen should redirect to 5. process station | when pressed redirected to 5. process station | Pass | figure 13 |
| Return to main CIM from 5. Process Station | return to CIM station from 5. process station | when pressed returned back to CIM station | Pass | figure 17 |
| move to Water Station from main CIM | when selected on CIM screen should redirect to water sttaion | when pressed redirected to water station | Pass | figure 14 |
| Return to main CIM from Water Station | return to CIM station from water station | when pressed returned back to CIM station | Pass | figure 17 |
| move to Wagon Code from main CIM | when selected on CIM screen should redirect to wagon code | when pressed redirected to wagon code | Pass | figure 15 |
| Return to main CIM from wagon code | return to CIM station from wagon code | when pressed returned back to CIM station | Pass | figure 17 |
| move to Material Selection from main CIM | when selected on CIM screen should redirect to mateiral selection | when pressed redirected to material selection | Pass | figure 16 |
| Return to main CIM from Material Selection | return to CIM station from material selection | when pressed returned back to CIM station | Pass | figure 17 |
| cart retainer identifier shows red when cart is being held | light goes red when cart was retained for 5 seconds. | when cart was in station the retainer held the cart and appeared red on VOT | Pass | figure 6 |
| cart retainer identifier shows green when cart is released | light goes green when cart was released until new cart entered station. | when cart was released the retainer released the cart and appeared green on VOT | Pass | figure 6 |

## Conclusions and Recommendations

Through the creating and upgrading of an integrated automation system the ability for machines to communicate together to complete a task without the need for human interaction has become apparent. Through the course of the assignment systems have been seen to work together to identify the state in which a product is in, and to complete the necessary steps to produce the final product. This has been possible using M2M communication and advanced programming.

Through upgrades made to the HMI screens the ability to create user-friendly data has been adopted and implemented where necessary to ensure the ability to monitor and fault find on the system is as simple as possible.

Creating an online control panel for the control of the CIM system has been a new feature that saves money and creates a more advanced human interface system where monitoring and working on a process is more useful and technical.

Health and safety around the CIM system has been highly thought of with the recommendations for change listed in the risk assessment. The ability to control the CIM system in the case of an emergency stop situation has been located and the need for a safety PLC has been identified. This will provide the PLC the ability to create the safest outcome of the system and the recipient of danger.

## Team Working

As part of a team the primary job was to create a web-based user interface to control the CIM system with only an internet connection, IP address and password. As part of a team the screens were created and tagged to the appropriate data from the main PLC 101. Through the process of creating the VOT each team member joined thoughts to ensure the completion of the task. My job in the crating of the screens was to locate the tags and tag them to the necessary places, such as buttons, indication lamps and figure boxes.

Through the process of testing the VOT the tam split into 3 sections. One controlled the CIM screen from the VOT, another monitored the PLCs reaction to the selection of buttons in the mater PLCs code, whilst the other then recorded the results in a test table to tabulate the results as they were unravelled.

Correct method of listing.

## Citation List

## References


Barbero, o. l., 2017. *Industry 4.0: key features and benefits.* [Online]
Available at: https://cocop-spire.eu/content/industry-40-key-features-and-benefits
[Accessed 16 04 2022].

ibm, 2021. *What is Industry 4.0?.* [Online]
Available at: https://www.ibm.com/uk-en/topics/industry-4-0
[Accessed 26 04 2022].

instrumental, 2022. *What is Smart Manufacturing?.* [Online]
Available at: https://instrumental.com/resources/industry-4-0/what-is-smart-manufacturing/?utm_medium=advertisement&utm_source=bing&utm_campaign=&utm_group=&utm_subgroup=smart%20manufacturing&msclkid=37dfd5a9b4dc15b4b5d7b7c1dcfa26b6
[Accessed 26 04 2022].

Qu, Y. et al., 2021. *A Blockchained Federated Learning Framework for Cognitive Computing in Industry 4.0 Networks.* [Online]
Available at: https://ieeexplore.ieee.org/document/9134967
[Accessed 26 04 2022].


Small Range of Sources

# Appendix

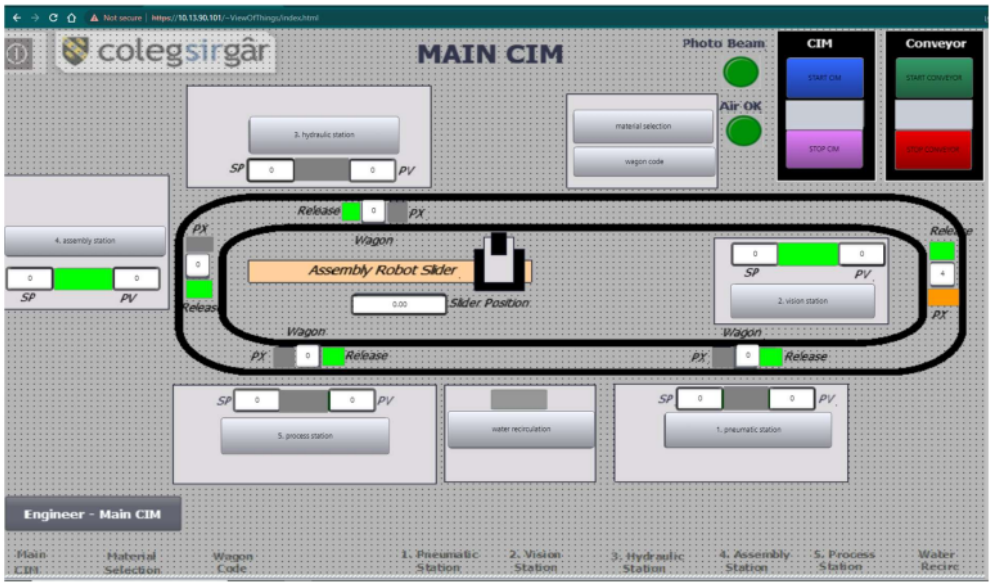



*Figure 1 VOT teamwork*

Stop CIM

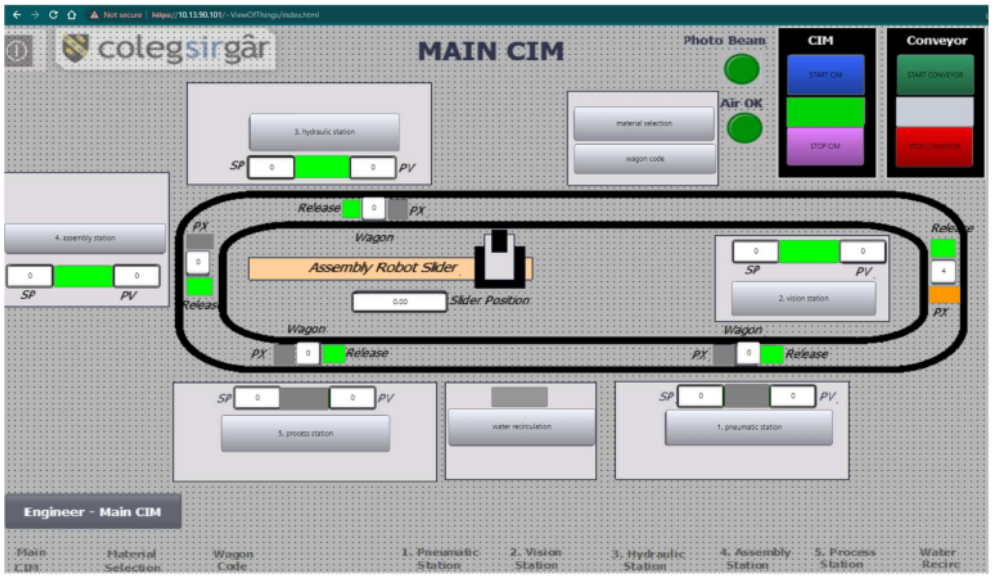



*Figure 2 VOT teamwork*

Start CIM

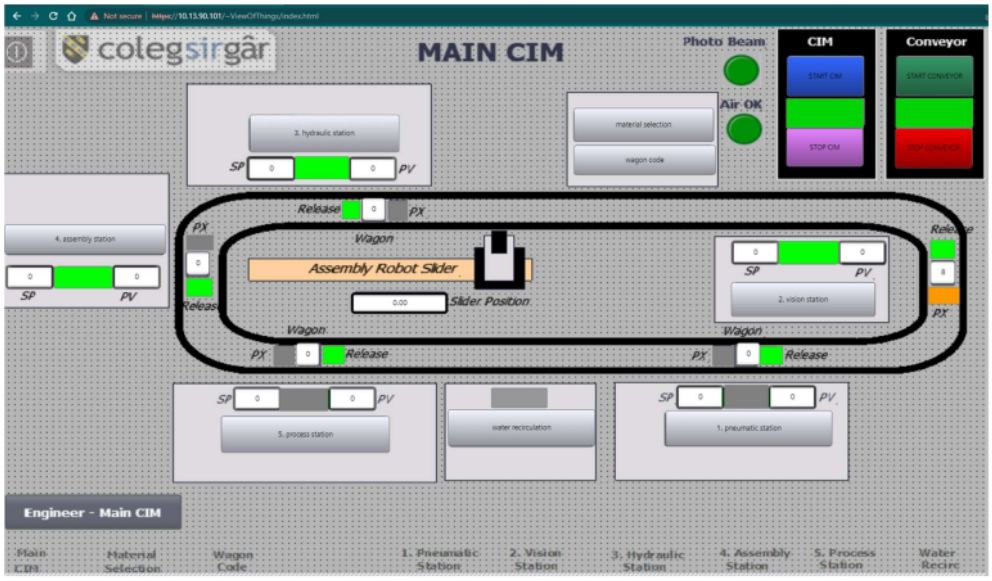



*Figure 3 VOT teamwork*

Strat conv

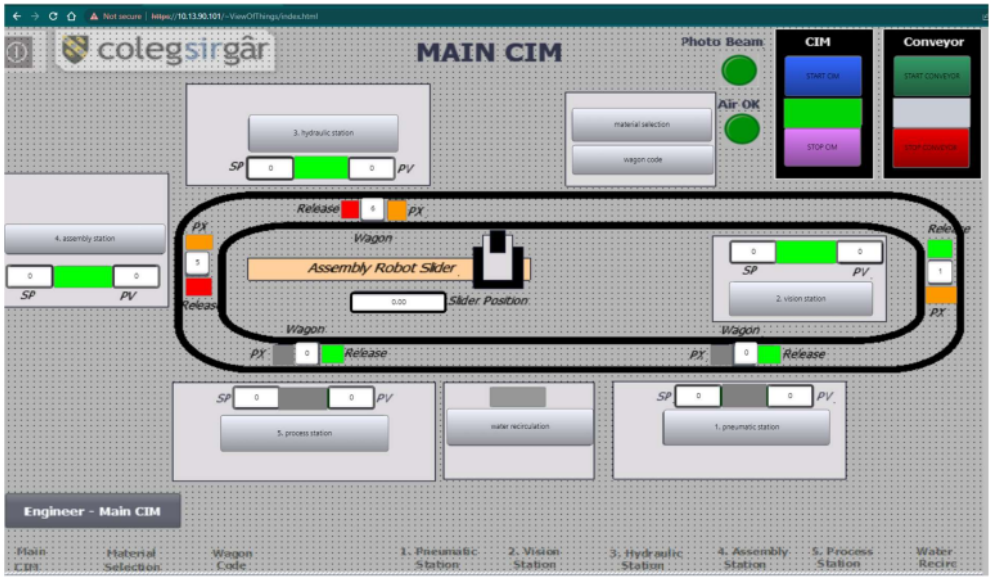



*Figure 4 VOT teamwork*

Stop conv

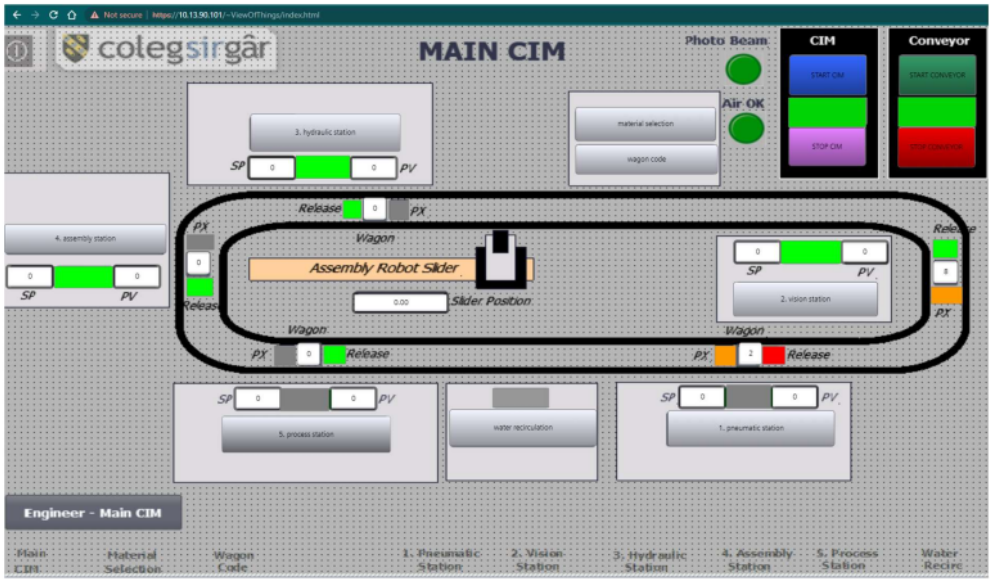



*Figure 5 VOT teamwork*

Wagon numbers change

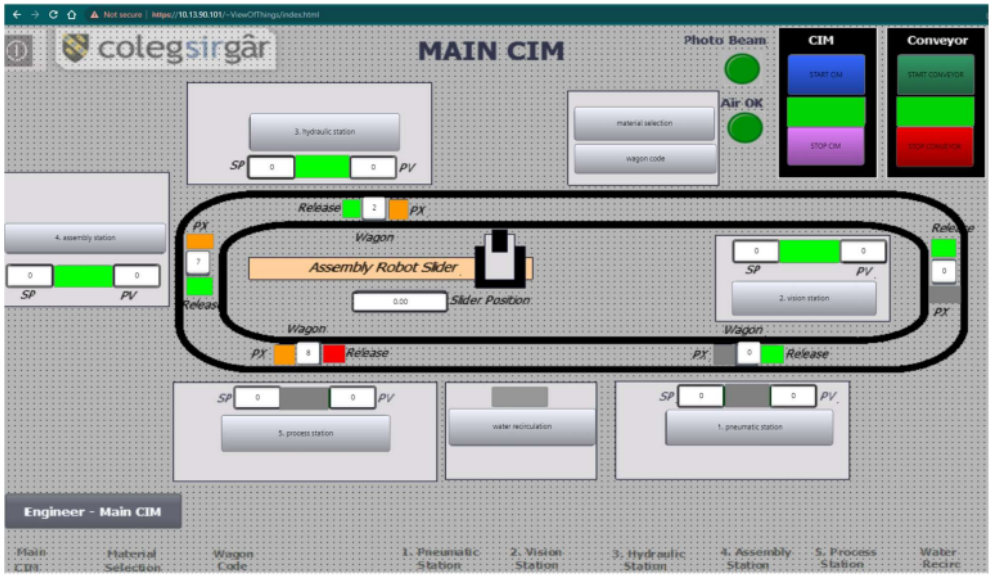



*Figure 6 VOT teamwork*

PX sensors change colour as requested when wagon is at station and released

Release wagon indication appears when the wagon stopper is released from the station

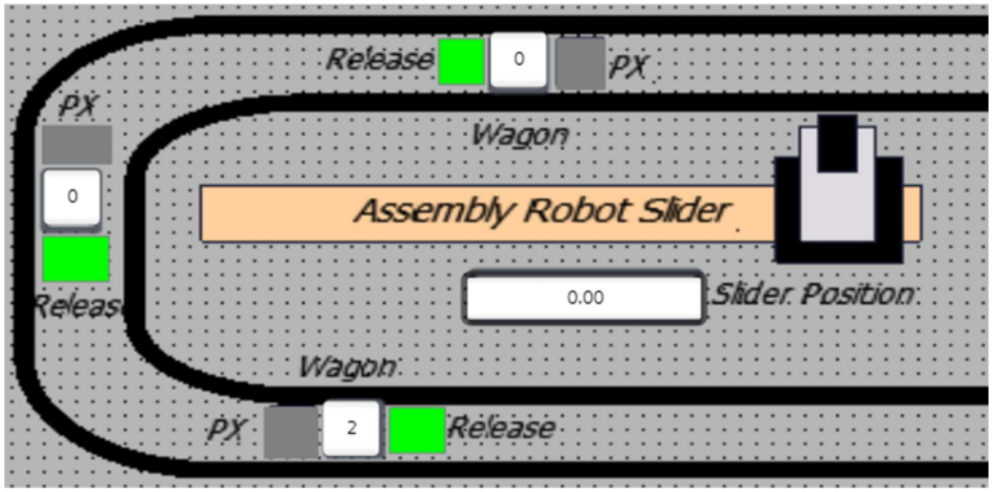



*Figure 7 VOT teamwork*

Slider position zero

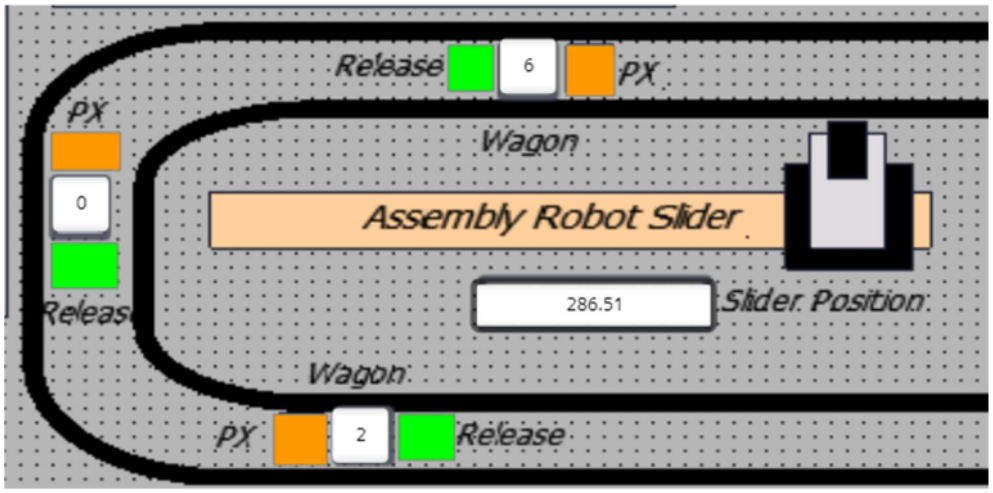



*Figure 8 VOT teamwork*

Slider position matches that of the HMI screens and actual position

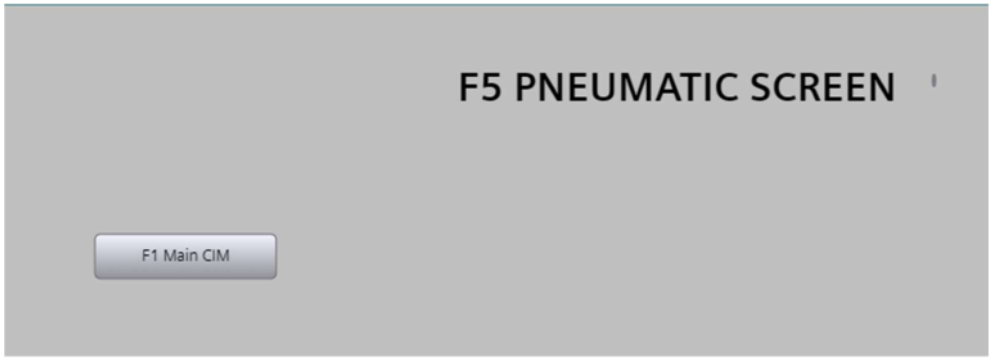



*Figure 9 VOT teamwork*

From pneumatic screen to main CIM




*Figure 10 VOT teamwork*

From vision station to main CIM

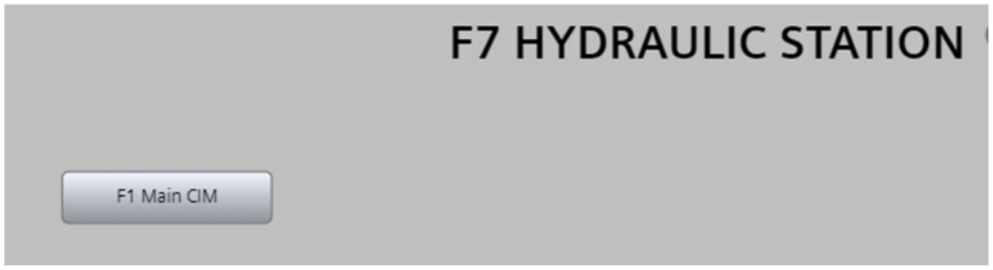



*Figure 11 VOT teamwork*

From hydraulic station to main CIM

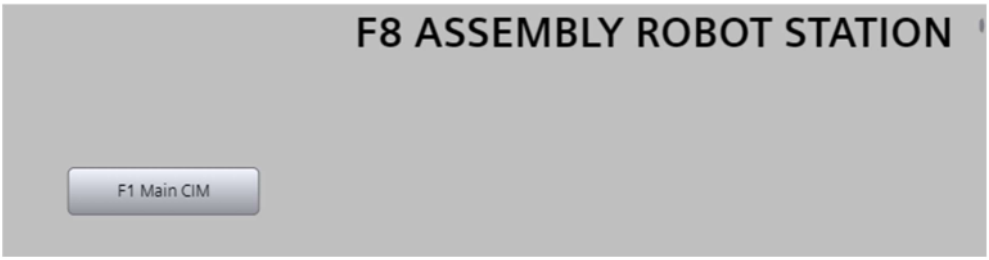



*Figure 12 VOT teamwork*

From assembly station to main CIM




*Figure 13 VOT teamwork*

Process station

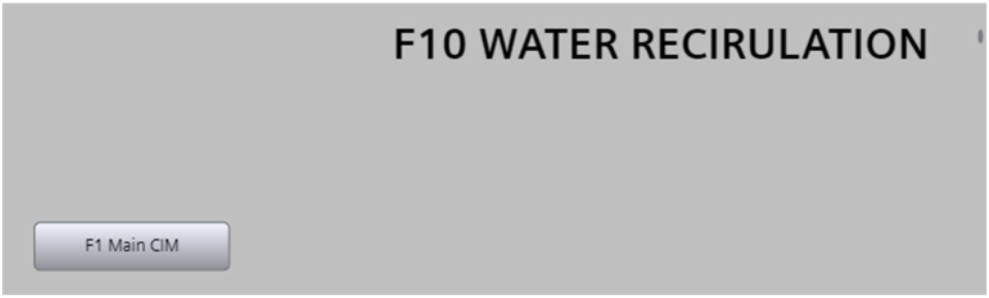



*Figure 14 VOT teamwork*

From water recirculation to main CIM

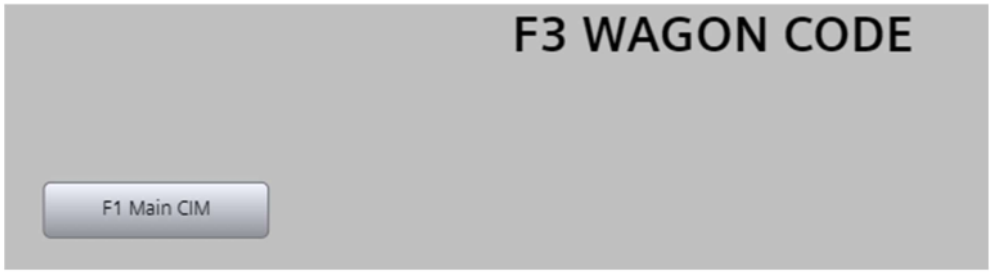



*Figure 15 VOT teamwork*

From wagon code to main CIM

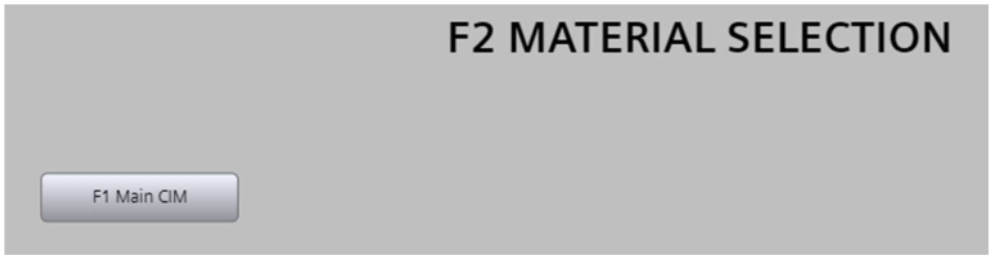



*Figure 16 VOT teamwork*

from Material selection to main CIM

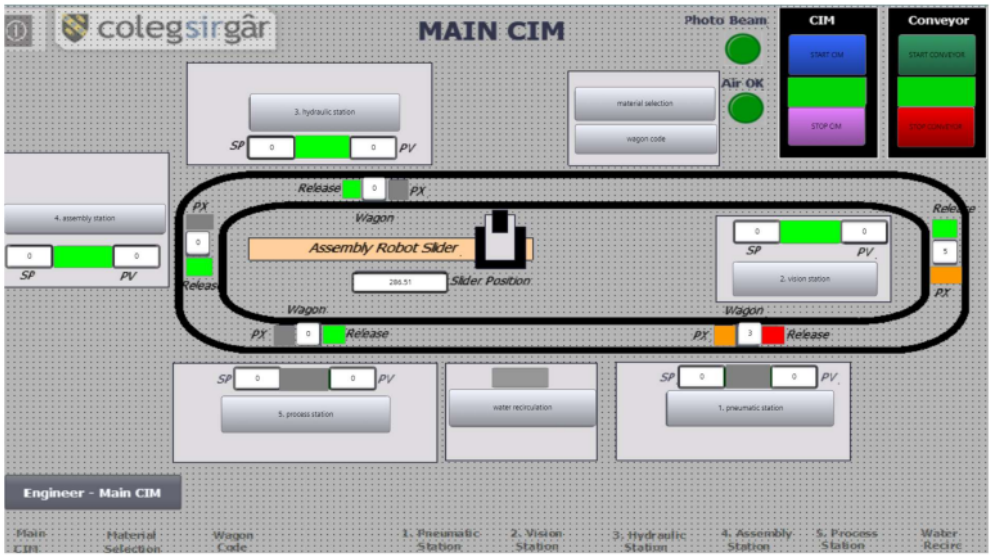



*Figure 17 VOT teamwork*

Stations activated

CIM Complete System_V16 - Student Version 2022_V17 ▸ PLC 101 Master - 0 [CPU 1511F-1 PN] ▸ ViewOfThings [WinCC Unified VoT] ▸ HMI 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.Pnuematic_Station_PV | Web_Data.Pnuematic_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 18 VOT teamwork*

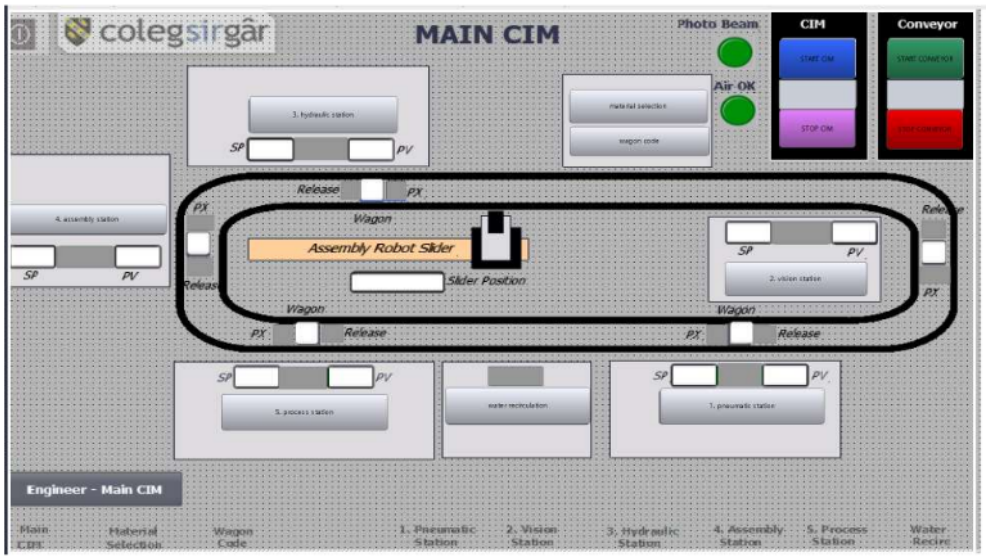



*Figure 19 VOT teamwork*

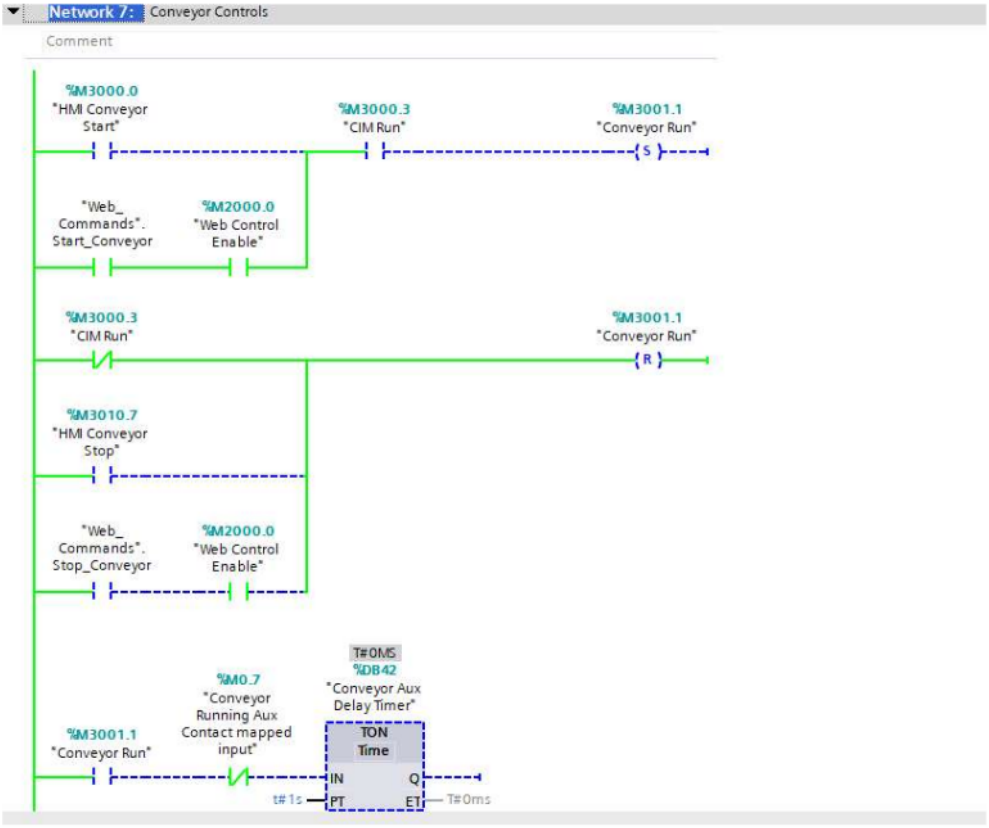



*Figure 20 VOT teamwork*

Start CIM

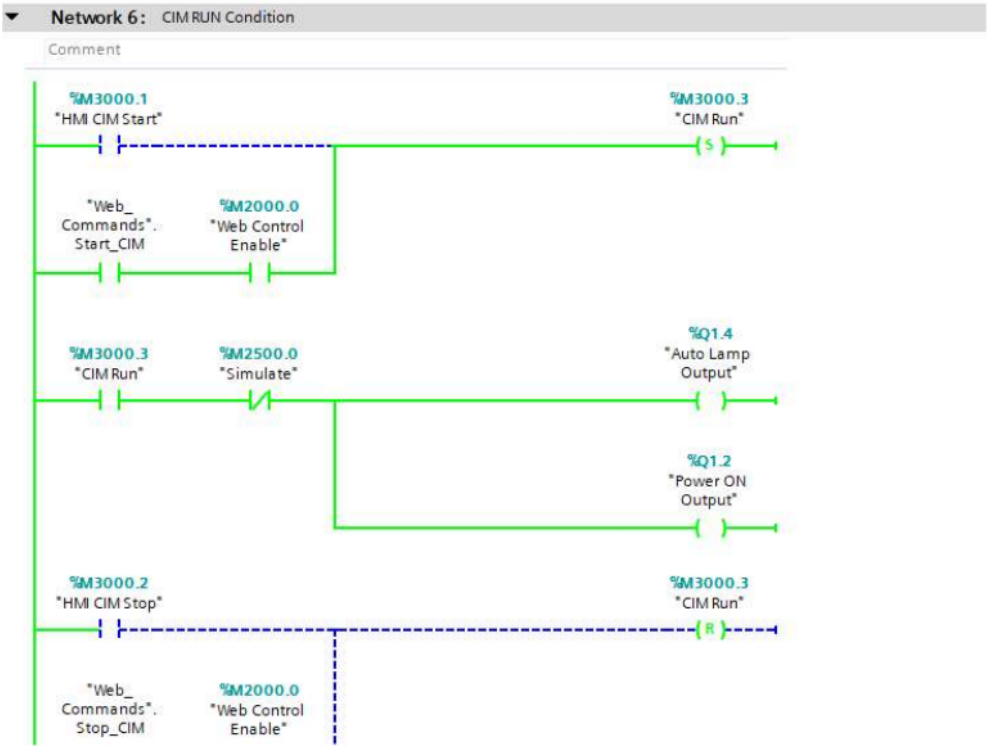



*Figure 21 VOT teamwork*

Stop CIM

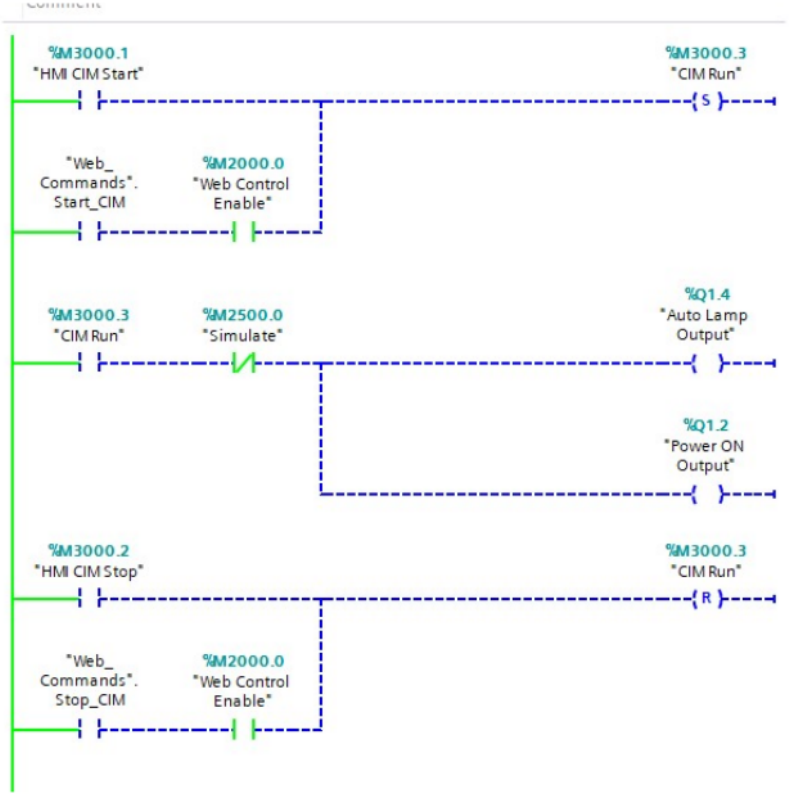



*Figure 22 VOT teamwork*

Start conveyor

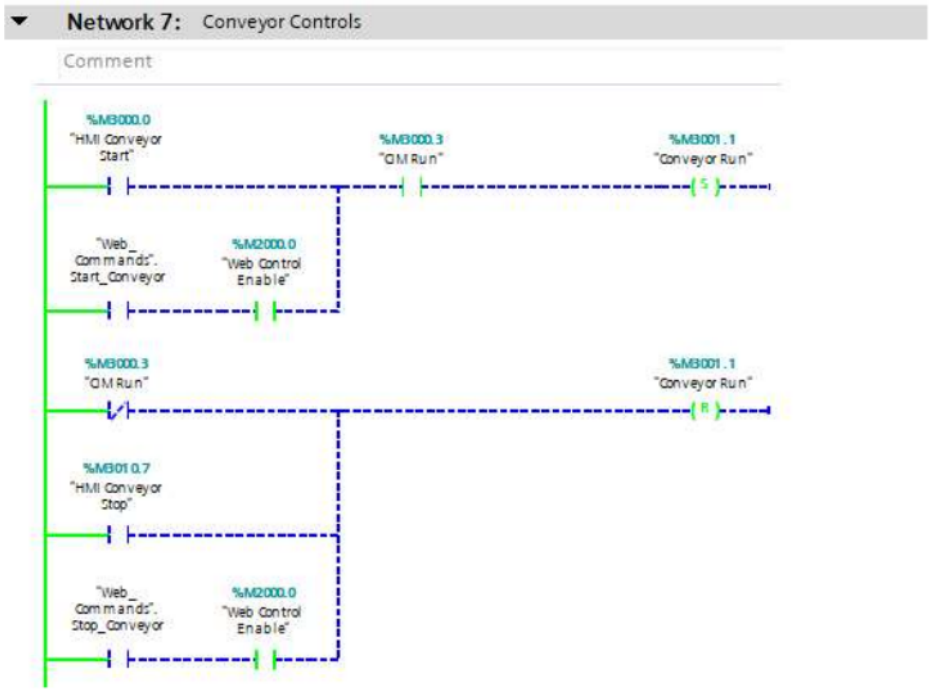



*Figure 23 VOT teamwork*

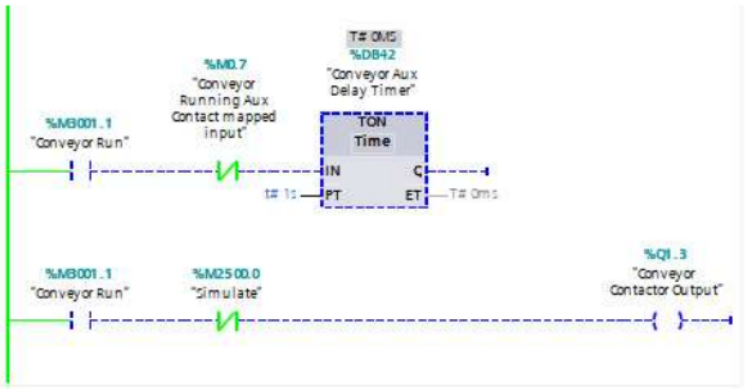



*Figure 24 VOT teamwork*

Stop conveyor

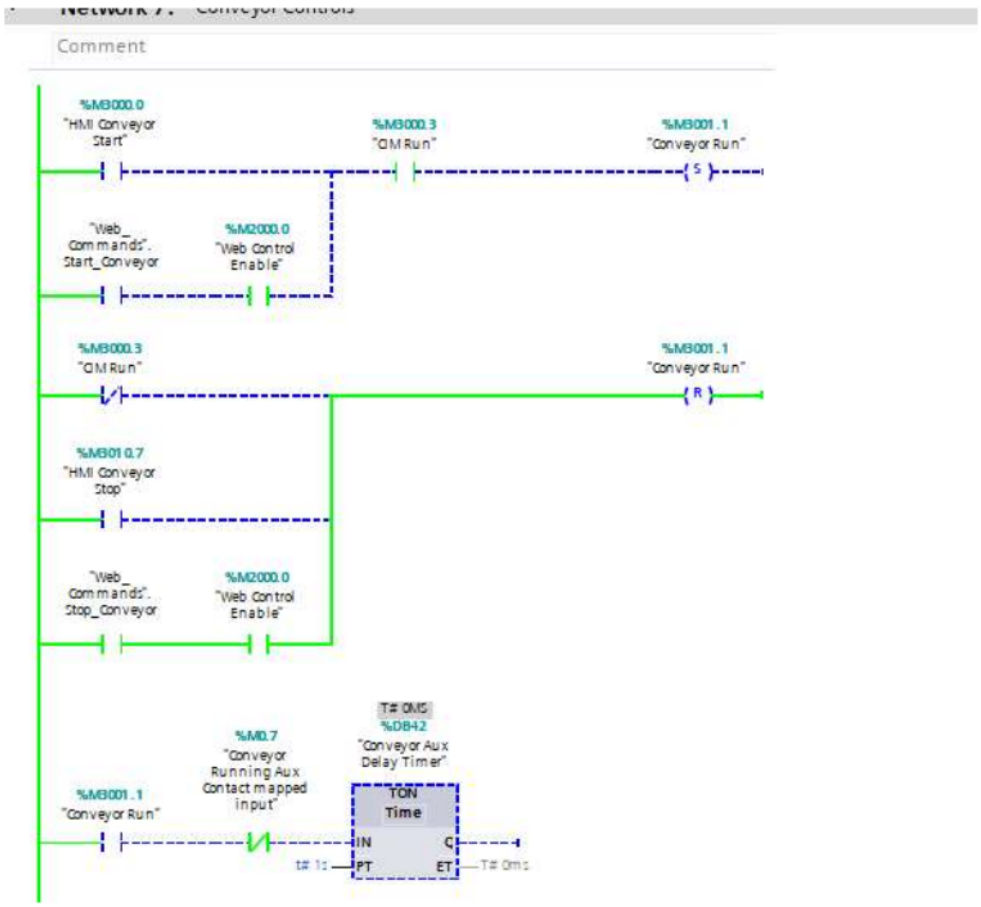



*Figure 25 VOT teamwork*




*Figure 26 VOT teamwork*

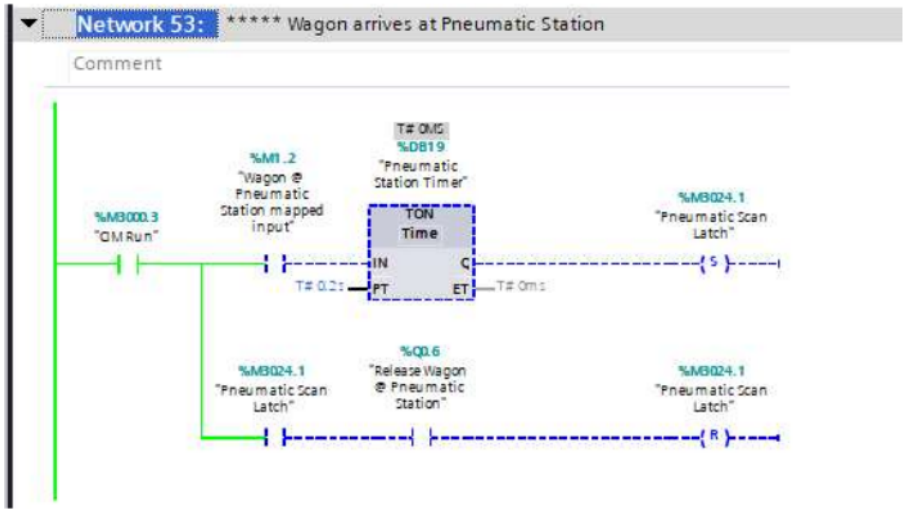



*Figure 27 VOT teamwork*

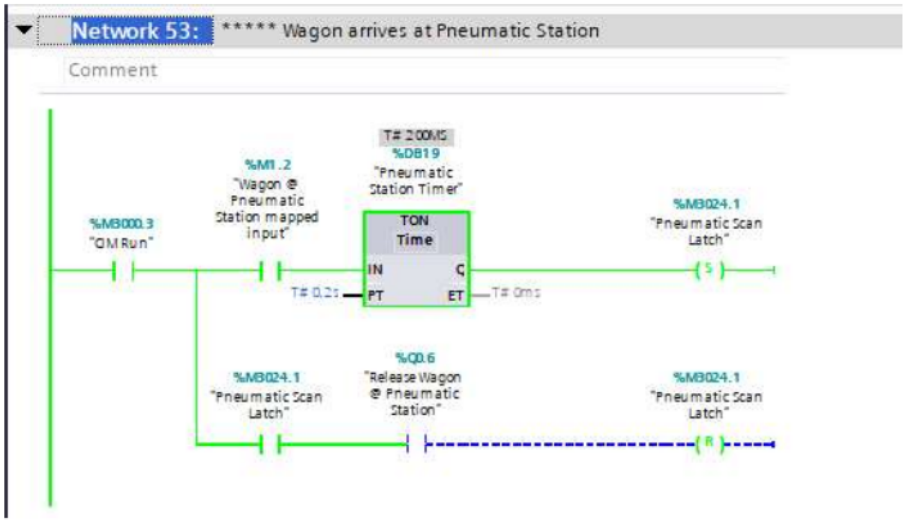



*Figure 28 VOT teamwork*

general

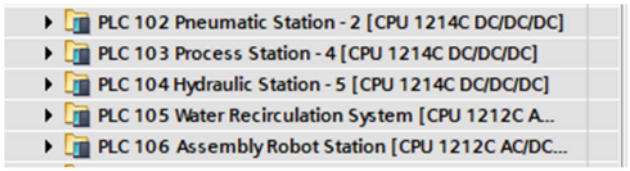



*Figure 29 station PLCs*




*Figure 30 PLCs data blocks*

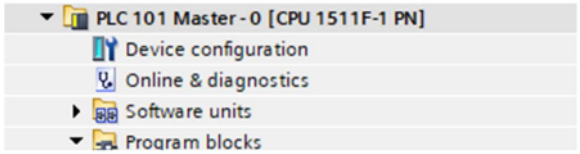



*Figure 31 master PLC*

Plc 106

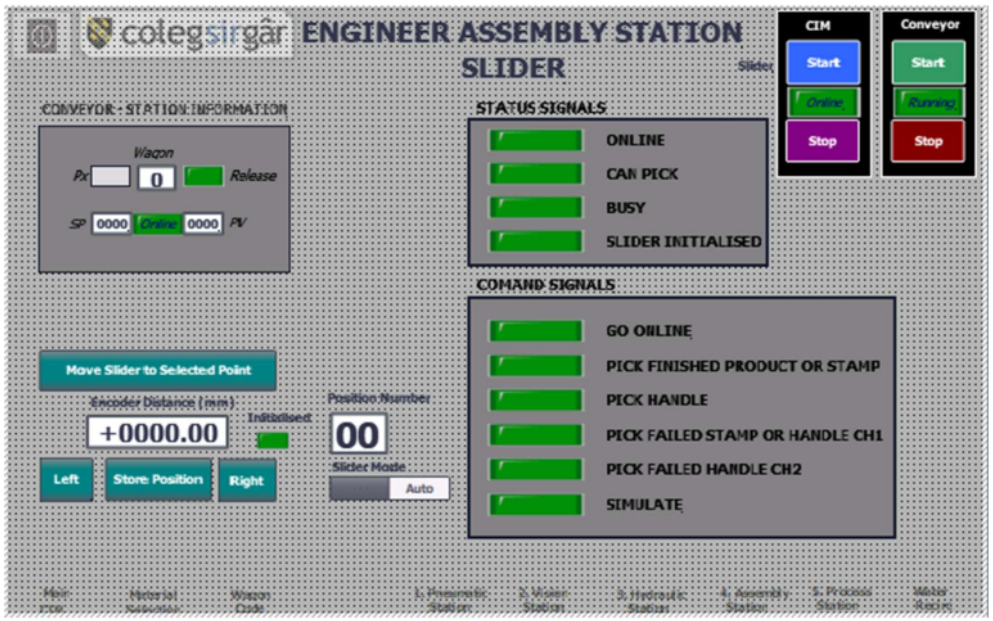



*Figure 32 assembly station adjustments*

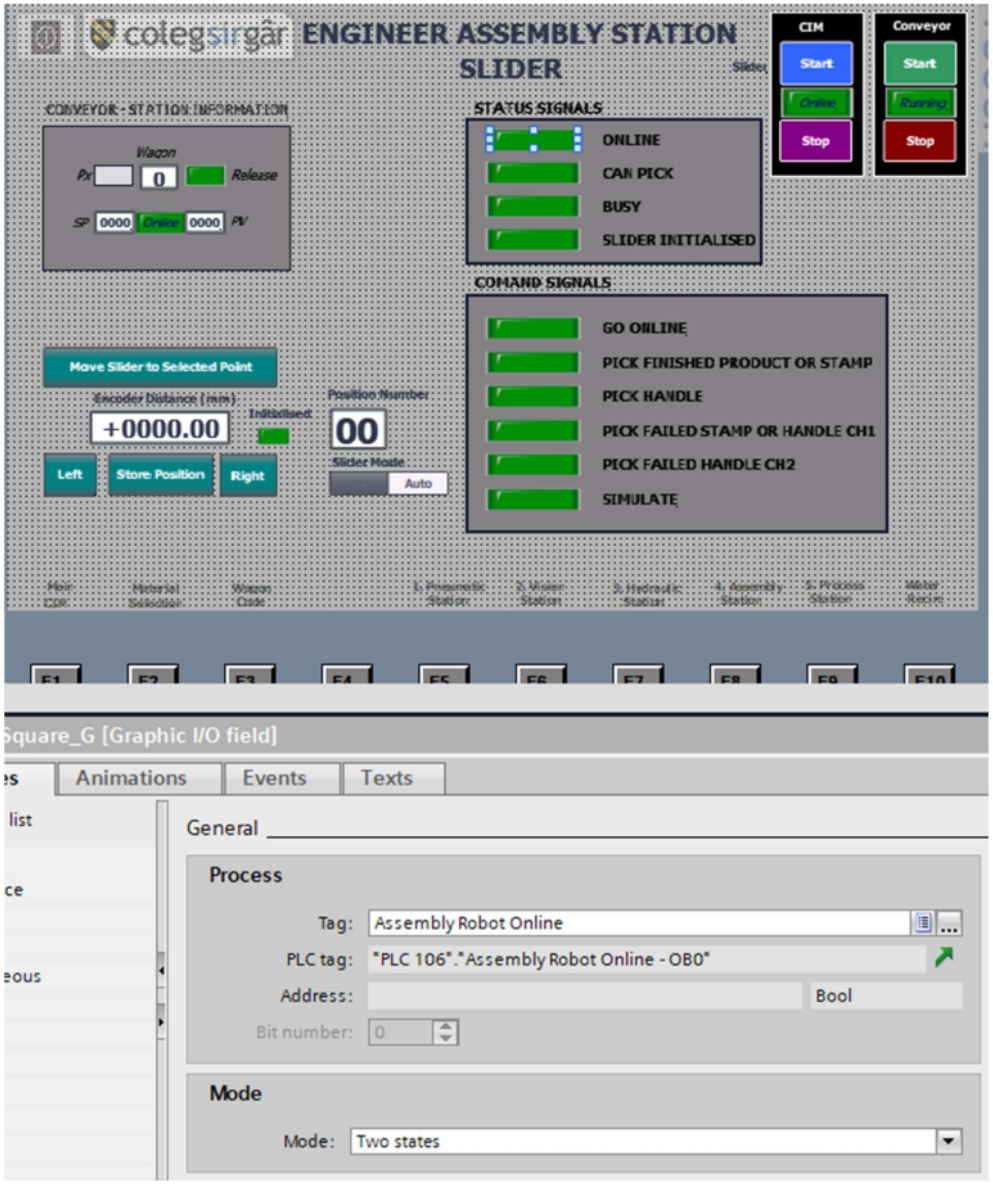



*Figure 33 assembly station adjustments*

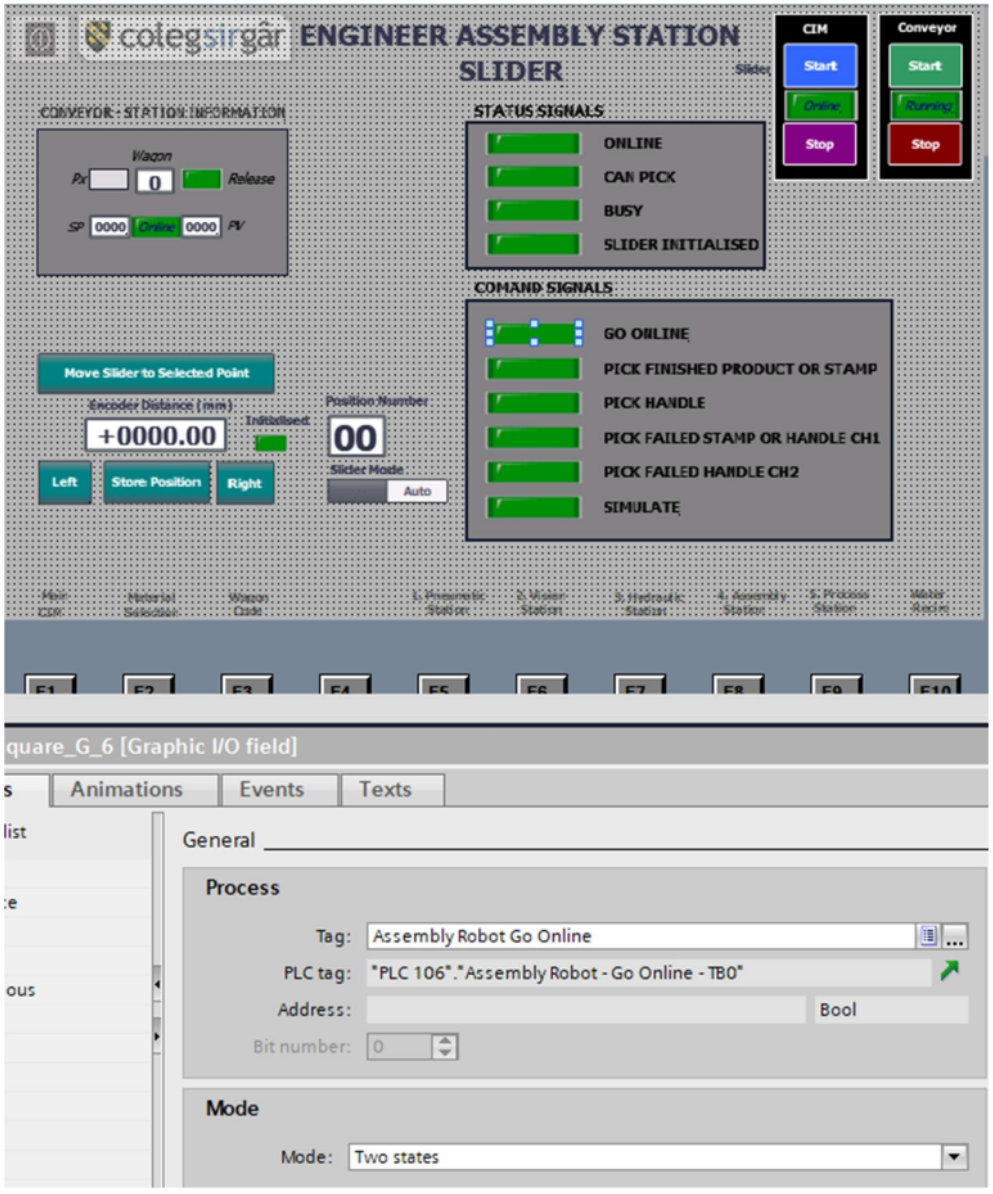



*Figure 34 assembly station adjustments*

| PLC 106 | | |
|---|---|---|
| | | Name |
| 1 | | Static |
| 2 | | Get Bit 0 - clock test bit |
| 3 | | Assembly Robot - Go Online - TB0 |
| 4 | | Assembly Robot - Pick Finished Product or Stamp - TB1 |
| 5 | | Assembly Robot - Pick Handle - TB2 |
| 6 | | Assembly Robot - Pick Fail Stamp or Handle CH1 - TB4 |
| 7 | | Assembly Robot - Pick Fail Handle CH2 - TB6 |
| 8 | | Assembly Robot - Simulate |
| 9 | | Assembly Robot - Teach Box Manual Mode |
| 10 | | Assembly Robot - Teach Box Move to Selected Point |
| 11 | | Assembly Robot - Teach Box Move Left |
| 12 | | Assembly Robot - Teach Box Move Right |
| 13 | | Assembly Robot - Teach Box Store Selected Position |

*Figure 35 assembly station adjustments*

| PLC 106 | | |
|---|---|---|
| | | Name |
| 31 | | Get Word 14 |
| 32 | | Get Word 15 |
| 33 | | Put Bit 0 - clock test bit |
| 34 | | Assembly Robot Online - OB0 |
| 35 | | Assembly Robot Can Pick - OB1 |
| 36 | | Assembly Robot Busy - OB2 |
| 37 | | Assembly Robot Stamp in place - OB4 |
| 38 | | Assembly Robot Handle in place - OB6 |
| 39 | | Assembly Robot Slider Initialised |
| 40 | | Assembly Robot Slider Input 0 - Encoder Signal |
| 41 | | Assembly Robot Slider Input 1 - RES Signal |
| 42 | | Assembly Robot Slider Input 2 - Left Limit Signal |
| 43 | | Assembly Robot Slider Input 3 - Right Limit Signal |
| 44 | | Assembly Robot Slider Input 4 - Slider Command LSB |
| 45 | | Assembly Robot Slider Input 5 - Slider Command ISB |
| 46 | | Assembly Robot Slider Input 6 - Slider Command MSB |
| 47 | | Assembly Robot Slider Input 7 - Slider Move to Position |
| 48 | | Assembly Robot Slider Output 0 - Move Right RSR relay |
| 49 | | Assembly Robot Slider Output 1 - Move Left RSL relay |
| 50 | | Assembly Robot Slider Output 2 - Speed RSN Relay |
| 51 | | Assembly Robot Slider Output 3 |
| 52 | | Assembly Robot Slider Output 4 - In Position |
| 53 | | Put Bit 20 |

*Figure 36 assembly station adjustments*

Plc 104

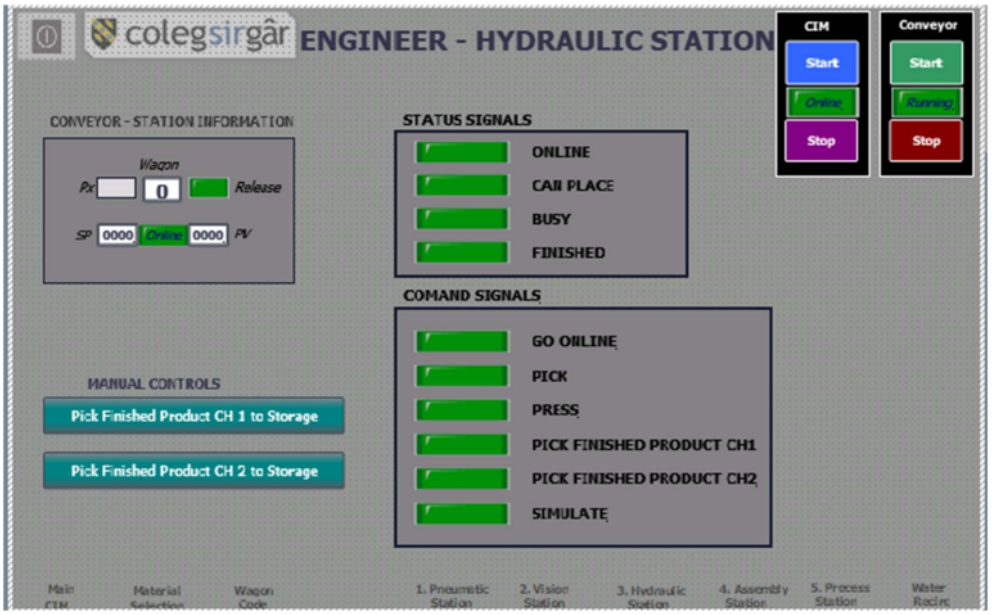



*Figure 37 hydraulic station adjustments*

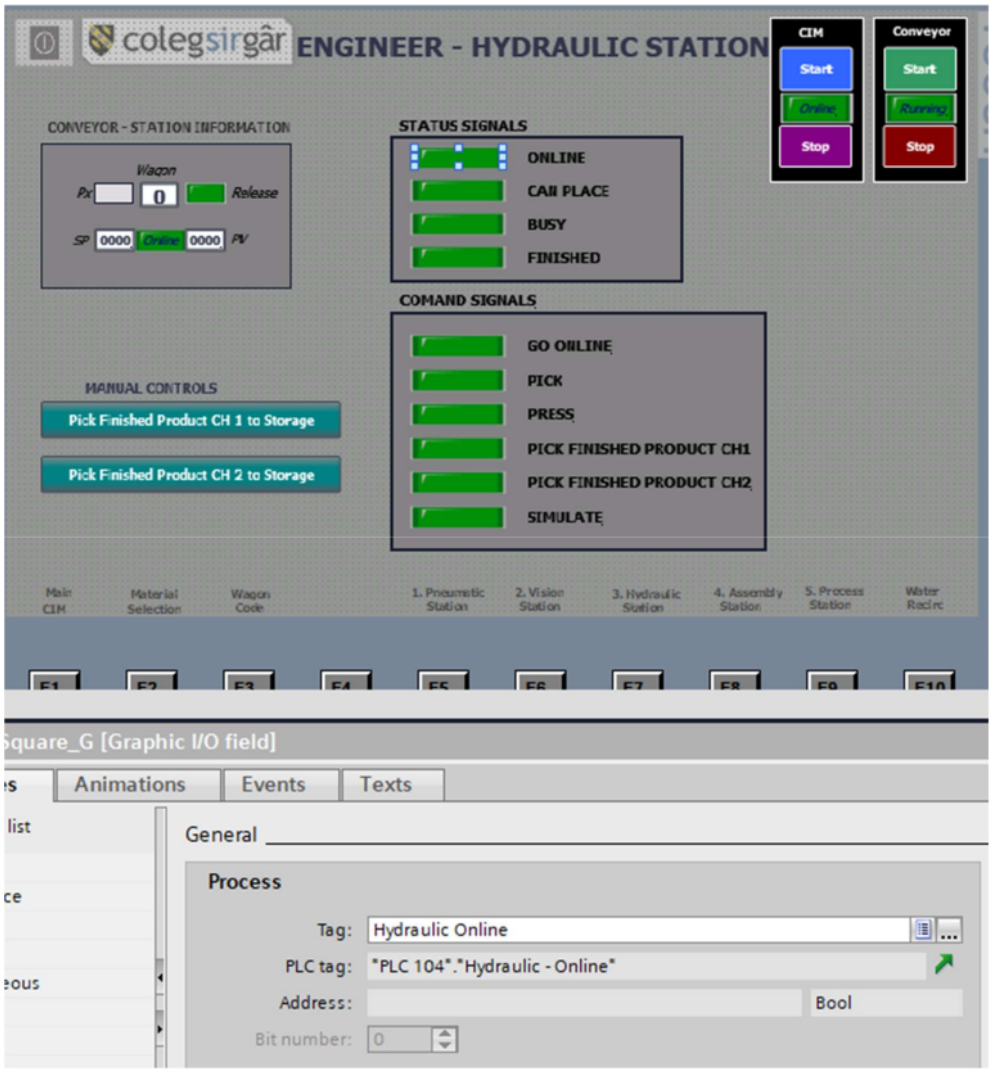



*Figure 38 hydraulic station adjustments*

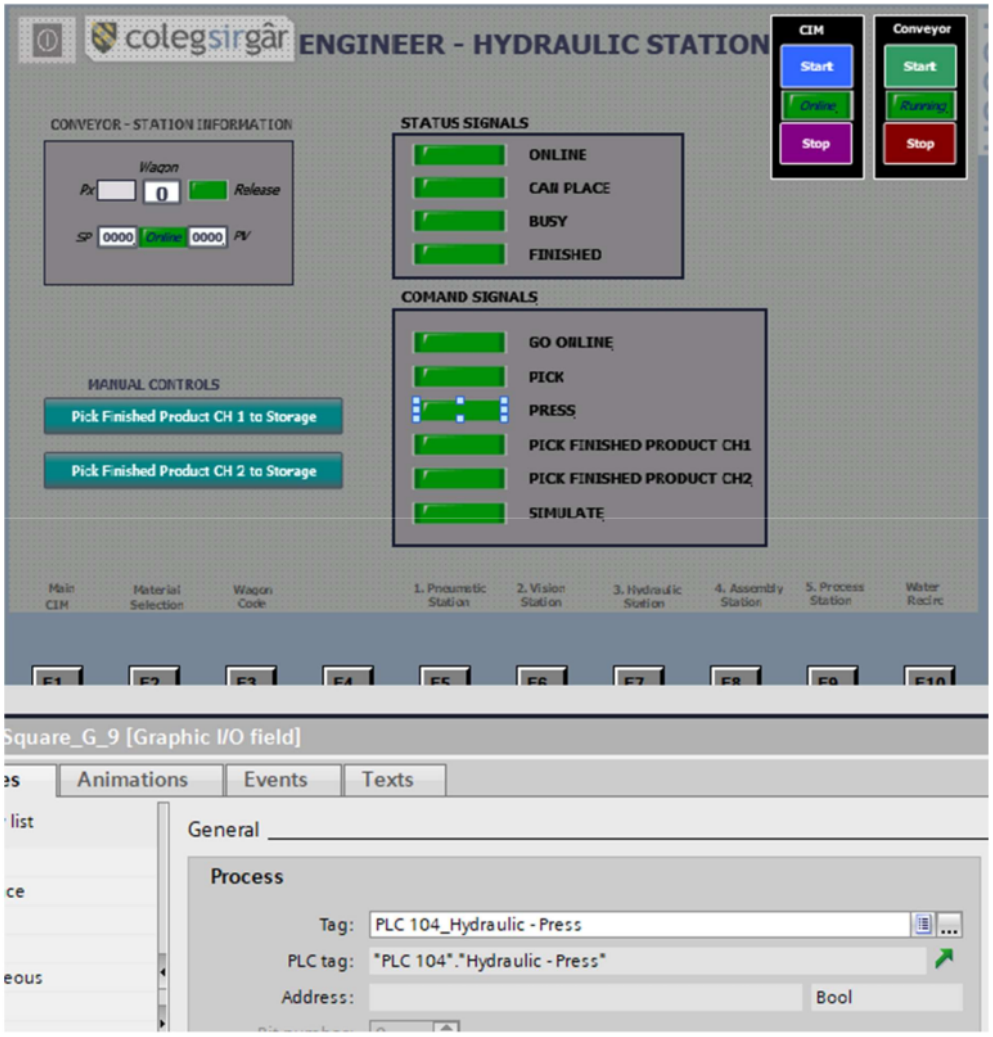



*Figure 39 hydraulic station adjustments*

PLC 104

| | | Name | Data type | Offset |
|---|---|---|---|---|
| 1 | | Static | | |
| 2 | | Get Bit 0 - clock test bit | Bool | 0.0 |
| 3 | | Hydraulic - Go Online | Bool | 0.1 |
| 4 | | Hydraulic - Pick | Bool | 0.2 |
| 5 | | Hydraulic - Press | Bool | 0.3 |
| 6 | | Hydraulic - Pick Finished Product from CH1 | Bool | 0.4 |
| 7 | | Hydraulic - Pick Finished Product from CH2 | Bool | 0.5 |
| 8 | | Hydraulic - Simulate | Bool | 0.6 |
| 9 | | Get Bit 7 | Bool | 0.7 |
| 10 | | Get Bit 8 | Bool | 1.0 |

*Figure 40 hydraulic station adjustments*

PLC 104

| | | Name | Data type | Offset |
|---|---|---|---|---|
| 25 | | Get Word 8 | Word | 16.0 |
| 26 | | Get Word 9 | Word | 18.0 |
| 27 | | Get Word 10 | Word | 20.0 |
| 28 | | Get Word 11 | Word | 22.0 |
| 29 | | Get Word 12 | Word | 24.0 |
| 30 | | Get Word 13 | Word | 26.0 |
| 31 | | Get Word 14 | Word | 28.0 |
| 32 | | Get Word 15 | Word | 30.0 |
| 33 | | Put Bit 0 - clock test bit | Bool | 32.0 |
| 34 | | Hydraulic - Can Pick | Bool | 32.1 |
| 35 | | Hydraulic - Online | Bool | 32.2 |
| 36 | | Hydraulic - Busy | Bool | 32.3 |
| 37 | | Hydraulic - Finished | Bool | 32.4 |

*Figure 41 hydraulic station adjustments*

Plc 102

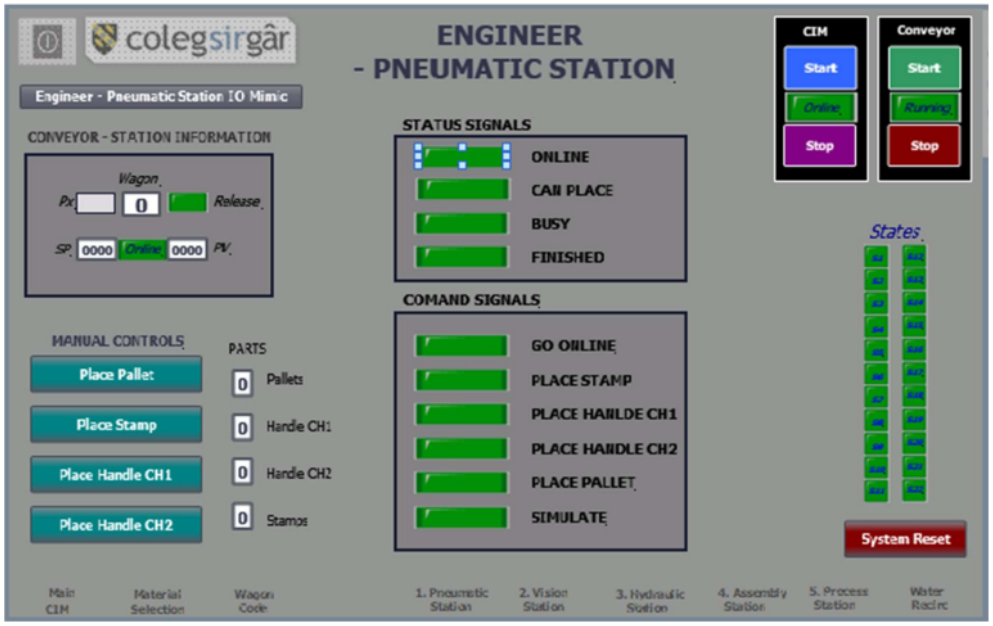



*Figure 42 pneumatic station adjustments*

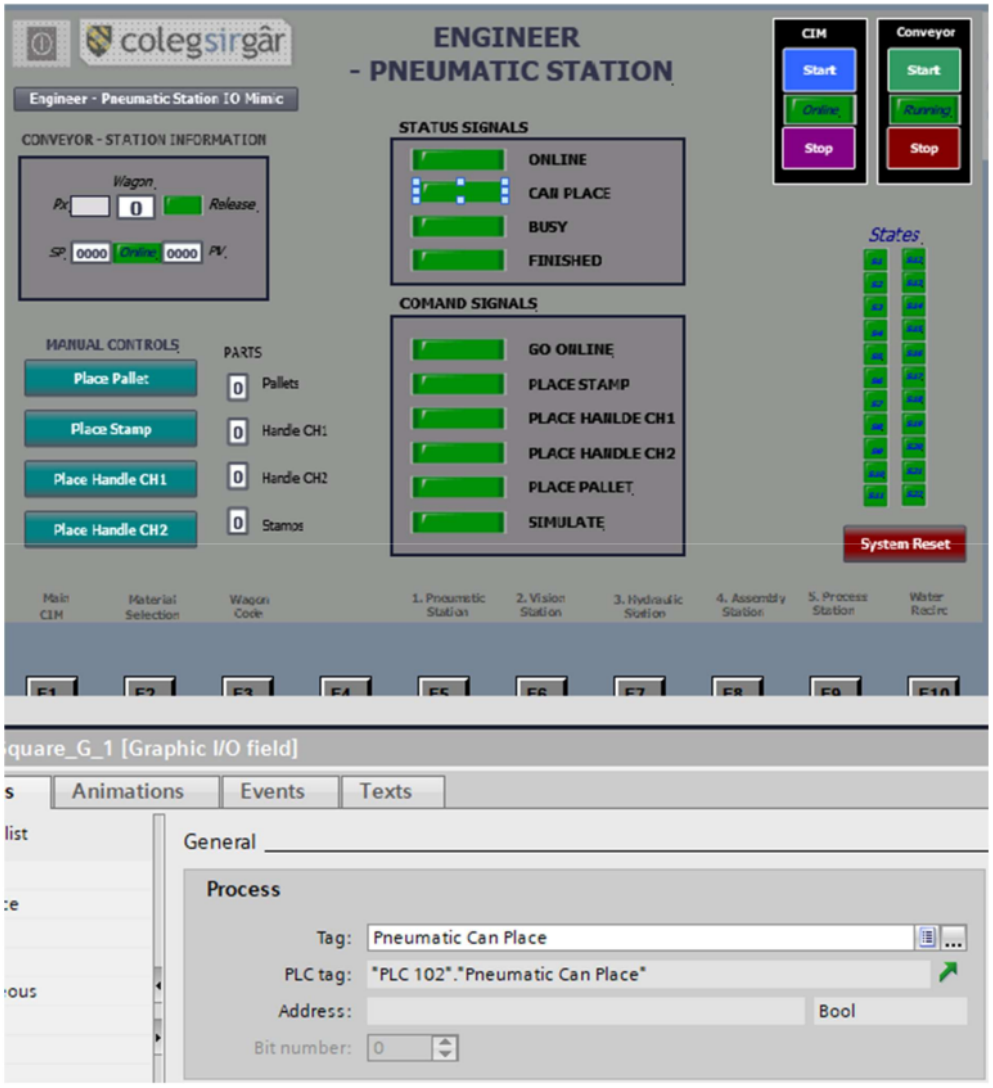



*Figure 43 pneumatic station adjustments*

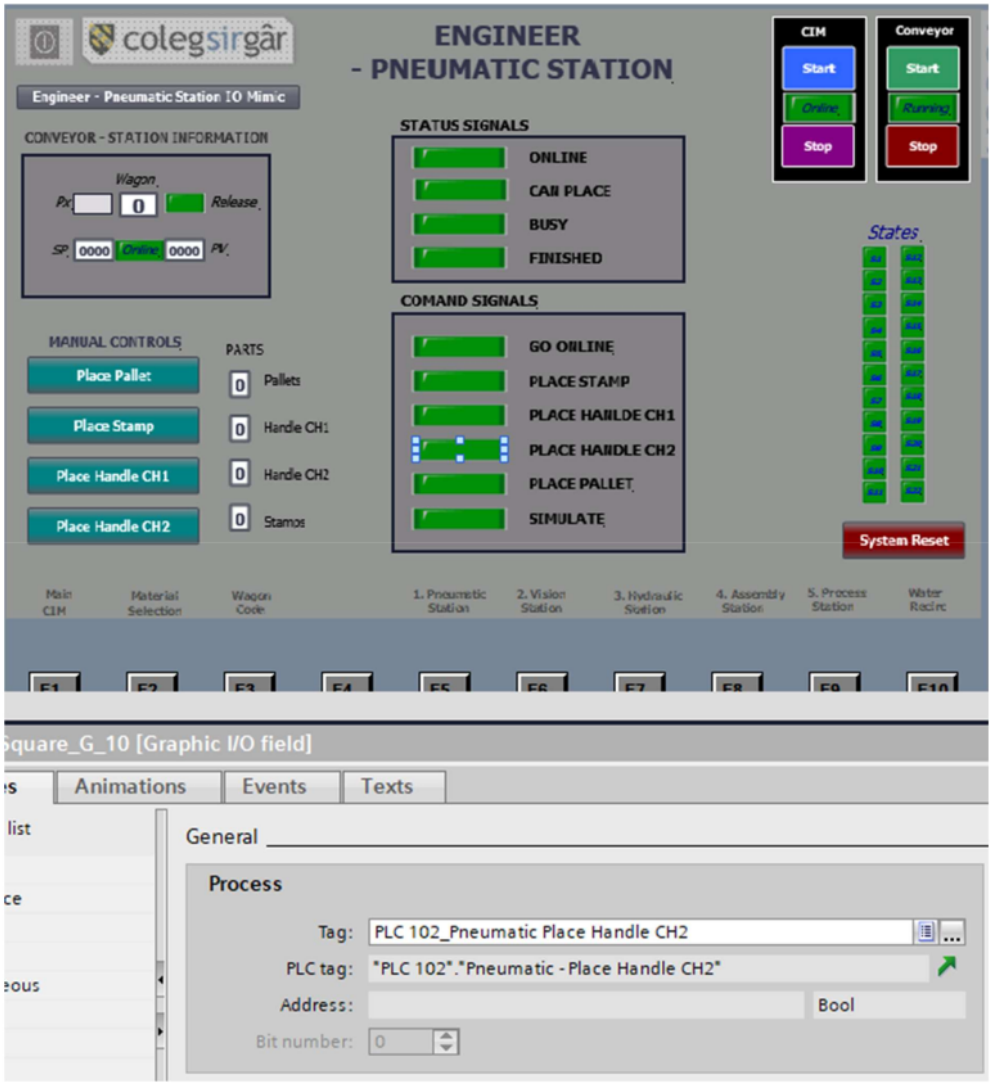



*Figure 44 pneumatic station adjustments*

| PLC 102 | | | |
|---|---|---|---|
| | Name | Data type | Offset |
| 1 | Static | | |
| 2 | Get Bit 0 - Clock test bit | Bool | 0.0 |
| 3 | Pneumatic - Go Online | Bool | 0.1 |
| 4 | Pneumatic - Place Stamp | Bool | 0.2 |
| 5 | Pneumatic - Place Handle CH1 | Bool | 0.3 |
| 6 | Pneumatic - Place Handle CH2 | Bool | 0.4 |
| 7 | Pneumatic - Place Pallet | Bool | 0.5 |
| 8 | Pneumatic - HMI Place Stamp | Bool | 0.6 |
| 9 | Pneumatic - HMI Place Handle CH1 | Bool | 0.7 |
| 10 | Pneumatic - HMI Place Handle CH2 | Bool | 1.0 |
| 11 | Pneumatic - HMI Place Pallet | Bool | 1.1 |
| 12 | Pneumatic - HMI Reset | Bool | 1.2 |
| 13 | Pneumatic - Simulate | Bool | 1.3 |
| 14 | Get Bit 12 | Bool | 1.4 |

*Figure 45 pneumatic station adjustments*

| PLC 102 | | | |
|---|---|---|---|
| | Name | Data type | Offset |
| 31 | Get Word 14 | Word | 28.0 |
| 32 | Get Word 15 | Word | 30.0 |
| 33 | Put Bit 0 - Clock test bit | Bool | 32.0 |
| 34 | Pneumatic Online | Bool | 32.1 |
| 35 | Pneumatic Can Place | Bool | 32.2 |
| 36 | Pneumatic Busy | Bool | 32.3 |
| 37 | Pneumatic Finished | Bool | 32.4 |
| 38 | Pneumatic - Air OK | Bool | 32.5 |
| 39 | Pneumatic - System Healthy | Bool | 32.6 |
| 40 | Pneumatic - Other Healthy | Bool | 32.7 |
| 41 | Pneumatic - Pallet Manipulator Heal.. | Bool | 33.0 |
| 42 | Pneumatic - Round Manipulator He... | Bool | 33.1 |
| 43 | Put Bit 10 | Bool | 33.2 |
| 44 | Put Bit 11 | Bool | 33.3 |
| 45 | Put Bit 12 | Bool | 33.4 |
| 46 | Put Bit 13 | Bool | 33.5 |
| 47 | Put Bit 14 | Bool | 33.6 |
| 48 | Put Bit 15 | Bool | 33.7 |
| 49 | Pneumatic States Word - bits 0 to 15 | Word | 34.0 |
| 50 | Pneumatic States Word - bits 16 to ... | Word | 36.0 |
| 51 | Pneumatic Solenoid Outputs Word ... | Word | 38.0 |
| 52 | Pneumatic Inputs Word 1 | Word | 40.0 |
| 53 | Pneumatic Inputs Word 2 | Word | 42.0 |
| 54 | Put Word 6 | Word | 44.0 |

*Figure 46 pneumatic station adjustments*

Plc 103

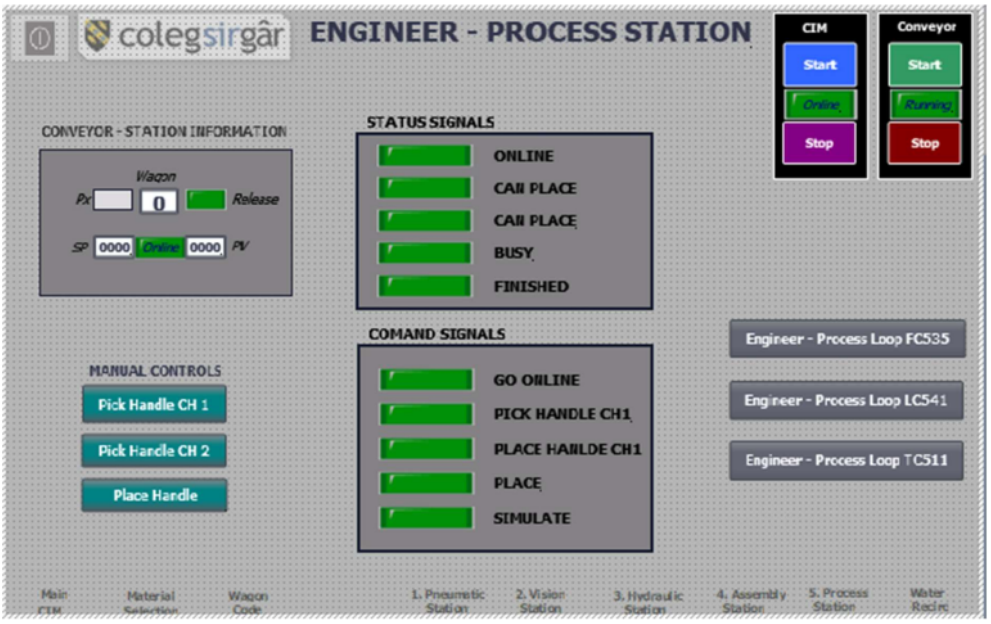



*Figure 47 process station adjustments*

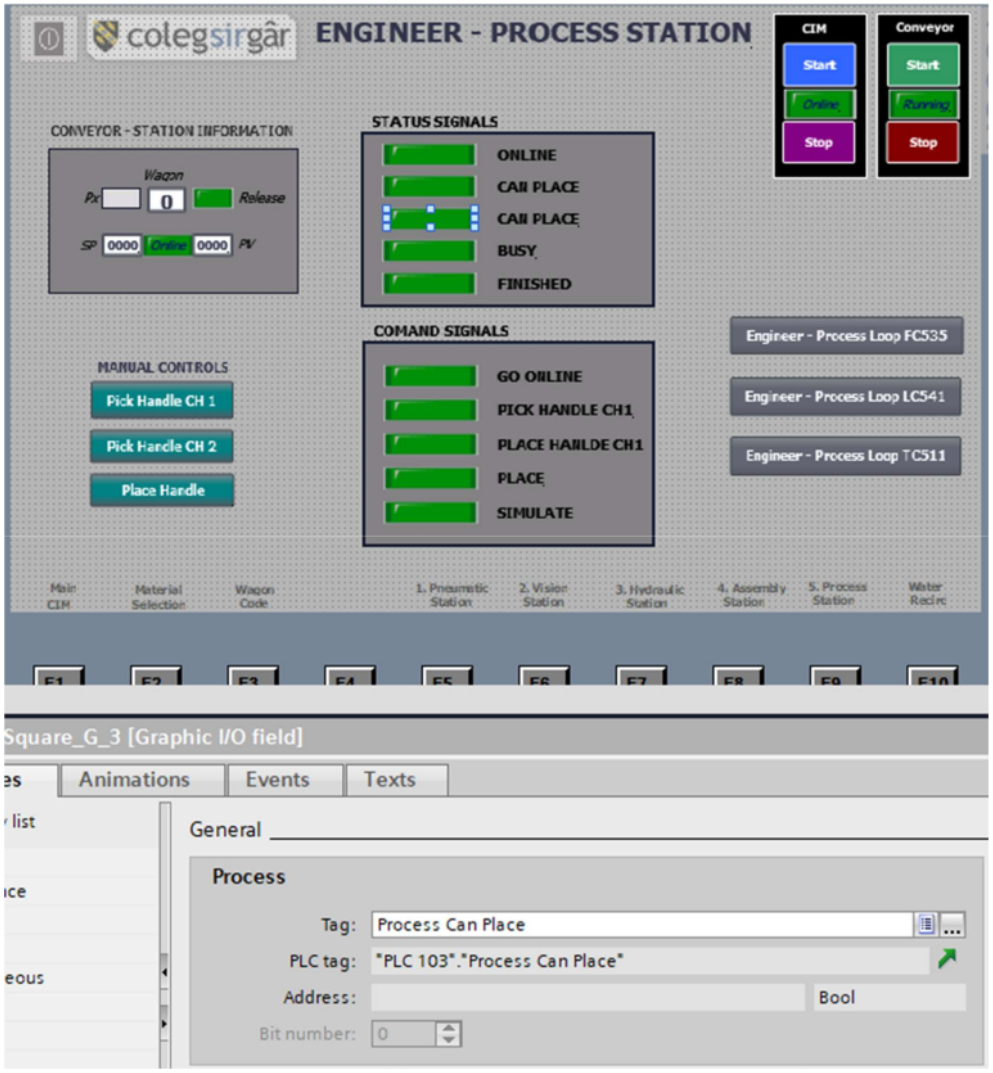



*Figure 48 process station adjustments*

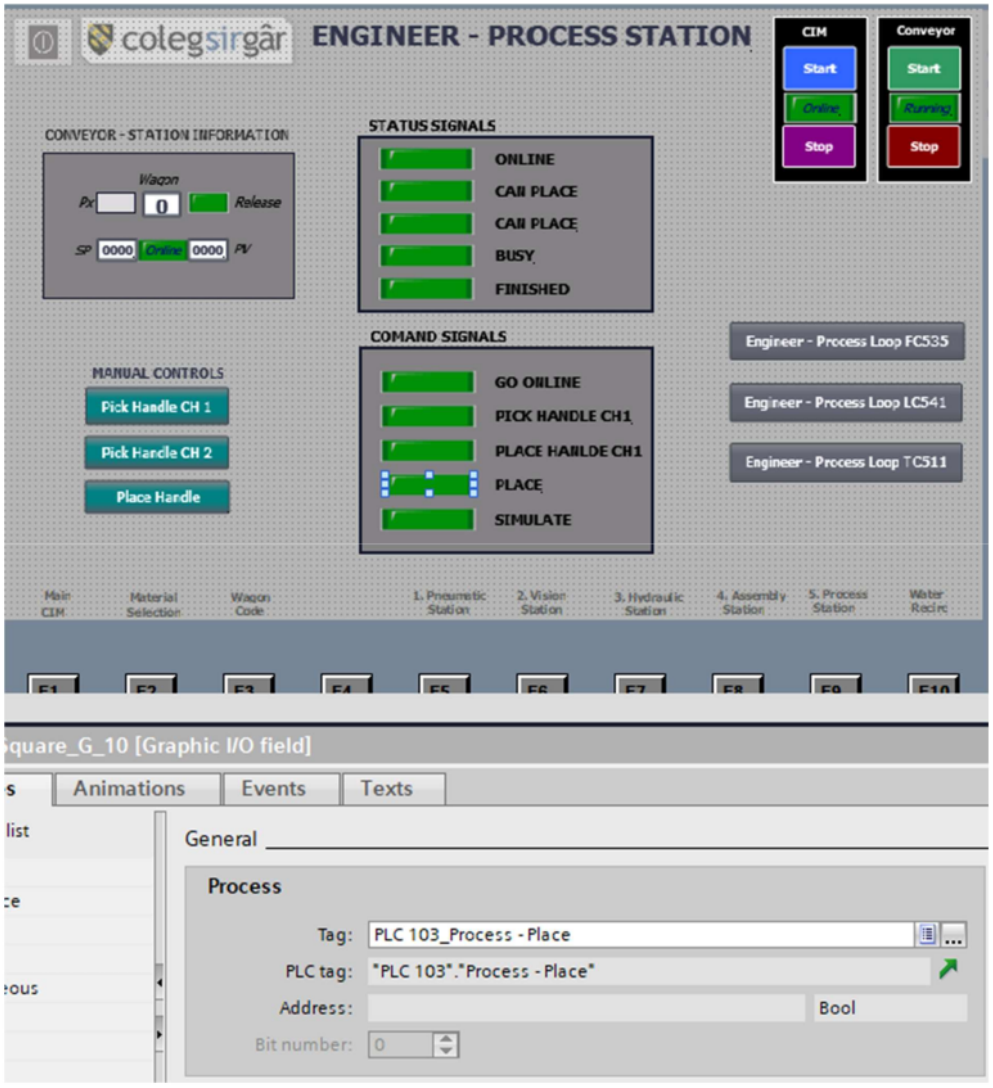



*Figure 49 process station adjustments*

| PLC 103 | | |
|---|---|---|
| | | Name |
| 1 | | Static |
| 2 | | Get Bit 0 - clock test bit |
| 3 | | Process - Go Online |
| 4 | | Process - Pick Handle CH1 |
| 5 | | Process - Pick Handle CH2 |
| 6 | | Process - Place |
| 7 | | Process - Simulate |
| 8 | | Get Bit 6 |
| 9 | | Get Bit 7 |

*Figure 50 process station adjustments*

| PLC 103 | | | |
|---|---|---|---|
| | | Name | Data typ |
| 25 | | Get Word 8 | Word |
| 26 | | Get Word 9 | Word |
| 27 | | Get Word 10 | Word |
| 28 | | Get Word 11 | Word |
| 29 | | Get Word 12 | Word |
| 30 | | Get Word 13 | Word |
| 31 | | Get Word 14 | Word |
| 32 | | Get Word 15 | Word |
| 33 | | Put Bit 0 - clock test bit | Bool |
| 34 | | Process Online | Bool |
| 35 | | Process Can Pick | Bool |
| 36 | | Process Can Place | Bool |
| 37 | | Process Busy | Bool |
| 38 | | Process Finished | Bool |
| 39 | | Put Bit 6 | Bool |

*Figure 51 process station adjustments*

Plc 105

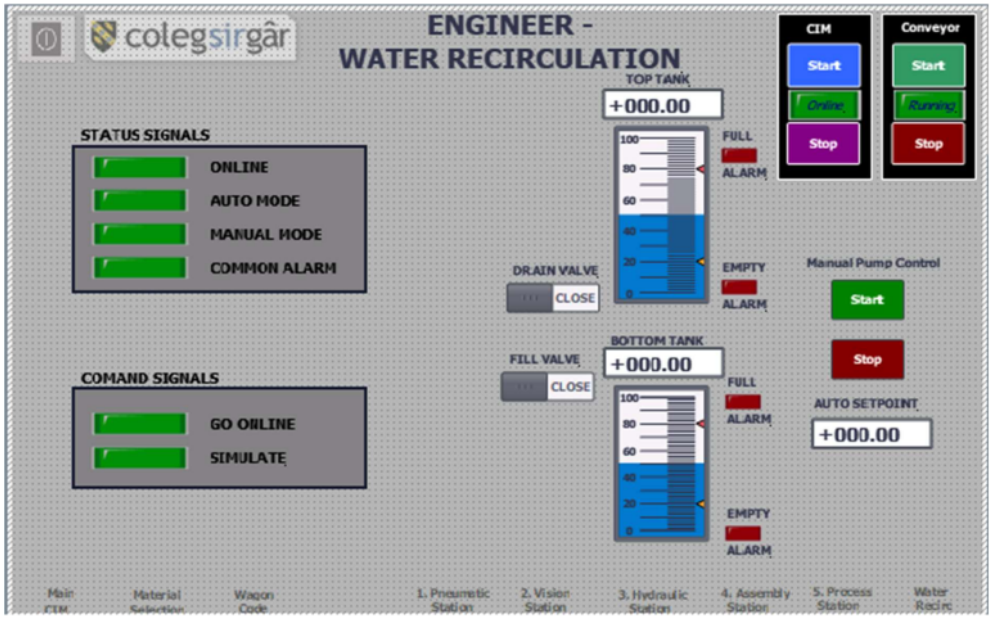



*Figure 52 water recirculation adjustments*

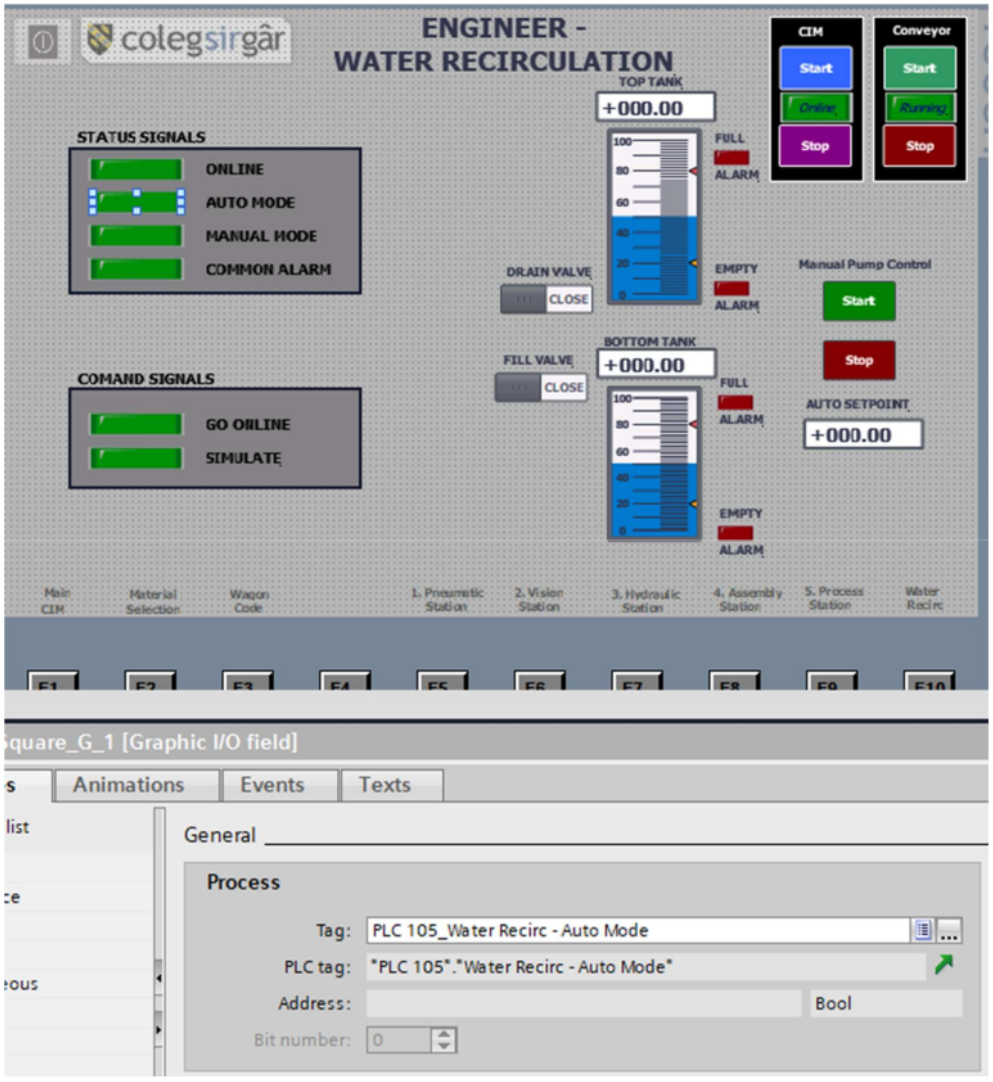



*Figure 53 water recirculation adjustments*

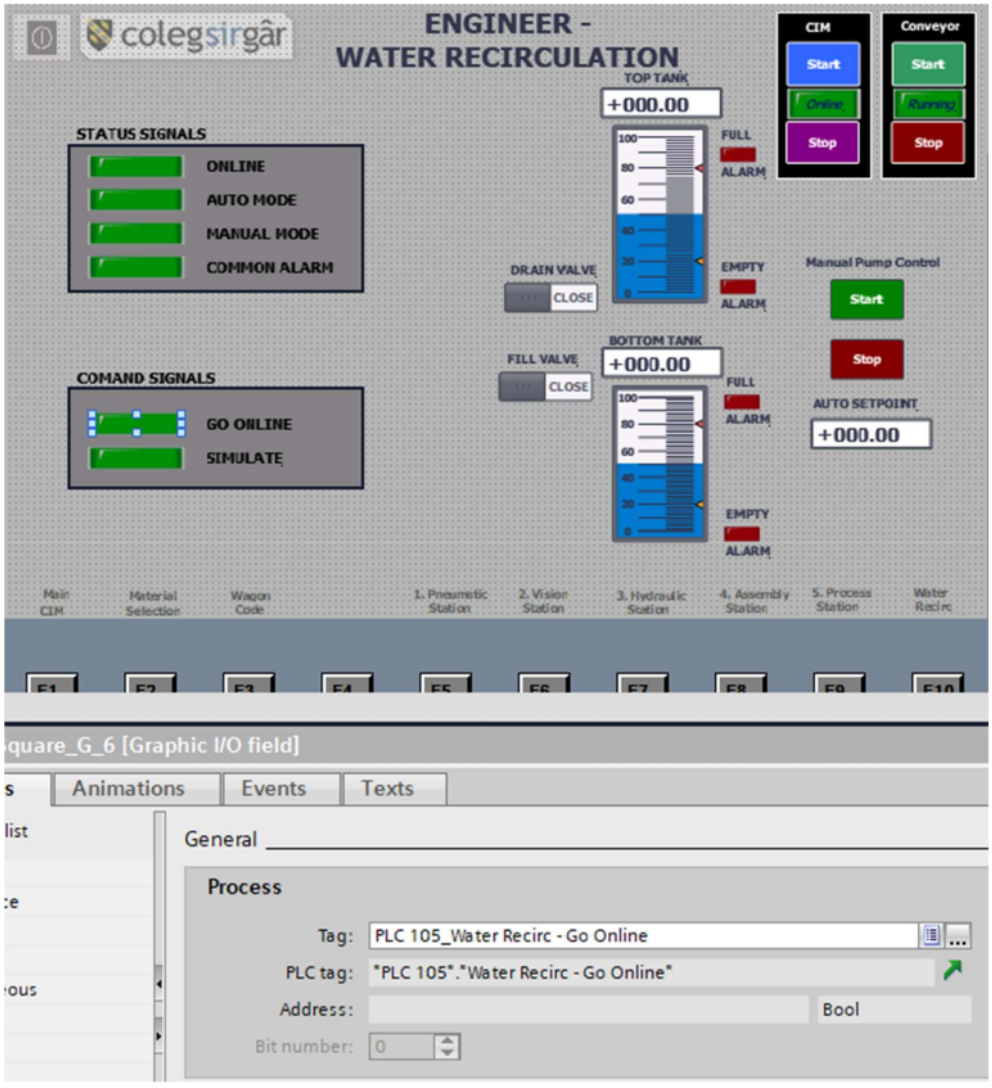



*Figure 54 water recirculation adjustments*

PLC 105

| | Name | Data typ |
|---|---|---|
| 1 | Static | |
| 2 | Get Bit 0 - clock test bit | Bool |
| 3 | Water Recirc - Go Online | Bool |
| 4 | Water Recirc - Simulate | Bool |
| 5 | Get Bit 3 | Bool |
| 6 | Get Bit 4 | Bool |

*Figure 55 water recirculation adjustments*

PLC 105

| | Name | Data typ |
|---|---|---|
| 25 | Get Word 8 | Word |
| 26 | Get Word 9 | Word |
| 27 | Get Word 10 | Word |
| 28 | Get Word 11 | Word |
| 29 | Get Word 12 | Word |
| 30 | Get Word 13 | Word |
| 31 | Get Word 14 | Word |
| 32 | Get Word 15 | Word |
| 33 | Put Bit 0 - clock test bit | Bool |
| 34 | Water Recirc - Online | Bool |
| 35 | Water Recirc - Auto Mode | Bool |
| 36 | Water Recirc - Manual Mode | Bool |
| 37 | Water Recirc - Common Alarm | Bool |
| 38 | Water Recirc - Top Tank Full Alarm | Bool |
| 39 | Water Recirc - Top Tank Empty Alarm | Bool |
| 40 | Water Recirc - Bottom Tank Full Alarm | Bool |
| 41 | Water Recirc - Bottom Tank Empty Alarm | Bool |
| 42 | Put Bit 9 | Bool |

*Figure 56 water recirculation adjustments*

Move from analogue to plc 101

PLC 103

| | Name | Data ty |
|---|---|---|
| 56 | LC541 setpoint level | Real |
| 57 | LC541 process value | Real |
| 58 | LC541 error | Real |
| 59 | LC541 Ki | Real |
| 60 | LC541 Kp | Real |
| 61 | LC541 Kd | Real |
| 62 | LC541 CV | Real |
| 63 | LC541 percentage output | Real |
| 64 | LC541 net flowrate | Real |
| 65 | LC541 Tank B1 average volume | Real |
| 66 | TC541 Scaled Temperature | Real |
| 67 | FC535 SP | Real |
| 68 | FC535 PV | Real |
| 69 | FC535 scaled flowrate | Real |
| 70 | FC535 Kp | Real |
| 71 | FC535 Ki | Real |
| 72 | FC535Kd | Real |
| 73 | FC535 Error | Real |
| 74 | FC535 Int Accum | Real |
| 75 | FC535 P part | Real |
| 76 | FC535 I part | Real |
| 77 | FC535 D part | Real |
| 78 | FC535 CV % | Real |
| 79 | TC511 SP | Real |
| 80 | TT511 Scaled Temperature | Real |

*Figure 57 analogue to PLC MOVE*

| PLC 103 | | | |
|---|---|---|---|
| | | Name | Data type |
| 80 | | TT511 Scaled Temperature | Real |
| 81 | | TC511 Error | Real |
| 82 | | TC511 Kp | Real |
| 83 | | TC511 Ki | Real |
| 84 | | TC511 Kd | Real |
| 85 | | TC511 Int Accum | Real |
| 86 | | TC511 P part | Real |
| 87 | | TC511 I Part | Real |
| 88 | | TC511 D Part | Real |
| 89 | | TC511 CV | Real |
| 90 | | Put Real 23 | Real |
| 91 | | Put Real 24 | Real |

*Figure 58 analogue to PLC MOVE*

Analogue

**Analogue**

| | Name | Data type |
|---|---|---|
| 1 | Static | |
| 2 | TT511 Raw Temperatu... | Real |
| 3 | TT511 Offset | Real |
| 4 | TT511 Multiplier | Real |
| 5 | TT511 Divisor | Real |
| 6 | TT511 Scaled Temper... | Real |
| 7 | TC511 SP | Real |
| 8 | TC511 PV | Real |
| 9 | TC511 Error | Real |
| 10 | TC511 Old Error | Real |
| 11 | TC511 Int Accum | Real |
| 12 | TC511 Int Accum MAX | Real |
| 13 | TC511 Difference | Real |
| 14 | TC511 Kp | Real |
| 15 | TC511 Ki | Real |
| 16 | TC511 Kd | Real |
| 17 | TC511 P part | Real |
| 18 | TC511 I Part | Real |
| 19 | TC511 D Part | Real |
| 20 | TC511 CV % | Real |
| 21 | LT541 Raw Level Real | Real |
| 22 | LT541 Scaled Level | Real |
| 23 | LT541 Scaled Level Te... | Real |
| 24 | LT541 Scaled Level Te... | Real |
| 25 | LT541 Multiplier | Real |
| 26 | LT541 Divisor | Real |

*Figure 59 analogue to PLC MOVE*

| Analogue | | |
|---|---|---|
| | Name | Data type |
| 25 | LT541 Multiplier | Real |
| 26 | LT541 Divisor | Real |
| 27 | LT541 Offset | Real |
| 28 | LC541 SP | Real |
| 29 | LC541 PV | Real |
| 30 | LC541 Error | Real |
| 31 | LC541 Old Error | Real |
| 32 | LC541 Int Accum | Real |
| 33 | LC541 Int Accum MAX | Real |
| 34 | LC541 Difference | Real |
| 35 | LC541 Kp | Real |
| 36 | LC541 Ki | Real |
| 37 | LC541 Kd | Real |
| 38 | LC541 P part | Real |
| 39 | LC541 I Part | Real |
| 40 | LC541 D part | Real |
| 41 | LC541 CV % | Real |
| 42 | FT535 Raw Flowrate | Real |
| 43 | FT535 Scaled Percent... | Real |
| 44 | FT535 Scaled Flowrat... | Real |
| 45 | FT535 Multiplier | Real |
| 46 | FT535 Multiplier % | Real |
| 47 | FT535 Divisor | Real |
| 48 | FT535 Offset | Real |
| 49 | FT535 Offset % | Real |
| 50 | FC535 SP % | Real |

*Figure 60 analogue to PLC MOVE*

| Analogue | | |
|---|---|---|
| | Name | Data type |
| 49 | FT535 Offset % | Real |
| 50 | FC535 SP % | Real |
| 51 | FC535 SP % logged | Real |
| 52 | FC535 PV % | Real |
| 53 | FC535 Error | Real |
| 54 | FC535 Old Error | Real |
| 55 | FC535 Int Accum | Real |
| 56 | FC535 Int Accum MAX | Real |
| 57 | FC535 Difference | Real |
| 58 | FC535 Kp | Real |
| 59 | FC535 Ki | Real |
| 60 | FC535 Kd | Real |
| 61 | FC535 P part | Real |
| 62 | FC535 I part | Real |
| 63 | FC535 D part | Real |
| 64 | FC535 CV % | Real |
| 65 | FT531 Raw Flowrate | Real |
| 66 | FT531 Scaled Percent... | Real |
| 67 | FT531 Multiplier | Real |
| 68 | FT531 Divisor | Real |
| 69 | FT531 Offset | Real |
| 70 | VF531 Percentage Ou... | Real |
| 71 | VF531 Scaled Output | Real |
| 72 | LY541 Percentage Ou... | Real |
| 73 | LY541 Scaled Output | Real |
| 74 | junk | Real |

*Figure 61 analogue to PLC MOVE*

Move functions for FC

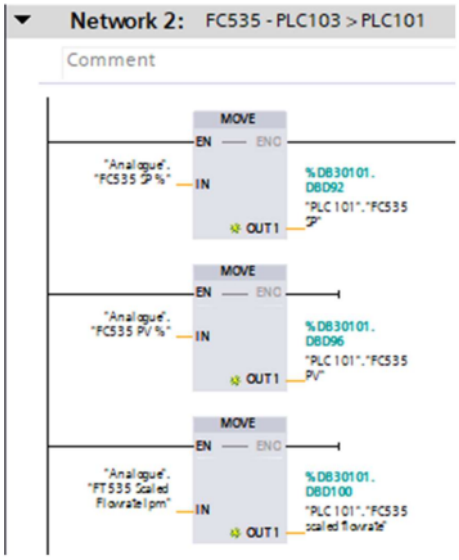



*Figure 62 analogue to PLC MOVE*

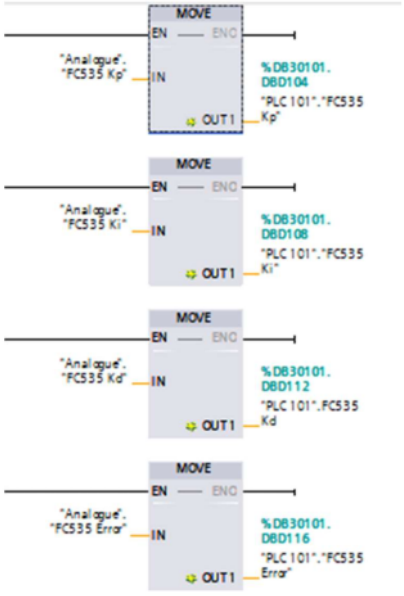



*Figure 63 analogue to PLC MOVE*

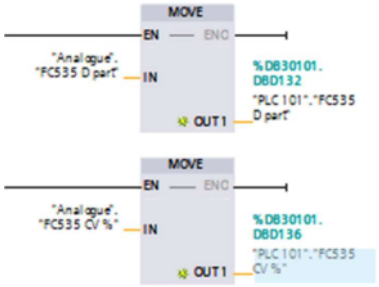



*Figure 64 analogue to PLC MOVE*

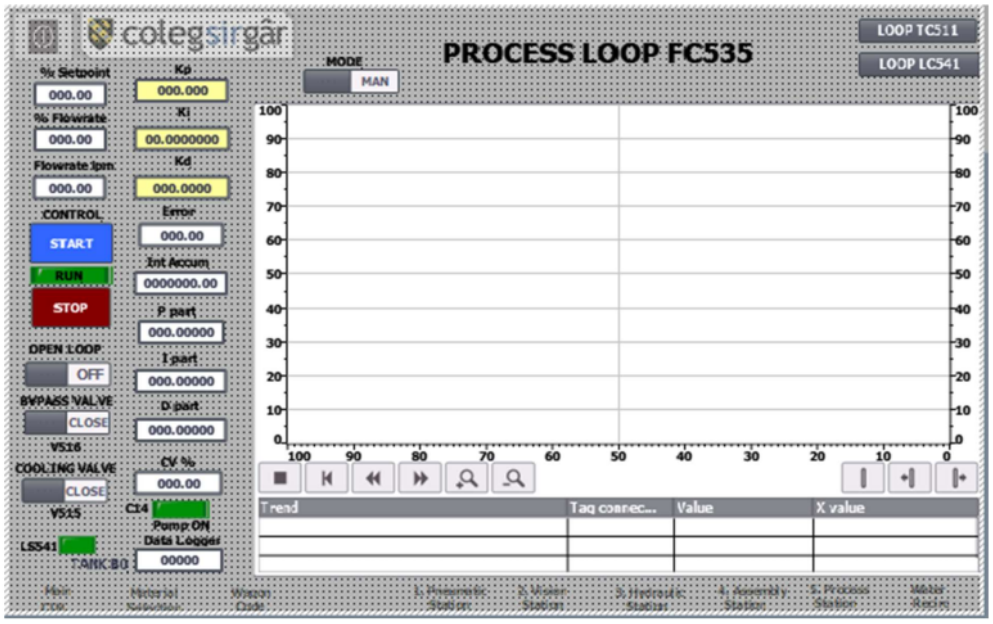



*Figure 65 analogue to PLC MOVE*

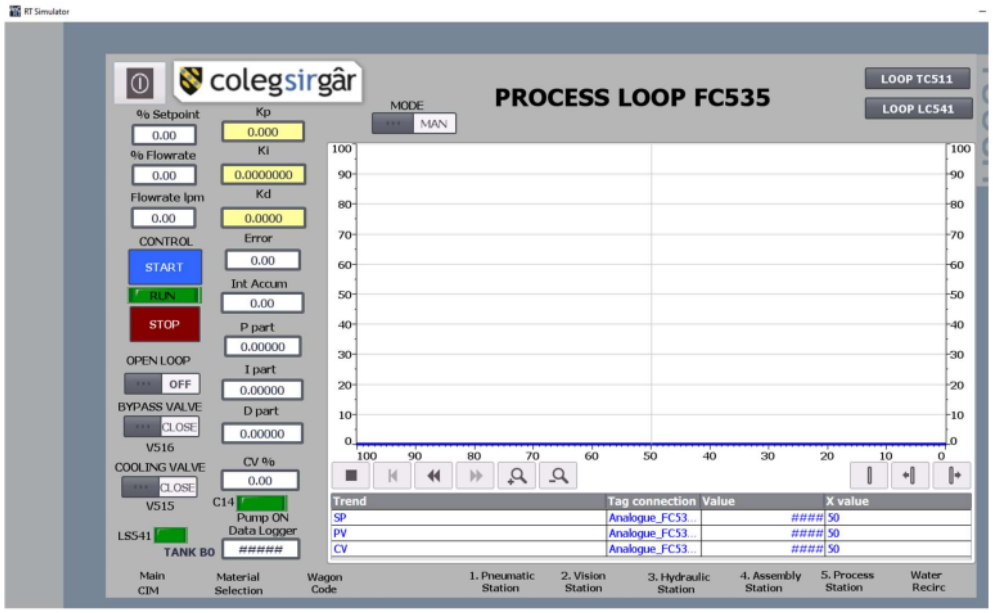



*Figure 66 analogue to PLC MOVE*

LC

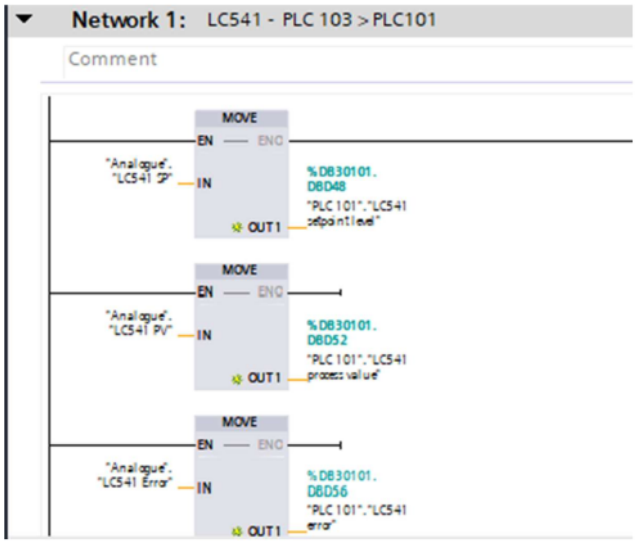



*Figure 67 analogue to PLC MOVE*

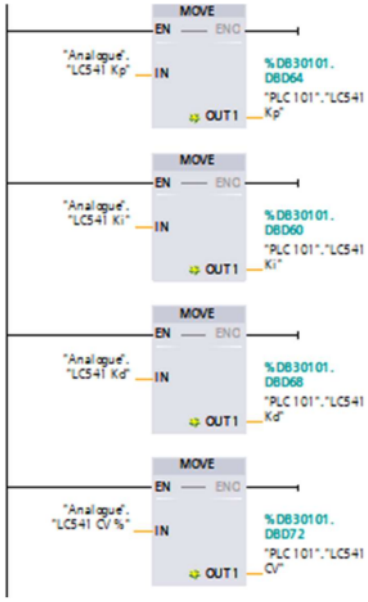



*Figure 68 analogue to PLC MOVE*

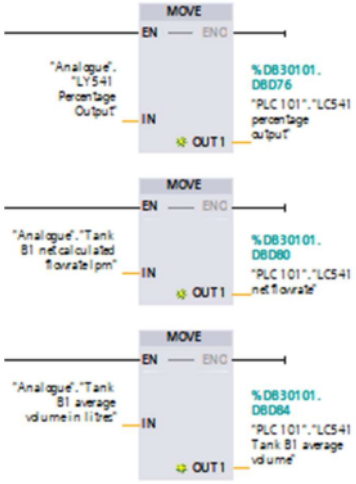



*Figure 69 analogue to PLC MOVE*

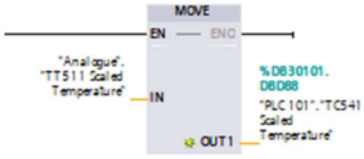



*Figure 70 analogue to PLC MOVE*

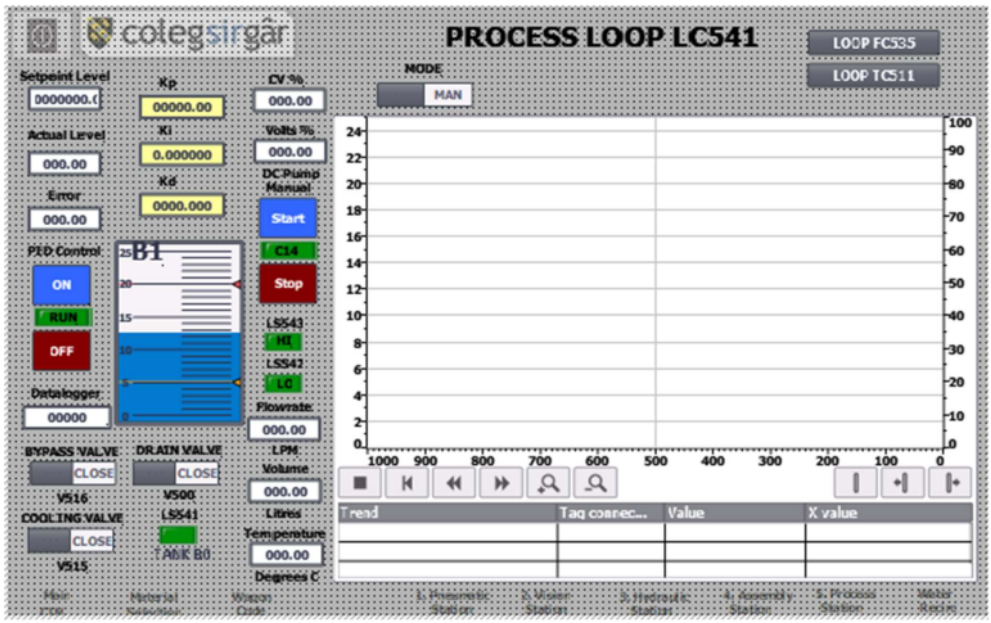



*Figure 71 analogue to PLC MOVE*

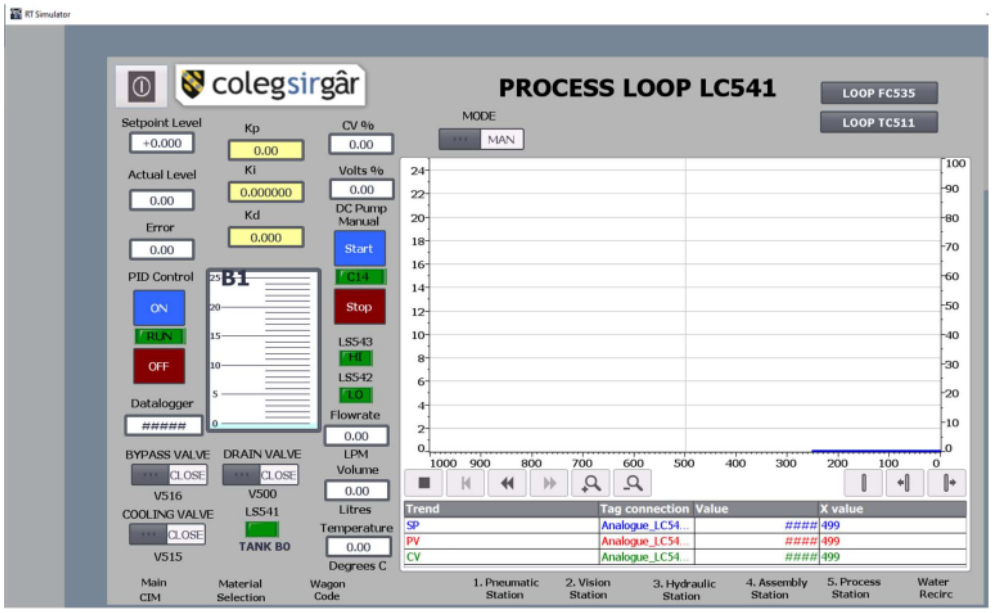



*Figure 72 analogue to PLC MOVE*

TC

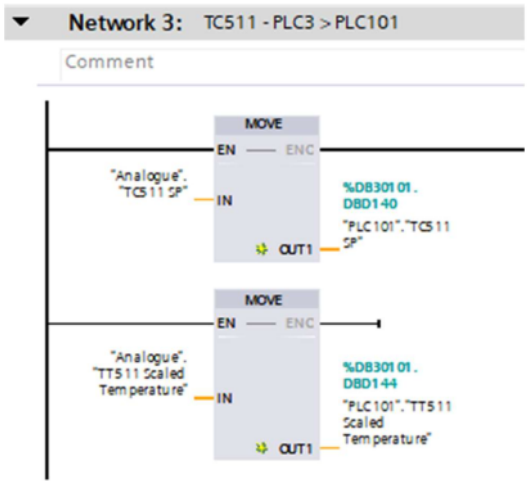



*Figure 73 analogue to PLC MOVE*

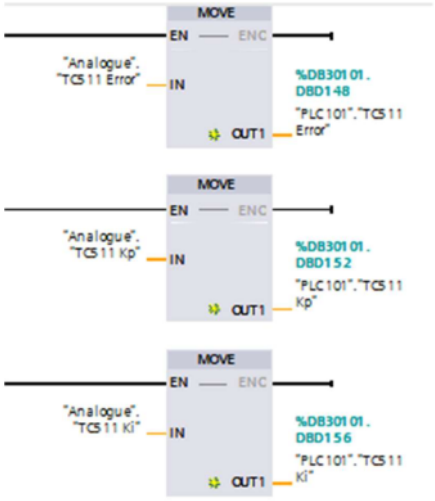



*Figure 74 analogue to PLC MOVE*

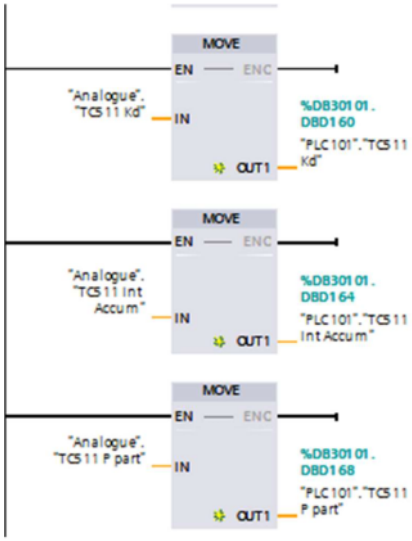



*Figure 75 analogue to PLC MOVE*

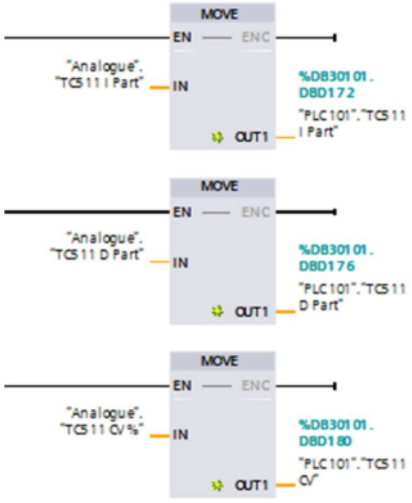



*Figure 76 analogue to PLC MOVE*

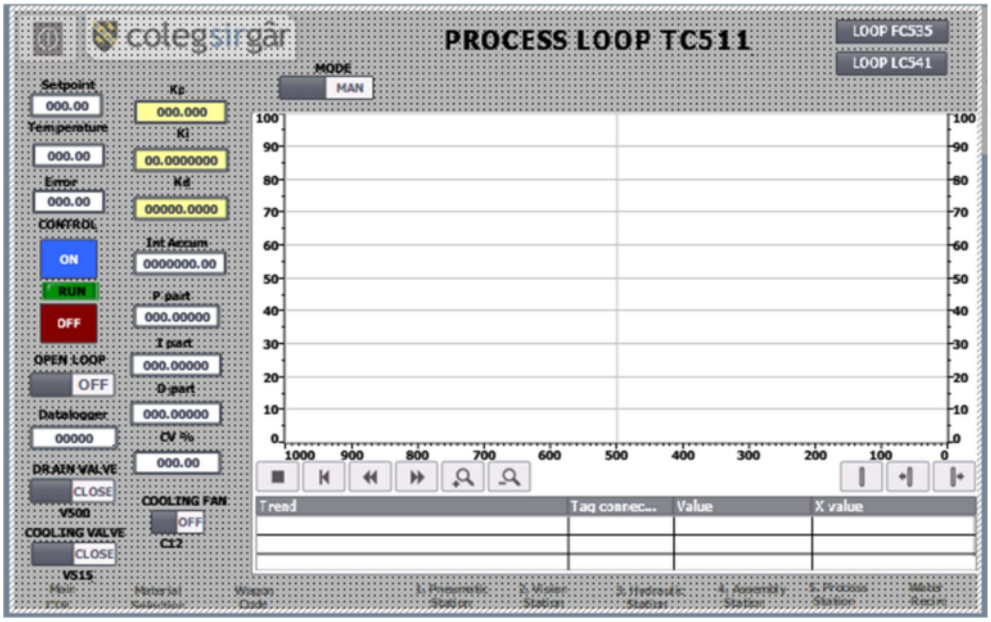



*Figure 77 analogue to PLC MOVE*

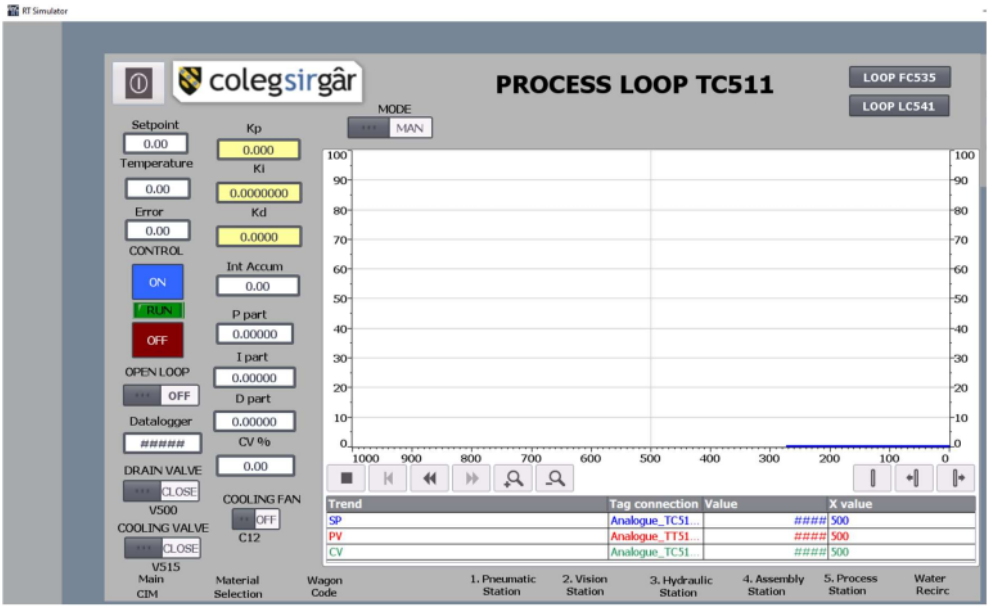



*Figure 78 analogue to PLC MOVE*

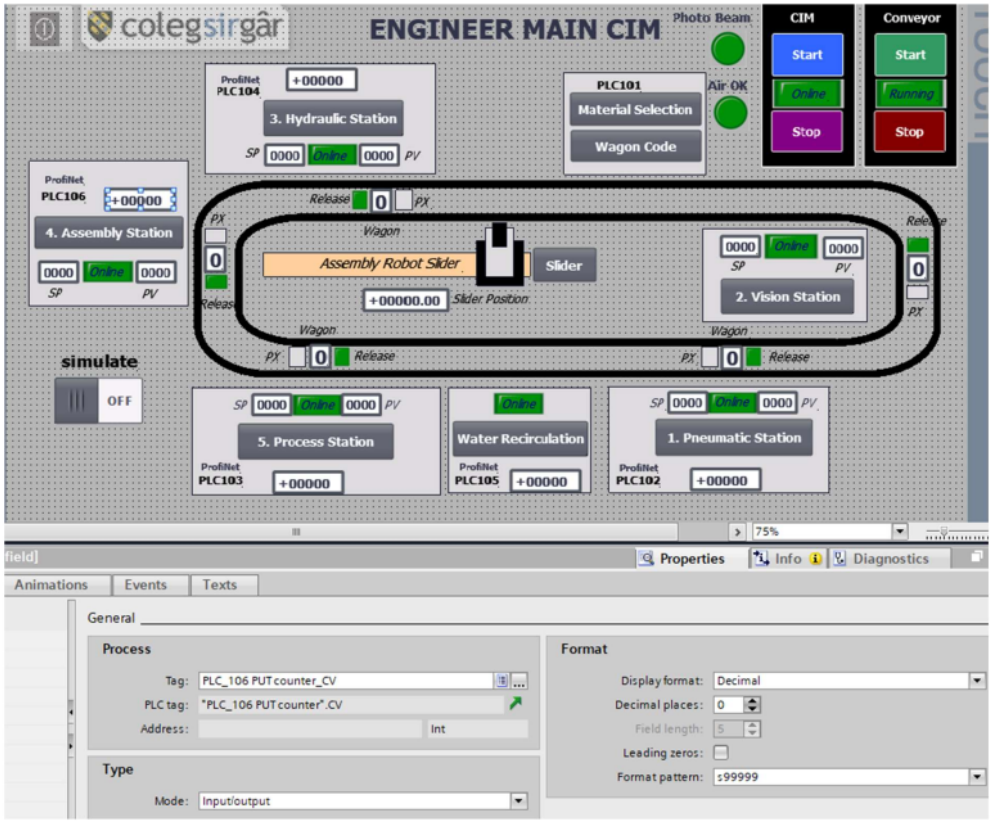



*Figure 79 PLC Communication confirmation*

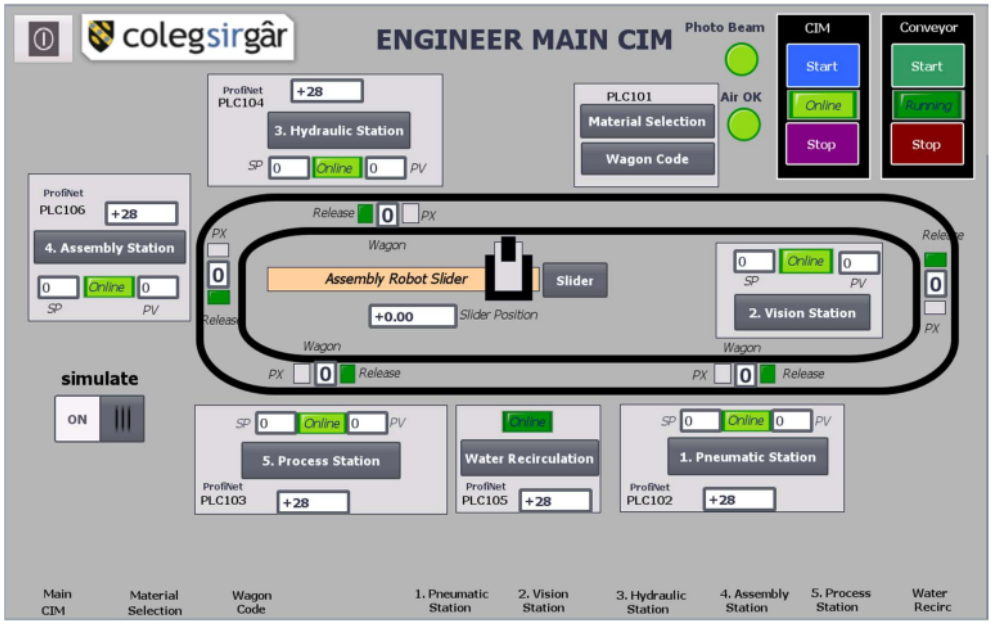



*Figure 80 communication confirmation counters*

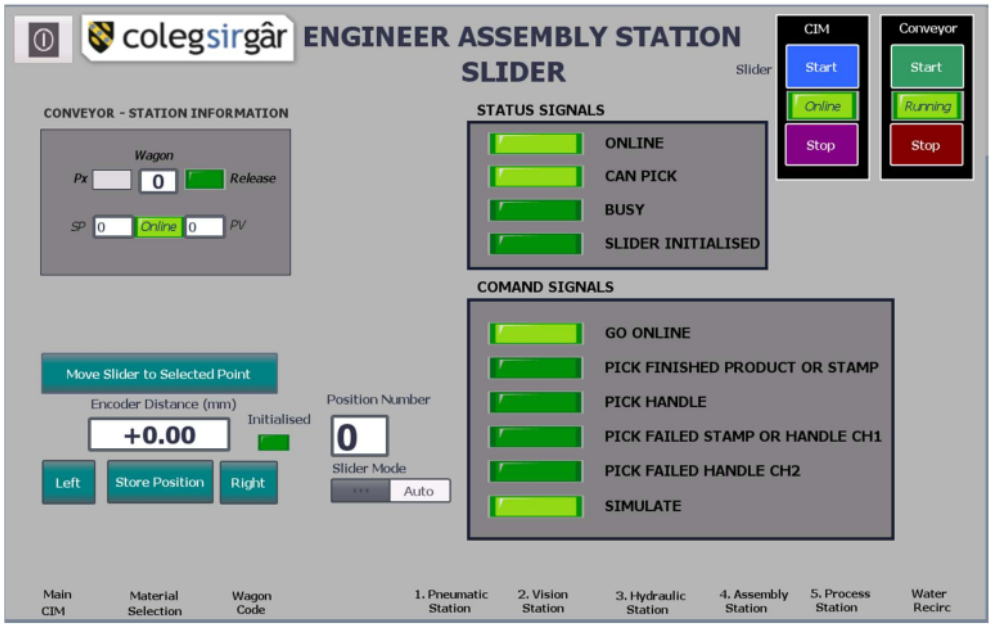



*Figure 81 assembly station upgrades*

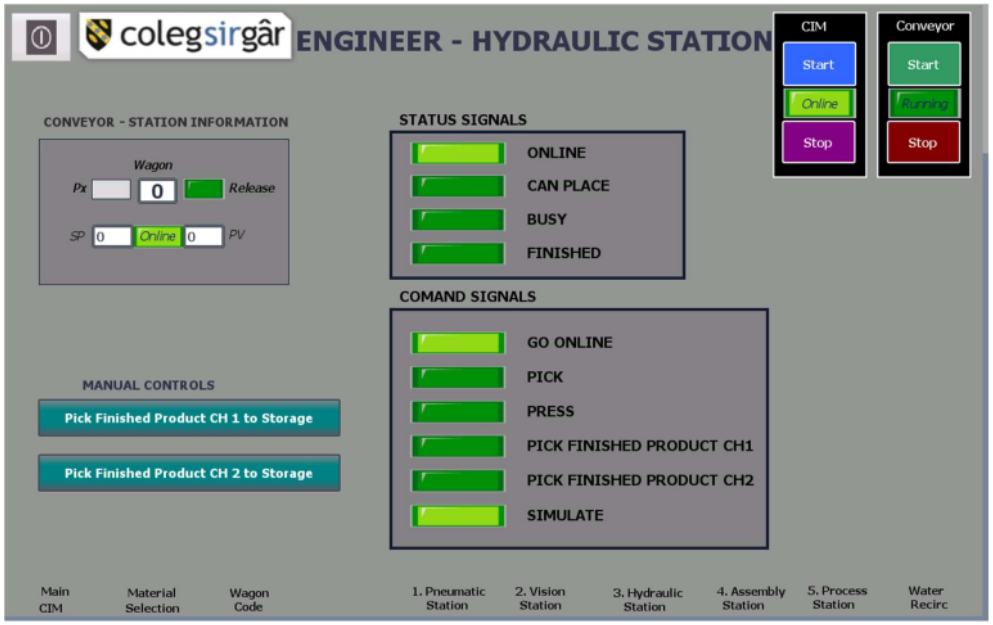



*Figure 82 hydraulic station upgrades*

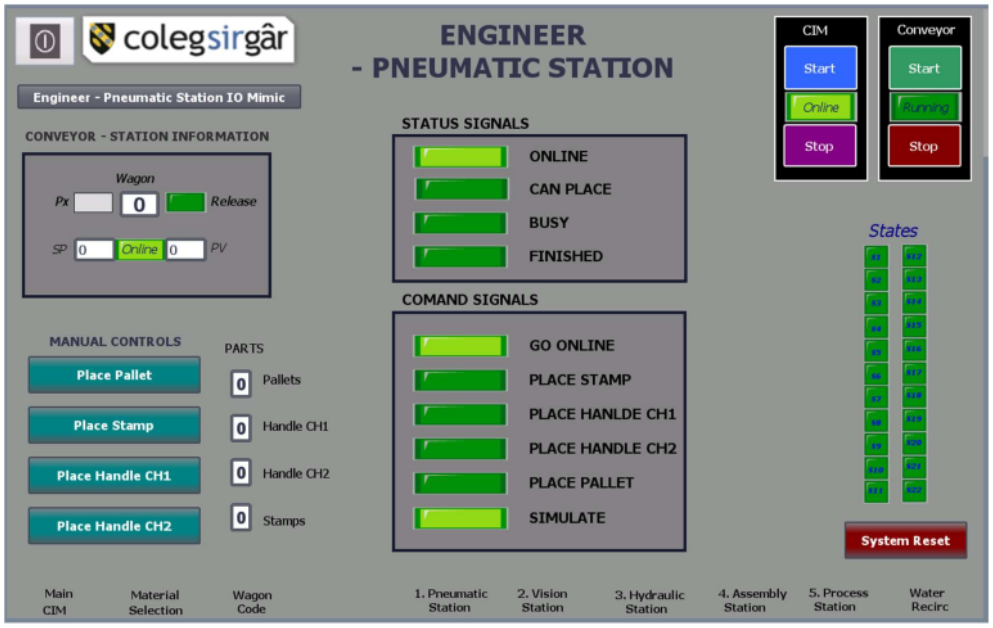



*Figure 83 pneumatic station upgrades*

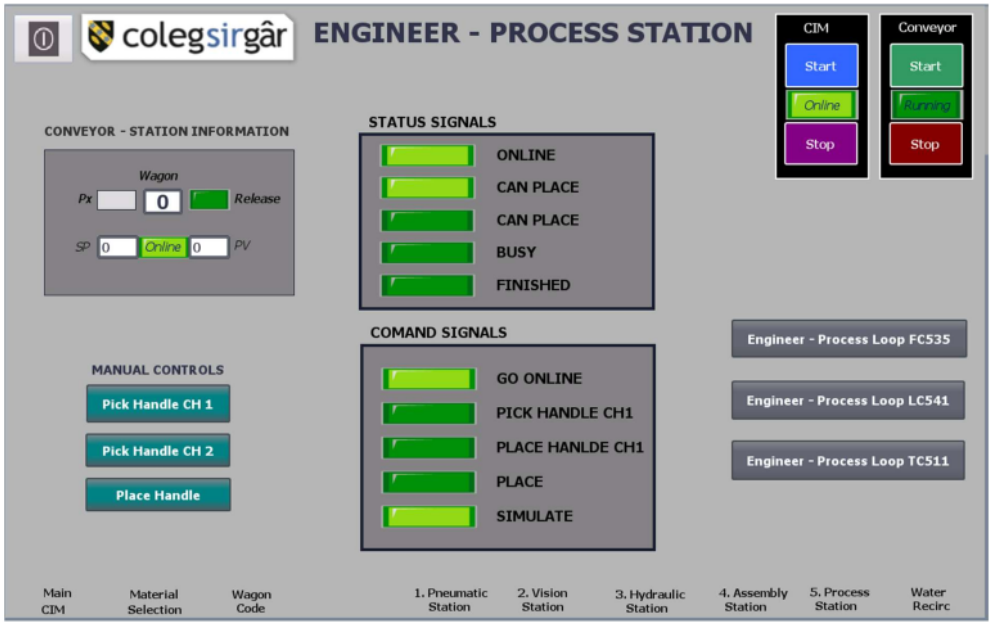



*Figure 84process station upgrades*

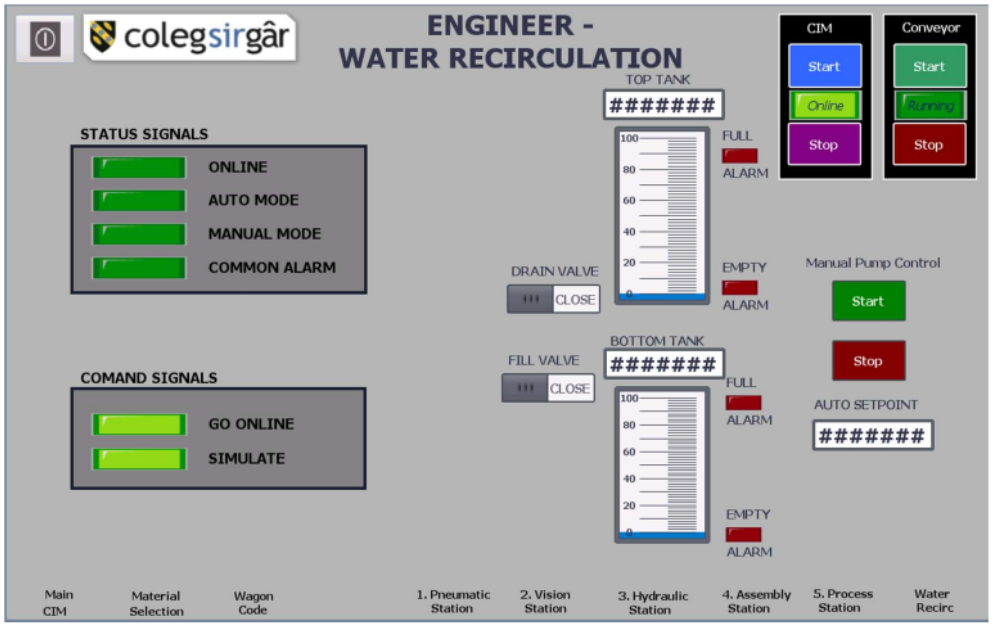



*Figure 85 water recirculation upgrades*




*Figure 86 comms module*

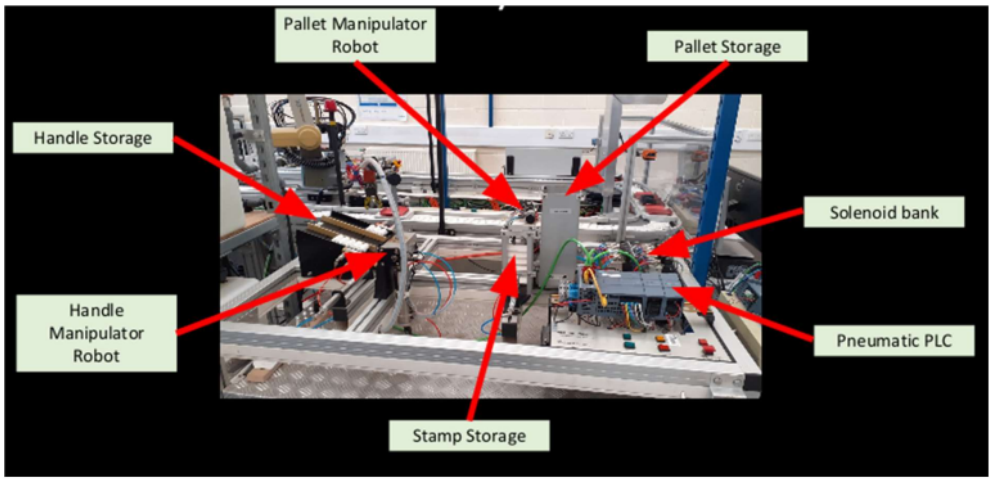



*Figure 87 CIM station detail*

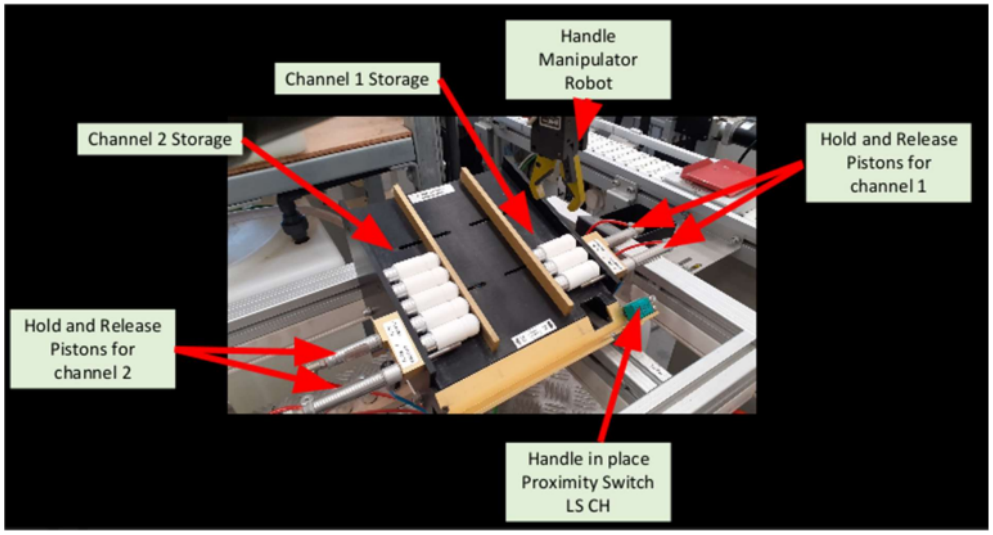



*Figure 88 CIM station detail*

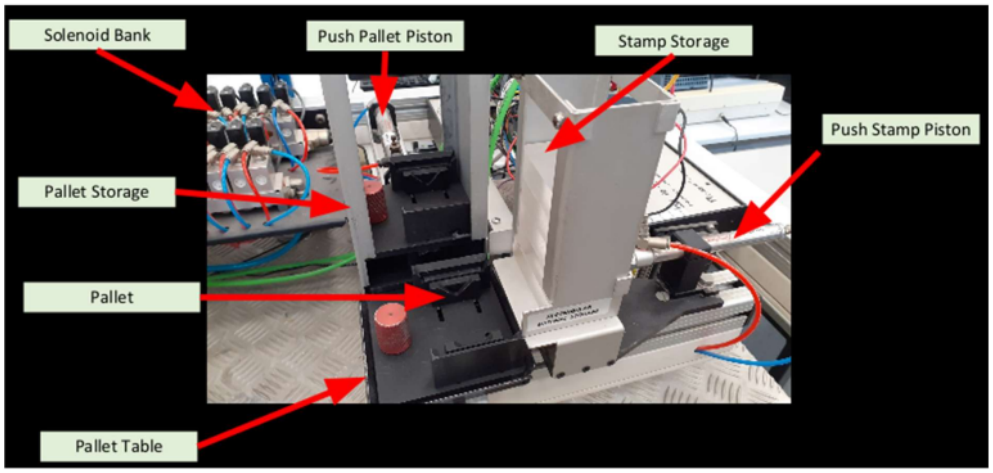



*Figure 89 CIM station detail*

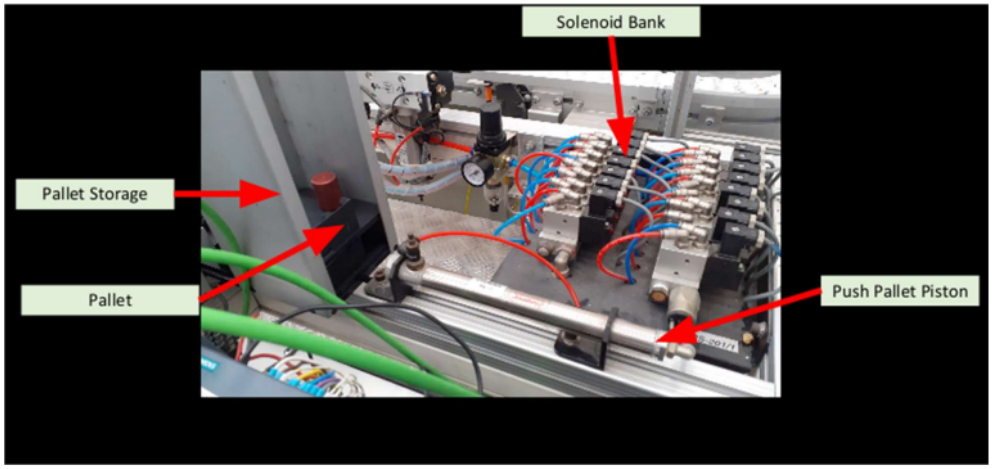



*Figure 90 CIM station detail*

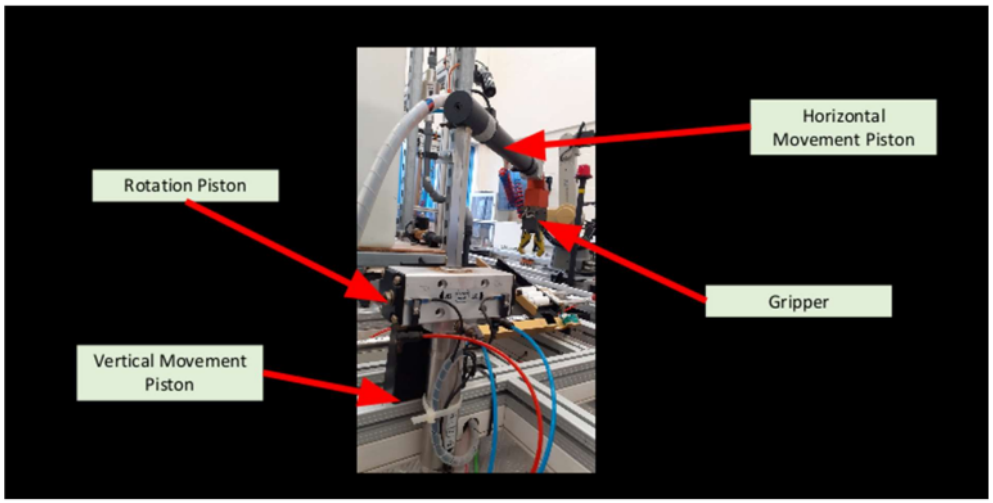



*Figure 91 CIM station detail*

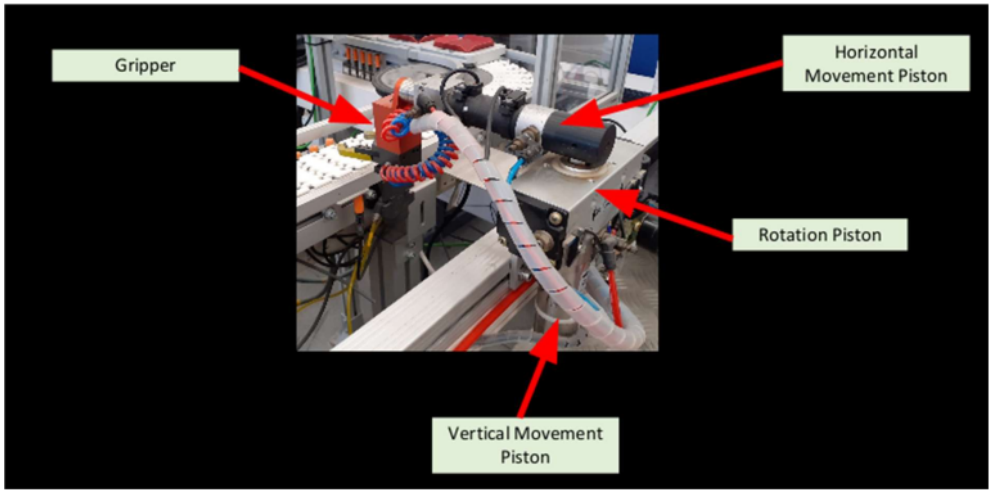



*Figure 92 CIM station detail*

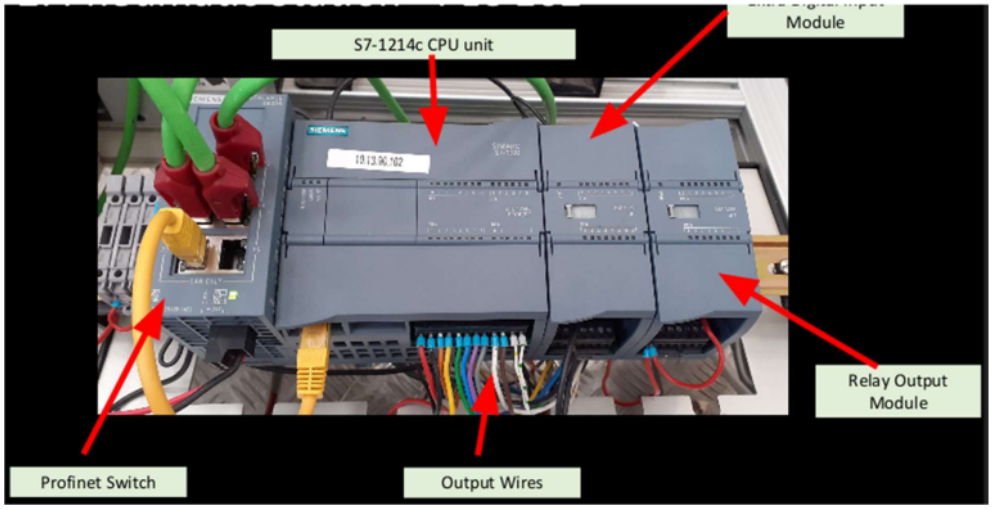



*Figure 93 CIM station detail*

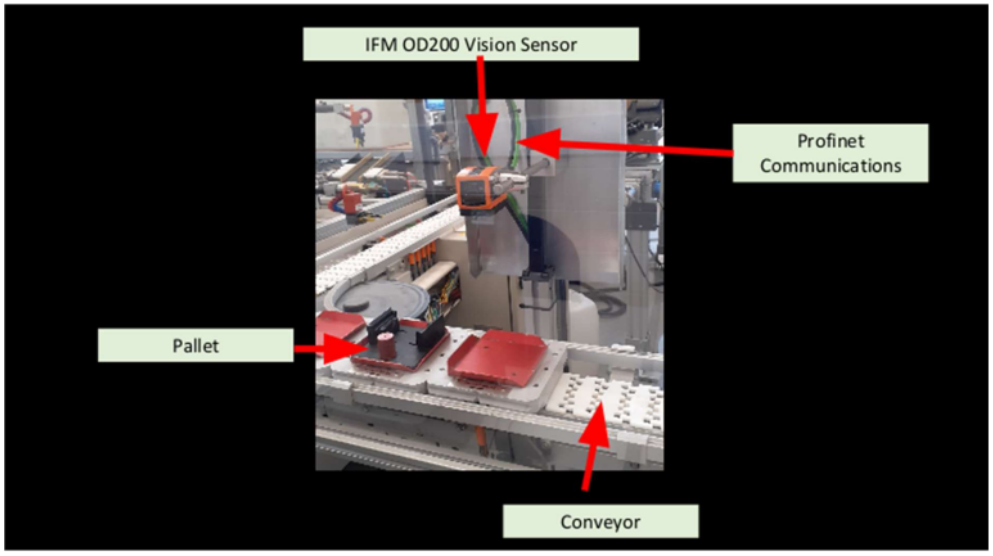



*Figure 94 CIM station detail*

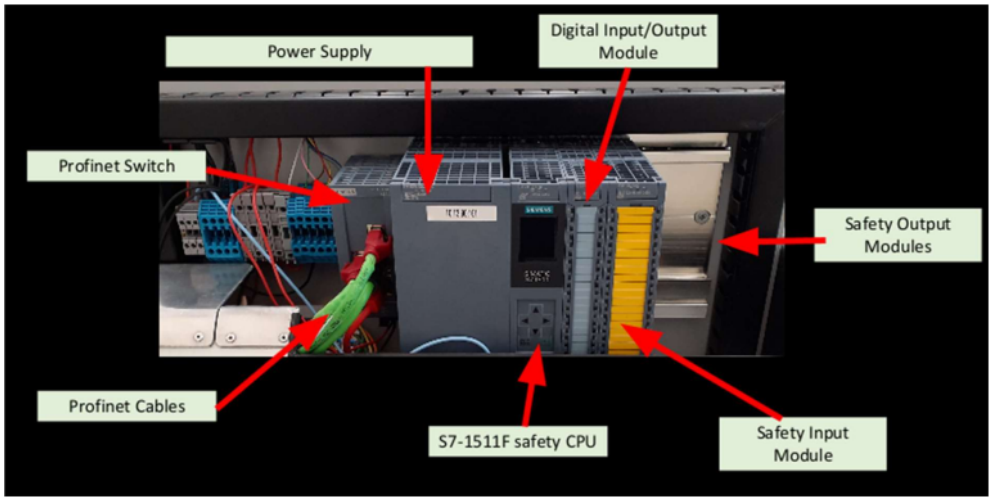



*Figure 95 CIM station detail*

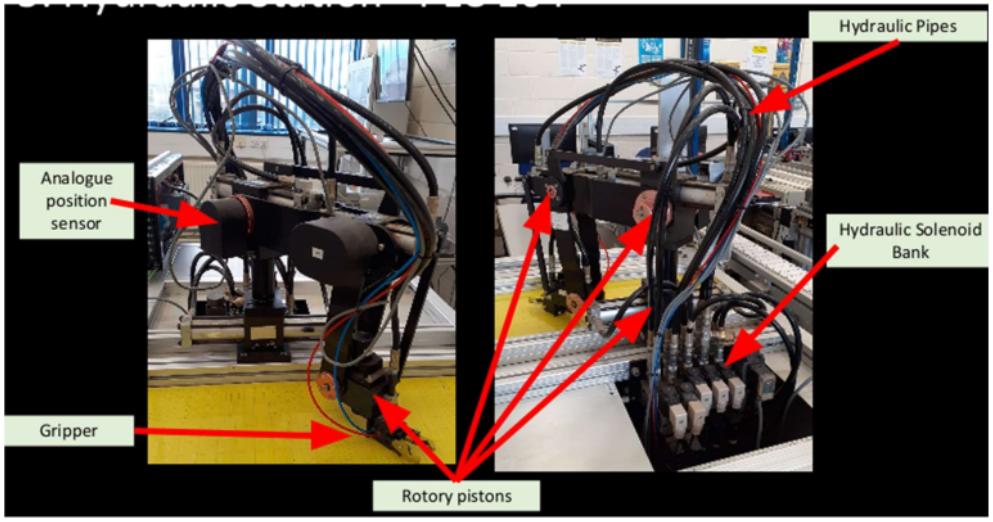



*Figure 96 CIM station detail*

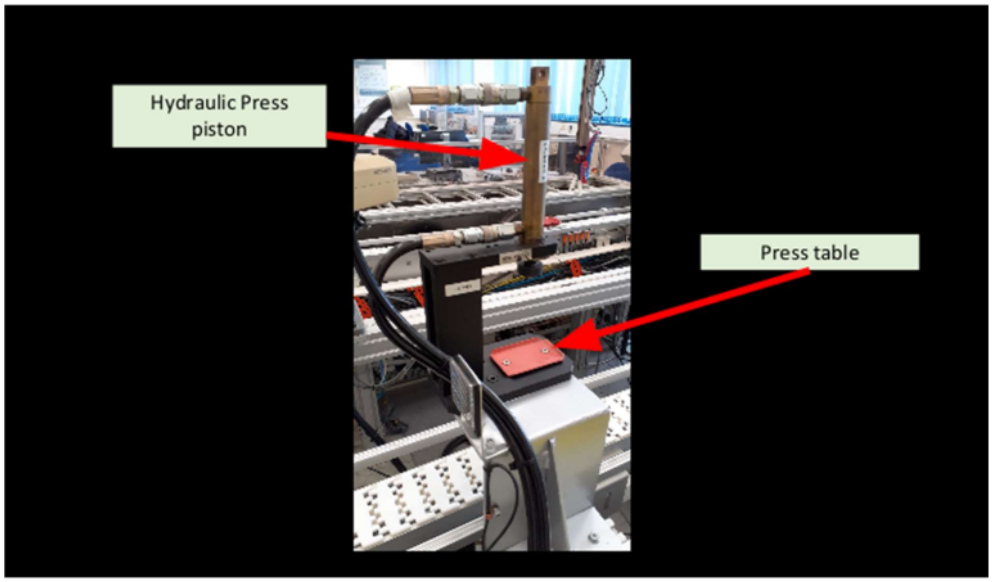



*Figure 97 CIM station detail*

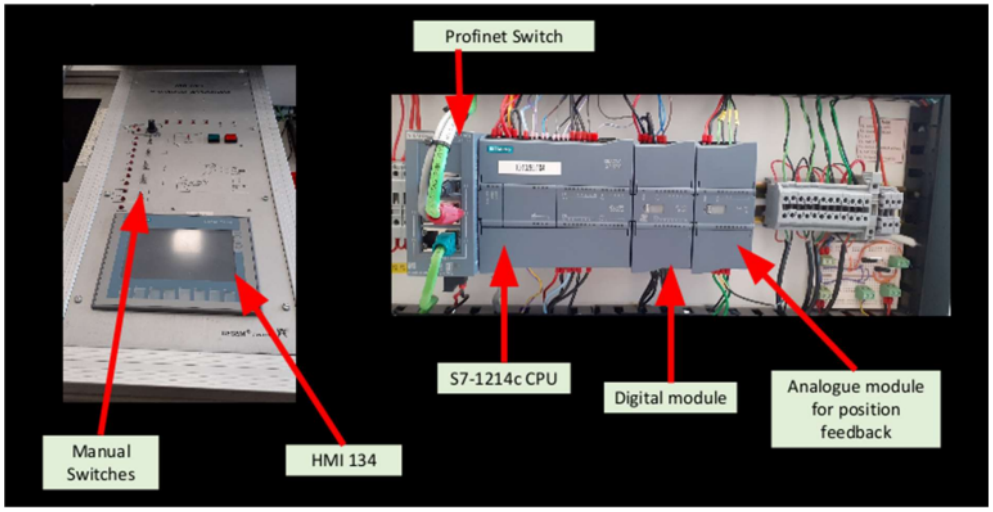



*Figure 98 CIM station detail*

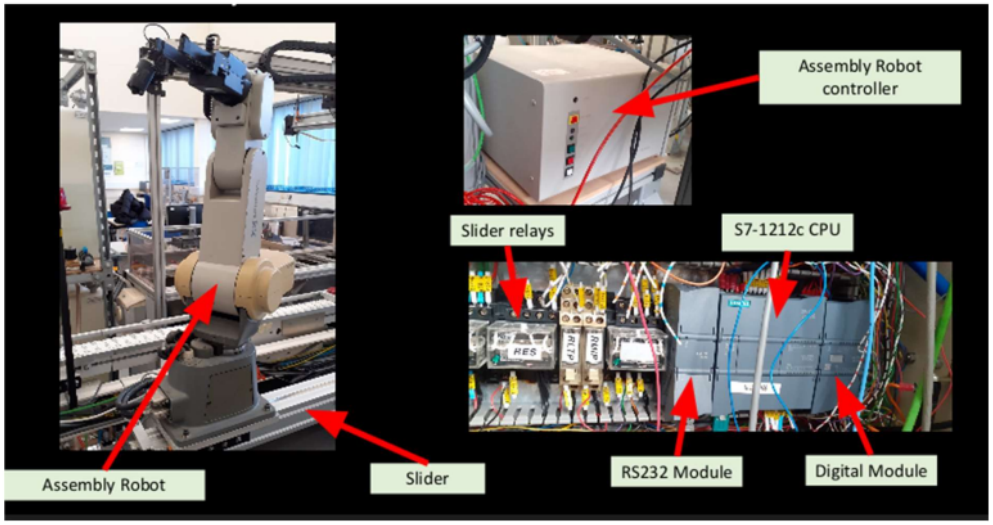



*Figure 99 CIM station detail*

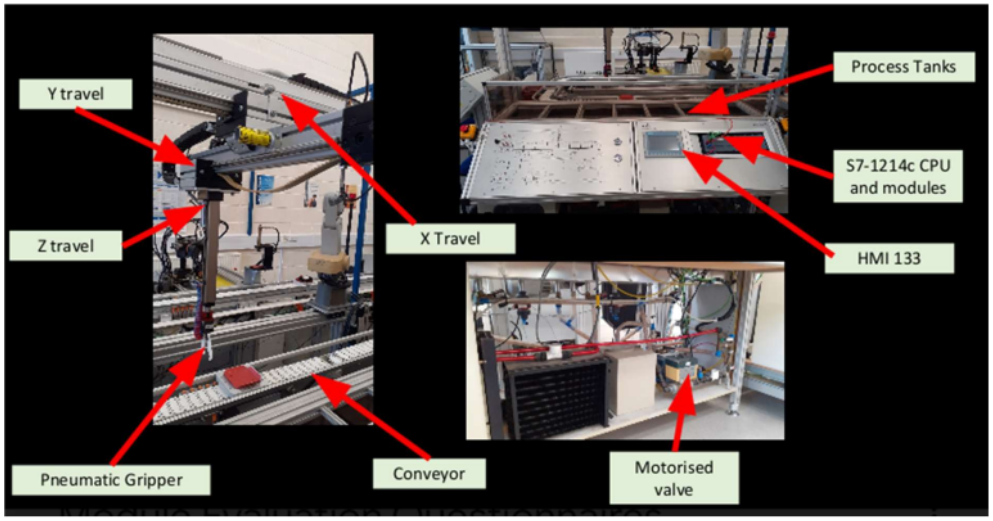



*Figure 100 CIM station detail*

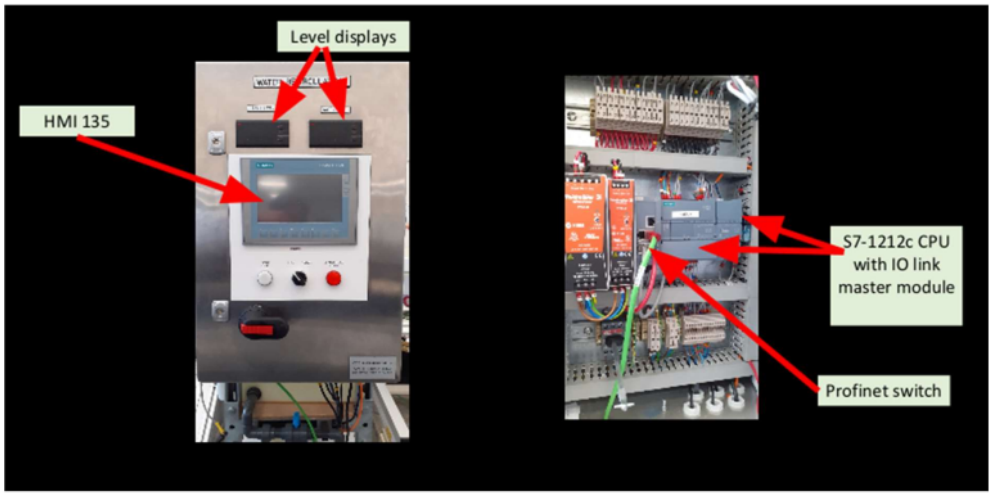



*Figure 101 CIM station detail*

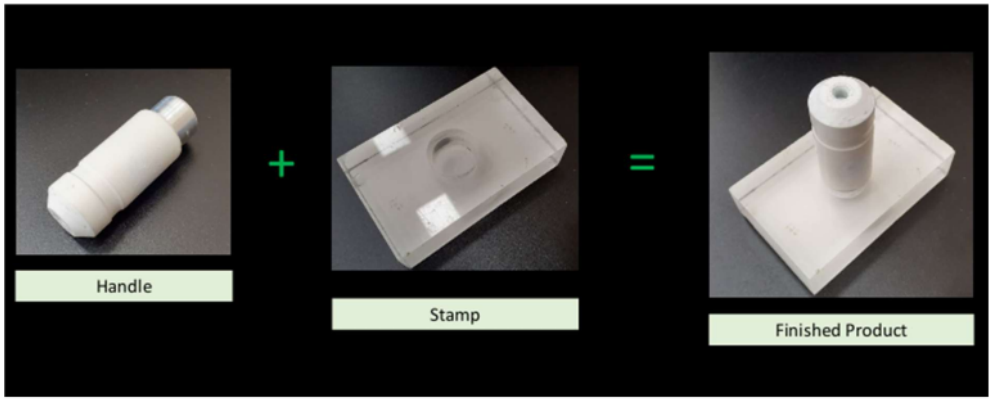



*Figure 102 materials*

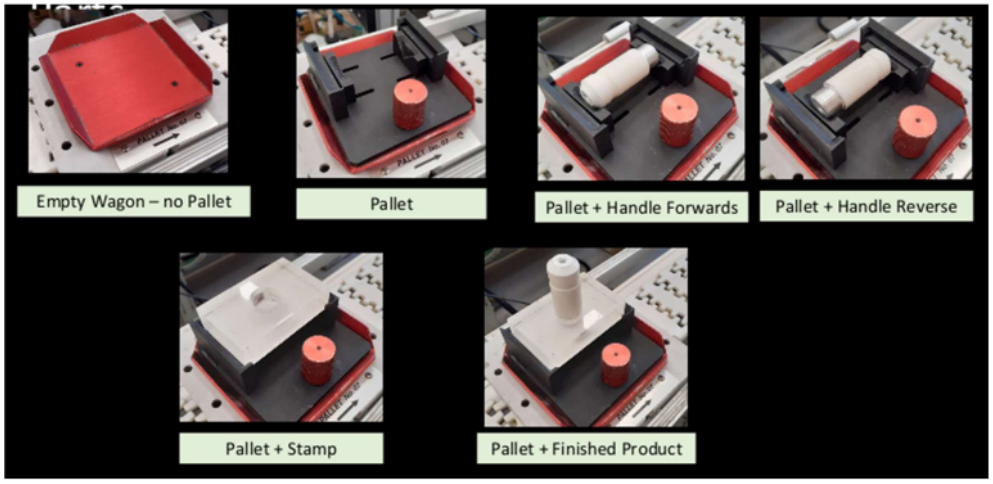



*Figure 103 order of materials*

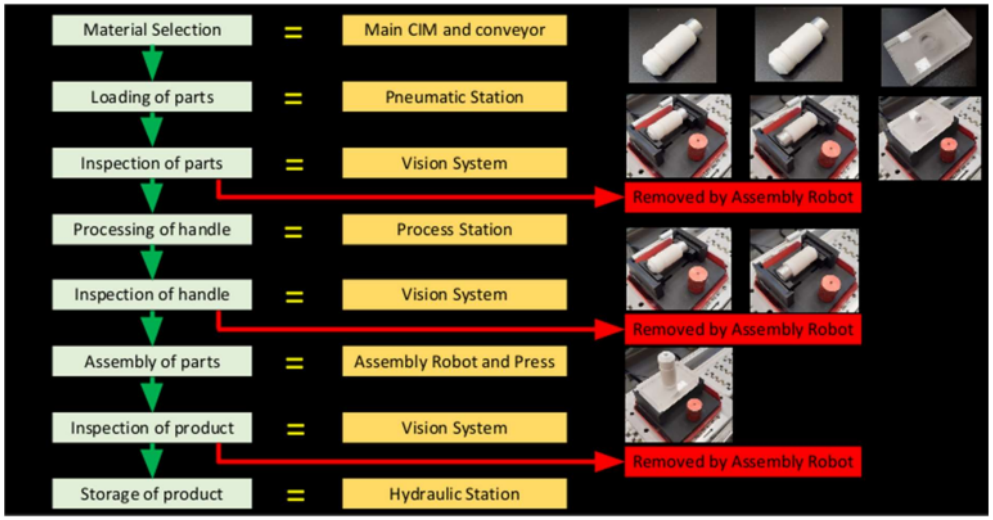



*Figure 104 material order meaning*

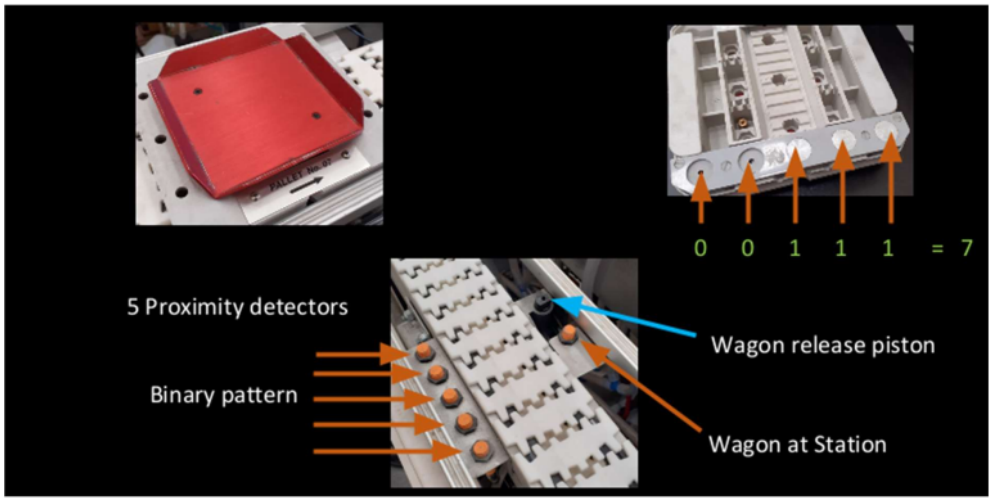



*Figure 105 wagon detection analysis*

| SP | PV | Description |
|---|---|---|
| 0 | 1000 | Empty Wagon (No work) |
| 2000 | 2000 | Wagon + Pallet (No work) |
| 3000 | 3000 | Wagon + Pallet + Stamp (No work) |
| 3100 | 3000 | Wagon + Pallet + Stamp (To be Inspected) |
| 3100 | 3101 | Wagon + Pallet + Stamp (Passed Inspection; To be Finished) |
| 3100 | 3102 | Wagon + Pallet + Stamp (Failed Inspection) |
| 4000 | 4000 | Wagon + Pallet + Round CH1 (No work) |
| 4200 | 4000 | Wagon + Pallet + Round CH1 (To be Inspected) |
| 4210 | 4000 | Wagon + Pallet + Round CH1 (To be Processed) (To be Inspected) |
| 4200 | 4203 | Wagon + Pallet + Round CH1 (Passed Inspection) |
| 4210 | 4203 | Wagon + Pallet + Round CH1 (To be Processed) (Passed Inspection) |
| 4200 | 4204 | Wagon + Pallet + Round CH1 (Failed Inspection) (To waste) |
| 4210 | 4214 | Wagon + Pallet + Round CH1 (Failed Inspection) (To waste) |
| 5000 | 5000 | Wagon + Pallet + Round CH2 (No work) |
| 5300 | 5000 | Wagon + Pallet + Round CH2 (To be Inspected) |
| 5320 | 5000 | Wagon + Pallet + Round CH2 (To be Processed) (To be Inspected) |
| 5300 | 5305 | Wagon + Pallet + Round CH2 (Passed Inspection) |
| 5320 | 5305 | Wagon + Pallet + Round CH2 (To be Processed) (Passed Inspection) |
| 5300 | 5306 | Wagon + Pallet + Round CH2 (Failed Inspection) (To waste) |
| 5320 | 5306 | Wagon + Pallet + Round CH2 (Failed Inspection) (To waste) |
| 4210 | 4213 | Wagon + Pallet + Round CH1 (To be Finished) |
| 5320 | 5325 | Wagon + Pallet + Round CH2 (To be Finished) |
| 6000 | 6000 | Finished Product to Store (To be Inspected) |
| 6000 | 6007 | Finished Product (Passed Inspection) (To Store) |
| 6000 | 6008 | Finished Product (Failed Inspection) (To waste) |

*Figure 106 wagon coding*

# 2024888

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

61 /100

PAGE 1

PAGE 2

QM **Sections should be numbered according to the brief**

PAGE 3

PAGE 4

QM **Sections should be numbered according to the brief**

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

QM **Correctly cited**

Citation method conforms to Harvard standard, well done.

QM **Citation Needed**

Cite Source:
Please use the link below to find links to information regarding specific citation styles:
http://www.plagiarism.org/plag_article_citation_styles.html

**Text Comment.** Capital letter

PAGE 5

**Text Comment.** The brief also asked you to consider M2M communications

PAGE 6

**Text Comment.** These diagrams are too large, they should be more detailed and placed in the appendix. Also, switching between portrait and landscape throughout the report is awkward for your reader.

**Text Comment.** Diagrams should be figured numbered

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

**Text Comment.** Explain this figure

PAGE 14

**Text Comment.** Why landscape?

**Text Comment.** the bottom 2 are 1212c PLCs

PAGE 15

**Text Comment.** this is a network switch

QM

## Punctuation Error

Punctuation error

PAGE 16

**Text Comment.** what is a DCV?

PAGE 17

QM

## Punctuation Error

Punctuation error

PAGE 18

PAGE 19

PAGE 20

PAGE 21

PAGE 22

PAGE 23

PAGE 24

PAGE 25

QM

## Correct method of listing.

You have listed your sources correctly according to the Harvard method.

QM

## Small Range of Sources

You have shown little evidence of reading, only a few sources listed here

PAGE 26

PAGE 27

PAGE 28

PAGE 29

PAGE 30

PAGE 31

PAGE 32

PAGE 33

PAGE 34

PAGE 35

PAGE 36

PAGE 37

PAGE 38

PAGE 39

PAGE 40

PAGE 41

PAGE 42

PAGE 43

PAGE 44

PAGE 45

PAGE 46

PAGE 47

PAGE 48

PAGE 49

PAGE 50

PAGE 51

PAGE 52

PAGE 53

PAGE 54

PAGE 55

PAGE 56

PAGE 57

PAGE 58

PAGE 59

PAGE 60

PAGE 61

PAGE 62

PAGE 63

PAGE 64

PAGE 65

PAGE 66

PAGE 67

PAGE 68

PAGE 69

PAGE 70

PAGE 71

PAGE 72

PAGE 73

PAGE 74

PAGE 75

PAGE 76

PAGE 77

PAGE 78

PAGE 79

PAGE 80

PAGE 81

PAGE 82

PAGE 83

PAGE 84

PAGE 85

PAGE 86

PAGE 87

PAGE 88

PAGE 89

PAGE 90

GRADING FORM: NEW CSG-RUBRIC

# ETHAN RIGBY

# 61

## 1. ENGAGEMENT WITH LITERATURE

Interesting research from a small range of sources, correctly cited and listed using Harvard. However, the focus should have included M2M communications between PLCs and devices. 10/20

**10**

## 2. KNOWLEDGE AND UNDERSTANDING

There is good information presented in the overview section but it is not well presented and nothing has been said about the tracking codes. Some explanation given of safety and maintenance. 12/20

**12**

## 3. COGNITIVE AND INTELLECTUAL

Good analysis of risk. Good evidence of testing and good conlcusions and recommendations. 13/20

**13**

## 4. PRACTICAL APPLICATION

Very good evidence of practical work with good test results presented in a table. However, you could have provided further evidence to prove that VoT was working. 16/20

**16**

**5. TRANSFERABLE SKILLS**

The report contains some good images and information and very good evidence of team working. However, report sections have not been numbered and you have not following the formating required in the brief with the switch between portrait and landscape. Many of the images and diagrams should be in the appendix with better details. 10/20

**10**