

2118459

by Cerys Joseph

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Task 1 – Work Plan for Lifelong Learning and Risk Assessment

Work Plan

The first thing that will need to be done is the safety checks, these are making sure all the guards around the machine are down, all the e-stops are not activated, and that all the wagons are safely placed along the track so that they don't set off the sensors. The program will be run, which will set the wagons to travel along the track. The process robot will place a product on the wagon, for the next stage of the line. Then in the visual station the robot will pass or fail the product, the pass products will carry on and the failed products will be placed in the bin.

Risk Assessment *This should be risks of working*

The risk assessments for this machine are placed in the appendix below, the first risk assessment is the guarding around the machine. In the risk assessment it explains that the possible harm that could come to a worker is 25, the possibility of the risk happening is 6 and the possibility of avoiding the hazard and the frequency that workers are exposure to the risk is both 6. These scores create a score of 3750, this score means the risk is extremely high risk to workers.

The second risk assessment sheet that is in the appendix is for the locks on the guarding of the moving arm, the degree of possible harm is 8, the possibility of a worker avoiding the hazard is 2.5, the possibility of the hazard occurring is 4 and the frequency of the hazard exposure is 3. So, the hazard rating score is 240 and the summary level of this hazard will be high risk.

The third risk assessment sheet is for the cable in the panel, the degree of possible harm and the possibility of occurrence to the worker is 4, the possibility of a worker avoiding the hazard is 7 and the frequency of exposure is 6. The score of the hazard rating number is 672 and the summary level will be very high risk to the workers.

The fourth assessment sheet is for the shielding underneath the machine, the degree of possible harm to the worker is 25 and the possibility of occurrence and the possibility of the worker avoiding the risks are both 2.5, and the frequency that the worker is exposure to the hazard will be 5. Once the values are multiplier by each other is the score is 781.25 and the summary level will be a very high risk to the workers.

This part belongs in section 4.

Task 2 – Research

The meaning of the acronym SIL is Safety Integrity Level. A SIL is how a safety system performance is measured on how it will fail. For this system it is shown that it is easier to base the figures off the chance that it will fail rather than the chance of it being a success. (MSA, N/A) SIL is separated into 7 parts which will fully support the analysis. The first is Part 1 this is the general requirements, Part 2 is the requirements for the E/E/PE safety related systems, Part 3 is for the software requirements, Part 4 is the definitions and abbreviations for the work, Part 5 is the examples of methods for the determination of the safety integrity levels, Part 6 is the guidelines for the applications of part 2 and part 3, and finally Part 7 is an overview of the techniques and measures. (DNV, N/A) Correctly cited

The Safety of Life cycle is to find out what hazard has occurred and how to fix it. The framework can be used to identify the hazards and analyse the best way to fix them. A Process Hazard Analyse is an assessment of all the potential hazards with the industry, such as equipment failing, loss of utilities or external factors. (C cross, 2022) Correctly cited

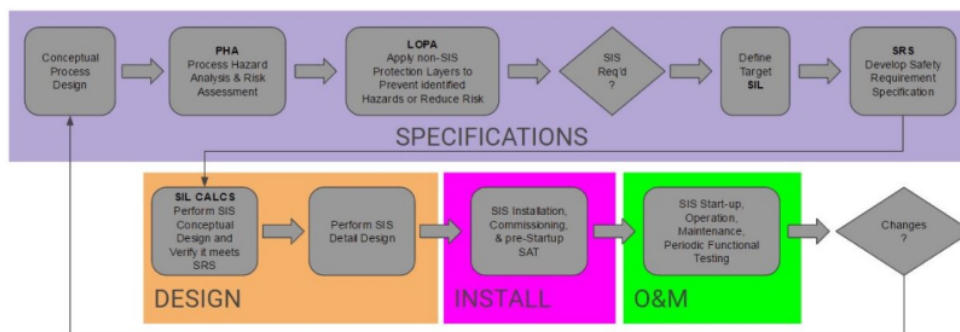


Figure 1 Safety Life Cycle (C cross, 2022)

PL rating means the Performance Level, this is a value which is used to define the safety related parts of a control system. The PL rating must be equal or must be higher than the mandatory performance level for that particular component. (Keyence, 2023) Correctly cited

The graph for the PL rating system is set into three sections, S, F and P, each section is for setting the risks into a section. The first section is P, which is the possibility of limiting or avoiding the hazard. The second section is for F, which is how often exposure is to the hazard and the third section is S, which is the severity of the injury. Once the risk has been assessed by this diagram then it can be placed into levels and then dealt with appropriately. (Keyence, 2023) Correctly cited

UKCA means UK Conformity Assessment, and the UKCA mark is on products that are sold in Wales, Scotland, and England. The UKCA marking can also be used on products with the CE mark on them, the product must reach these standards as well any other specific requirements. (GOV.UK, 23)

CE means European Conformity or in French it is known as Conformité Européenne. The CE marked products can be sold in the EU and a few other countries. However, to sell on the UK market the product must also include the UKCA mark. (BYTESNAP, N/A) The UKCA marking should be clear and legible when it is fixed to the product. Depending on the specific regulations, the mark may be placed on the manuals or on any supporting documents instead of on the product. (GOV.UK, 2022)

Correctly cited

A product is marked with the CE/UKCA marks after the following have been done, the necessary directives and standards have been identified, then the product's specific requirements have been checked and approved. The third step is identifying if the independent conformity assessment is needed for the marking to happen and then testing the product to make sure it is safe to use. The fifth step is to draw up the technical data and then finally to add the correct marking to the product. (BYTESNAP, N/A)

Correctly cited

The benefits of Network Security are keeping the data and information of the client safe from outside sources. It is a wide term that covers software and hardware, for example network analytics, firewalls, VPN encryption etc. (CHECK POINT, 2023) There are three components of Network Security are confidentiality, integrity and availability, the confidentiality is so that the data is only accessed by the allowed parties. The integrity is that the data hasn't been degraded or been tampered with before it has been sent in and the availability is it can be accessed when needed by the authorised people. (DNV, 2022)

Correctly cited

Task 3 – System Overview and Operation

The wagon tracking system works by using a binary code, which has 5 digits, to indicate where the wagons are on the track. When a wagon arrives at the station it activates the detector and sends a signal back to the HMI, after that a signal is sent by the 5 proximity detectors to state which of the 9 wagons are at the station. For example, if it was wagon 9 then the second and the last code would be light up. After the wagon has been loaded and leaves the station the wagon releases the piston sending a signal to the HMI. The HMI has counters on each of the stations which indicate where and how many of the wagons are at each of the stations.

When the wagons are travelling along the track there is a code which goes along with them to state what status the wagon is in. There are 25 individual codes, for example code 3101 is when the wagon, pallet and stamp have all passed the inspection and are to be finished. Another example is 5306, which is wagon, pallet and round CH2 have all failed inspection and are on their way to the waste.

Some topics are missing.

Task 4 – Health and Safety, and the Environment

The risks in the pneumatic station are the robot moving the handles after it's come down the ramp, and the robot collecting the stamps off the shelf. The risks involved with these robots are when they are moving from the storage area to the conveyer belt. In the pneumatic station the solenoid bank is open, without a cover.

The risks in the hydraulic station are the hydraulic arm moving around picking up and moving the products. Someone might get injured if the guards aren't securely fixed or if a cable is loose, then it can release air or electrical shocks. Another risk associated with the hydraulic station is the pressing machine, if someone's hand is in the area while it is running then it will get crushed by the machine.

The effects the CIM system could have on the environment is not being closed off correctly to prevent harm to someone. The system can have multiply checks carried on it in order to make sure that the system will run without errors or products being deemed as failures and being placed in the bin.

You should have referred to your Hazard tables in the appendix

Task 5 – Maintenance, Reliability and Commercial Risk

The View of Things, VoT, is a function that enables users to operate and then monitor the control parameters of the machines which are connected to it via the web server. The software is a drag and drop editor so it's easy for users to understand and use it. The software doesn't have to be used all the time it can be used whenever it is needed and the tools used are familiar, so it can be understood with ease. (Siemens, N/A)

In order to access the network, the IP address, username, and the password is needed, this prevents strangers from accessing the network. So, the network is fairly secure however it could be more secure. This can be achieved by using a VPN or plug in ports. The Ip address of the network that was used for the task was 10.13.90.101 and the username was VoT.

Task 6 – Complex System Design – Individual Modifications

The modifications that need to be done are adding Profinet counters for each station on the Engineer Main CIM, then adding handshaking signal to and from the PLC for each of the Engineer stations and to add an Assembly robot slider to indicate the position of the machine on the HMI.

The Profinet counters have been added to the Engineer Main CIM screen, figure 2 in the appendix shows that PLC 102 has been tagged to the Pneumatic station. This has been done by dragging a counter from the library and tagging it to 'PLC_102 PUT counter_CV' by it being tagged it will indicate how many are at the station. The next figure in the appendix will be the tag for the 103 PLC which is the Process station, the counter will be created the same way as the previous one except it will be tagged to 'PLC_104 PUT counter_CV'. The other stations will have counters which have been created in the same way, the Water Recirculation, shown in figure 5, will be tagged to 'PLC_105 PUT counter_CV' and the Assembly Station, shown in figure in 6, is tagged to 'PLC_106 PUT counter_CV'.

The other modifications that were completed were adding commands and status to the station, such as the Pneumatic station which had 5 commands and 10 status. The commands and status are tagged to the corresponding tags in the tag lists, the status 'simulate' will be tagged to the 'PLC 102_Pneumatic-Simulate' tag in the program tag list. This station is shown in the appendix below in figure 11. The Hydraulic station has 6 commands and 3 status, the commands and the status are matched to the corresponding tags. The example of this is the status 'finished' will be tagged to 'PLC 104_Hydraulic – Finished' this status will show when the hydraulic has finished moving to the set destination. The Vision station has 6 commands and 4 status. The command 'Test Handle CH2' is matched to 'Vision Test Handle CH2' tag in the program tag list. The other commands and status are tagged to their corresponding tags from the list. The process station has 14 commands and 4 status, the status 'Process Can Pick' is tagged to PLC 103 Process Can Pick' in the tag list. The Water Recirculation station has 4 commands and 7 status, the command which is tagged in the screenshot in figure 15 in the appendix, is 'Manual Mode' this command is tagged to 'PLC 105_Water Recirc – Manual Mode' in the program tag list. The other commands and status have been tagged to the corresponding tags from the list.

Task 7 – Complex System Design – Team Modifications

The team modifications that were completed are adding ProfiNet counters into each of the stations which are shown in the screenshots in the appendix. The modifications were creating and animating the manipulator so it as it moves along the track the little manipulator will move to the corresponding place. In the process station information was needed for the FC535, LC541 and TC511 loop data, the data that needed to be added into the process station page was SP, Error, Ki, Kp, Kd, PV, CV and for PV a graphic object is required.

Task 8 – Conclusions and Recommendations

Learning what VoT means and how it can improve the industries, it can be used so people can work or test remotely. The skills of creating and editing siemens complex systems has improved.

Task 9 – Team Working

The benefits of having equality and diversity while conducting the tasks is that the views and ideas will be difference from difference backgrounds. People of difference backgrounds will have different experiences which will influence their decisions.

Task 10 – Citation List

Correct method of listing.

BYTESNAP, N/A. *UKCA and CE Marking – what you need to know*. [Online]

Available at: <https://www.bytesnap.com/news-blog/ukca-and-ce-marking/#:~:text=1.,proves%20compliance%20with%20UK%20legislation.>
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Available at: [https://blog.msasafety.com/what-safety-integrity-level-means/#:~:text=It%20is%20a%20common%20misconception,failure%20on%20demand%20\(PFD\).](https://blog.msasafety.com/what-safety-integrity-level-means/#:~:text=It%20is%20a%20common%20misconception,failure%20on%20demand%20(PFD).)
[Accessed 14 3 2023].

Siemens, N/A. *Implement simple web visualization quickly*. [Online]

Available at: <https://www.siemens.com/global/en/products/automation/simatic-hmi/wincc-unified/view-of-things-web->

[hmi.html#:~:text=The%20View%20of%20Things%20function,PLC%20into%20your%20automation%20concepts.](#)

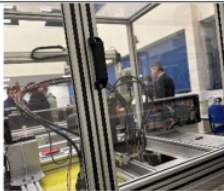
[Accessed 1 04 2023].

Task 11 – Appendix

Hazard Evaluation			
Hazard Title	Guard Protection		
Description	The machine does not have any guarding around it, so while it is		
	running there is no protection for the workers on the machine		
	from moving parts.		
HR – Risk Estimation & Evaluation			
Degree of Possible Harm	25	Possibility of Occurrence	6
Possibility of Avoidance	5	Frequency of Exposure	5
Hazard Rating Number	3750	Summary Level	Very High Risk

$$\text{HRN} = \text{DPH} \times \text{PA} \times \text{PO} \times \text{FE} = 25 * 5 * 6 * 5 = 3750$$

Hazard Mitigation			
Risk Reduction Description	The guarding should be placed around the machine to reduce		
	the risk of fatalities from this machine.		
Applied Standards		BS EN IEC 62046:2018	
		BS EN ISO 13851:2019	
HR – Risk Mitigation Evaluation			
Degree of Possible Harm	5	Possibility of Occurrence	4
Possibility of Avoidance	4	Frequency of Exposure	5
Hazard Rating Number		Summary Level	
HR – Possible Residual Risk & Mitigation	Fit the guarding protection around the machine		

Hazard Evaluation			
Hazard Title	No locks on the guarding		
Description	The panel cannot be safely locked while the machine is		
	running, this means the workers on the machine can access that		
	moving machine while it is running.		
HR – Risk Estimation & Evaluation			
Degree of Possible Harm	8	Possibility of Occurrence	4
Possibility of Avoidance	2.5	Frequency of Exposure	3
Hazard Rating Number	240	Summary Level	High Risk

$$HRN = DPH \times PA \times PO \times FE = 8 \times 2.5 \times 4 \times 3 = 240$$

Hazard Mitigation			
Risk Reduction Description	Locks should be placed on the doors to safely lock the panel		
	door to stop workers from accessing the panel once the		
	machine starts to run.		
Applied Standards	BS EN ISO 13856-1:2013	BS EN ISO 13851:2019	
	BSI PD ISO/TR 24119		
HR – Risk Mitigation Evaluation			
Degree of Possible Harm	4	Possibility of Occurrence	3
Possibility of Avoidance	2	Frequency of Exposure	2
Hazard Rating Number		Summary Level	
HR – Possible Residual Risk & Mitigation	Fit locks to the guarding around the moving arm		

Hazard Evaluation			
Hazard Title	Cables in the control panel		
Description	The cables in the control panel have the incorrect feral sizes,		
	this means the cables are not secured properly in the terminals.		
	Another hazard with this is the bare cables can be seen when		
	the cables are not in the feral properly.		
HR – Risk Estimation & Evaluation			
Degree of Possible Harm	4	Possibility of Occurrence	4
Possibility of Avoidance	7	Frequency of Exposure	6
Hazard Rating Number	672	Summary Level	Very High Risk

$$\text{HRN} = \text{DPH} \times \text{PA} \times \text{PO} \times \text{FE} = 4 * 7 * 4 * 6 = 672$$

Hazard Mitigation			
Risk Reduction Description	The cables should be disconnected then the ferals should be		
	replaced with the correct size and make sure the cables are in		
	the ferals so no bare cables are showing.		
Applied Standards	EN 50525-2-11	BS EN 60204-1:2018	
	BS 6724		
HR – Risk Mitigation Evaluation			
Degree of Possible Harm	3	Possibility of Occurrence	3
Possibility of Avoidance	5	Frequency of Exposure	4
Hazard Rating Number		Summary Level	
HR – Possible Residual Risk & Mitigation	Rewire the control panel with the correct ferals for the cable size		

Hazard Evaluation			
Hazard Title	No shielding underneath the machine		
Description	There's no shielding around the bottom of the machine, this		
	does not stop anyone or anything from climbing underneath the		
	machine while it is running.		
HR – Risk Estimation & Evaluation			
Degree of Possible Harm	25	Possibility of Occurrence	2.5
Possibility of Avoidance	2.5	Frequency of Exposure	5
Hazard Rating Number	781.25	Summary Level	Very High Risk

$$HRN = DPH \times PA \times PO \times FE = 25 \times 2.5 \times 2.5 \times 5 = 781.25$$

Hazard Mitigation			
Risk Reduction Description	Shielding should be placed around the bottom of the machine to		
	stop workers from accessing the bottom of the machine while it		
	is running.		
Applied Standards	BS EN ISO 14119:2013	BS EN ISO 14120:2015	
	BS EN IEC 62046:2018		
HR – Risk Mitigation Evaluation			
Degree of Possible Harm	5	Possibility of Occurrence	2
Possibility of Avoidance	2	Frequency of Exposure	4
Hazard Rating Number	80	Summary Level	
HR – Possible Residual Risk & Mitigation	Fit shielding around the base of the machine		

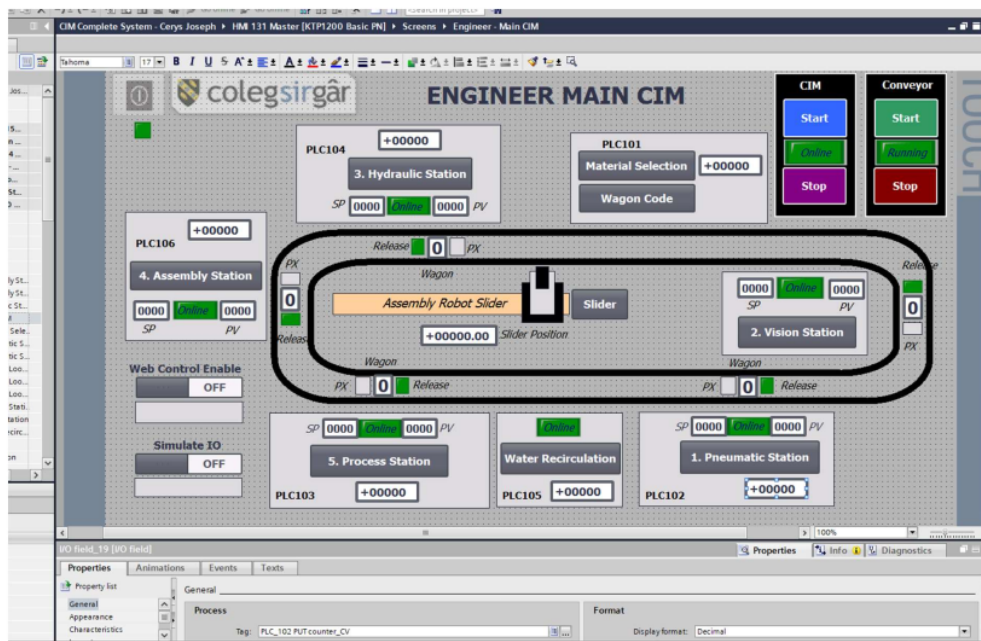


Figure 2 Engineer Main CIM PLC_102 Tag Screenshot

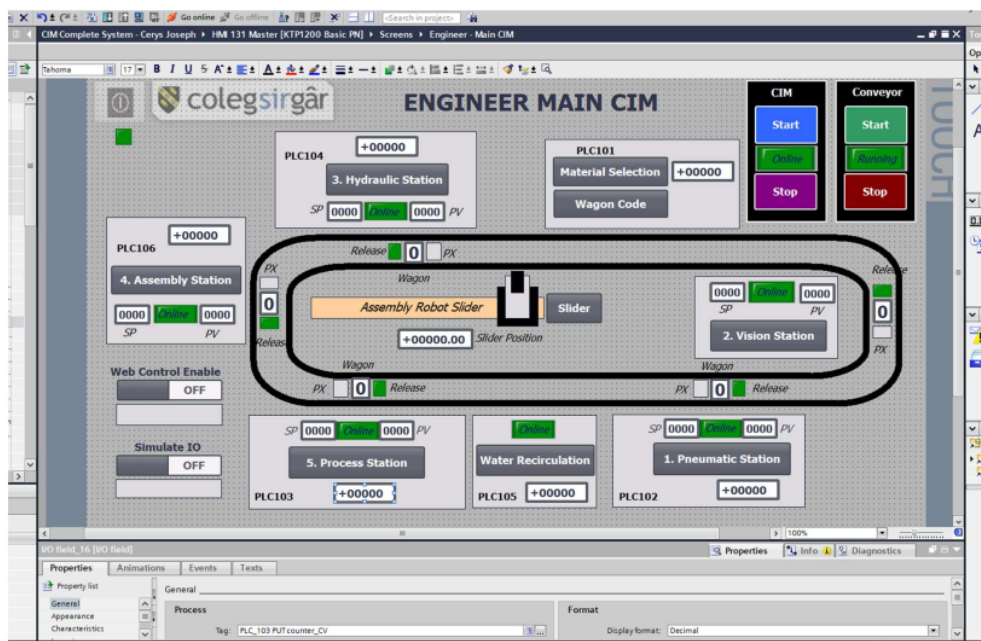


Figure 3 Engineer Main CIM PLC_103 Tag Screenshot

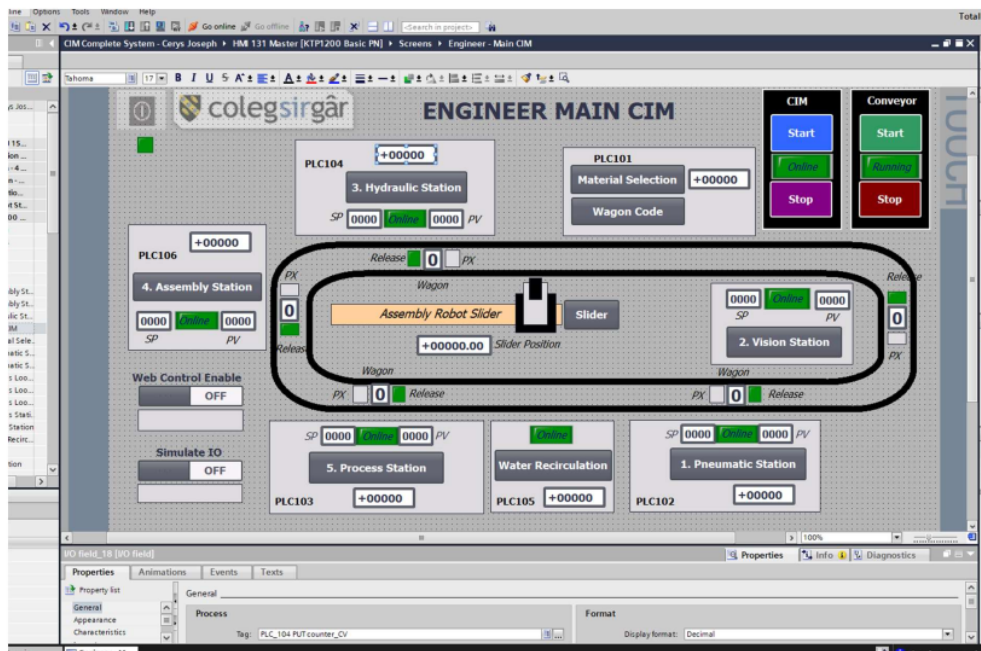


Figure 4 Engineer Main CIM PLC_104 Tag Screenshot

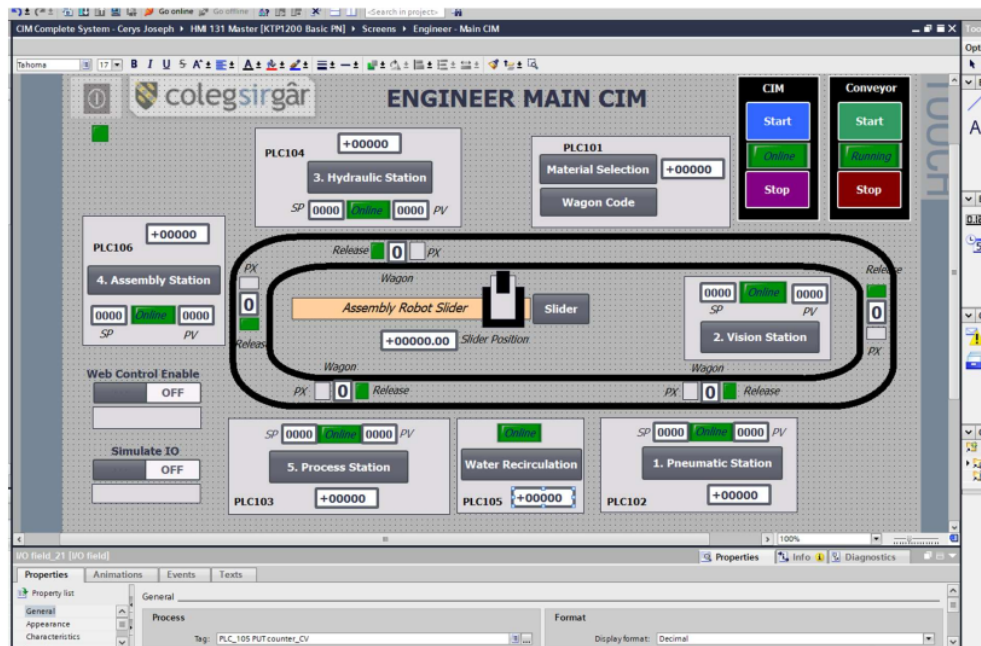


Figure 5 Engineer Main CIM PLC_105 Tag Screenshot

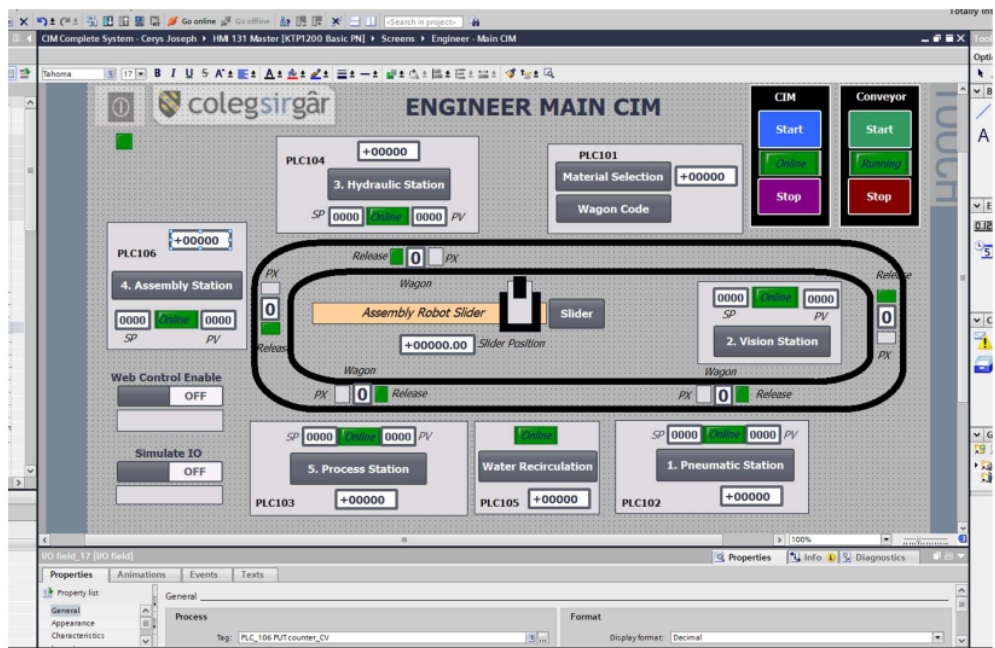
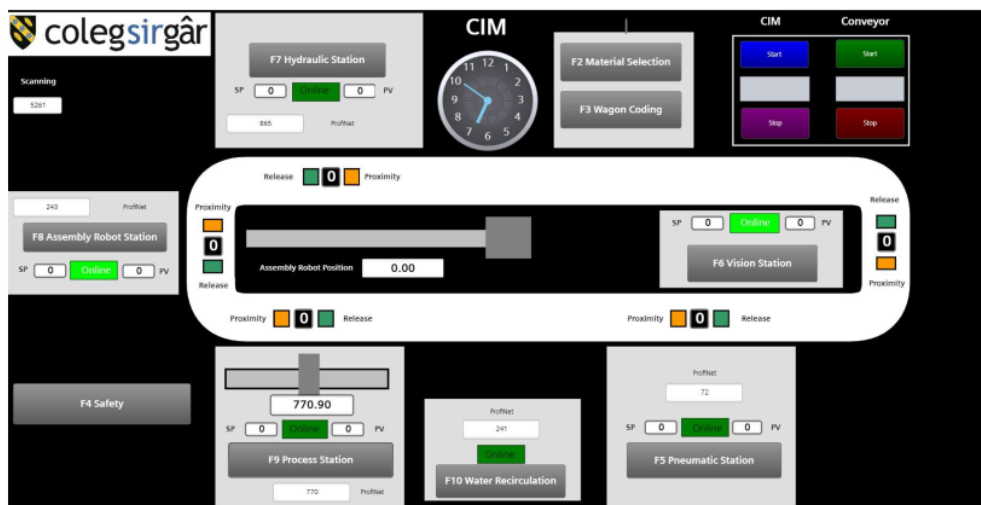


Figure 6 Engineer Main CIM PLC_106 Tag Screenshot



Figure 7 Team Mods - Main CIM 1



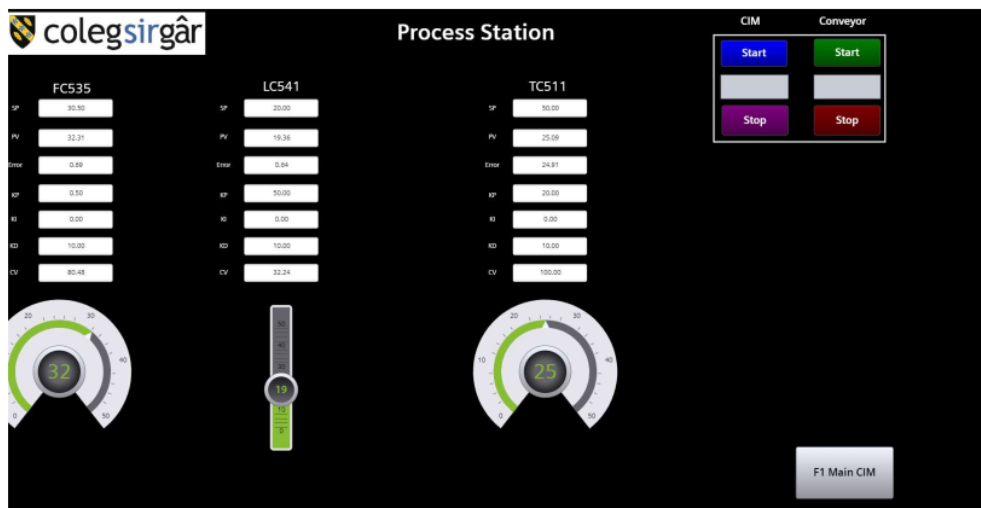


Figure 10 Team Mods - Process Station

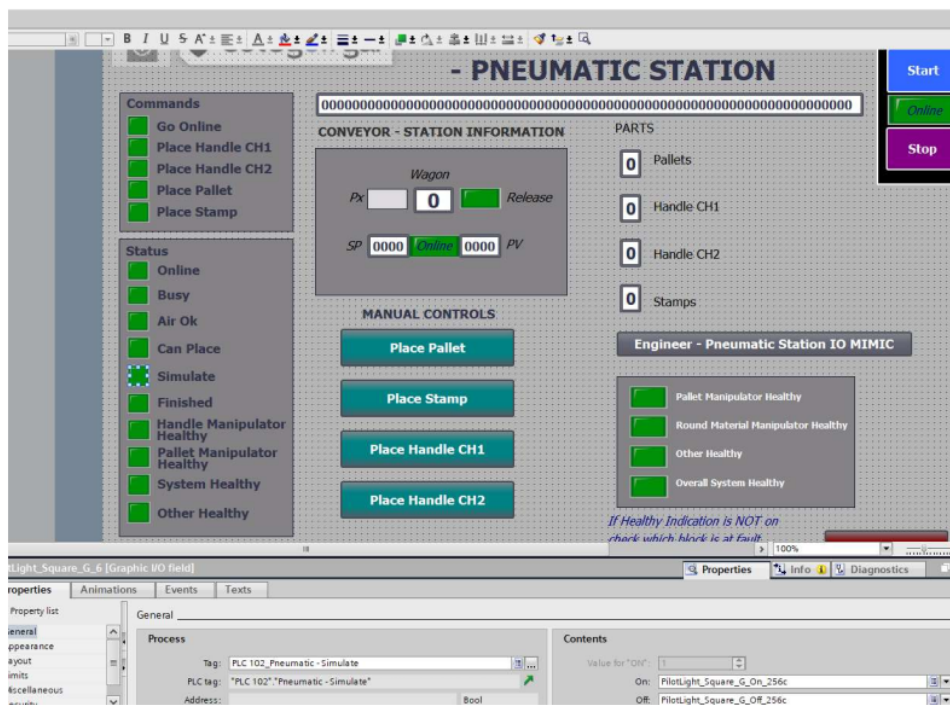


Figure 11 Pneumatic Station Screen

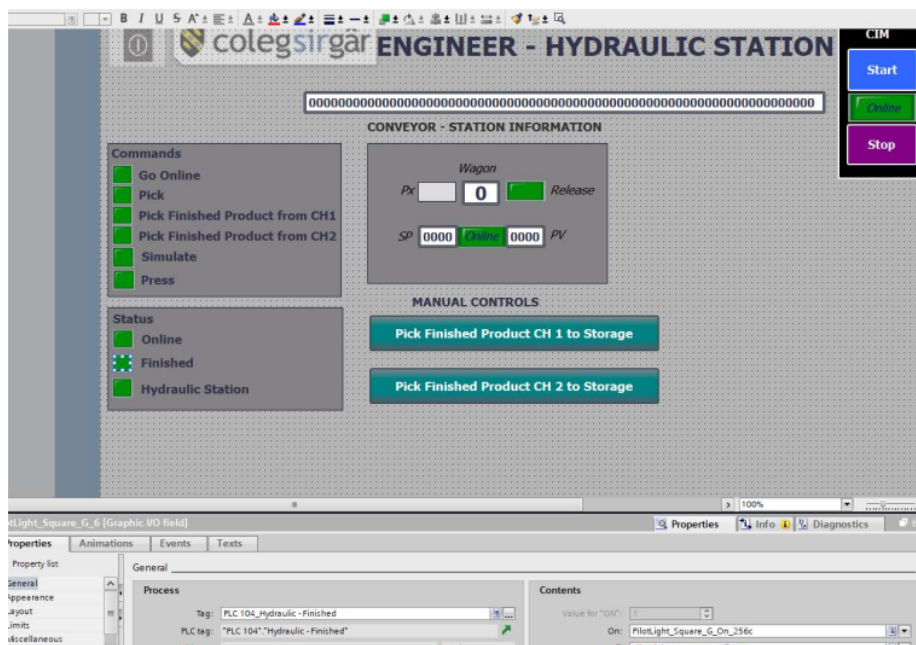


Figure 12 Hydraulic Station Screen



Figure 13 Vision Station Screen

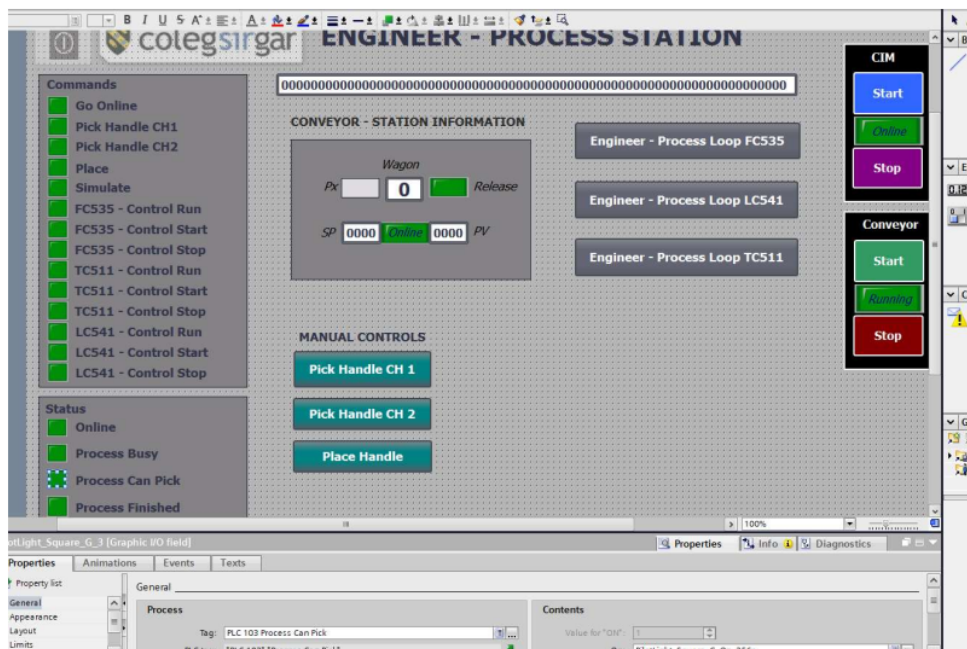


Figure 14 Process Station Screen

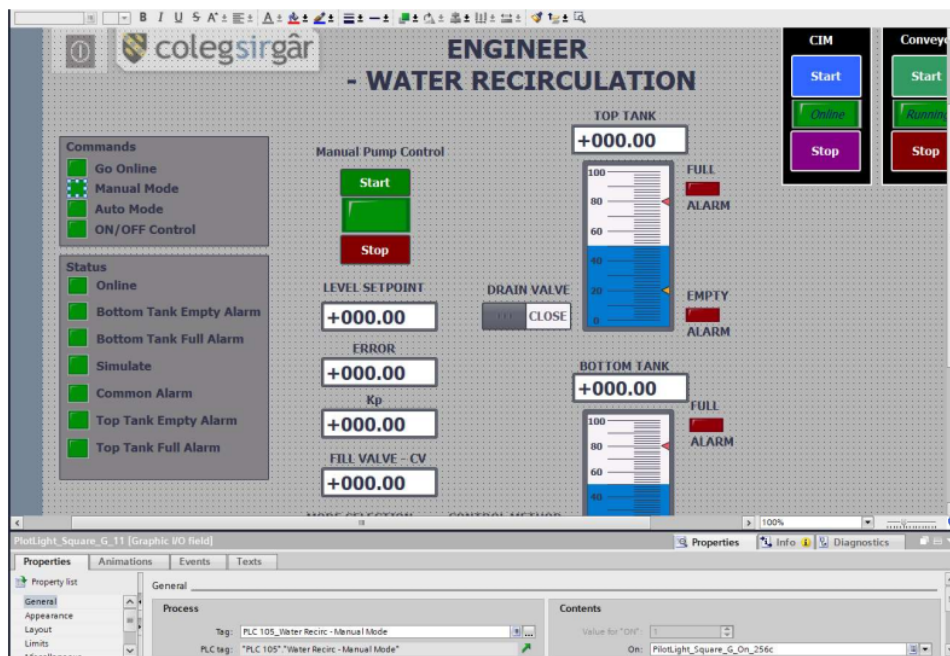


Figure 15 Water Recirculation Station

FINAL GRADE

GENERAL COMMENTS

Instructor

58/100

PAGE 1

PAGE 2

QM

Good Structure

Report is structured exactly as stated in the assignment brief.

PAGE 3

Text Comment. This should be risks of working

Text Comment. This part belongs in section 4.

PAGE 4

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

QM

Correctly cited

Citation method conforms to Harvard standard, well done.



Correctly cited

Citation method conforms to Harvard standard, well done.



Correctly cited

Citation method conforms to Harvard standard, well done.



Correctly cited

Citation method conforms to Harvard standard, well done.

Text Comment. Some topics are missing.

Text Comment. You should have referred to your Hazard tables in the appendix



Good range of sources

You have demonstrated reading from a good range of sources shown by your list below



Correct method of listing.

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

PAGE 18

PAGE 19

PAGE 20

PAGE 21

PAGE 22

PAGE 23

GRADING FORM: NEW CSG-RUBRIC

CERY'S JOSEPH

58

1. ENGAGEMENT WITH LITERATURE



A good research section with evidence of reading from a wide range of sources cited and listed correctly using the Harvard method as seen in sections 2 and 10. 14/20

14

2. KNOWLEDGE AND UNDERSTANDING



Some knowledge and understanding demonstrated in all report sections and particularly sections 3, 4 and 5. 10/20

10

3. COGNITIVE AND INTELLECTUAL



Some evidence of analysis through testing for team work but not individual work and no testing table for results, with brief conclusions and recommendations. 8/20

8

4. PRACTICAL APPLICATION



Some evidence of practical work with both individual and team work on VoT web server mods. No results for individual simulations. 14/20

14

5. TRANSFERABLE SKILLS



A brief work plan and no risk assessment of working practice. Good explanation of team working. Report is well structured, well written and correctly presented. Good clear diagrams. Word count not exceeded. 12/20

12