

2117261

by Elias Thomas

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Name: Elias Thomas

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Task 1 - Work Plan for Lifelong Learning and Risk Assessment

This reads more like an introduction

The assignments purpose is to research and identify instrumentation and integrated automation system and understand them. These systems are typically used in modern manufacturing industries. A system located in Coleg Sir Gar will be researched and modified, this is located in room G8 in the college. The system is called the CIM system (Computer Integrated System). A number of HMI's are used and an array of PLCs, these are integrated with a range of instrumentation. When working as a team, all genders and ethnicities will be respected. New legislation and regulations such as UKCA/EU marks have been understood after conducting the assignment.

See appendix for risk assessment.

Not a full list of things to do

Task 2 – Research

Safety Integrated Level

Safety integrated level (SIL) is a safety standard that is used in industry from IEC 61508. It focuses on functional safety. SIL is a safety rating, the rating is based on the frequency and severity of the hazards. It determines in terms of probability failure on demand. (Instrumentation, 2020) SIL is used further then to conclude what risk reduction precautions are needed, given by a safety function. The rating also determines the execution required to maintain safety. (Perforce, 2021) There are four levels of ratings. They are SIL 1, SIL 2, SIL 3 and SIL4. The higher the safety level, the higher the SIL rating and the increase of safety safeguards needed. (MSafety, 2022)The probability of failure is expressed as a value, as seen in figure one.

Safety Integrity Level	Probability of Failure on Demand	Risk Reduction Factor
SIL 4	$\geq 10^5$ to $< 10^4$	100,000 to 10,000
SIL 3	$\geq 10^4$ to $< 10^3$	10,000 to 1,000
SIL 2	$\geq 10^3$ to $< 10^2$	1,000 to 100
SIL 1	$\geq 10^2$ to $< 10^1$	100 to 10

Figure 1 SIL rating table

(Perforce, 2021)

Performance Level

Performance level (PL) regarding ISO 13849-1:2006 is a rating given to a safety function to determine how long it can perform its purpose under the foreseeable conditions. The parts in the functional safety system must equal to or higher the performance level. Similarly, to SIL, PL has a different rating. (Controls, 2022) The performance level is listed using the letters A, B, C, D, E. From figure two, the PL rating is determined by the severity of the injury, frequency and exposure time, possibility of avoiding the hazard. It also takes into consideration Mean time to dangerous failure MTTFd (Pilz, 2021).

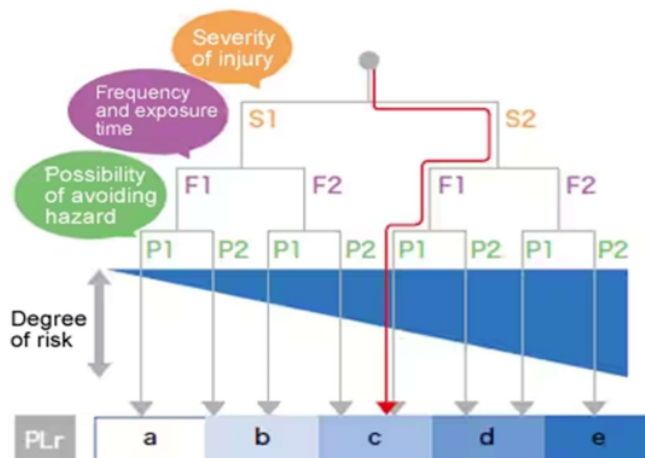


Figure 2 PL rating chart

(Controls, 2022)

UKCA/CE

UKCA and CE markings are the legal framework behind machinery safety. The CE mark is used for Europe (European conformity) and UKCA is used for the UK. To be able to mark a product with the markings, the product must be tested to its rated power, designs specification and its production limits. To meet the European environmental, health and safety requirement. This is the same for the UKCA mark, however in the UK. (HSE, 2022) A product with the markings comes with either a declaration of conformity (DC) or a declaration of incorporation (DI). DC involves that the product has met all requirements for it to conform to the legislative requirements of the mark. DI signifies that the product hasn't met the requirements. It is in need to confirm to the Essential health and safety requirements (EHSR) of the machinery directive. A DI is incomplete to conform fully to the CE mark; however, the product should come with a list of requirements needed to be implemented to meet the mark. (Batt, 2023)

Internet safety

Network safety is paramount. As without it, an external source could have access to interconnected systems, and cause a catastrophe. To combat this, networks can be protected by firewalls. A firewall uses the parties' data being sent and received and filters the network traffic. Depending on the customers security needs. (point, 2020) Another form of security is encryption. This essentially places a password on the network.

CIM system

The legislation that would apply to the CIM system are SIL and PL. The system needs a thorough risk assessment to determine its performance level of its safety features, and to determine if more safety features by doing so, thus a 1200 risk assessment can be taken. Table 1 is an example of a risk assessment of the CIM system. The other legislation applicable is a CE mark, and a declaration of incorporation. All safety equipment purchased while still in the EU, must have this mark, and its DI/DC checked.

Citation Needed

Task 3 – System Overview and Operation

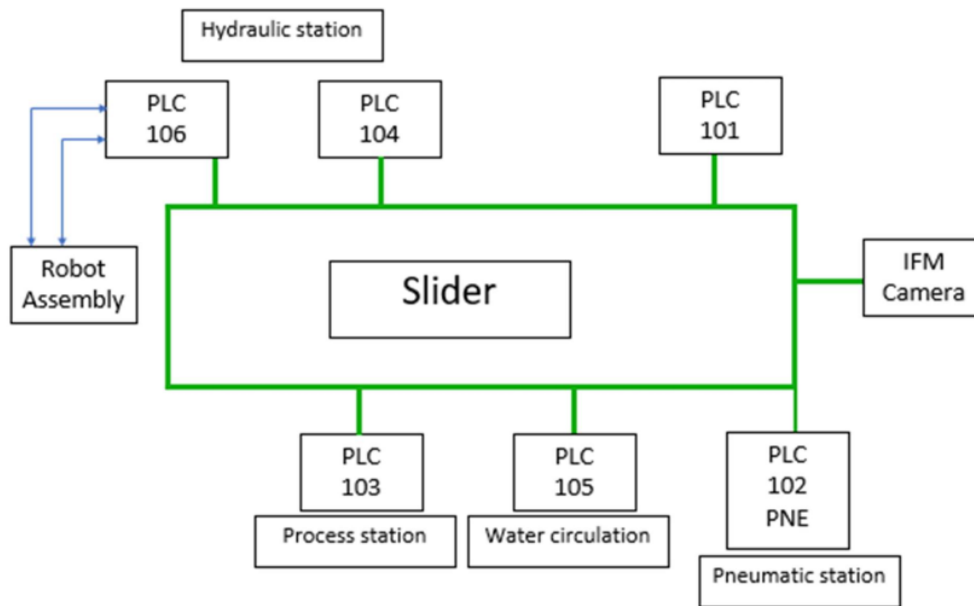


Figure 3 Network diagram

PLC communication

There are five master PLCs, one slave PLC (101) and three HMIs all communicating together through profinet and the use of IP addresses. All are physically connected by data cables. The sole slave contains a data block for storing data to and from each master PLC, also a function calls for marshalling data. The master PLCs also have a data block storing data from and to the slave. The Profinet handshaking signals used are put and get. This is the communication of data within the data blocks. The communication is initiated by the master PLC.

Wagon tracking system

The wagon tracking system uses five proximity detectors (PD) to determine what wagon is at the station. These five PDs are used to form a binary code. At the bottom of the wagon there are metal disks to form its unique binary code, thus if there is a code of (0 0001). It's wagon number one. The PDs are sent to the PLC as inputs from right to left as %0.0 to %0.04. there is also a separate PD used to determine if the wagon is at the station. There is also a wagon release. This is an output actuator and will release after its task is concluded.

Camera inspection system

The camera system uses an IFM OD200 vision sensor to inspect the wagon to determine if the part passes or fails. This is on the network and communicates through Profinet. The cameras pass or fail capability is programmed externally on an online software. This software is given applications and is told if it should pass or fail the part. When looking at the string coming back, the fifth character is monitored and if it's a P, it's a pass. If it's a F, it's a failure.

Assembly robot

The assembly robot is controlled by using PLC 106 (S7-1212c) with a digital and RS232 modules, and slider relays. This is needed as the robot doesn't have profinet communication. There are handshake signals with PLC 106 and Mitsubishi. An RS232 module allows the program to be stored. The Robot is programmed using basic language. An array of string was built. The program has 250 lines of code. It uses bits and bytes and monitors them. If the bit is – it is 0, and if its + it's a 1. At the start of the program, it is self-checking itself and waiting to go online. Bit 0 is go online. Once this achieved it retreats to a home position again self-checking waiting for its next instruction. This is line 30 in the code. Line 30 tells the robot to go to line 10.

A good attempt at all parts

Task 4 - Health and Safety, and the Environment

From the information discovered from the research. It is suitable to suggest checking all UKCA/CE markings on the CIM. By doing this a declaration of incorporation may be found and the part may not comply with the marking. Making it invalid to be marked with UKCA/CE. A 1200 risk assessment can also be undertaken on the CIM system. By doing this, hazards can be highlighted, and further precautions be taken to make it safer, and work out its total mission time to determine when to change components. As some parts may have been passed their lifecycle. This also ties in with the Performance level rating (PL), this could also be applied to the systems risk assessment.

You could have referred to your appendix Hazard tables

The CIM system uses electricity, this has been a topic of discussion in recent times. As most of the UK's electricity is produced by fossil fuels. This has a detrimental impact on the environment. To combat that, a renewable source of electricity can be installed. In form of solar panels and/or small wind turbines. The renewable electricity can be stored in a battery. These two methods of renewable energy are ideal as the local area has a constant stream of wind and sun.

Task 5 - Maintenance, Reliability and Commercial Risk

For a maintenance worker, the Use the third Person a remote platform such as View of Things (VoT) is priceless. This is because you are not tied down to a stationary piece of equipment and depending on where the HMI/computer screen is. It may be detrimental to diagnosing a problem if one was to arise. The VoT I on a server and can be accessed by visiting the web page by using the IP address (10.13.90.101), username (VoT), password (CIM_system_#v17) and be displayed on a portable tablet. If it has access to the network through Wi-Fi. When using the VoT, it has all indication on the handshaking signals back and forth from PLC101 and the rest of the PLC's, which is also good for maintenance. This creates a reliable system to be maintained.

The system can be made more secure by implementing a fire wall. This filters the data being sent and received and protects the system being accessed by an outside source. The VoT web page is already protected by a password. But if this is found out, there is access to all actions. A suggestion to be made is to enter your college credentials to perform tasks that could move equipment and only allow a view only mode without.

Task 6 – Complex System Design – Individual Modifications

This task includes solo modifications to the CIM system. These mods are to ensure the system conforms to industry 4.0 and to improve its performance.

The work done was to insert indication of handshaking signals between PLC 101 and the desired PLC to the engineer's screen on HMI 131. This was done by tagging the LEDs with the PUT/GET from the data blocks they are stored. Also, a profinet counter on all stations. Other mods included indicating AIR OK and Photobeam OK. Another mod was to show the sliders linear drive distance. This was done by dynamizing the slider and tagging "linear slider distance", and insert the minimum and maximum value of its movement.

To test the modifications, a simulation was taken place. PLC 101 was simulated and pressed run once it shows. As seen in figure 6. Then simulate the HMI 131 and the simulate toggle on the HMI was selected along with CIM RUN. To test the slider moving. It was required to go online in PLC DB 30106 and manually change "assembly robot slider" to a desired length. This can be seen in figure 8 and 10.

Test number	Description	Expected result	Actual result	Pass or fail
1	Profinet counters to be counting and AIR OK and Photobeam ok are illuminating	For profinet counters for each station are counting and AIR OK and Photobeam OK are on	Profinet counters for each station are counting and AIR OK and Photobeam OK are on	P Figure 5
2	The Assembly Robot Slider to move from right to left according to the Linear Drive Distance	To see the slider move	Slider moved	P Figure 7,9
3	Engineer Pneumatic Station screen show indicators for handshaking signals	Handshaking indication to be illuminated	Indication illuminated	P Figure 12
4	Engineer Process Station screen show indicators for handshaking signals	Handshaking indication to be illuminated	Indication illuminated	P Figure 13
5	Engineer Hydraulic Station screen show indicators for handshaking signals	Handshaking indication to be illuminated	Indication illuminated	P Figure 14
6	Engineer Water recirculation screen show indicators for handshaking signals	Handshaking indication to be illuminated	Indication illuminated	P Figure 15
7	Engineer assembly station screen show indicators for handshaking signals	Handshaking indication to be illuminated	Indication illuminated	P Figure 16
8	Engineer vision station screen show indicators for handshaking signals	Handshaking indication to be illuminated	Indication illuminated	P Figure 17

Figure 4 Individual modifications testing table

Task 7 – Complex System Design – Team Modifications

This task included a small team and further system modification to the VoT webpage have been produced.

The work produced was again using PLC 101 and HM 131, the engineers main CIM page. The following was added. A profinet counter for each station on the HMI. The next mod was to display the process station slider and animate its position, this was done by tagging the slider "Process robot position for VoT int" and a position indicator this was tagged "Process robot position" from PLC 103 this can be seen in figures 20, 21, 22. Another mod was to add the FC535, LC541, and TC511 loop data to the process station page. This was done by tagging the information from their respected loop. Which is DB30103 in PLC 103. A graphic object was also added for each loops PV.

These changes were tested by downloading to the mater PLC 101 and downloading HMI 131. By entering IP address (10.13.90.101), username (VoT), password (CIM_system_#v17) into an online search engine. The web page can be accessed, ensuring the web enable feature is on.

Test number	Description	Expected result	Actual result	Pass or fail
1	ProfiNet counter for each station as shown on the HMI	For the counter to count	Counter counted	P Figure 17
2	The process station slider to move when the slider moves	For the slider to move when operated	Slider moved	P Figure 18,19,20
3	FC535 LC541 TC511 loop data	SP, PV, Error, Kp, Ki, Kd, CV and a graphic object for the PV for loops FC535 LC541 TC511	SP, PV, Error, Kp, Ki, Kd, CV and a graphic object for the PV shown	P Figure 21

Figure 5 Team modification test table

Task 8 – Conclusions and Recommendations

The information attained whilst conducting this assignment is relevant to industry, current standards and legislations. Whilst accomplishing the modifications, a method was clearly established, which can be transferred to a work place application. This includes risk assessments also; these risk assessments give an idea on how the CIM system safely operates and its mission time. This was completed by using the safety integrated level and performance level.

By completing regular maintenance, the system is deemed reliable and by placing the HMI on an online interface such as View of Things. It creates an extra angle to the maintenance routine. This can help with fault finding and identifying failures. This can be done by using data logging and plotting trends. This feature can prevent failures before it happens. A suggestion to be investigated is the use of a renewable energy source. This will be cost effective and good for the environment.

Another recommendation could be to create a management of change (MOC) procedure. This standardises any changes completed to the CIM system. This includes a comprehensive risk assessment, which should include the mission time of all components, a SIL rating and a PL rating. When a change is made all modifications to drawing must be updated. Another feature of a MOC is to keep a list of all components and where from was the purchase was taken. Then stock at least one in stock in spares. Therefore, if there was a failure of a component, there will no time lost due to waiting for spares.

An additional modification could be the change of the assembly robot. The robot uses an outdated language of 'Basic', and an outdated communication method of using a RS232 module. To change the robot to a robot with profinet capabilities, the maintenance and reliability of the system will highly increase, as there are less components to maintained, and the current robot's panel can be disposed of. Then the new robot can simply be placed on the network and be controlled using handshaking signals.

Task 9 – Team Working

The group included Kyran, Harri and Elias. In the group each member had a role during the testing. This was discussed and agreed on in the planning period. All work completed was done in a respectful manner, and everyone respected each other's religions and genders. For each test every member changed roles when going into the next test. Working as a team performed well when discussing different methods of completing modifications.

Task 10 – Citation List

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[Accessed 21 April 2023].

Task 11 – Appendix

Risk assessment				
Risk rating	What is the risk	Person at risk	Precautions	New rating
Medium	Acid burns from acid bath	Student	Wear correct PPE and stay clear of the area	Low
High	Moving objects	Student	Stay alert and don't operate with a crowd	Medium
Low	Electric shock	Student	Test for dead and E-stops	Low
Medium	Compressed air	Student	Correct and be aware	Low
Low	Trip hazard	Student	Cover mat to cover cables	Low
Medium	Moving objects (Robot)	Student	When operated stay clear of robot	Low
Low	Pneumatic valve failing	Student	When operated stay clear of robot, routine checks	Low
Low	Hydraulic contamination	Student	When operated stay clear of robot, routine checks	Low

Severity/Consequence				
		Slightly harmful (1)	Harmful (2)	Extremely harmful (3)
Likelihood	Highly unlikely (1)	Trivial risk (Score 1)	Tolerable risk (Score 2)	Moderate risk (Score 3)
	Unlikely (2)	Tolerable risk (Score 2)	Moderate risk (Score 4)	Substantial risk (Score 6)
	Likely (3)	Moderate risk (Score 3)	Substantial risk (Score 6)	Intolerable risk (Score 9)

Figure 6 CIM risk assessment

Table 1 1200 Risk Assessments

Hazard Evaluation			
Hazard Title	Hazards associated with environments which the machine is used.		
Description	Stagnant water not treated when not in use. (legionnaires disease		
			
HR – Risk Estimation & Evaluation			
Degree of Possible Harm	5	Possibility of Occurrence	1.25
Possibility of Avoidance	2.5	Frequency of Exposure	5
Hazard Rating Number	78.125	Summary Level	Significant

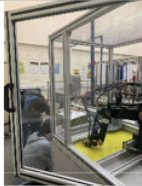
$$HRN = DPH \times PA \times PO \times FE$$

Hazard Mitigation			
Risk Reduction Description	An alarm to be raised on the HMI once a month to treat the water.		
	The alarm would interlock the CIM system and will only unlock		
	when the task is complete, and the alarms is acknowledged		
Applied Standards			
HR – Risk Mitigation Evaluation			
Degree of Possible Harm	5	Possibility of Occurrence	1.25
Possibility of Avoidance	0.75	Frequency of Exposure	5
Hazard Rating Number	23.44	Summary Level	Low Risk

HR – Possible Residual Risk & Mitigation	Signage to be erected		
Hazard Evaluation			
Hazard Title	Mechanical – machinery mobility		
Description	A moving robot guarded but not interlocked		
			
HR – Risk Estimation & Evaluation			
Degree of Possible Harm	8	Possibility of Occurrence	2.5
Possibility of Avoidance	2.5	Frequency of Exposure	2
Hazard Rating Number	100	Summary Level	Significant

$$\text{HRN} = \text{DPH} \times \text{PA} \times \text{PO} \times \text{FE}$$

Hazard Mitigation			
Risk Reduction Description	Interlocked guarding using a safety PLC		
Applied Standards			
HR – Risk Mitigation Evaluation			
Degree of Possible Harm	8	Possibility of Occurrence	0.05
Possibility of Avoidance	0.75	Frequency of Exposure	2
Hazard Rating Number	0.6	Summary Level	Negligible

HR – Possible Residual Risk & Mitigation	Signage to be erected – Moving parts		
Hazard Evaluation			
Hazard Title	Mechanical – high pressure		
Description	High pressure hydraulics guarded but not interlocked.		
			
HR – Risk Estimation & Evaluation			
Degree of Possible Harm	11	Possibility of Occurrence	1.25
Possibility of Avoidance	0.75	Frequency of Exposure	1
Hazard Rating Number	10.3	Summary Level	Very low risk

$$\text{HRN} = \text{DPH} \times \text{PA} \times \text{PO} \times \text{FE}$$

Hazard Mitigation			
Risk Reduction Description	Interlocked guarding using safety PLC		
Applied Standards			
HR – Risk Mitigation Evaluation			
Degree of Possible Harm	8	Possibility of Occurrence	0.05
Possibility of Avoidance	0.75	Frequency of Exposure	2
Hazard Rating Number	0.6	Summary Level	Negligible

HR – Possible Residual Risk & Mitigation		Signage to be erected – high pressure	
/Hazard Evaluation			
Hazard Title		Electric shock	
Description		The panel has not got an interlocking isolator and is accessible	
		When not locked.	
			
HR – Risk Estimation & Evaluation			
Degree of Possible Harm	40	Possibility of Occurrence	2.5
Possibility of Avoidance	0,75	Frequency of Exposure	3
Hazard Rating Number	225	Summary Level	High risk

$$\text{HRN} = \text{DPH} \times \text{PA} \times \text{PO} \times \text{FE}$$

Hazard Mitigation			
Risk Reduction Description	To install an interlocking isolating method.		
Applied Standards			
HR – Risk Mitigation Evaluation			
Degree of Possible Harm	40	Possibility of Occurrence	0.05
Possibility of Avoidance	0.75	Frequency of Exposure	3
Hazard Rating Number	4.5	Summary Level	Negligible

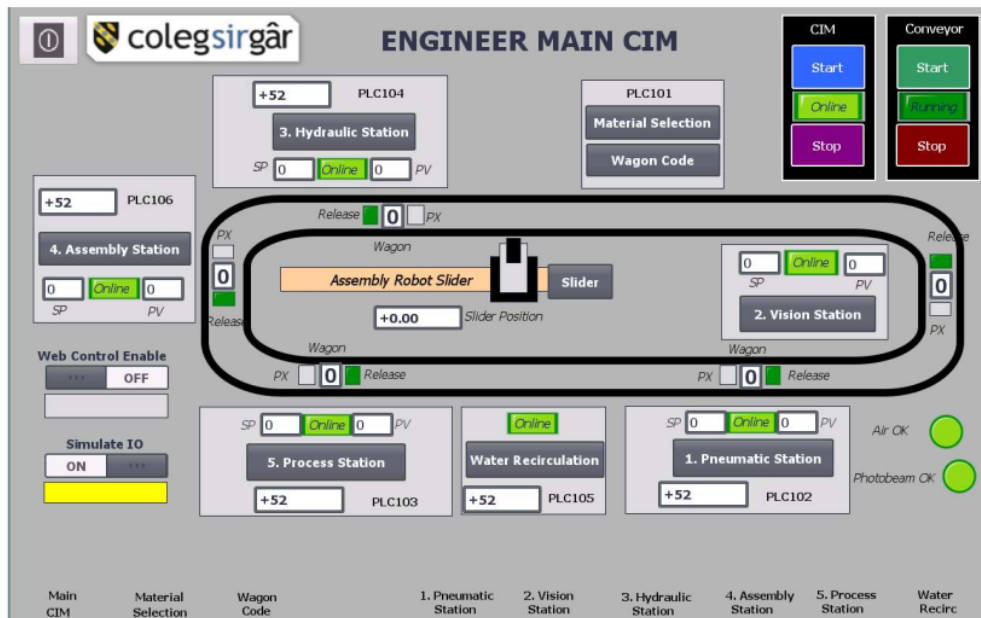


Figure 7 Solo mod profinet counter



Figure 8 Simulated PLC

CIM Complete System - Student Version ▶ PLC 101 Master - 0 [CPU 1511F-1 PN] ▶ Program blocks ▶ PLC 106 [DB30106]

Keep actual values Snapshot Copy snapshots to start values Load start values as actual values

PLC 106

	Name	Data type	Offset	Start value	Monitor value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint
46	Assembly Robot Slider...	Bool	33.5	false	FALSE	☐	☒	☒	☒	☐
47	Assembly Robot Slider...	Bool	33.6	false	FALSE	☐	☒	☒	☒	☐
48	Assembly Robot Slider...	Bool	33.7	false	FALSE	☐	☒	☒	☒	☐
49	Assembly Robot Slider...	Bool	34.0	false	FALSE	☐	☒	☒	☒	☐
50	Assembly Robot Slider...	Bool	34.1	false	FALSE	☐	☒	☒	☒	☐
51	Assembly Robot Slider...	Bool	34.2	false	FALSE	☐	☒	☒	☒	☐
52	Assembly Robot Slider...	Bool	34.3	false	FALSE	☐	☒	☒	☒	☐
53	Put Bit 20	Bool	34.4	false	FALSE	☐	☒	☒	☒	☐
54	Put Bit 21	Bool	34.5	false	FALSE	☐	☒	☒	☒	☐
55	Put Bit 22	Bool	34.6	false	FALSE	☐	☒	☒	☒	☐
56	Put Bit 23	Bool	34.7	false	FALSE	☐	☒	☒	☒	☐
57	Put Bit 24	Bool	35.0	false	FALSE	☐	☒	☒	☒	☐
58	Put Bit 25	Bool	35.1	false	FALSE	☐	☒	☒	☒	☐
59	Put Bit 26	Bool	35.2	false	FALSE	☐	☒	☒	☒	☐
60	Put Bit 27	Bool	35.3	false	FALSE	☐	☒	☒	☒	☐
61	Put Bit 28	Bool	35.4	false	FALSE	☐	☒	☒	☒	☐
62	Put Bit 29	Bool	35.5	false	FALSE	☐	☒	☒	☒	☐
63	Put Bit 30	Bool	35.6	false	FALSE	☐	☒	☒	☒	☐
64	Put Bit 31	Bool	35.7	false	FALSE	☐	☒	☒	☒	☐
65	Assembly Robot Slider...	Word	36.0	16#0	16#0000	☐	☒	☒	☒	☐
66	Put Word 3	Word	38.0	16#0	16#0000	☐	☒	☒	☒	☐
67	Put Word 4	Word	40.0	16#0	16#0000	☐	☒	☒	☒	☐
68	Put Word 5	Word	42.0	16#0	16#0000	☐	☒	☒	☒	☐
69	Put Word 6	Word	44.0	16#0	16#0000	☐	☒	☒	☒	☐
70	Assembly Robot Slider...	Word	46.0	16#0	16#0100	☐	☒	☒	☒	☐
71	Assembly Robot Slider...	Real	48.0	0.0	100.0	☐	☒	☒	☒	☐

Figure 10 PLC 106 30106

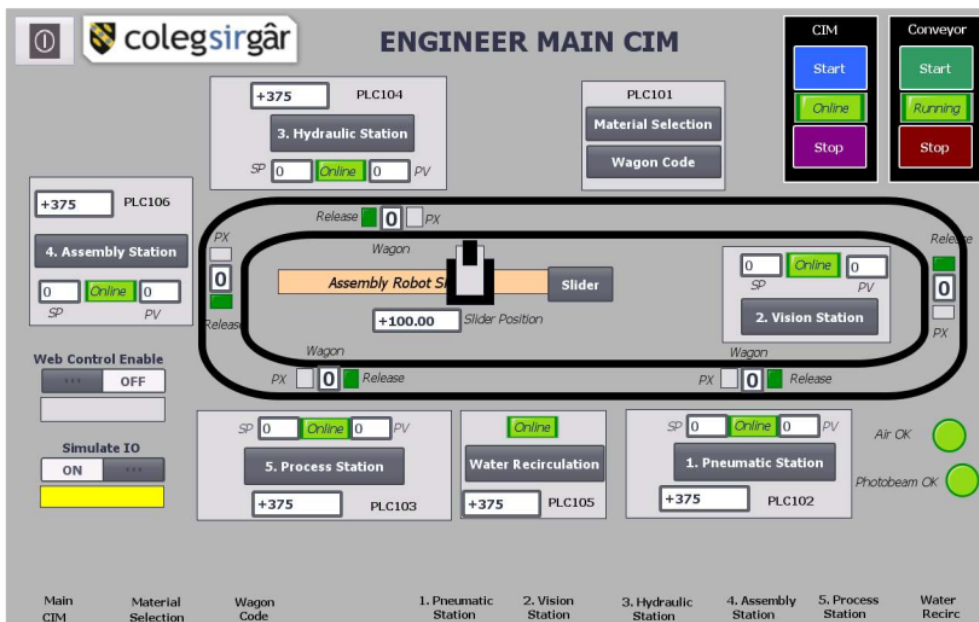


Figure 9 Slider moved #1

CIM Complete System - Student Version ▶ PLC 101 Master - 0 [CPU 1511F-1 PN] ▶ Program blocks ▶ PLC 106 [DB30106]

Keep actual values Snapshot Copy snapshots to start values Load start values as actual values

PLC 106

	Name	Data type	Offset	Start value	Monitor value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint
46	Assembly Robot Slider...	Bool	33.5	false	FALSE		☒	☒	☒	
47	Assembly Robot Slider...	Bool	33.6	false	FALSE		☒	☒	☒	
48	Assembly Robot Slider...	Bool	33.7	false	FALSE		☒	☒	☒	
49	Assembly Robot Slider...	Bool	34.0	false	FALSE		☒	☒	☒	
50	Assembly Robot Slider...	Bool	34.1	false	FALSE		☒	☒	☒	
51	Assembly Robot Slider...	Bool	34.2	false	FALSE		☒	☒	☒	
52	Assembly Robot Slider...	Bool	34.3	false	FALSE		☒	☒	☒	
53	Put Bit 20	Bool	34.4	false	FALSE		☒	☒	☒	
54	Put Bit 21	Bool	34.5	false	FALSE		☒	☒	☒	
55	Put Bit 22	Bool	34.6	false	FALSE		☒	☒	☒	
56	Put Bit 23	Bool	34.7	false	FALSE		☒	☒	☒	
57	Put Bit 24	Bool	35.0	false	FALSE		☒	☒	☒	
58	Put Bit 25	Bool	35.1	false	FALSE		☒	☒	☒	
59	Put Bit 26	Bool	35.2	false	FALSE		☒	☒	☒	
60	Put Bit 27	Bool	35.3	false	FALSE		☒	☒	☒	
61	Put Bit 28	Bool	35.4	false	FALSE		☒	☒	☒	
62	Put Bit 29	Bool	35.5	false	FALSE		☒	☒	☒	
63	Put Bit 30	Bool	35.6	false	FALSE		☒	☒	☒	
64	Put Bit 31	Bool	35.7	false	FALSE		☒	☒	☒	
65	Assembly Robot Slider...	Word	36.0	16#0	16#0000		☒	☒	☒	
66	Put Word 3	Word	38.0	16#0	16#0000		☒	☒	☒	
67	Put Word 4	Word	40.0	16#0	16#0000		☒	☒	☒	
68	Put Word 5	Word	42.0	16#0	16#0000		☒	☒	☒	
69	Put Word 6	Word	44.0	16#0	16#0000		☒	☒	☒	
70	Assembly Robot Slider...	Word	46.0	16#0	16#0700		☒	☒	☒	
71	Assembly Robot Slider...	Real	48.0	0.0	700.0		☒	☒	☒	

Figure 12 PLC 106 30106

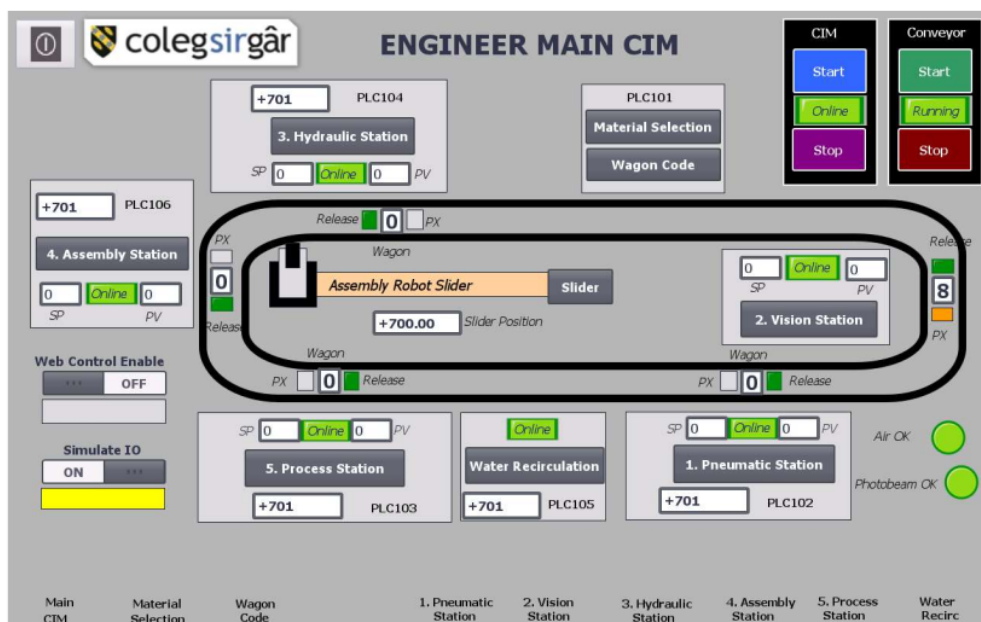


Figure 11 Slider moved #2

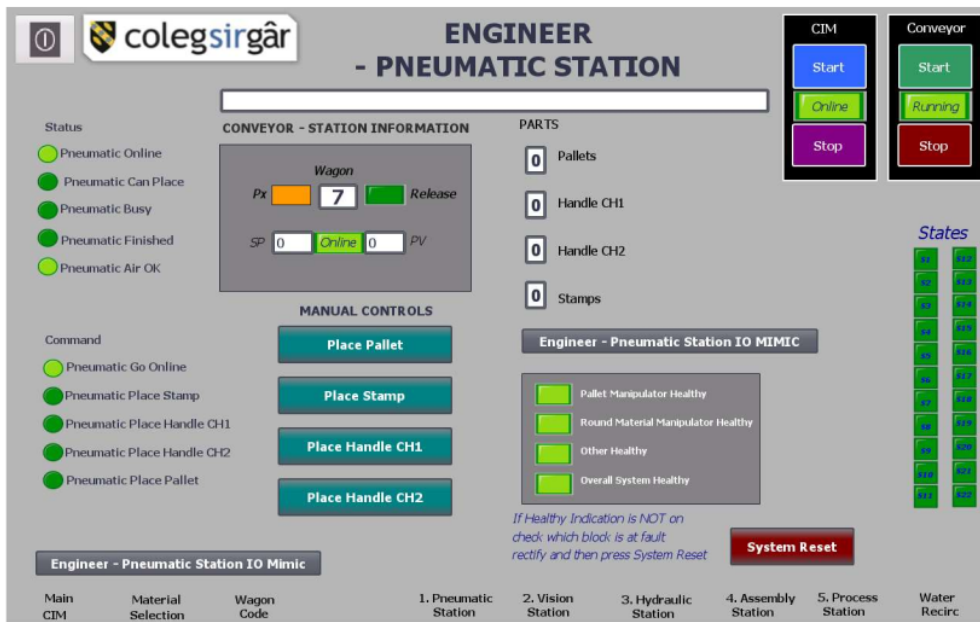


Figure 14 Engineers pneumatic HMI

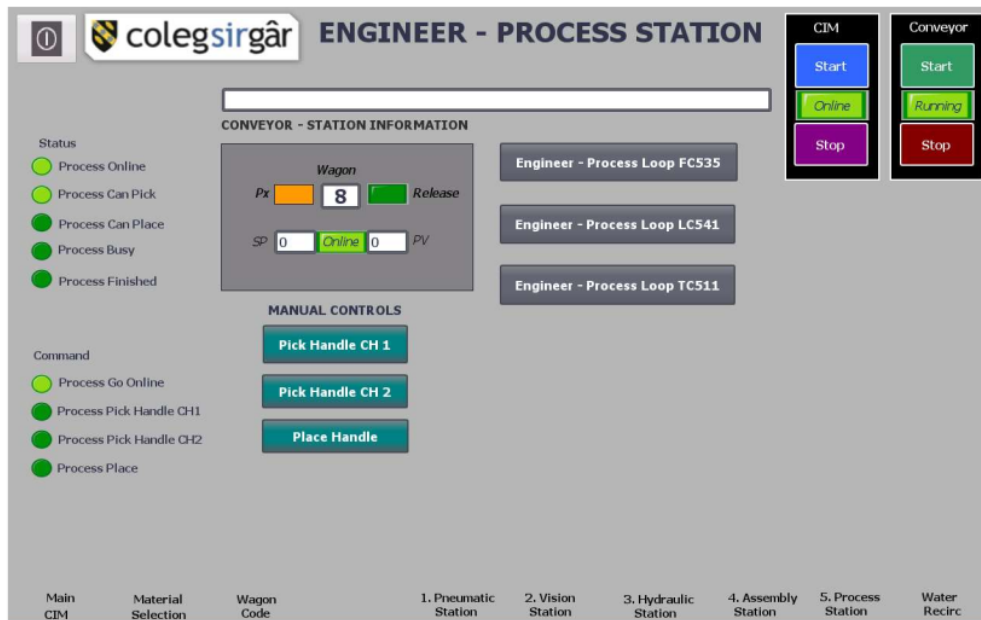


Figure 13 Engineers Process HMI

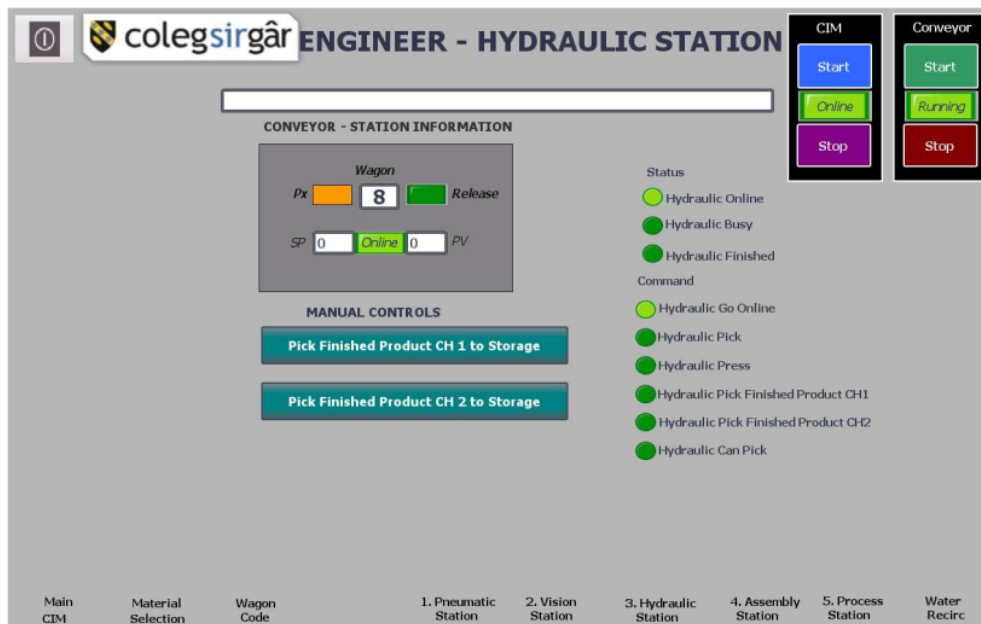


Figure 16 Engineers hydraulic HMI

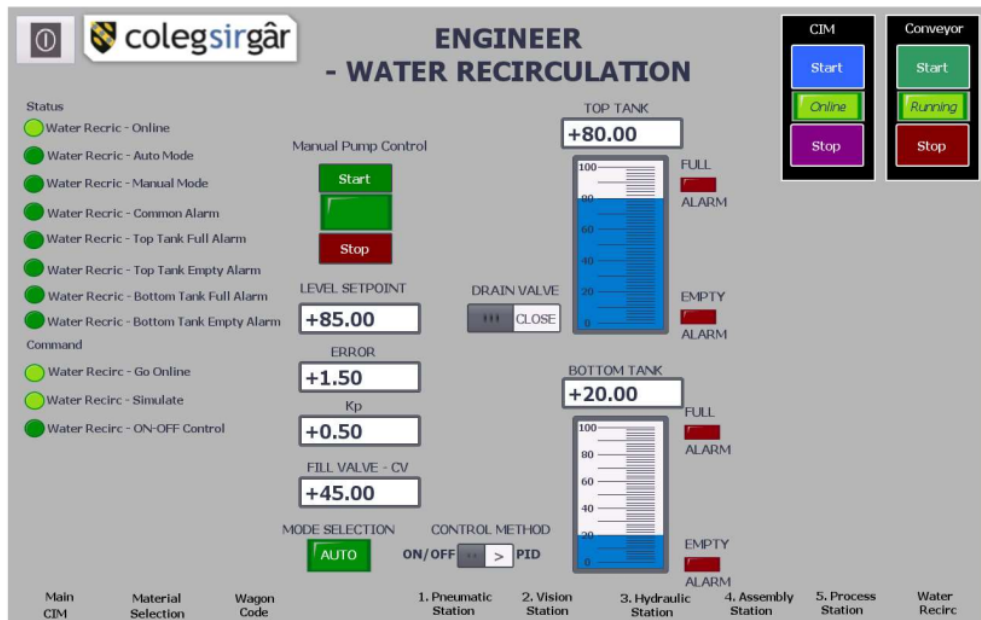


Figure 15 Engineers water recirculation HMI

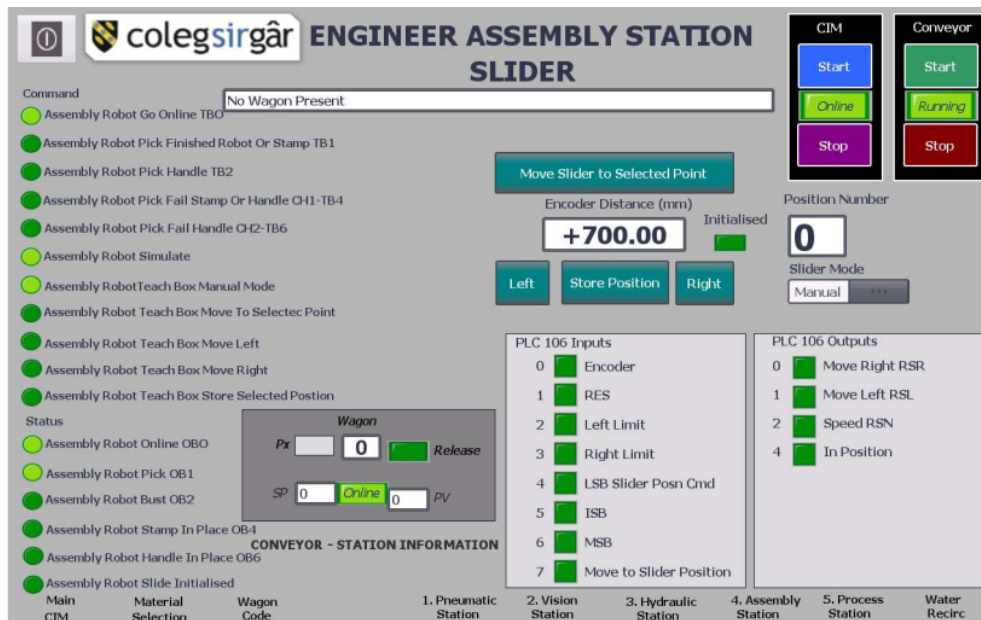


Figure 18 Engineers assembly station slider screen HMI



Figure 17 Engineers vision station HMI



Figure 19 VoT engineering HMI

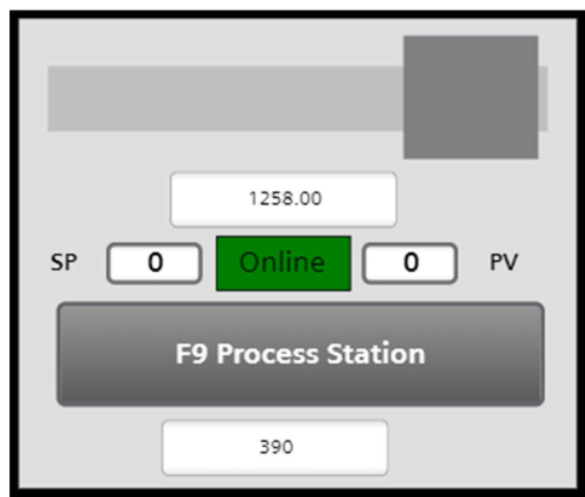


Figure 20 Slider animation #1

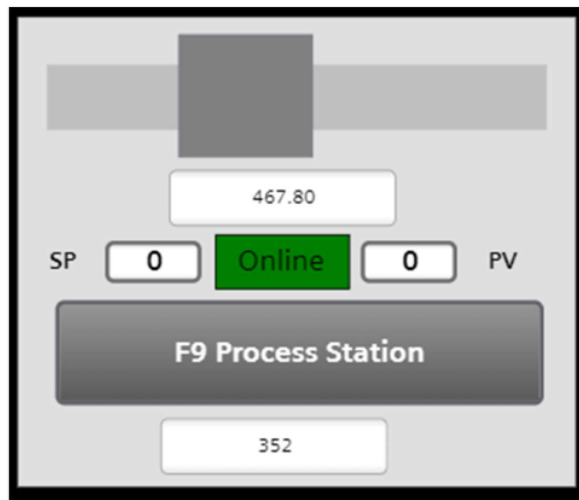


Figure 21 Slider animation #2

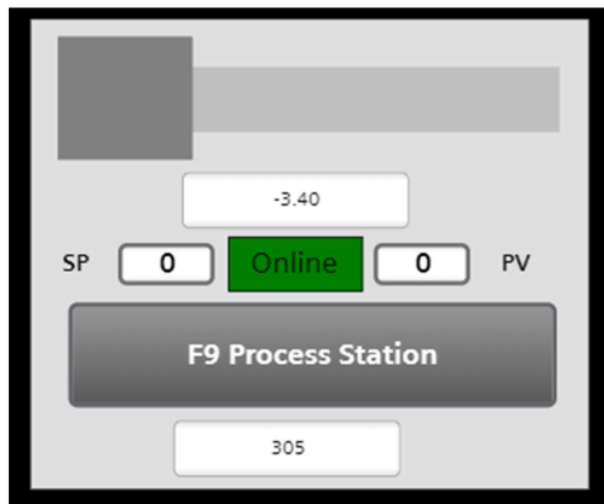


Figure 22 Slider animation #3

Process Station

Conveyor

CIM

Start

Stop

Start

Stop

Temperature

TC511

SP 50.00

Level

LC541

SP 20.00

Flow

FC535

SP 40.91

Level



Flow



Temperature



PV 26.81

PV 19.18

PV 38.71

Error 23.19

Error 0.82

Error 1.62

Kp 20.00

Kp 50.00

Kp 0.50

Ki 0.00

Ki 0.00

Ki 0.00

Kd 10.00

Kd 10.00

Kd 10.00

CV 100.00

CV 40.91

CV 80.29

F1 Main CIM

Figure 23 Process station VoT

FINAL GRADE

GENERAL COMMENTS

Instructor

78/100

PAGE 1

Text Comment. wrong title

PAGE 2



Good Structure

Report is structured exactly as stated in the assignment brief.

PAGE 3

PAGE 4

Text Comment. This reads more like an introduction

Text Comment. Not a full list of things to do

PAGE 5

PAGE 6

PAGE 7



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

PAGE 8

Text Comment. A good attempt at all parts

Text Comment. You could have referred to your appendix Hazard tables

QM

Use the third Person

You are referring to first or second persons (I, we, you, us etc) whereas you should use the third person thus depersonalising it.

QM

Correct method of listing.

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

QM

Wide Range of Sources

You have shown good evidence of reading from a wide range of sources.

PAGE 25

PAGE 26

PAGE 27

PAGE 28

PAGE 29

PAGE 30

PAGE 31

PAGE 32

GRADING FORM: NEW CSG-RUBRIC

ELIAS THOMAS

78

1. ENGAGEMENT WITH LITERATURE



A very 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. 15/20

15

2. KNOWLEDGE AND UNDERSTANDING



Very good knowledge and understanding demonstrated in all report sections and particularly sections 3, 4 and 5. 16/20

16

3. COGNITIVE AND INTELLECTUAL



Excellent evidence of analysis through testing with a good testing table for results, with good conclusions and recommendations. 16/20

16

4. PRACTICAL APPLICATION



Excellent evidence of practical work both with individual system modifications with simulation and with team work on VoT web server mods. 16/20

16

5. TRANSFERABLE SKILLS



A reasonable work plan and good risk assessment. Good explanation of team working. Report is well structured, well written and correctly presented. Good clear diagrams. Word count not exceeded. You must learn to use the third person all the time. 15/20

15