

Richard Harrison 1809806

by Richard Harrison

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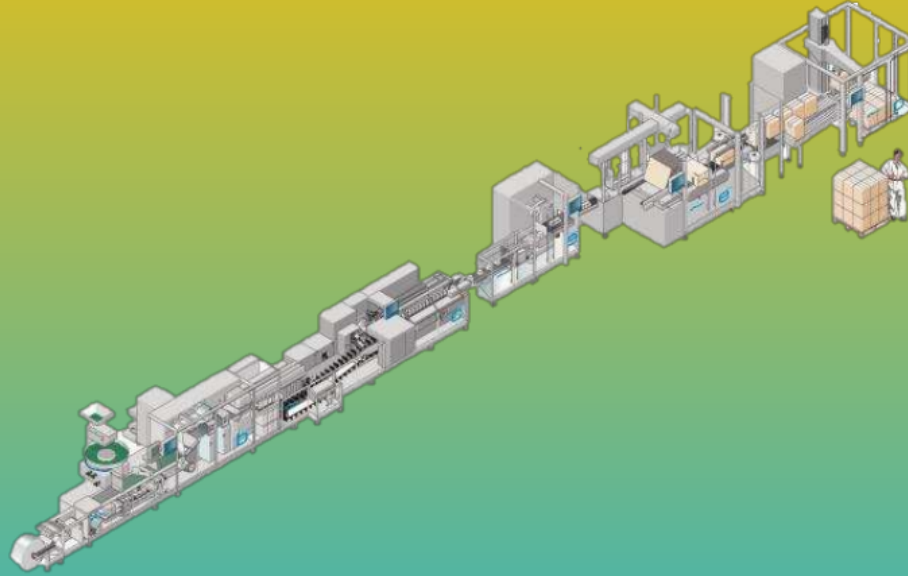
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Word count: 674

Character count: 3612

1. SCADA remote monitoring system



Presentation 2: Project design, Implementation and evaluation

Module: SGEL6000 BSc (Hons) Electrical and Electronic Engineering

Name: Richard Harrison 1809806

2. Aims + objectives

This project aims to:

- Streamline planning
- Increase running efficiencies
- Provide a line monitoring aid
- Trial the concept of monitoring lines remotely
- Trial the effectiveness of collecting and pooling running data

- **Where?** Meat processing and packaging factory
- **Scope?** Single production line with various different machines from multiple manufacturers.
- **Main objective?** Trial the possibility of using remote monitoring systems on-site.
- **If successful?** Integrate system into other lines.

3. Functional design specification (FDS)

Original deliverables:

- The HMI screen set out to show the line as a schematic/block-diagram with the state of each machine (Green for running/Red for stopped) with downtime in case of faults.
- The system must be connected to the company servers and viewable through a company gateway. **Not achieved with restrictions**
- All cabling must be off the floor and secure, modules should be inside their machines cabinets and junction boxes must be IP67 rated. **Not built due to restrictions**
- The line must be able to run without the system in case it itself, develops a fault. **Untested due to restrictions**

4. FDS

FDS item no:	Test description	Expected outcome	Actual outcome	Pass/Fail	Evidence/Reference
4.1.1	Stop + start multiple machines	HMI shows machine status changing. History shows status changing	Machine status changes for each machine	Pass	See Appendix figures 29 - 37
4.1.2	Stop + start each machine in turn	HMI must show machine green when running and red when stopped/fault	Each machine shows green when running + red when stopped	Pass	See Appendix figure 29 -37
4.1.3	Run each machine individually	Each machine should be able to run individually	Unable to perform	N/A	Unavailable
4.1.4	Using PC, log into HMI through gateway	Can access the HMI and view the line	Unable to perform	N/A	Unavailable
4.1.5	Wash down line	Cat5 junction boxes must be dry inside	Unable to perform	N/A	Unavailable
4.1.6	Turn off SCADA system	Line must run as normal	Unable to perform	N/A	Unavailable
4.1.7	Create a fault on each machine	Each machine must show a fault	Each machine in turn shows stopped/fault	Pass	See Appendix figure 29 - 37
4.1.8	Create various faults on the line	HMI must have a page recording recent faults	History tab records runtime data +machine status	Pass	See Appendix figure 39

5. Solution

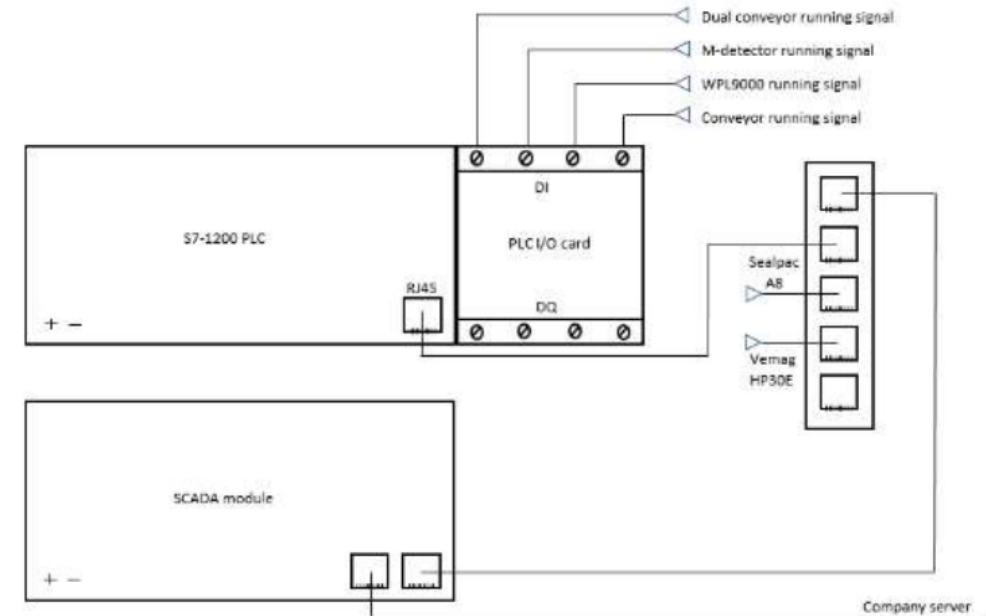
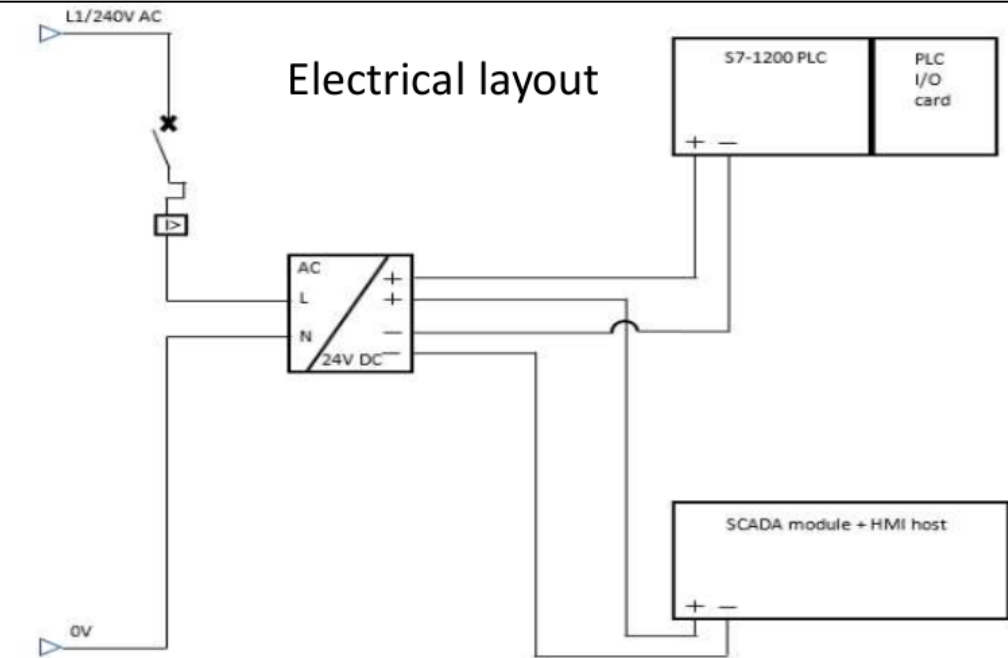
To meet the requirements for FDS:

- Most cost-effective pricing
- Increased reliability
- Simplicity to use
- Less downtime needed for installation
- No need for extra software installs on company computers
- Vastly greater compatibility with existing machines
- Less necessary modifications.

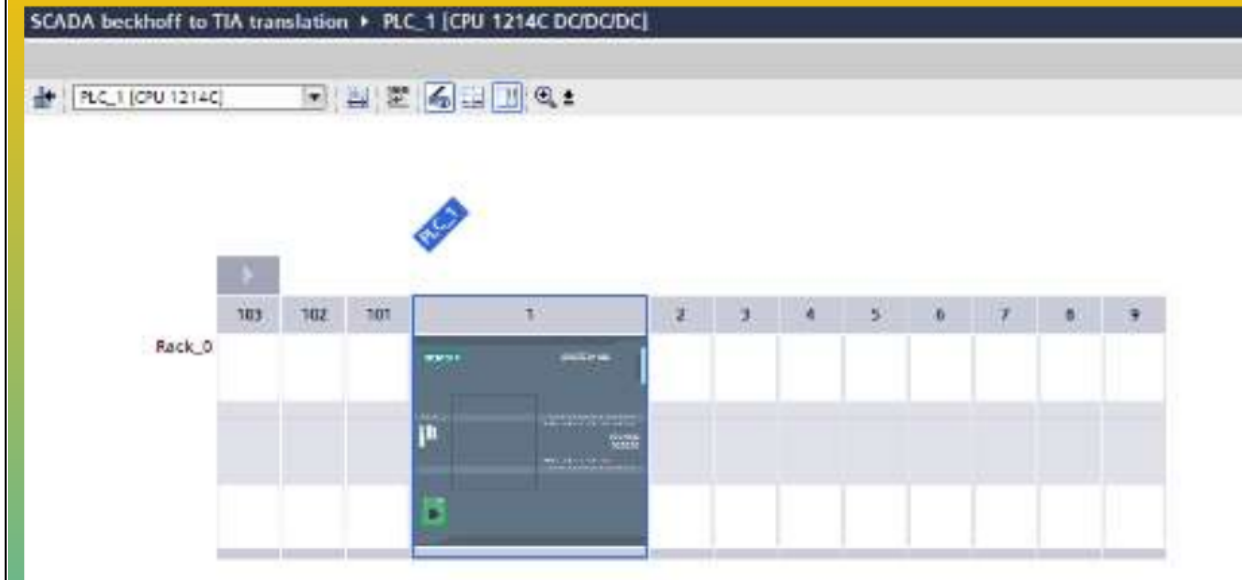
The following steps were taken:

- Simple design layout for the HMI
- Separate screen on HMI for running times
- Use of highly compatible and adaptable SCADA Ignition software

6. Construction



7. Program construction



SCADA beckhoff to TIA translation ▶ PLC_1 [CPU 1214C DC/DC/DC] ▶ Program blocks ▶ Data_block_1 [DB1]

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

Data_block_1

	Name	Data type	Start value	Retain	Accessible f...	Writa...	Visible in ...	Setpoint
1	Static							
2	ConveyorRunning	Bool	false		☒	☒	☒	
3	DualConveyorRunning	Bool	false		☒	☒	☒	
4	MarelRunning	Bool	false		☒	☒	☒	
5	VemagRunning	Bool	false		☒	☒	☒	
6	PortionerRunning	Bool	false		☒	☒	☒	
7	SealpacRunning	Bool	false		☒	☒	☒	
8	MetalDetectorRunning	Bool	false		☒	☒	☒	
9	RavenwoodRunning	Bool	false		☒	☒	☒	
10	PacksPerMinute	Int	0		☒	☒	☒	
11	<Add new>							

SCADA beckhoff to TIA translation ▶ PLC_1 [CPU 1214C DC/DC/DC] ▶ PLC tags

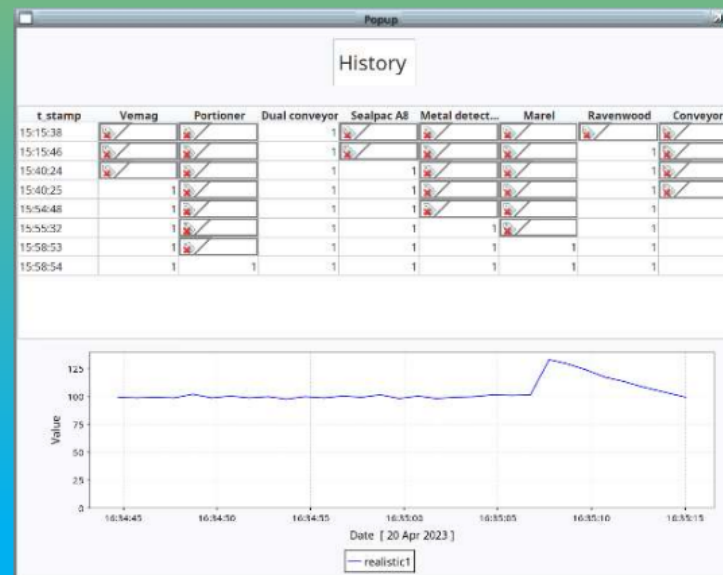
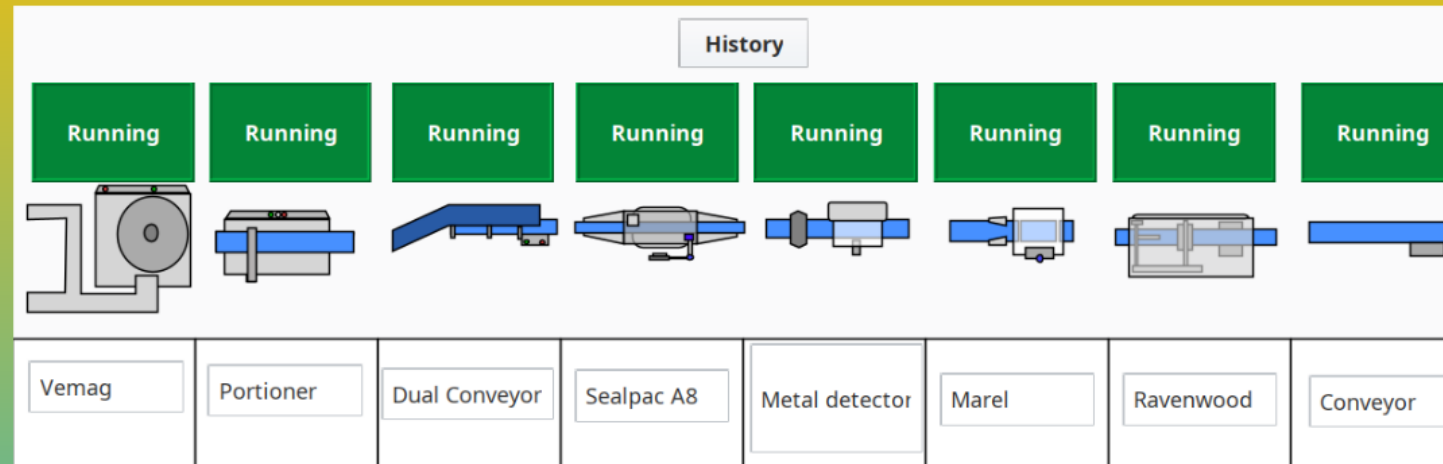
PLC tags

	Name	Tag table	Data type	Address	Retain	Acces...	Writa...	Visibl...
1	ConveyorRunning	Default tag table	Bool	%I0.0	☐	☒	☒	☒
2	DualConveyorRunning	Default tag table	Bool	%I0.1	☐	☒	☒	☒
3	MarelRunning	Default tag table	Bool	%I0.2	☐	☒	☒	☒
4	VemagRunning	Default tag table	Bool	%I0.3	☐	☒	☒	☒
5	PortionerRunning	Default tag table	Bool	%I0.4	☐	☒	☒	☒
6	SealpacRunning	Default tag table	Bool	%I0.5	☐	☒	☒	☒
7	MetalDetectorRunning	Default tag table	Bool	%I0.6	☐	☒	☒	☒
8	RavenwoodRunning	Default tag table	Bool	%I0.7	☐	☒	☒	☒
9	PacksPerMinute	Default tag table	Int	%QW1	☐	☒	☒	☒
10	<Add new>					☒	☒	☒

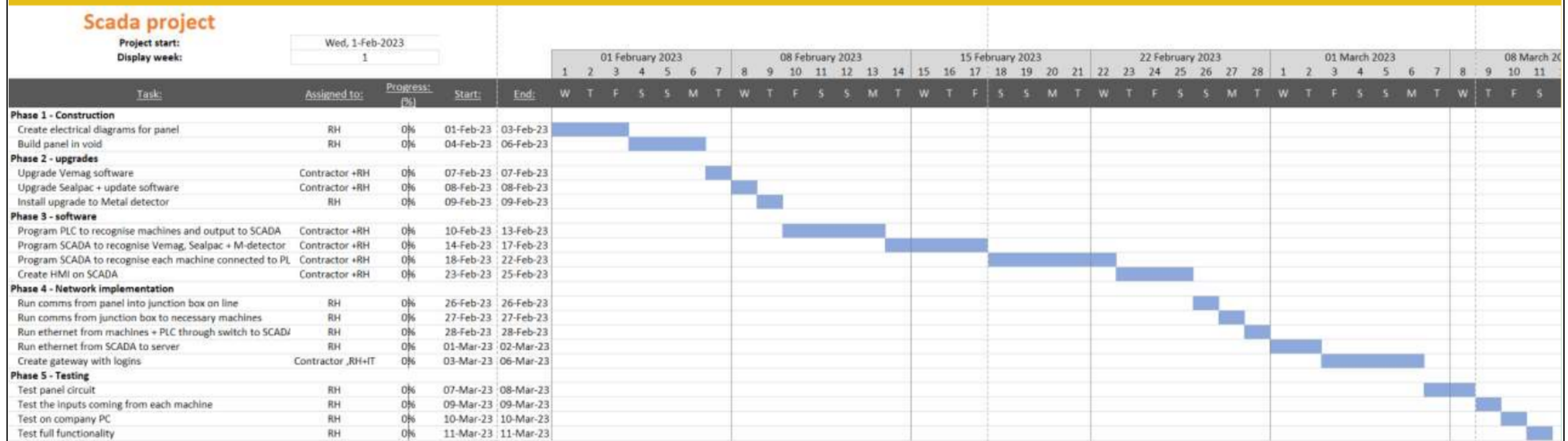
IF... CASE... OF... FOR... TO DO... WHILE... DO... (*...*) REGION

```
1 IF "VemagRunning"
2   AND "PortionerRunning"
3   AND "DualConveyorRunning"
4   AND "SealpacRunning"
5   AND "MetalDetectorRunning"
6   AND "MarelRunning"
7   AND "RavenwoodRunning"
8   AND "ConveyorRunning"
9 THEN
10   "PacksPerMinute" := 50;
11 ELSE
12   "PacksPerMinute" := 0;
13
14 END_IF;
15
```

8. Finished HMI layout (Main screen + history)

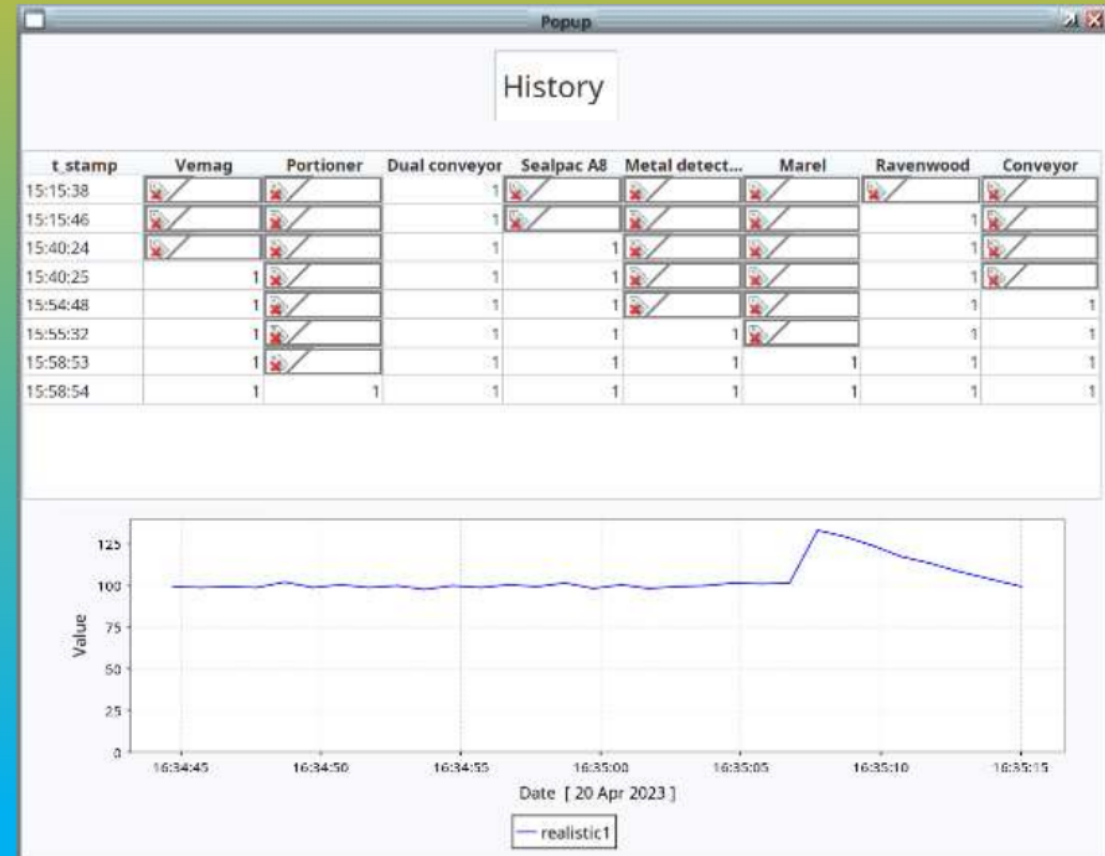
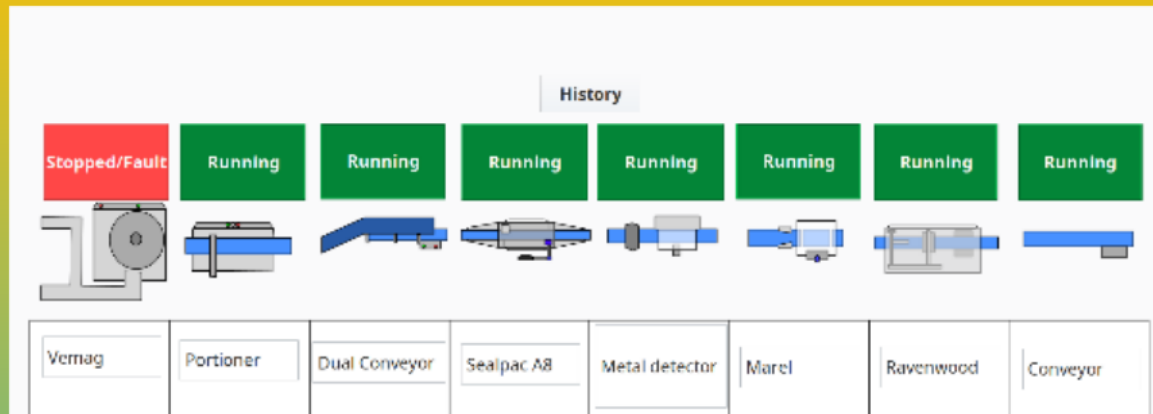


9. Original planning



- (To complete by Feb 6th, 2023) Build panel to house main system components such as SCADA unit and PLC and fit in void.
- (To complete by Feb 9th, 2023) Necessary upgrades to existing machines to be finished and software updated.
- (To complete by Feb 25th, 2023) PLC + SCADA programming completed, and HMI screen created.
- (To complete by Mar 6th, 2023) Install communications from machines to panel, install ethernet + create gateway.
- (To complete by Mar 11th, 2023) Complete testing of the system including Panel, HMI + gateway.

11. Testing solution



12. Outcome evaluation + conclusions

Conclusions

- Due to constraints, completing the project to the specification proved very difficult and sacrifices had to be made to produce a working trial of the intended result.
- Despite setbacks of trialling multiple different ways around problems, a working programme prototype was created
- If funded and supported by company, project would have been successful

Recommendations

- If done again, proper support and help would be expected in order for the project to be successful

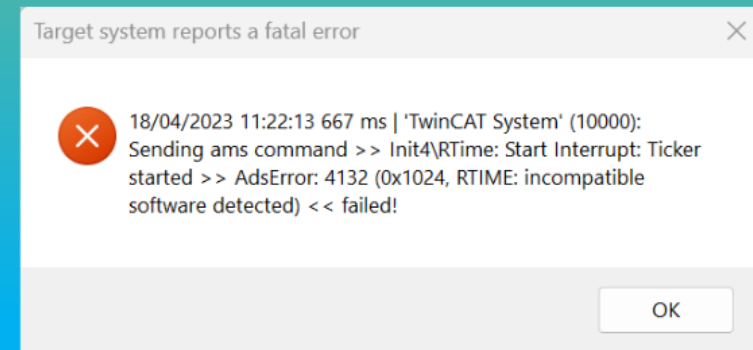
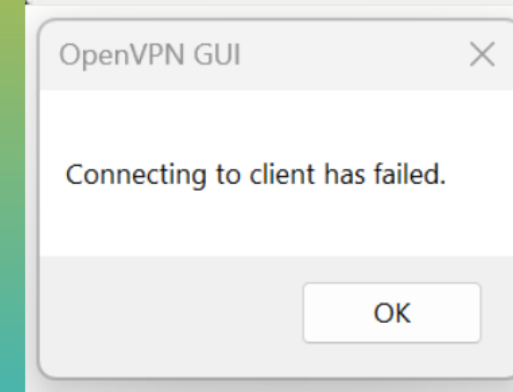
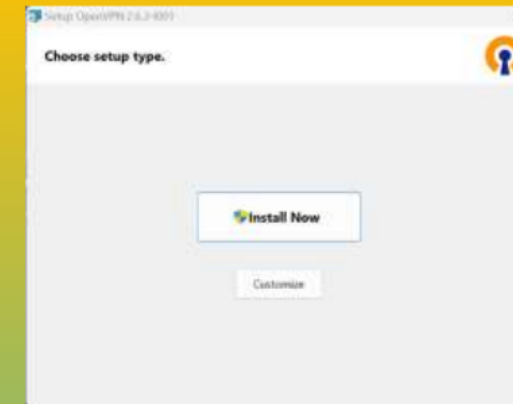
13. Problems encountered



Your PC ran into a problem and needs to restart. We're just collecting some error info, and then we'll restart for you.



	Scope	Name	Address	Data type
1	VAR_GLOBAL	ConveyorRunning		BOOL
2	VAR_GLOBAL	DualConveyorRunning		BOOL
3	VAR_GLOBAL	MarelRunning		BOOL
4	VAR_GLOBAL	VemagRunning		BOOL
5	VAR_GLOBAL	PortionerRunning		BOOL
6	VAR_GLOBAL	SealpacRunning		BOOL
7	VAR_GLOBAL	MetalDetectorRunning		BOOL
8	VAR_GLOBAL	RavenwoodRunning		BOOL
9	VAR_GLOBAL	PacksPerMinute		INT



14. Questions?

FINAL GRADE

GENERAL COMMENTS

Instructor

53/100

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PAGE 8

PAGE 9

PAGE 10

GRADING FORM: NEW CSG-RUBRIC

RICHARD HARRISON

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1. ENGAGEMENT WITH LITERATURE

2. KNOWLEDGE AND UNDERSTANDING

- Project design
Basic design explained, panel designs done by MS Word (5/10)
Project implementation
SCADA screen and simulation to a good standard (6/10)
Response to questions
Good in parts but a little vague in some questions (6/10)

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3. COGNITIVE AND INTELLECTUAL

	Testing and analysis of results	16
	Some evidence of testing through simulation and historian (6/10)	
	Critical evaluation of the project outcomes relating to FDS and constraints	
	Good evaluation (5/10)	
	Conclusions and recommendations	
	Realistic and honest with some plan moving forward (5/10)	

4. PRACTICAL APPLICATION

	Deployment method, use of material, tools, equipment and techniques in the construction of the project	15
	Only SCADA and PLC code built (6/10)	
	Quality of the final product or system	
	Some quality in evidence (5/10)	
	Management of the design process including use of plans, costing spreadsheet	
	Poor management of the project, better planning would have produced a much better result. (4/10)	

5. TRANSFERABLE SKILLS

	Quality of the presentation slides	5
	Generally good but text is small in parts (3/5)	

Quality of the delivery

Good but lacking in confidence (2/5)