

1809806 Project Definition, Research and Quality Planning

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Course and module are incorrect, see the brief. The course is BSc, the module is SGEL6000 and the assignment is Project definition

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1. Executive Summary

This project involved upgrading an existing line within the factory with a remote monitoring system to allow management staff to view the line in real time with the aim to create a usable and *long sentences* interactive HMI for the end user, have the line shown working on-screen in real time, for the system to be easily adaptable in case machines are moved around in the future and for the line to not have to rely on the SCADA system to work. Three potential solutions were evaluated using SCADA, SITRANS and PCS7 and the SCADA solution was chosen because it was a more cost-effective approach and would be easier to implement because it was far more compatible/adaptable with the existing machinery. However, due to chip shortages, the SCADA module was difficult to get hold of, but the situation would have been the same with each of the solutions. The plan for implementation involved three main parts. The SCADA module, PLC and networking from machines/to company server. There were global supply difficulties which proved problematic when it came to acquiring more complicated parts for the chosen solution such as the SCADA module and PLC.

"is taking place" - not finished yet
The project took place in a meat processing and packaging factory and the line in question was laid out using a flow-diagram followed by a definition of the problem that needed solving and the constraints/risks that may have affected the project. The FDS then detailed the reasoning behind the project, its requirements and basic groundwork that was needed before any solution could be implemented. Following this, a test plan was created for when the project was completed and a literary review detailing each solution was made with an evaluation and conclusion of the chosen solutions. Following this, cost predictions and an implementation plan (Gantt chart) was created.

The brief asked for 1.5 line spacing and fully justified text

2. Introduction

The aim of this project is to create a remote monitoring system for a production line, to demonstrate the benefits of such a system and evaluate the need for it to be implemented across the factory.

The project aims to provide a real-time, reactive monitoring HMI of the line that is accessible through a gateway on the company network. Giving management a better understanding of what is happening within the factory. The line must not rely on the system to run, and the system must be expandable and adaptable in case the line layout changes. The aim is, for the system to be expanded to more lines in the future if it's deemed a success and proves beneficial to the company.

3. Project Background and Problem Definition and Constraints

3.1 Background

This project is based in a meat processing and packaging factory on a single line with various different machines from multiple manufacturers, with the intent to expand to other lines if the project proves to be successful and produces satisfactory improvements. The customer/business requires, that the project implements a remote monitoring system into an existing line (determined to be L21). Figure 1 shows the line order/layout. *This would have been a good place to add a photo of a machine*

Line layout block diagram

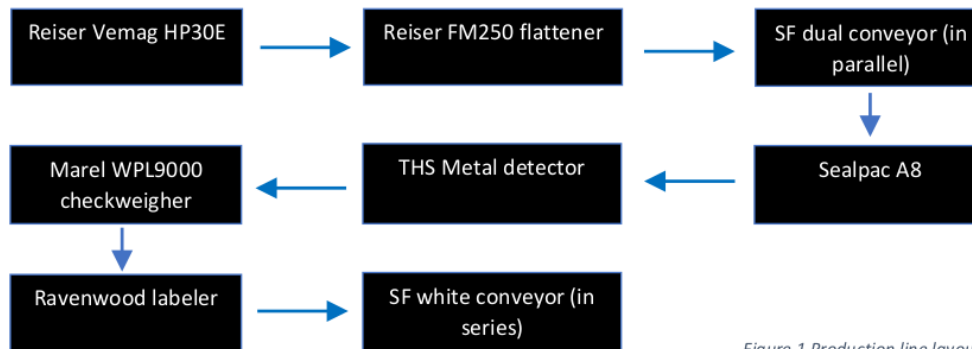


Figure 1 Production line layout

The following list gives each machine and its function:

1. Vemag HP30E – (**Start of the line**) Takes blended meat in through a hopper, further processes it and produces mince/burger/meatballs etc.
2. FM250 flattener – Is run in sync with HP30E Vemag to portion the Vemag output into cuts.
3. SF conveyor - Provides a workspace for production to place burgers/mince into trays.
4. Sealpac A8 – Vacuums, adds gas mixture and seals product in packets.
5. THS Metal detector – monitors all packs for metal contamination.
6. Marel WPL9000 checkweigher – Weighs each individual pack to make sure it is within tolerances.
7. Ravenwood labeller – Cuts, prints and applies labels to packs.
8. SF conveyor (white) – Provides workspace for despatch to put packs into crates.

3.2 Problem Definition

When a machine on the production line goes into error, the downtimes and monitoring of the line are recorded on paper forms and as a result have a subsequent margin of human error and inaccuracy.

Production also has to manually contact engineering via a single phone on the shop floor. Leading to production time lost for every stoppage because of the delay with engineering being notified.

This is a continuation of the previous sentence and not a sentence in itself.

Machines that are still running while the line is inactive waste power and reduce production efficiencies. Run rates are recorded on boards at the start of each line and are not as accurate as they could be compared to if they were recorded electronically. The result of implementing the proposed system would be better planning, greater knowledge of what goes on and increased accuracy in the recording of line statistics, all while reducing wasted paper that no longer needs to be used for downtime sheets. As it will be recorded electronically/automatically.

This is a continuation of the previous sentence and not a sentence in itself.

3.3 Constraints

Certain PLC driven machines have the capability but not the translations (software-wise) to send the appropriate error messages to the proposed system. E.g., Sealpac A8 and Vemag HP30E. However, with help from the machine manufacturers, error messages can still be sent, and a translation document can be implemented with the system HMI to translate the error messages to produce the correct error message on the HMI.

it is unclear what you mean here

do you mean error code?

Other machines such as the CEIA THS Metal detector can communicate errors with it such a system??

error codes?

The first machine on the line (I.E Vemag HP30E) changes periodically depending on production. Meaning the system will need to be able to run with multiple different Vemag HP30E machines (All primarily the same). However, since these machines only need an update to function with such a system, (Each update is priced per-machine) this problem will not be that difficult to overcome.

The line in question is still in use so a time window will need to be agreed upon for the installation of the cabling to the monitoring system from the machines and for each of the necessary upgrades to the machines for interfacing purposes.

Once completed, the system cannot be constrained to only run with all the machines enabled. There needs to be a way of manually enabling certain machines in case one is down for a longer period or if only half the line is needed. (For example, for labelling purposes).

This section reads more like an FDS

3.4 Risks

You could have made reference to your risk assessment in the appendix.
Health + safety and codes of practice

General risks concerning the job include electric shock, moving parts and injuries from improper use of tools. All of which can be reduced by following proper working procedures like locking off necessary machines, testing to ensure the machine is off (testing for dead), ensuring appropriate PPE is worn at all times, that any and all equipment used is in working order and that materials such as cabling is not damaged before being installed. Contractors are given company PPE upon arrival which is food safe. As stated by VDI: "Engineers perform these tasks and actions carrying both individual and shared responsibilities." (VDI, 2022) (Page 2) *when quoting, you should suppress the author*

Whenever work is done, all parties should be constantly aware of their surroundings and assessing their surroundings. HSE states in RR216 report: "probability of a combination of the occurrence of harm and the severity of that harm, which are often referred to as either risk factors or risk components. Risks are classified depending on the estimated chance of harm and its severity" (Innovation Electronics LTD + Health & Safety Laboratory, 2022) (page 6). Workers should be able to identify risks to themselves and others and act on them to minimise them. As a result, during installation, the line will be shut down and only engineering/qualified contractors will be allowed on the line, while codes of practice such as those provided by the IET will be followed at all times. Multiple machines will require additions to their setups. However, this doesn't affect their existing setup. It simply takes their outputs to another device which uses the input to read its status.

Ethical/standards and sustainable development

Ethical risks involving this project relate to environmental issues and the safety of fellow workers both in engineering and regular production staff.

Ethical boundaries must be maintained during all aspects of work meaning all involved staff must ensure that the health and safety of their fellow workers is top priority at all times and if they feel there is an issue, to raise it as soon as possible. This includes respecting/upholding intellectual property rights etc.

The RCE states that engineers should:

1. "Identify, evaluate and quantify risks"
2. "Avoid deceitful acts, corrupt practices, professional misconduct and declare conflicts of interest "
3. "hold paramount the health and safety of others"

(The Royal Academy of Engineering, 2022)
when quoting, you should suppress the author and give the page number

The project poses minimal risk to the environment and produces no hazardous substances or biproducts/materials. The system is being implemented partly in order to reduce wasted energy as a result of breakdowns and to prevent build-up of wasted meat product and lost time. Focusing on improving efficiencies and reducing losses for the line. Thus, helping promote the idea of sustainable development by reducing environmental impacts. Additionally, if the system is expanded to other lines, the unit controlling line 21 can also control the other lines and show them on the HMI with no additional modules. Only the existing machines on the new line will need to have modifications. Parts will be sourced from green companies.

Commercial risks

Commercial risks to the project primarily include:

- Financing: Funds to put towards all aspects of the project i.e., parts, contractors etc.
- Completion: Completion dates, timekeeping and organisation.
- Construction: Availability of materials/components and contractors.
- Supply/support: Software/hardware support, the discontinuation of products.
- Goals: Realistic, complexity.

One of the main risks to the project currently is the global chip shortage/supply, which is impacting the supply of vital parts to the project and could cause delays if supply does not improve. However, the biggest risk to the project is the line itself. There are plans to re-organise the entire factory layout and even this could be delayed. This is crucial because the line must be re-settled before work can be done and if this does not happen or the line gets scrapped it could jeopardise the entire project since no lines have a common machine layout. Therefore, development and planning would have to be started over again. Furthermore, with lines moving and a large strain on the engineering department it may not be possible to spare manpower. Furthermore, with the company spending large sums of money on upgrading existing lines with new machines it may be decided that the project would not be viable at the time for costs reasons and time/resources was needed elsewhere.

3.5 Liability

The two main parties, (Customer and supplier of the monitoring system) are liable for the system, its upkeep and safe working practices within their workplace. The customer company itself is liable for both the upkeep of the system, ensuring the existing systems are ready for the monitoring system and ensuring they are happy with its operation once completed. The company supplying the monitoring solution software and HMI system is liable for the software package and providing a support service to the customer.

Within the customer company, the company is liable for providing all the necessary tools, equipment and training to ensure their staff can carry out the task safely and to the proper standard. The employees are liable for their own safety when working and have the right to ask for any equipment/training needed for the job to be done safely.

3.6 Contractors, specialists and conduct

Contractors will be needed for the creation and implementation of the monitoring solution software/HMI. Additionally, some manufacturers of the existing machines may require one of their approved engineers to come on-site to install/upgrade/update a machine for use with the chosen solution. In this case the contractor will be signed in, given a work order upon arrival and a site engineer will accompany the contractor and aid in their work.

A high level of professionalism and the following of proper codes of practice allow for a safe, efficient and happy work environment for all staff. Treating all employees, contractors etc with respect, working to reduce workplace hazards wherever possible and making sure proper planning is in place for each part of the project will ensure it's successful.

4. Functional Design Specification, ^{not included in brief} Preparation and Test Plan

The system must be easy to use and simple to understand for production and easily accessible/serviceable for engineering and maintenance staff if needed. This can be achieved by providing a simple HMI layout showing all the required info clearly labelled. The hardware that makes up the system must be clearly marked for ease of maintenance.

The system must integrate with on-site servers to allow certain company users to view an HMI screen with a representation of the line through a gateway accessed on the local company server. This must provide real-time monitoring of the status of the line and relative data such as total run-time, downtime, efficiencies and percentage of product done. This must include the showing of whichever machine is in fault or stopped (shown as **RED**) and machines that are enabled/running will show **GREEN**.

Basic machines such as conveyors must be monitored by an RTU (Remote terminal unit), or equivalent unit recommended by the machine manufacturer to interface with the system. This must monitor the status of basic control equipment such as relays, valves etc used by simpler (non-PLC driven) equipment, while more complex machines such as the Sealpac A8 can be connected via their on-board PLC through Cat5 (ethernet) for monitoring purposes. Sending errors and status updates to SCADA.

4.1 Preparation/project foundation

Between all the potential solutions, certain aspects and requirements will remain the same since they will lay the foundation for such a system to work on the line. These include:

4.1.1 Ethernet cabling and routing layout:

Three service pipes from the void currently supply the line with utilities. The machines must all be connected through ethernet (cat5) cable in series down the line and up into the void to the remote monitoring host device and then from there, to the nearest server. Routing all the machines into one cable will reduce wasted materials.

4.1.2 Tray work for cabling:

Must abide by company guidelines and be food safe. Therefore, it must be made of stainless steel, be off the floor and not go above the product as it travels down the line (for contamination reasons).

4.1.3 Periodic changes to line:

The Vemag HP30E changes regularly depending on production planning. The monitoring system needs to be able to run with multiple different Vemag HP30E machines (All primarily the same). However, since these machines only need an update to function with such a system, this problem will not be that difficult to overcome. The only issue being each update is priced per-machine.

4.1.4 Machine upgrades and software updates:

In order to communicate with the potential solution systems each machine will need both/either software or hardware additions/upgrades to allow communications with monitoring solutions. The use of RTUs or other control units within the existing systems mean very little modification to existing machinery or to production line itself. Meaning little downtime for installation once upgrades are done since most of the work for the main project would be done upstairs in the void and in creating programs for the monitoring system.

4.2 Requirements include:

- 4.2.1 The HMI screen must show a schematic/block-diagram-type representation of the line along with the state of each machine (running/stopped), Run-rates for the day/shift, run percentages, total downtime in case of errors.
- 4.2.2 Machines shown on the HMI must show green when running and red when in fault/e-stop/stopped manually.
- 4.2.3 The system needs to have the ability to run certain machines on the line without needing to start the whole line.
- 4.2.4 The system must be connected to the company servers and viewable through a company gateway.
- 4.2.5 The operating environment is harsh and often gets wet. All cabling must be off the floor and secure, modules should be inside their machines cabinets and junction boxes must be IP67 rated.
- 4.2.6 The line must not be reliant upon the system to run. The line must be able to run without the system in case it itself, develops a fault.
- 4.2.7 When a fault occurs, an alarm must show on the HMI.
It would have been helpful here if you had specified which alarms are to be displayed
- 4.2.8 The HMI must have a page which displays a list of machines that have recently been in fault going back a week prior to present date.

The system will only be for monitoring purposes since being able to start the system remotely poses a safety risk to anyone who is around the line.

A good list of functions but lacks some technical details that would allow measurements to be taken for testing

4.3 Public perception/aesthetics

Aesthetically, aside from the possibility of adding a HMI screen on the production line, the system should be barely noticeable except when the line is in operation. The only visible parts may be the cabling tied neatly to trunking/tray-work and junction-boxes. The main panel will be hidden in the roof void and from there it will be connected to the nearest server.

4.4 Budget

£40,000.00

4.5 Timescale

Completion date 31st March 2023

This is a limited testing plan. If your FDS had contained more details of measureables, more tests could have been created to check them.

4.6 Testing Plan (Factory acceptance test)

FDS item No:	Test description	Expected outcome	Actual outcome	Pass/Fail	Evidence reference
4.1.1	Stop and start multiple machines.	HMI shows machine status changing. Run rates, downtime, errors etc, are recorded.			
4.1.2	Stop and start each machine in turn.	On HMI, machine must show green when running and red when stopped.			
4.1.3	Only run individual machines.	Each machine should be able to run individually.			
4.1.4	Use a company PC to log into the HMI through a gateway.	Able to access the HMI by logging in and see the line.			
4.1.5	Have line washed down as done typically.	Cat5 junction boxes must be dry inside.			
4.1.6	Turn off the SCADA system.	Line must run as normal.			
4.1.7	Create a fault on each machine.	Fault for each machine must appear on HMI.			
4.1.8	Create faults on the line.	HMI must have a page recording the recent faults.			

Table 1 - Factory acceptance test table

5. Literature Review

5.1 Potential solutions:

5.1.1 Solution 1: Siemens PCS7 hosted

Create a control system through the implementation of Siemens RTUs, Scalance router modules and a combination of Siemens Simatic hardware platform and TIA software hosted on a PC, which can then be mirrored on a company webpage. Figure 2 shows the layout of the solution.

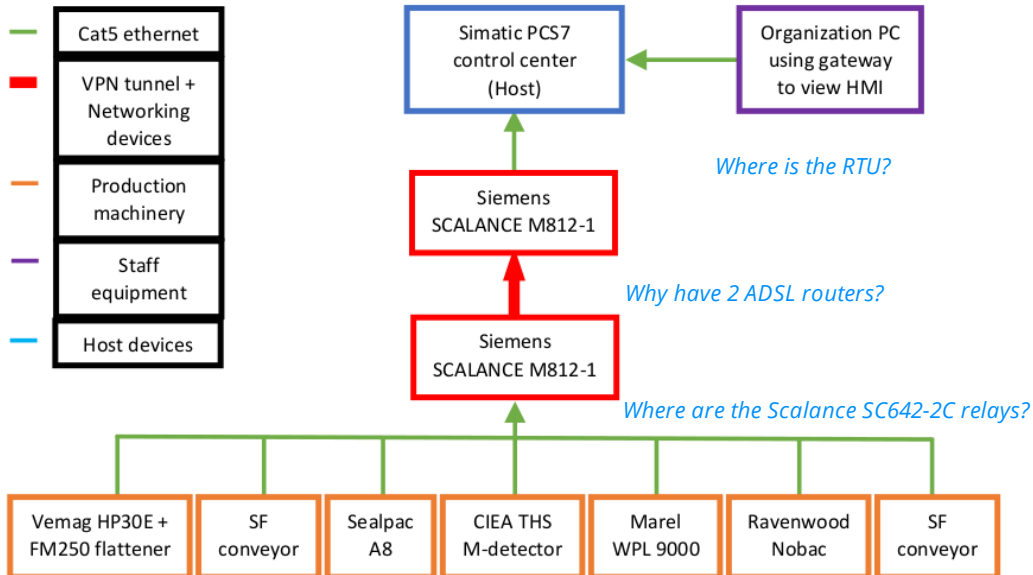


Figure 2 - Solution 1

The SIMATIC RTU3010C RTU can store data from the machine and transfer it via its RJ45 port to an external router and master station (Siemens, 2022). Making it ideal for use in each machine compared to a more traditional PLC. The RTUs have the ability to monitor the outputs of each machine to determine its running status and relay fault messages while not interfering or requiring modifications to the existing setup. This means minimal adjustment to existing machine documentation. Cat5 ethernet means high speed connections within the network and Siemens M812-1 Scalance router modules relay information using VPN tunnels meaning safe, secure communications. A Siemens Scalance SC642-2C relays communications to the PC-hosted Simatic HMI/TIA software, where the line is represented on screen. A LAN interface with the firewall functionality of a SCALANCE M module or via the use of encrypted access via OpenVPN offers good network protection (Siemens, 2022) Using the PC hosted software and the stream of data from the RTUs, a visual representation of the line can be constructed to monitor the line in real time and relay errors.

The cost for this solution is £ 39,939.41

5.1.2 Solution 2: SCADA hosted

Figure 3 details a SCADA LAN (Local Area Network) system. By grouping simpler machines' start/stop relay outputs into a S7-1200 PLC which talks to a SCADA unit and connecting others directly to SCADA through ethernet, unlike solution 1 no RTUs are needed because a S7-1200 PLC is handling approximately 60% of the machine I/O. Making connecting various different major brands/types of machines compatible with SCADA and the integration of that data into the SCADA system easier. The SCADA Vision Module allows for the displaying/writing of database information to any screen/database. (Inductive automation, 2022)

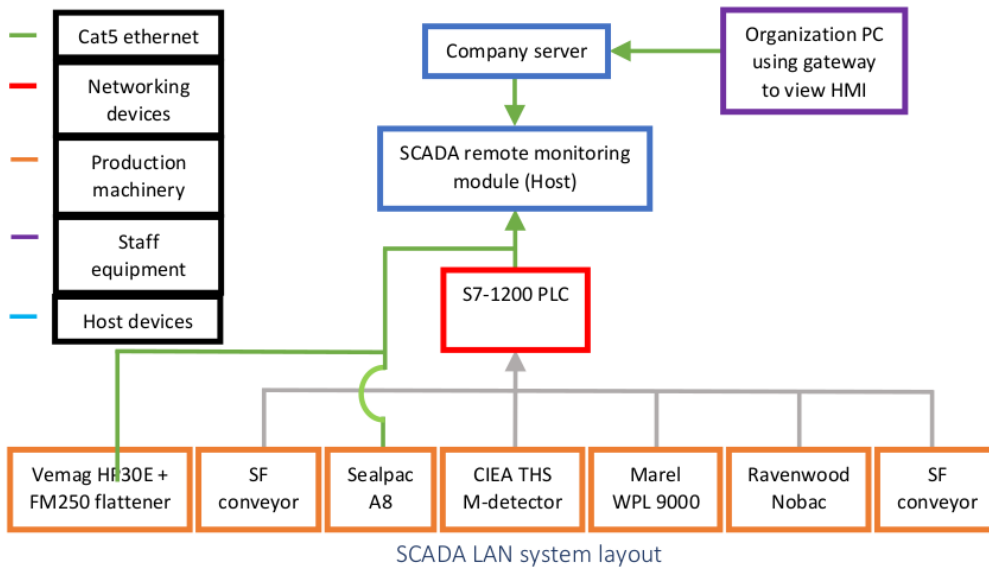


Figure 3 - Solution 2

The required software for the SCADA Vision module, (Ignition Designer) contains all the tools needed to create a HMI. Incoming data can be assigned to inputs and shown as visual displays, tables, and graphs etc. Templates are also supplied. (Inductive automation, 2022)

Solution 2 is significantly cheaper than solution 1 at £ 31,378.89

5.1.3 Solution 3: SITRANS RD500 + WinCC runtime advanced remote monitoring

Figure 4 is similar to solution 1 since it requires similar software running on the organization's computers. Setup, however, is much simpler. RD500 Siemens SITRANS modules wirelessly connect to the company's Wi-Fi or through Cat5 (to reduce interference). A pair of dedicated OPC servers handle and pool the incoming data from the SITRANS modules and organizational PCs on the network can use WinCC/TIA software to make sense of the data and create a usable HMI. WinCC is used in all Siemens HMI applications, including simpler operations solutions, more basic machines and fully remote monitoring applications on computer-based, multi-user networks (Siemens, 2022).

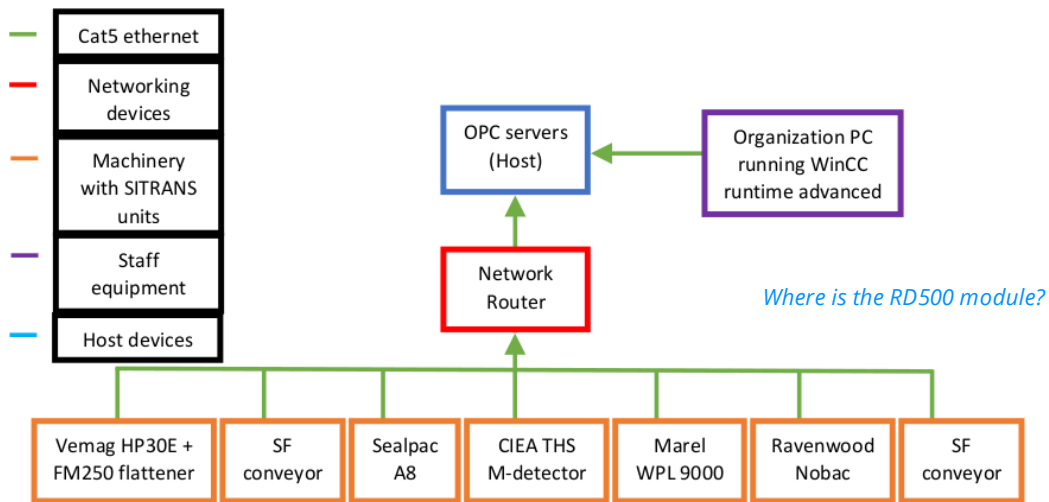


Figure 4 - Solution 3

The RD500 module functions as an information display and data logging device, integrating a configurable internal web page with flexible I/O. Connectable via Ethernet or wirelessly, by GSM GPRS Hayes-compatible modem and Wi-Fi networks (Siemens, 2022) SITRANS RD500 modules can store up to 2 gigabytes of removable flash memory on sim-card. Standard HTML is used for reporting, meaning access can be granted automatically using email, FTP transfer, or the integrated web server. Any stored data files are remotely accessible through the server and data files can be sent to remote servers for integration into a logistics system (Siemens, 2022)

The cost of this solution = £ 35,537.79

Advantages/disadvantages of each solution

Benefits of PCS7 hosted:

- Most expandable solution
- Provides safest and most secure networking solution
- Allows for further development beyond monitoring in the future if required

Drawbacks of PCS7 hosted:

- Expensive
- Complex to setup
- Most time consuming and will require most downtime to install
- Will require more changes to existing machines and their documentation
- May prove difficult to integrate with existing company servers
- Requires software installs on organisation PCs

Benefits of SCADA hosted:

- Vastly more cost-effective compared to solutions 1 and 3
- Easy integration of multiple different devices from different manufacturers
- Minimal necessary modifications of existing machines
- Requires least downtime of production line for setup/installation
- Depending upon software supplier, can test system before paying for software
- Easy integration of other lines for expansion
- System is hosted on dedicated module, so no extra software installs are required

Drawbacks of SCADA hosted:

- Cannot develop added control functionality like other two solutions
- Most basic in terms of functionality

Benefits of RD500 remote data manager:

- Auto I/O detection and I/O scalability as well as flexible and varied I/O options
- Alarm and remote monitoring notification via email, SMS, or FTP
- Web visualization for remote site management
- Simple configuration with no programming required
- Large datalogging capacity with 2 GB CompactFlash card support
- Flexible communications options with Ethernet, GPRS, and support for other serial modems
- Does not require as much Cat5 cable running
- Can be accessed completely remotely using the web

Drawbacks of RD500 remote data manager:

- Requires software installs on organisation PCs
- The most expensive option of the three
- Complex to install
- Will require large changes to machines and documentation
- Uses Wi-Fi and network is less secure compared to others
- May be susceptible to interference

		SOL1: PCS7	SOL2: SCADA	SOL3: SITRANS
(lower=better)	Cost	1	3	2
(for end user)	Usability	1	3	2
(Simpler=better)	System/program complexity	1	3	2
(Less=better)	Install time	1	2	3
(Less=better)	Effect upon current setup	1	3	2
(Simpler=better)	Implementability	1	3	2
(Less=better)	Maintenance required	1	2	3
(More=better)	Reliability	1	3	2
		1 = Worst	3 = Best	

Table 2 - Solutions evaluation

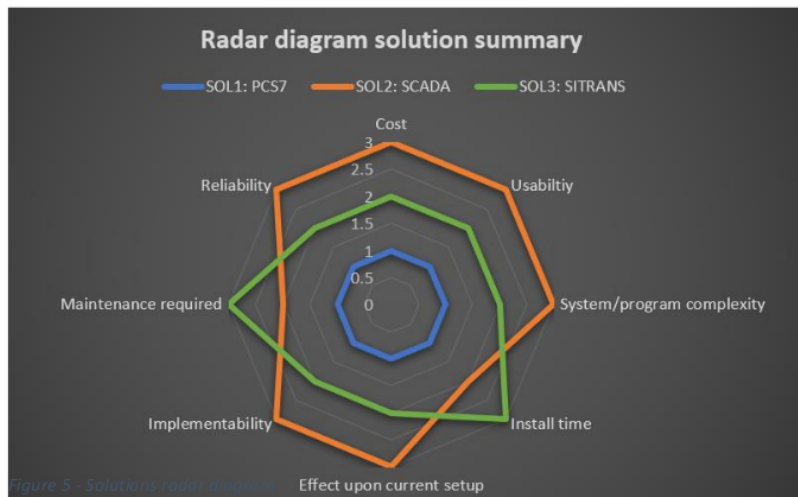


Figure 5 - Solutions radar diagram

Good evidence for selection of solution

Chosen solution

Because of the results shown in figure 5 and table 2 above, Solution 2 (SCADA) has been chosen due to its more 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 and therefore, less necessary modifications. (See Appendix 9.1 for technical datasheets needed for modifications to existing machines.)

Machine Datasheet details. *This section was not required and the datasheets were not needed.*

Figure 6 (Page 27) shows the layout of the metal detector upgrade board. This is an add-on board which fits onto the existing board, which runs the metal detector head. Using the relay shown in the diagram (marked as “Ready Relay”), a signal can be transmitted to the PLC which in turn talks to SCADA.

Figure 7 (Page 28) shows several “Run” contacts currently on the WPL900 Marel check-weigher. Any of which can be used for the project and only 1 is needed to send a signal to the S7-1200 PLC.

Figures 8+10 (Page 29+30) show the translation sheet needed once the Vemag processor software is upgraded. This allows the software to talk to the SCADA module and can also translate fault codes if required in the future.

Figure 9 (Page 30) Shows the upgrade quote for the Sealpac Vacuum-packer software install.

Figure 11 (Page 31) Shows the contact for the SF conveyors that will be used to send a running signal to the PLC. Coil (K200) is energised to pull in this contact. The coil works off of the start push-button circuit in the diagram. So once the conveyor(s) are started the coil will energise, sending a “Run” signal to the PLC.

6. Project Planning, Work breakdown and Management Techniques

6.1 Costing spreadsheet

Predicted costing	Actual costing
Scada Module + software package: £6362.12	
SCADA contractor/installation engineer: £3k	
Ethernet cable (500m): £718.53	
Communications cable (4 core 304m): £503.82	
S7-1200 PLC: £210	
PLC software: £821	
Siemens engineer to create program: £2k	
Electrical panel/cupboard for PLC: £300	
MCB for panel: £56.84	
Isolator (10A): £37.78	
Panel DC power supply: £73.60	
Rj45 connectors: £15.30	
Vemag software upgrade: £8k (Includes contractor costs)	
Sealpac software + module upgrade package: £7k (includes contractor costs)	
Ceia M-detector Communications board: £1.5k (Includes contractor costs)	
8-core data cable (100m): £303.90	
Junction box (IP65 rated): £3.78	
Din rail (2M): £6.64	
Din rail terminals (10 pack): £5.69	
Cable glands (5 per bag need 10): £7.76	
Cable markers: £7.86	
Ethernet switch: £244	
Total: £31,378.89	Total: £

Table 3 - Cost spreadsheet

See figures 12 – 27 (appendix) for parts screenshots.

6.2 Gantt chart

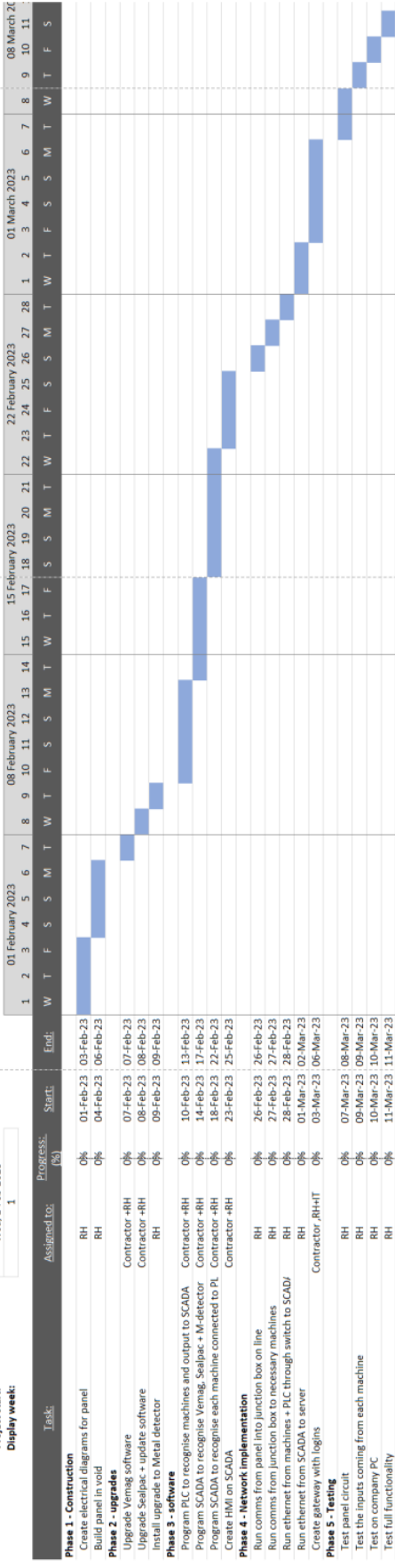
Scada project

Project start:

Wed, 1-Feb-2023

1

Display week:



6.3 Milestones

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

The line is due to move between 01/01/23 and 31/01/23. Therefore, no work can be done until after this date.

This belongs in the appendix and should come before the planning chart

6.4 WBS chart

No:	Task type	Task description	Deliverables	Work package	Person(s) responsible	Deadline
1	Table 4 - Work Breakdown Structure (Part 1)		Planning			
1.1	Identify issue	Assess how line could be monitored better	Issues and ways of improving are identified	Assess line layout, ask management and production about potential problems, identify future plans for the line	Richard Harrison	01/12/2022
1.2	Create FDS	Produce FDS for customer to view	Show what is needed for the project to be a success with budget and timescale included	Provide project outcomes, measurable performance parameters, features to be included, Produce a budget and timescale for project	Richard Harrison	15/12/2022
1.3	Produce + assess solutions	Provide 3 solutions and decide upon best option	Provide a detailed solution which best suits the project	Detail 3 potential solutions, assess each solution, budget each solution, compare each solution + decide upon which suits best	Richard Harrison, Dylan Jones	20/12/2022
1.4	Create planning documents	Create Gantt chart, risk assessment and costing spreadsheet for parts required	Produce predicted costs for the project, a risk assessment + detailed Gantt chart showing how the project will play out	Produce risk assessments, Gantt charts, a detailed predicted cost breakdown + milestones to be achieved	Richard Harrison	01/01/2023
2			Design			
2.1	Order materials/Parts	Using costing spreadsheet, order necessary parts/materials	Have parts/materials ready and waiting for start date	Order each part listed on the costing spreadsheet, check in company stores + make sure parts aren't already in stock.	Richard Harrison, Malcolm Green, Dylan Jones	10/01/2023
2.2	Create drawings	Create drawings for SCADA panel in void + cabling to each machine	Have a layout and plan for SCADA panel	Create wiring diagrams of SCADA panel broken down into power, PLC communications, SCADA communications	Richard Harrison, Stuart Hall	15/01/2023
2.3	PLC/SCADA requirements	Determine SCADA/PLC I/O + software requirements	Pre-determine I/O requirements ready for implementation	Ensure SCADA + PLC units have correct software and sufficient I/O	Richard Harrison, Contractor	20/01/2023
2.4	Implementation paperwork	Work permits for contractors	Have permits approved + ready for contractors prior to their arrival on-site	Have contractors cleared for arrival on-site and permits prepared	Richard Harrison, Dylan Jones	25/01/2023
3			Implementation			
3.1	SCADA panel	Build SCADA/PLC panel as-per drawings, mount in roof void + connect up power	Have Panel completed, ready for connecting to machines	Fit MCB, PSU, SCADA unit, PLC, I/O module, DIN-rail terminals, isolator, ethernet hub + glands into panel. Mount panel in void	Richard Harrison, Stuart Hall	03/02/2023
3.2	Machine upgrades	Install required upgrades to pre-determined machines (see Gantt chart)	Reiser Vemag, Sealpac A8 + M-detector ready for connecting to SCADA	Install software upgrades to Reiser Vemag (meat processor) + Sealpac A8 (Vacuum sealer). Install M-detector comms board	Richard Harrison, Contractors	09/02/2023
3.3	PLC program	Create PLC program to translate basic machine run signals into something SCADA can use	Have panel PLC ready for connecting to line	Programme PLC to recognise inputs from 2 conveyors + check-weigher as run signals then relay that to the SCADA module	Richard Harrison, Siemens contractor	13/01/2023
3.4	SCADA program	Create SCADA program and HMI	Have SCADA ready for connecting to PLC + machines	Programme SCADA module to recognise input from Vemag, Sealpac, M-detector + PLC. Create HMI interface	Richard Harrison, Contractor	25/01/2023
3.5	PLC communications	Run communications from machines to PLC	Machine communications connected to PLC	Connect 2 conveyors + checkweigher into panel PLC	Richard Harrison	27/02/2023

3.6	SCADA communications	Run SCADA ethernet communications to machines	Vemag, Sealpac + M-detector machines connected to SCADA via Cat5	Using Cat5, connect Vemag, Sealpac, M-detector + PLC to the SCADA unit through ethernet hub	Richard Harrison	28/02/2023
3.7	Company network integration	Connect setup to company server + create gateway login	SCADA connected to company server + HMI available through gateway	Run Cat5 from SCADA to company server, create IP, gateway+ login for HMI	Richard Harrison, IT	06/03/2023
4	Commissioning					
4.1	Verify drawings	Make sure all drawings are correct	Make sure all drawings are correct	Check through completed panel and communications to machines on-line to check the circuit matches the diagram	Richard Harrison, Stuart Hall	09/03/2023
4.2	Complete testing	Using Factory acceptance test, complete functional + compliance testing	Ensure a fully functional system	Follow the factory acceptance test created in FDS + ensure full functionality	Richard Harrison, Ben Davies	11/03/2023
4.3	Complete paperwork + sign-off	Fill out QA documents + project sign-off	Ensure company is happy with the result	Complete sign-off documentation, QA acceptance documents, Permit sign-offs	Richard Harrison, Dylan Jones	11/03/2023

Table 5 - Work Breakdown Structure (Part 2)

7. Conclusions and Recommendations

To conclude the project so far, planning and justifications are sound, and the next step is to order parts for its construction and organise required contractors to aid in the specialised aspects of the project in order for it to develop on schedule and to operating standards required by the company. It is recommended that all required parts be on-site and ready before the start date for building in order to keep within the timeline.

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9. Appendix *The brief makes it clear that datasheets should not be included in the appendix It would have been better to have extracted the important information and cited the source of the datasheet.*
10. Datasheets + Diagrams:

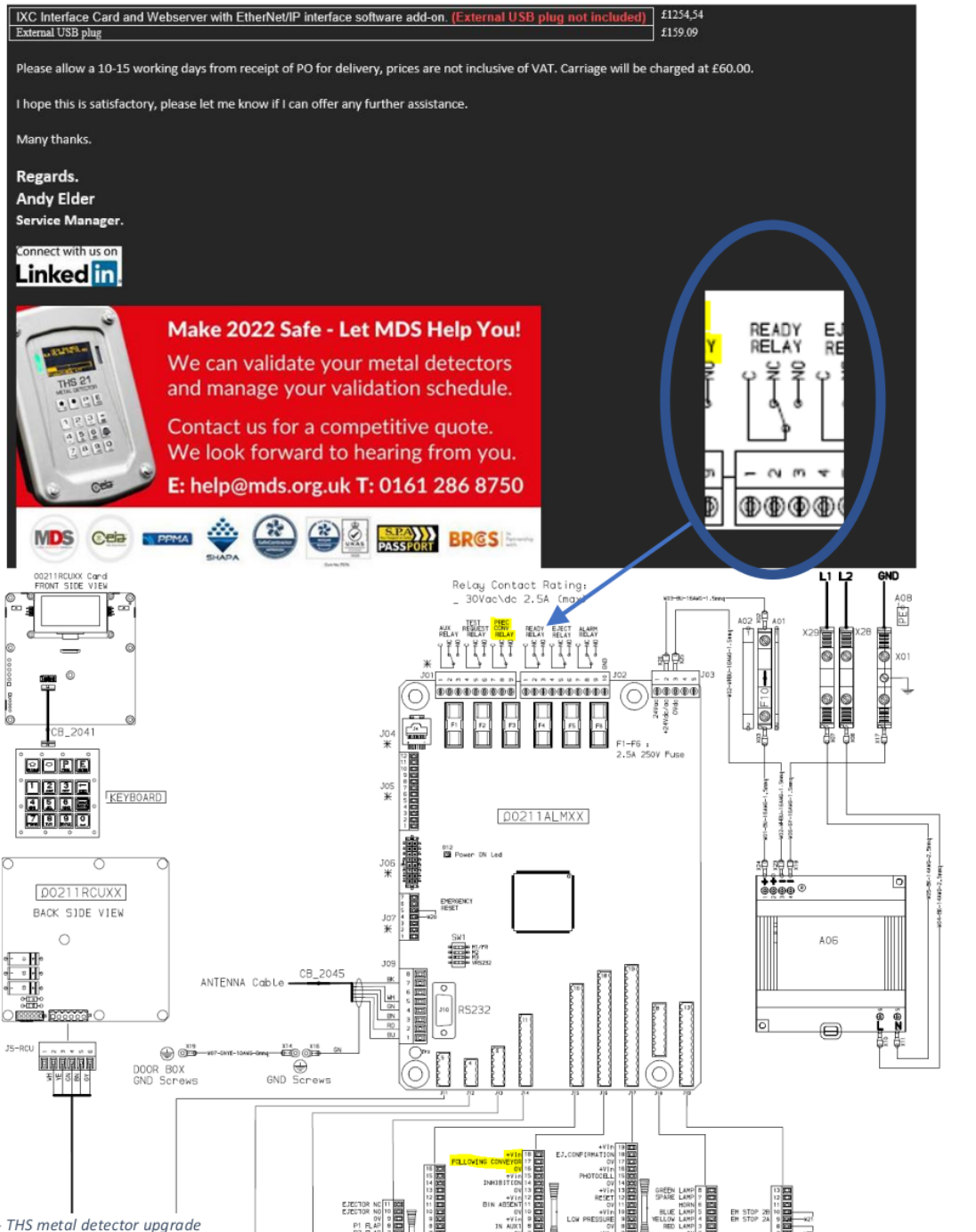


Figure 6 - THS metal detector upgrade

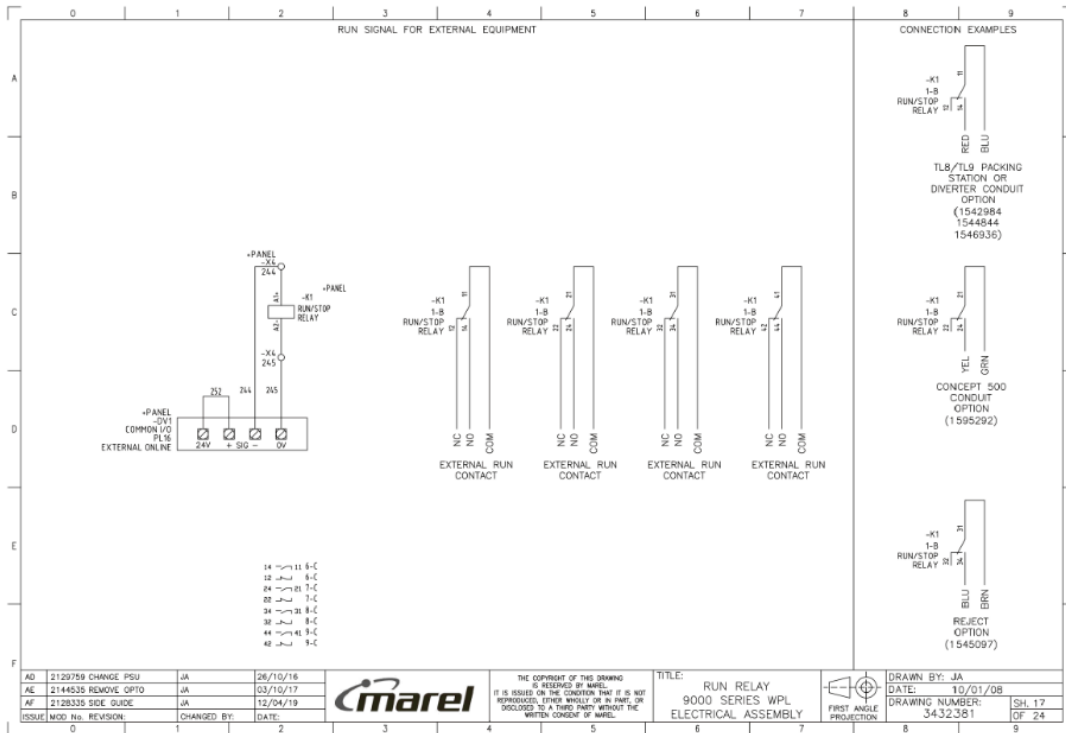


Figure 7 - WPL9000 Marel Contacts to be connected to PLC in panel

OPC UA Data points filling machine				Currently supported data types: DINT, UDINT, REAL and STRING.			
Data Point	Display Name for UA Client	Datatype	Meaning	Read right	Write right		
Article No.	ArticleNo.Data	DINT	Article No. / Item No. Item number of the current recipe. Program change via article number is possible.	X	X		
Program name	ProgramName.Data	STRING	Name of the currently loaded recipe / program	X			
Accesslevel	SCADA.sAccessLevel	DINT	The user key can be used to block access to certain functions. -1: program lock (changing programs, entering weight corrections, calibration tube test) 0: Experienced user (setting up and changing programs) 1: Professional user (option) 2: Service (machine configuration)	X	X		
Analog output 1	SCADA.sAnalogOut1X10	DINT	This function sets the tempo of an external drive. Adjustable range from 0 - 100 corresponds to 0 - 10 volts. If "-1" is selected, the tempo will be synchronized between master and slave machine. The tempo corresponds to a voltage value (e.g., 10% = 1V) (e.g., feed belt).	X			
Analog output 2	SCADA.sAnalogOut2X10	DINT	See analog output 1	X			
Back suction	SCADA.sBackSuctionX10	DINT	Back suction [g * 10]	X	X		
Calibre	SCADA.sCalibre	DINT	Durchmesser der Wurst [mm]	X			
Clipp time	SCADA.sClippTime	DINT	time for clipp (ClippLage: negative = leading) [ms]	X	X		
Corrected weight	SCADA.sCorrectedWeight	DINT	Current corrected weight (in grams X10)	X			
Tempo Crimperbelt	SCADA.sCrimperBeltSpeed	DINT	Crimper belt speed [%] Application: CC215	X			
Daily idle time	SCADA.sDailyIdleTimeSec	UDINT	Day idle time [sec] of the machine. The machine is ready but does not produce. This counter is reset daily at 0:00 am (as soon as the date changes on the machine).	X			
Daily production Runtime	SCADA.sDailyProductionRunTimeSec	UDINT	Daily production run time [sec] of the machine. This counter is reset daily at 0:00 am (as soon as the date changes on the machine).	X			
Daily-Quantity Counter	SCADA.sDailyQuantityCounter	UDINT	Daily quantity counter [g]. This counter is reset daily at 0:00 am (as soon as the date changes on the machine).	X			
Daily-Piece Counter	SCADA.sDailyStrokeCounter	UDINT	Daily piece counter. This counter is reset daily at 0:00 am (as soon as the date changes on the machine).	X			
Efficiency	SCADA.sEfficiency	REAL	Efficiency of the Doublescrew, determined by setpoint / corrected weight	X			
Activating the OPC UA server for 60 seconds	SCADA.sEnabled	DINT	Activating the OPC UA server for 60 seconds. 0: The OPC UA server is disabled (unless sPermanentlyEnabled = 1) 1: The OPC UA server is active and all other variables can be read out. If sEnabled is set to 1, this variable will remain at 1 for 60 seconds and then automatically reset to 0.	X	X		
ErrorCode	SCADA.sErrorCode	DINT	The error number of the current error	X			
Tempo feed belt	SCADA.sFeedBeltSpeedX10	DINT	Tempo feed belt in relation to the crimper belt [%] Application: CC215plus	X			
Tempo of alginate pump (HPCoex)	SCADA.sFillerB_Speed	DINT	Tempo of the alginate pump Application: CC215	X			
Gel output	SCADA.sGelOutput	DINT	Alginate consumption (gel output) in relation to sausage [%] provided that a clean gel calibration and a clean weight correction were performed.	X			
Gel thickness	SCADA.sGelThickness	DINT	Gel thickness [µm] of alginate, application: CC215	X			
Error active	SCADA.sIsErrorActive	DINT	0: There is currently no error that would hinder production. 1: The machine currently has an error that causes production to stop.	X			
Hopper filling status	SCADA.sIsHopperEmpty	DINT	0: hopper is filled. 1: hopper needs to be filled.	X			
Machine is idle	SCADA.sIsMachineIdle	DINT	0: The machine is either not ready or it is being produced. 1: The machine is ready, but it is not being produced.	X			
Machine is in production	SCADA.sIsMachineInProduction	DINT	0: The machine is not producing right now. 1: The machine is currently producing.	X			
Warning active	SCADA.sIsWarningActive	DINT	0 if there is no warning active. Switches periodically between 0 and 1 if there is an active warning	X			
LifeBit	SCADA.sLifeBit	DINT	Switches between 0 and 1 each second whenever the machine is turned on.	X			
Tempo of the main drive	SCADA.sMainSpeedX10	DINT	Main Speed in [%]. 0%: minimum speed 100%: maximum speed	X	X		
Operating mode	SCADA.sOpMode	DINT	Numerical representation of the operating mode of the recipe (continuous, LPG, etc.)	X			
Break time	SCADA.sPauseTime	DINT	The pause time between the portions in clocked mode	X	X		
Permanent activation of the OPC UA server	SCADA.sPermanentlyEnabled	DINT	Permanent activation of the OPC UA server. 0: The OPC UA server is permanently disabled (unless sEnabled = 1) 1: The OPC UA server is permanently active and all other variables can be read out. Even after a restart of the machine, the OPC UA server is immediately active and all variables can be read immediately.	X	X		
Portions per minute	SCADA.sPortionsPerMinuteX100	UDINT	Number of portions per minute. This value is not a setpoint specification, but only a display parameter. In continuous or pressure control mode, no value for portions per minute can be determined. Decimal places: 2.	X			
Portion delay	SCADA.sPortionDelay	DINT	Current portion delay [ms] of the recipe if set	X			
Portion delay mode	SCADA.sPortionDelayMode		Numerical representation of the Delay mode that is set in the recipe. 0: Off 1: Time 3: Signal S-M 4: Coex	X			
Portions per minute Setpoint	SCADA.sPPMX10	DINT	Portions per minute	X	X		

Figure 8 - Vemag fault list to SCADA translations (Part 1)

Soft start mode	SCADA.sSoftStart	DINT	0: Soft start - off 1: Soft start - all Portions 2: Soft start - first Portion 3: Soft start - on (continuous mode) 4: LPG-Mode 1 5: Ramp adaption for LPG-Mode	X	
Special Control mode	SCADA.sSpecialControl	DINT	0: OFF 1: FILL 2: BREAK 3: LIFTING TABLE 4: EMPTY CASING 5: CONTINUOUS 6: VACUUM PROTECTION 7: START COMMAND 8: READY 9: HANGING HOOK 10: INFEEED STOP 11: NOT READY 12: PLANNED HOOK 13: DEV2_REF_READY 14: PORTION END	X	
Program number	SCADA.sProgramNo	DINT	Number of the currently loaded recipe / program	X	X
Sausage Length	SCADA.sSausageLength	DINT	Sausage length (mm)	X	
Start-Stop-Mode	SCADA.sStartStopMode	DINT	0: Knee 1 1: Knee 2 >=2: Remote modes	X	
Piece Counter	SCADA.sStrokeCounter	UDINT	Piece counter that can never be reset	X	
System time	SCADA.sSystemTime	DINT	Provides the machine's system time in 3 bytes; representing second, minute, hour (starting from the least significant bit).	X	
Tempo Transportbelt	SCADA.sTransportBeltSpeedX10	DINT	Tempo Transportbelt in relation to the crimper band [%] Application: CC215	X	
Vane Cell	SCADA.sVaneCell	DINT	Numerical representation of the vane cell that is currently used. X: number of chambers, -1 if no vane cell	X	
Weigh Correction	SCADA.sWeightCorrectionX10	STRING	Way [cm3] at the main drive per portion	X	X
Weight sample	SCADA.sWeightedSampleX10	DINT	Last weight sample of the scale 877	X	
Nominal weight	SCADA.sWeightX10	DINT	Current nominal weight	X	X

Figure 9 - Vemag fault list to SCADA translations (Part 2)

Sealpac UK Limited, Concept House, 81 Sopers Lane, Poole,
Dorset, BH17 7EN, UK Tel +44 (0) 845 302 3056
Registered in England Company Number 4373358

QUOTATION
e-mail: spares@sealpac-uk.com
www.sealpac-uk.com

For our Terms and Conditions please see our website www.sealpac-uk.com/terms-and-conditions

Quotation Requested By:
Dunbia (UK)
Mr. [REDACTED]
Cross Hands Food Park
Cross Hands
SA14 6RB Llanelli
Tel :
Email :

Our Quotation No. : 44510073
Date : 20/10/2022
Representative : Mary Furness
Payment condition : 30 days

Your ID : **Quotation: 4451007**

Dear [REDACTED]

We are pleased to quote our best price to you. Should you have any queries, please do not hesitate to contact us.

Part no.	Description	Qty	Unit Price	Total
	Machine No: A8-01-2534			
953-0006	BDE Data to OPC-UA (Client)	1.0	6476.74	6,476.74
DELIVERY (SPARES EU)	Packaging, Delivery & Documentation	1.0	160.00	160.00

Figure 10 - Sealpac upgrade quote

It would have been sufficient to list the costs in a table. This level of detail is not appropriate in this report.

1.1 SCADA Parts Cost breakdown:

The screenshot shows the 'ignition' pricing page on inductiveautomation.com. The page is divided into three main steps: 1. Select Modules & Drivers, 2. Add Redundancy & Support, and 3. See Your Quote. Under '1. Select Modules & Drivers', there are three modules listed:

Module Name	Description	Price
Perspective Module Unlimited	Easily build cutting-edge, modern industrial applications and freely deploy them to any web browser, mobile device, or desktop computer. Perspective Applications can be deployed directly to a web browser, or can leverage native applications for a richer experience on mobile and thick-client devices.	\$10,450
Vision Module Unlimited	Build and web-launch industrial clients anywhere on the network.	\$7,150
Web Browser Module	Embed a web browser component into a Vision application.	\$605

On the right side of the page, there is a 'Custom Package' section with a 'Show details' toggle and a 'Have a question?' section with contact information: 'We'd love to help! Get in touch by calling us at 1-916-456-1045.'

Figure 12 - SCADA module

The screenshot shows the product page for Belden Cat5e Ethernet Cable on RS-online.com. The product is 'Belden Cat5e Ethernet Cable, S/FTP Shield, Grey LSZH Sheath, 500m'. The page includes a product image, a price table, and a 'View all Ethernet Cable' button.

Reel(s)	Per Reel	Per Metre*
1 +	£718.53	£1.437

The price for 1 Reel of 500 Metre(s) is £718.53 (exc. VAT). The price for 1 Reel of 500 Metre(s) is £862.24 (inc. VAT). The price is indicative.

Figure 13 - Cat5e ethernet cable (500m)

uk.rs-online.com/web/p/twisted-pair-multicore-data-cables/2827202

Our customers say **Great** 4.1 out of 5 based on 2,181 reviews **Trustpilot**

Cables & Wires > Electrical Power & Industrial Cables > Twisted Pair & Multicore Data Cable

Belden Twisted Pair Multipair Industrial Cable, 2 Pairs, 0.33 mm², 4 Cores, 22 AWG, Screened, 304m, Chrome Sheath **BELDEN**

RS Stock No.: 382-7202 | Mfr. Part No.: 8723NH.00305 | Brand: Belden



2 in stock - FREE next working day delivery available

1 Reel(s) **Add to basket**

Check stock levels

Price 1 Reel of 304 Metre(s)
£503.82 (exc. VAT) **£604.58** (inc. VAT)

Reel(s)	Per Reel	Per Metre*
1 +	£503.82	£1.657

*Price indicative

[View this category](#)

Figure 14 - Industrial signalling cable (300m)

uk.rs-online.com/web/p/plcs-programmable-logic-controllers/6244551m_mmc-uk_PLA_DS3A... google... CS5_UK_EN_Automation_N25_Control_Gear_Whosop... PLCs... Programmable+Logic+Contro...

Our customers say **Great** 4.1 out of 5 based on 2,181 reviews **Trustpilot**

Automation & Control Gear > PLCs, HMIs & Industrial Computing > PLCs - Programmable Logic Controllers

Siemens, S7-1200, PLC CPU - 6 (Digital Input, 2 switch as Analogue Input) Inputs, 4 (Digital Output, Relay Output) **SIEMENS**

RS Stock No.: 862-4455 | Mfr. Part No.: 6ES7211-1BE40-0XB0 | Brand: Siemens



Available to back order for despatch 02/02/2023, delivery within 2 working days

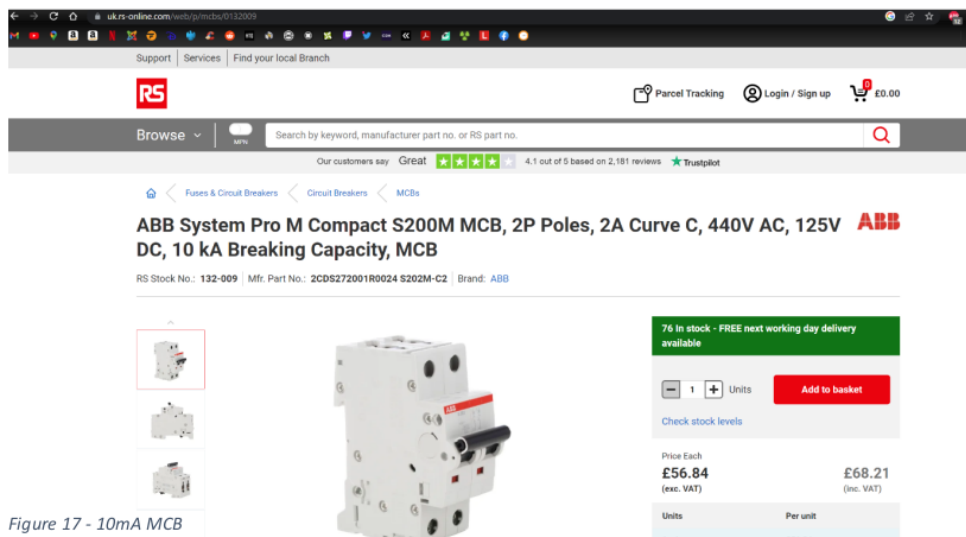
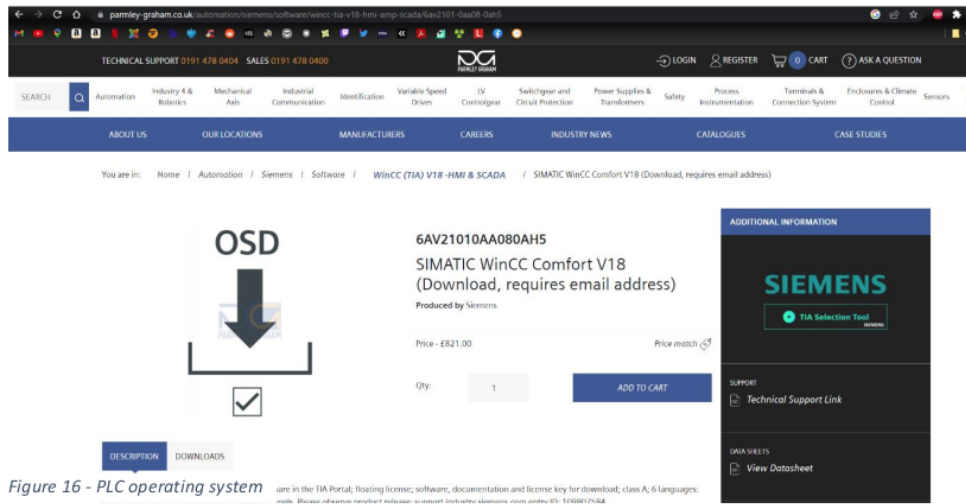
1 Units **Back order**

Not available for guaranteed pre 9am/10am delivery

Price Each
£210.00 (exc. VAT) **£252.00** (inc. VAT)

Units	Per unit
1 +	£210.00

Figure 15 - S7-1200 PLC



uk.rs-online.com/web/p/isolator-switches/7729279

Support Services Find your local Branch

Parcel Tracking Login / Sign up £0.00

Browse Search by keyword, manufacturer part no. or RS part no. 4.1 out of 5 based on 2,181 reviews Trustpilot

Switches Switch Disconnectors & Components Isolator Switches

Eaton 3P Pole Isolator Switch - 10A Maximum Current, 4kW Power Rating, IP65 F.T.N

RS Stock No.: 773-0679 Mfr. Part No.: 045992 T0-2-1/V/SVB-SW Brand: Eaton



1 In stock - FREE next working day delivery available

1 Units **Add to basket**

Check stock levels

Price Each
£37.78
 (exc. VAT) **£45.34**
 (inc. VAT)

Units	Per unit
1 +	£37.78

Image representative of range

Live Chat 0700 - 1800

Figure 18 - Isolator (10A Max current)

uk.rs-online.com/web/p/din-rail-power-supplies/1238020

Support Services Find your local Branch

Parcel Tracking Login / Sign up £0.00

Browse Search by keyword, manufacturer part no. or RS part no. 4.1 out of 5 based on 2,185 reviews Trustpilot

Power Supplies & Transformers Power Supplies DIN Rail Power Supplies

PULS PIANO Switch Mode DIN Rail Power Supply, 230V ac, 24V dc dc Output, 5A PULS Output, 120W

RS Stock No.: 123-8020 Mfr. Part No.: PIC120.242C Brand: PULS



Available to back order for despatch 10/01/2023

1 Units **Back order**

Price Each
£73.60
 (exc. VAT) **£88.32**
 (inc. VAT)

Units	Per unit
1 +	£73.60

Alternative

Figure 19 - DC power supply

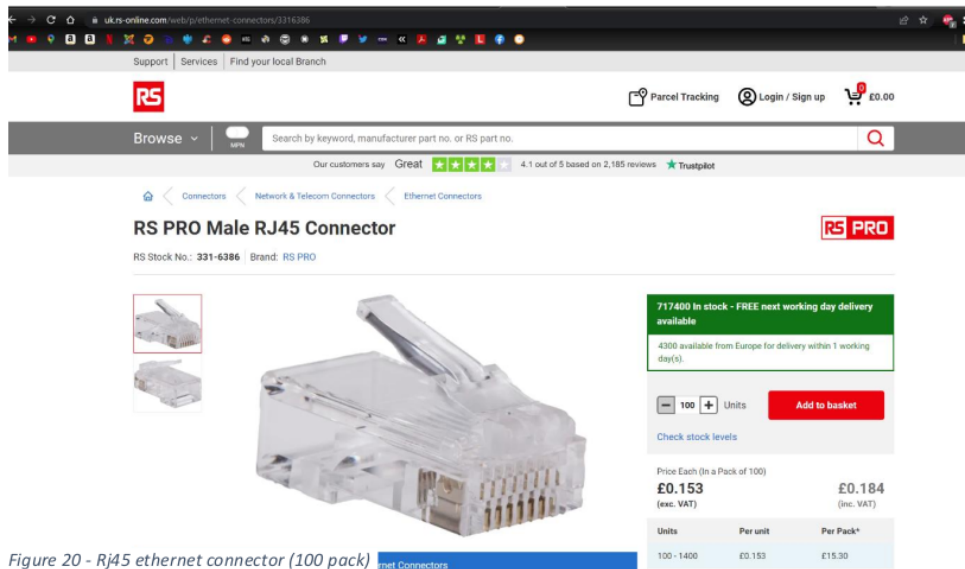


Figure 20 - RJ45 ethernet connector (100 pack)

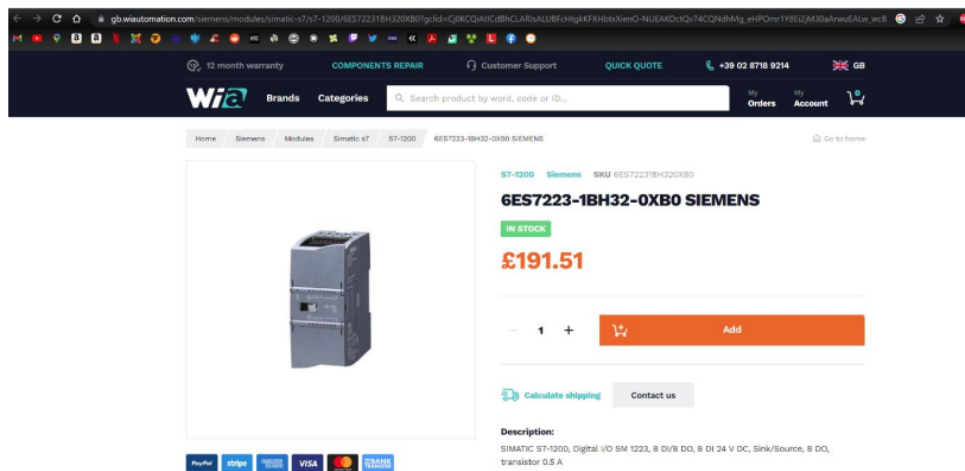


Figure 21 - PLC I/O extension module

uk.rs-online.com/web/p/twisted-pair-multicore-data-cable/8124750

Our customers say **Great** 4.1 out of 5 based on 2,185 reviews **Trustpilot**

Cables & Wires > Electrical Power & Industrial Cables > Twisted Pair & Multicore Data Cable

RS PRO Twisted Pair Data Cable, 4 Pairs, 0.25 mm², 8 Cores, 24 AWG, Screened, Grey Sheath

RS Stock No.: 812-4750 Brand: RS PRO



22 In stock - FREE next working day delivery available

1 Reel(s) **Add to basket**

Check stock levels

Price 1 Reel of 100 Metre(s)
£303.90 (exc. VAT) **£364.68** (inc. VAT)

Reel(s)	Per Reel	Per Metre*
1 +	£303.90	£3.039

*price indicative

[View this category](#)

Figure 22 - Data cable 300m

uk.rs-online.com/web/p/junction-boxes/0454955

Our customers say **Great** 4.1 out of 5 based on 2,185 reviews **Trustpilot**

Enclosures & Server Racks > Enclosures > Junction Boxes

ABB Grey Thermoplastic Junction Box, IP65, 100 x 100x 50mm

RS Stock No.: 454-955 Mfr. Part No.: 00846 M008460000 Brand: ABB



4915 In stock - FREE next working day delivery available

504 available from Europe for delivery within 1 working day(s).

1 Units **Add to basket**

Check stock levels

Price Each
£3.78 (exc. VAT) **£4.54** (inc. VAT)

Units	Per unit
1 - 4	£3.78
5 - 9	£3.58
10 - 24	£3.41

[View all Junction Boxes](#)

Figure 23 - Junction box

uk.rs-online.com/web/p/din-rails/7424138

Support Services Find your local Branch

RS Parcel Tracking Login / Sign up £0.00

Browse Search by keyword, manufacturer part no. or RS part no.

Our customers say Great 4.1 out of 5 based on 2,185 reviews Trustpilot

Enclosures & Server Racks Enclosures & Racking Components DIN Rails

RS PRO Steel Slotted DIN Rail, Top Hat Compatible, 2m x 35mm x 7.5mm

RS Stock No.: 742-4138 Brand: RS PRO



9800 in stock - FREE next working day delivery available

4 Units Add to basket

Check stock levels

Price Each (In a Pack of 4)
 £6.64 (exc. VAT) £7.97 (inc. VAT)

Units	Per unit	Per Pack*
4 - 56	£6.64	£26.56
60 - 96	£6.308	£25.232

Figure 24 - DIN rail (2m)

uk.rs-online.com/web/p/din-rail-terminal-blocks/501803

Support Services Find your local Branch

RS Parcel Tracking Login / Sign up £0.00

Browse Search by keyword, manufacturer part no. or RS part no.

Our customers say Great 4.1 out of 5 based on 2,185 reviews Trustpilot

Connectors Terminal Blocks DIN Rail Terminal Blocks

RS PRO Grey DIN Rail Terminal Block, Single level, 0.2 → 4mm², 800 V

RS Stock No.: 501-803 Brand: RS PRO



19670 in stock - FREE next working day delivery available

2280 available from Europe for delivery within 1 working day(s).

10 Units Add to basket

Check stock levels

Price Each (In a Pack of 10)
 £0.569 (exc. VAT) £0.683 (inc. VAT)

Units	Per unit	Per Pack*
10 - 50	£0.569	£5.69

Figure 25 - DIN rail terminals

It is not appropriate to include this level of detail in this report

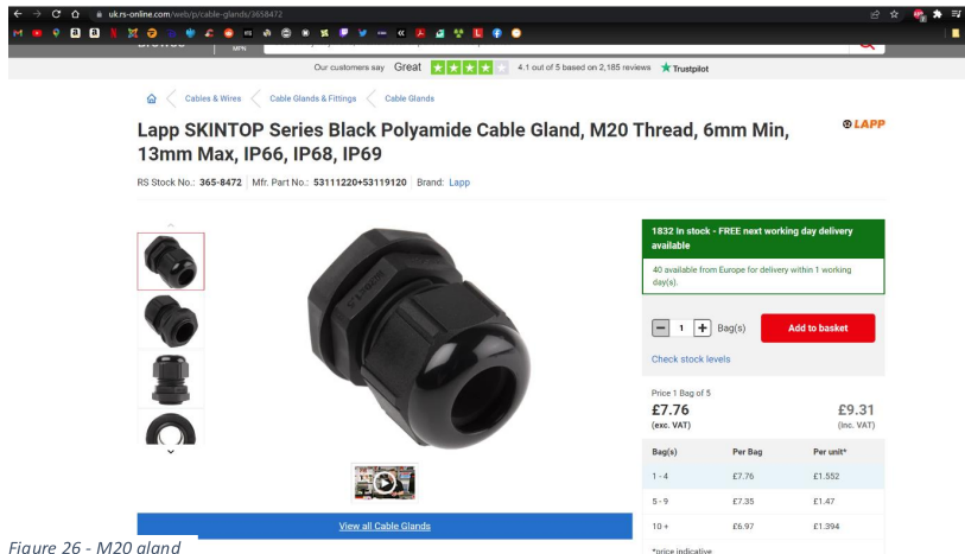


Figure 26 - M20 gland

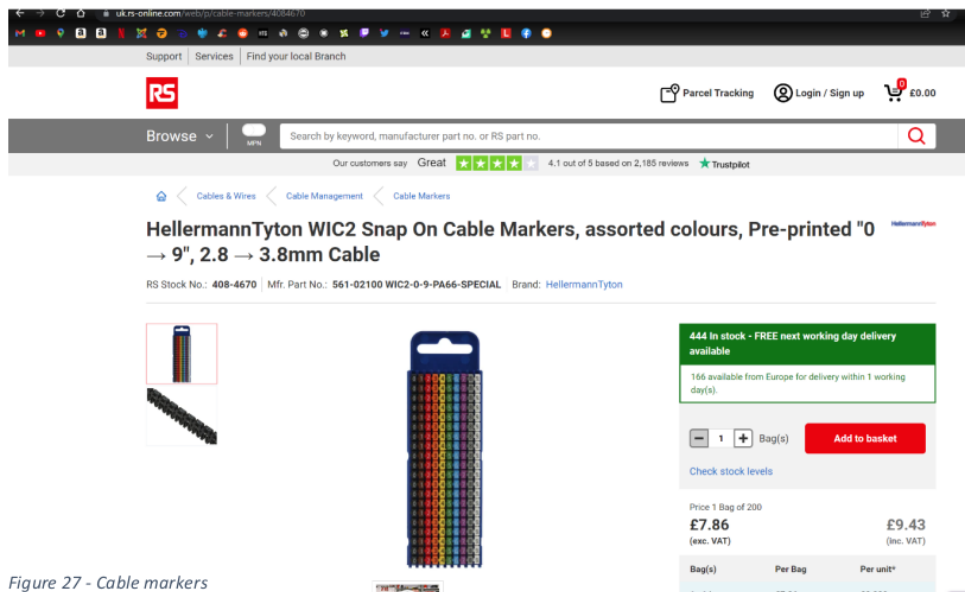


Figure 27 - Cable markers

1.3 Project proposal

L21 SCADA system

SGEE6000 Independent project

Project proposal

Richard Harrison

SCADA integration project for production line 21

07/10/2022

Budget: £40000

Contacts/parties involved: Richard Harrison (engineer/Student), Dylan John (Maintenance Manager), Simon Grove (Projects manager)

Project Description

This project is based in a meat processing and packaging factory. When a machine on the production line goes into error, machines before and after carry on working. This creates build-ups of product, along with machines that need to be stopped manually before the issue with the faulty machine can be fixed. Once fixed, the build-up of product needs to be distributed down the line before proper production can resume. Leading to production time lost for every stoppage. Also, machines that are still running while the line is inactive waste power and reduce efficiencies while production run-rates, are recorded on boards at the start of each line and are not as accurate as they could be. Furthermore, there can be a delay between the machine breaking down and the relevant personnel being notified.

A SCADA LAN (Local Area Network) system could be used to resolve this, by allowing all the machines on the line to communicate with each other through one device such as an RTU or PLC. Therefore, if one stops, they all would stop. This would reduce build-ups when a fault occurs allowing production staff to resolve the issue with the troublesome machine faster while engineering + other relevant parties can be notified if needed, through automated messaging (email/SMS) of line status changes. This would increase up-time, reduce downtime and increase efficiency levels for both production and power usage. The system must integrate with on-site servers to allow certain company users to view a HMI screen with a representation of the line. This would provide real-time monitoring of the status of the line and relative data such as total run-time, downtime, efficiencies and percentage of product done. This must include the showing of whichever machine is in fault (shown as **RED**). Machines before the faulty machine should show **ORANGE** (standby/manually stopped) and machines after should remain **GREEN** (can continue running or also go into standby to reduce wasted power depending on user preference). The result would be better planning, greater knowledge of what goes on and increased accuracy in the recording of line statistics.

In addition, care must be taken to ensure the system is expandable to implement more lines in the future if the need arises.

Completion date

31st March 2023

Approval signatures

Student Signature: _____ Date: _____

Industrial Supervisor Signature: _____ Date: _____

Academic Tutor Signature: _____ Date: _____



SGEL6000
Independent Project
Log Book

Richard Harrison
SCADA system line implementation
2022-2023

Summary of Entries

Log Entry	Date	Brief Description of Activity	Duration (hrs)	Accumulated time (hrs)
1	23/09/22	First draft of proposal	6.5	6.5
2	30/09/22	Further discussed project with manager	5.5	13.5
3	07/09/22	Determining how to make machines SCADA-ready	4.5	18
4	14/09/22	Inquiring into SCADA implementation with manufacturers	9	27
5	21/10/22	Discussed project solutions with manufacturers	6.5	33.5
6	28/10/22	Developed FDS + literature review further	5	38.5
7	04/11/22	Talked with SF conveyors about their panels	3.5	42
8	11/11/22	Contacted Marel and Ravenwood again	5	47
9	18/11/22	Discussed lines moving within the company	4.5	51.5
10	25/11/22	Talked to Marel about machine modification	5	55.5
11	02/12/22	Checked void for place to mount SCADA panel	4.5	60
12	09/12/22	Looked into parts required for SCADA panel	4	64
13	16/12/22	Received SCADA translation document from Reiser	3.5	67.5
14	23/12/22	Looked into SF conveyor modifications	3	70.5
15	30/12/22	Discussed line move timeline with projects manager	2	72.5
16	06/01/23			
17	13/01/23			
18	20/01/23			
19	27/01/23			
20	03/02/23			
21	10/02/23			
22	17/02/23			
23	24/02/23			
24	03/03/23			
25	10/03/23			
26	17/03/23			
27	24/03/23			
28	30/03/23			
29	07/04/23			
30	14/04/23			

Log Entry Sheet

Log Number	1
Date	23/09/22
Duration (hrs)	6.5
Accumulated time (hrs)	65

Record of activities and achievements

1. Created first draft of project proposal for workplace manager and tutor to look over.
2. Collected information on further documents needed.

Plans for next week

1. Planned to meet with the workplace manager when next available to discuss the proposal draft.
2. Need to clarify what PLCs are in each machine to check compatibility and whether the manufacturer will allow slight changes to the program to allow for the SCADA implementation.

Signed _____

Signed _____

Log Entry Sheet

Log Number	2
Date	30/09/22
Duration (hrs)	7
Accumulated time (hrs)	13.5

Record of activities and achievements

1. Brainstormed other methods of further improving upon the proposed system and thought about piggy-backing the existing I/O of the machines using logic modules.
2. Met with the workplace manager and discussed the project and got confirmation that it can be done. During the discussion additional points were made in that when a machine goes into fault the system must show what the fault is on the SCADA HMI/gateway in the offices along with a catalogue of faults that have occurred, their times, total downtime, runtime etc.
3. Discussed how the system could be expanded and built upon afterwards if required.
4. Took down information from each machine on the line and determined what information was still needed from the manufacturer to make sure the machine can be made ready for SCADA.
5. Condensed proposal into a single page.

Plans for next week

1. Need to discuss a bypass with the manager. If production needs to run only a section of the line for specific reasons that can be done easily.
2. Need to talk with another engineer who is in the process of renewing and refurbishing conveyor panels within the factory so the refurbished panels are ready for the necessary equipment for SCADA elsewhere if the system is expanded at a later date.
3. Begin calling up manufacturers to see how the machines can be made ready for SCADA
4. Inquire about the system using <https://inductiveautomation.com>
5. Enquire about budget for SCADA system

Signed _____

Signed _____

Log Entry Sheet

Log Number	3
Date	07/10/22
Duration (hrs)	4.5
Accumulated time (hrs)	18

Record of activities and achievements

1. Enquired what would be needed to make certain machines SCADA-ready.
2. Talked with the tutor about improving the proposal.
3. Planned out deadlines for parts of the documentation.

Plans for next week

1. Need to discuss a bypass with the manager. If production needs to run only a section of the line for specific reasons that can be done easily.
2. Need to talk with another engineer who is in the process of renewing and refurbishing conveyor panels within the factory so the refurbished panels are ready for the necessary equipment for SCADA elsewhere if the system is expanded at a later date.
3. Inquire about the system using <https://inductiveautomation.com>
4. Enquire about budget for SCADA system
5. Continue calling up manufacturers to determine requirements for SCADA.

Signed _____

Signed _____

Log Entry Sheet

Log Number	4
Date	14/10/22
Duration (hrs)	9
Accumulated time (hrs)	27

Record of activities and achievements

1. Finished sending enquiries to each machine manufacturer regarding implementation with SCADA.
2. Produced project requirements, Testing and Project background + definition + constraints documents.
3. Reproduced project aims and objectives to manager for review.

Plans for next week

1. Need to discuss a bypass with the manager. If production needs to run only a section of the line for specific reasons that can be done easily.
2. Need to talk with another engineer who is in the process of renewing and refurbishing conveyor panels within the factory so the refurbished panels are ready for the necessary equipment for SCADA elsewhere if the system is expanded at a later date.
3. Enquire about the budget for SCADA system and required parts.

Signed _____

Signed _____

Log Entry Sheet

Log Number	5
Date	21/10/22
Duration (hrs)	6.5
Accumulated time (hrs)	33.5

Record of activities and achievements

1. Received replies from Reiser, THS and Sealpac machine manufacturers and talked about various issues and potential solutions with parts of the project regarding their machines.
2. Awaiting replies from Marel, Ravenwood and SF conveyors.
3. Discussed potential SCADA suppliers with the manager.
4. Discusses bypass options with the manager. Allowing production to only run a section of the line if needed.

Plans for next week

1. If no reply has been received regarding enquiries into Marel, Ravenwood and SF conveyors, will need to contact each again.
2. Discuss SCADA suppliers with the manager.
3. Discuss bypasses with the manager.

Signed _____

Signed _____

Log Entry Sheet

Log Number	6
Date	28/10/22
Duration (hrs)	5
Accumulated time (hrs)	38.5

Record of activities and achievements

1. Looked back over Functional Design Specification
2. Researched other potential solutions for the project other than SCADA that would provide the same outcome for literature review.

Plans for next week

1. If no reply has been received regarding enquiries into Marel, Ravenwood and SF conveyors, will need to contact each again.
2. Discuss SCADA suppliers with the manager.
3. Discuss bypasses with the manager.

Signed _____

Signed _____

Log Entry Sheet

Log Number	7
Date	04/11/22
Duration (hrs)	3.5
Accumulated time (hrs)	42

Record of activities and achievements

1. Spoke more with SF conveyors about their electrical panels supplied by another party.
2. Talked to the manager about the project and how it will be affected by lines being moved around in the company.

Plans for next week

1. Carry on with FDS work for project documentation.
2. Contact Ravenwood again.
3. Contact Marel again.

Signed _____

Signed _____

Log Entry Sheet

Log Number	8
Date	11/11/22
Duration (hrs)	5
Accumulated time (hrs)	47

Record of activities and achievements

1. Contacted Ravenwood again regarding the project
2. Contacted Marel again regarding the project
3. Looked back over project documentation

Plans for next week

1. Act on replies from Marel and Ravenwood
2. Adjust documentation considering machine control

Signed _____

Signed _____

Log Entry Sheet

Log Number	9
Date	18/11/22
Duration (hrs)	4.5
Accumulated time (hrs)	51.5

Record of activities and achievements

1. Gave further details to SF conveyors regarding the panels fitted to their conveyors in the factory.
2. Talked with the Projects manager within the company regarding the line my project is going to be implemented on. Got assurance that while the line may be moved it will still be within the factory.

Plans for next week

1. Get back to the project manager and see if he can be brought more on-board with the project. What are the timelines for the lines moving and can I implement my project when the line moves?
2. Tie up with Ravenwood and Marel.

Log Entry Sheet

Log Number	10
Date	25/11/22
Duration (hrs)	5
Accumulated time (hrs)	55.5

Record of activities and achievements

1. Discussed with Marel engineer how the WPL9000 could be implemented into such a system. It was suggested that there were extra relays within the system that could be used.
2. Investigated machine panel and drawings for external run relays that the Marel engineer talked about

Plans for next week

1. Supply machine drawings with project assignment
2. Look into other machines connectivity to SCADA
3. Get back to the project manager and see if he can be brought more on-board with the project. What are the timelines for the lines moving and can I implement my project when the line moves?
4. Tie up with Ravenwood and Marel.

Signed _____

Signed _____

Log Entry Sheet

Log Number	11
Date	02/12/22
Duration (hrs)	4.5
Accumulated time (hrs)	60

Record of activities and achievements

1. Added machine drawings for the metal detector upgrade
2. Attempted to contact Ravenwood.
3. Checked along the void space for mounting points and power for the panel to house the SCADA and PLC units.
4. The Project manager is currently busy with organising the move of all lines within the factory. Line that the project will be done on will need to be moved before the project can begin.

Plans for next week

1. Supply machine drawings with project assignment
2. Look into other machines connectivity to SCADA
3. Get back to the project manager and see if he can be brought more on-board with the project. What are the timelines for the lines moving and can I implement my project when the line moves?

Signed _____

Signed _____

Log Entry Sheet

Log Number	12
Date	09/12/22
Duration (hrs)	4
Accumulated time (hrs)	64

Record of activities and achievements

1. Looked into the equipment and parts required to build the necessary panel for the SCADA and PLC unit and cross-referenced those parts with stock in the company stores to see what parts were already on site and available to use.

Plans for next week

1. Supply machine drawings with project assignment
2. Look into other machines connectivity to SCADA
3. Get back to the project manager and see if he can be brought more on-board with the project. What are the timelines for the lines moving and can I implement my project when the line moves?

Signed _____

Signed _____

Log Entry Sheet

Log Number	13
Date	16/12/22
Duration (hrs)	3.5
Accumulated time (hrs)	67.5

Record of activities and achievements

1. Talked to Reiser (meat processing machine manufacturer) for the line in question and got the error translations for their machine to be used by SCADA so the system can process the input from the machine.
2. Inspected SCADA translation document and added it to documentation appendix.

Plans for next week

1. Supply machine drawings with project assignment
2. Look into other machines connectivity to SCADA
3. Get back to the project manager and see if he can be brought more on-board with the project. What are the timelines for the lines moving and can I implement my project when the line moves?

Signed _____

Signed _____

Log Entry Sheet

Log Number	14
Date	23/12/22
Duration (hrs)	3
Accumulated time (hrs)	70.5

Record of activities and achievements

1. Found circuit diagrams for the two SF conveyors on the production line and determined the best place to take the run signal for the PLC.
2. Added drawings to project documentation appendix.

Plans for next week

1. Get back to the project manager and see if he can be brought more on-board with the project. What are the timelines for the lines moving and can I implement my project when the line moves?

Signed _____

Signed _____

Log Entry Sheet

Log Number	15
Date	30/12/22
Duration (hrs)	2
Accumulated time (hrs)	72.5

Record of activities and achievements

1. Checked with the project manager about the timeline for line move. Still unknown

Plans for next week

1. Get back to the project manager about the timelines for the lines moving and can I implement my project when the line moves?

Signed _____

Signed _____

1809806 Project Definition, Research and Quality Planning

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

60/100

PAGE 1

Text Comment. Course and module are incorrect, see the brief. The course is BSc , the module is SGEL6000 and the

Text Comment. assignment is Project definition

PAGE 2

PAGE 3

PAGE 4

Text Comment. long sentences

Text Comment. "is taking place" - not finished yet

Text Comment. The brief asked for 1.5 line spacing and fully justified text

PAGE 5

PAGE 6

Text Comment. This would have been a good place to add a photo of a machine

PAGE 7

Text Comment. This is a continuation of the previous sentence and not a sentence in itself.

Text Comment. This is a continuation of the previous sentence and not a sentence in itself.

Text Comment. it is unclear what you mean here

Text Comment. do you mean error code?

Text Comment. error codes?

Text Comment. ??

Text Comment. This section reads more like an FDS

PAGE 8

Text Comment. You could have made reference to your risk assessment in the appendix.

Text Comment. when quoting, you should suppress the author

Text Comment. when quoting, you should suppress the author and give the page number

PAGE 9

PAGE 10

PAGE 11

Text Comment. not included in brief

PAGE 12

Text Comment. It would have been helpful here if you had specified which alarms are to be displayed

Text Comment. A good list of functions but lacks some technical details that would allow measurements to be taken for testing

PAGE 13

PAGE 14

Text Comment. This is a limited testing plan. If your FDS had contained more details of measurables, more tests could have been created to check them.

Text Comment. Where is the RTU?

Text Comment. Why have 2 ADSL routers?

Text Comment. Where are the Scalance SC642-2C relays?

Text Comment. This is part of the previous sentence

Text Comment. Where is the RD500 module?

Text Comment. Good evidence for selection of solution

Text Comment. This section was not required and the datasheets were not needed.

Text Comment. This belongs in the appendix and should come before the planning chart

Text Comment. The brief makes it clear that datasheets should not be included in the appendix

Text Comment. It would have been better to have extracted the important information and cited the source of the datasheet.

PAGE 29

PAGE 30

PAGE 31

PAGE 32

PAGE 33

Text Comment. It would have been sufficient to list the costs in a table. This level of detail is not appropriate in this report.

PAGE 34

PAGE 35

PAGE 36

PAGE 37

PAGE 38

PAGE 39

PAGE 40

Text Comment. It is not appropriate to include this level of detail in this report

PAGE 41

Text Comment. without signatures, there is no evidence of approval

PAGE 42

PAGE 43

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PAGE 57

PAGE 58

GRADING FORM: NEW CSG-RUBRIC

RICHARD HARRISON

60

1. ENGAGEMENT WITH LITERATURE



Sections 3 and 5: Engagement in research, judicial use and critical evaluation sources for project constraints and literature review of solutions There is good evidence of use of sources in the literature review and the constraints. (7/10) Sections 3, 5 and 8: Extent of reading, use of credible sources, use of Harvard method for listing and citing A wide range

13

of sources shows extensive reading with Harvard referencing convention applied correctly most of the time. (6/10) Total = 13/20

2. KNOWLEDGE AND UNDERSTANDING



Section 3: Project background and problem definition Background has been brief explained with a useful diagram. Problem has been briefly defined (3/5) Section 3: Project constraints: Ethical. Some consideration given very briefly (2/5) Section 3: Project constraints: Sustainability Good consideration given (3/5) Section 3: Project constraints: Legal/Commercial Thoroughly considered (4/5) Total = 12/20

12

3. COGNITIVE AND INTELLECTUAL



Section 4: Functional Design Specification A good list of requirements specified. However, it would have been useful to have included more requirements that were measurable. (3/5) Section 4: Test planning A short testing plan included (2/5) Section 5: Evaluation of solutions and justification of final solution An interesting section though more could have been done to clarify some of the diagrams. Very good method used for selecting the choice with lots of discussion. (5/5) Section 7: Conclusions and Recommendations A very brief section to conclude the report. (1/5) Total = 10/20

10

4. PRACTICAL APPLICATION



Section 6: Project Plan A detailed Gantt chart with milestones identified but no contingencies (3/5)
Section 6: Working breakdown structure, costing exercise and management techniques A detailed WBS in table form (3/5) Appendix: Risk assessment for implementation phase No risk assessment included. (0/5) Appendix: Planning phase log-book entries. Report contains brief log entries to date (3/5) Total = 9/20

9

5. TRANSFERABLE SKILLS



Section 1: Executive summary A good summary that covers most points (4/5) All Sections: Presentation quality of the report, diagrams, charts, tables, figure numbering, page, and section numbering etc Good quality presentation (5/5) All Sections: Quality of the writing style, use of punctuation and grammar Punctuation is fine but the writing style is often awkward with some sentences being extension of previous sentences. (2/5) Word count limit not exceeded Limit not exceeded (5/5) Total = 16/20

16