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by Jack Rogers

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Assignment: 1. Project Definition, Research and Quality Planning

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There are some good things in this report

Areas of improvement are in the formatting of the text, detail in the solutions, costing, consideration needed for ethical and sustainability, more detailed WBS and planning. In future, start the work sooner and keep on top of it.

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1. Executive Summary

Paragraphs should be fully justified text as required in the

At the start of the report an introduction was written to give a layout of the report and what's to come. A project proposal was made and agreed and can be found in 'figure 10' in the appendix. The background of the project was researched, and the project will take place in a meat processing factory while implementing an upgrade pack stopper system to the current machine (Mondini Trave 1000). The safety standards relevant to the project was stated along with a risk assessment table being created to highlight the current risks for the project. A functional design specification was created so that the design of the project can follow the FDS to meet its entire requirements. Next, a testing plan was created by following the requirements from the FDS and a test function was created for each relevant step. The literature review was then discussed as 3 different solutions were researched and described in order to find out the most logical and best solution to implement for the project, that's why solution 2 was the best option. After this a Gantt chart was created to make a project plan to show the deadline guide for each task needed to be carried out for the project. Finally, a conclusion was written to discuss each decision that was made in detail.

This reads more like an introduction to the report, your reader will glean little about the project from this summary.

2. Introduction

Paragraphs should be fully justified text as required in the brief

In this report there will be background research carried out about the industry and where the project will take place and what the company does and its goals. There will also be background research carried out about the machine that the project will need to be done on and what the machine does along with each section broken down in how they work while also giving a problem definition and why the project will be necessary in regard to environmental and sustainable challenges. There will be a risk assessment carried out for the machine in correspondence with the standards and regulations of the company and working in industry. A functional design specification will be created in order for the project to meet the demands requested by the company and a test plan will be created in correspondence to the FDS that has been made. There will be a literature review discussed going through 3 different solutions to solve the issue in the problem definition. These 3 solutions will be analysed and broken down into benefits and disadvantages for each solution with a cost breakdown and a radar chart to highlight the best and final solution that will be used for the project. A project plan and work breakdown structure will be created using management techniques as to when each task will need to be completed by. Finally, a conclusion will be given for the report along with a recommendation on optional extras that can be implemented in order to improve the sustainability and environmental effects of the project.

A good introduction

3. Project Background and Problem Definition and Constraints

3.1 Background

The project is based on a meat processing company that operates in the United Kingdom and Ireland. The company is recognized for its involvement in the meat industry, particularly in the processing and distribution of beef and lamb. It operates across multiple sectors, including retail, foodservice, and export markets. (Wales, 2020)

Figure 1 shows the existing HMI screen of the machine, this can be shown below.



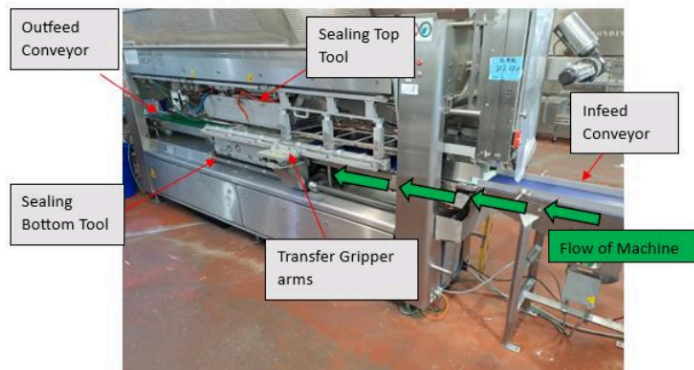
Figure 1 - HMI for Machine

The Mondini Trave 1000 is a tray sealer machine and is used to seal packages of products with either MAP (modified atmosphere packaging) or skin trays. MAP trays are sealed packs that contain gas (CO₂, O₂ and N) to create a small dome on top of the pack, while the Skin tray is where vacuum is used to suck the air out of the pack and create a skintight pack). The machine is considered to have four sections such as an infeed conveyor system, film transfer system; this system has a winding motor and an unwinding motor so that one drives the film through the machine and the other pulls the film out of the machine, after each cycle a new length of film is transported through the machine ready to be used for the unsealed packs, the sealing station and the transport outfeed system; conveyor that takes the sealed

packs out of the machine and turns the packs to the correct orientation when leaving the machine to go down the production line. The packs come in from the infeed system and get transported to the sealing station by two arms with pack slots on them. In the sealing station the film gets transferred onto the sealing head, which is the top tool consisting of 5 pods including heating elements and vacuum holes with teflon coating and blades. The sealing top tool and bottom tool comprises a die box and includes 5 chambers that have adjustable depths that depend of the depth of the pack. When it closes, it uses vacuum to suck the air out of the pack before transferring the film to the pack to create a sealed pack. Finally, the arms transfer the sealed packs from the sealing station to the outfeed section while simultaneously transferring the packs from the infeed section to the sealing station again. This process is known as one 'Cycle'. (G.MONDINI, 2024)

3.2 Problem Definition

This figure should have come earlier



Good image

Figure 2 - Breakdown of machine

The problem is that, when the infeed conveyor transfers the pack into the machine, it can only cope with 5 packs at a time and when the cycle has completed, the next 5 packs will follow creating the next cycle. The issue is when the infeed gets overcrowded with packs and the operator tries to infeed the machine before the cycle has completed causing the machine to go into error with cycle not done. As this is a very common issue, although it is a simple one to reset, the amount of times this issue occurs creates a lot of downtime for the line which leads to shortages of production and therefore a loss of profit and potentially loss of customers. One reason why this project will need to take place is because the machine is designed to run at 20 packs per minute but at the moment with this ongoing issue it struggles to make the planned run rate. (SPA, 2024)

3.3 Legal/Commercial

There are many regulations that need to be met to fit the criteria and deemed legal in the workplace. In correspondence to this project there are many regulations that need to be followed.

Repetition

The health and safety work Act 1974 is relevant with this system because of the operators and engineers that will be working as there are responsible for their own duties when using the equipment and each other. (Gov.uk, 2024)

Correctly cited

Not enough detail

The Electricity at work regulations 1989 is relevant with this system because a new system will be made and the electrical wiring for this system comes under these standards as they will also comply with the BS7671 standards. (Executive, 2024)

Correctly cited

The Use of work equipment regulations 1998 (PUWER) is relevant with this system because safety measures will be in place such as guarding, emergency stop and isolation from supply for system. It is also relevant as the it will only by used by people who have had the correct training or are qualified to work on this system. (HSE.Gov, 2024)

Correctly cited

The Food Safety Act 1990 is relevant with this system because the system is based in a meat processing factory. Therefore, the system must not harm or include any feature that could affect the meat being processed. (Gov.UK, 2024)

While following the regulations is a must, there are other practices that will need to be taken into account such as recognising the responsibilities, benefits and importance of supporting equality, cultural diversity and inclusion. In correspondence to this project as there are foreign operators that will be running the production line there might be a language barrier therefore an option of the operating instructions must be applicable in different languages or using images that are easy to understand. This is essential in understanding the importance of treating everyone equally, respecting different cultures, and making sure everyone has the same working and learning opportunities.

good explanation

4. Functional Design Specification and Test Plan

4.1 Functional Design Specification

The purpose of this document is to cover the criteria that the project will be required to meet.

The following information will provide a key to each category of the FDS outcomes.

Table Key:

I = Image

F = Function

S = Safety

D = Data

P = Performance

C = Cost

T = Time

The table below shows each of the expected outcomes of the project using the above key.

Table 1 - Functional Design Specification (FDS)

Are any of the items related to standards

Functional Specification Design	
Criteria/Ref No.	Requirement
I.1	The new panel must be no smaller than that H = 400mm x W = 300mm x D= 200mm.
F.1	Panel must have a Power LED Indicator
F.2	The new panel will include a Stop control

F.3	The new panel will include a LED Reset button
F.4	A start control will be included on the new panel.
F.5	The system must have a Speed control method to operate from the new panel
F.6	The Stopper cylinders must be able to fire manually
F.7	Stoppers must remain closed until pack arrives
F.8	Stoppers must Release when pack arrives
S.1	The Emergency Stop button will be included on the new panel
S.2	Isolator will be included on new panel
S.3	A guard will be mounted to cover pack stopper system
D.1	The system must be able to know how many packs goes into the machine
D.2	The system must be able to read the speed of the infeed conveyor in terms of packs per minute
D.3	The machine must be able to count how many packs per minute (ppm) the system is actually producing.
D.4	The system must improve downtime of machine
P.1	Stoppers must count 5 packs then stop until cycle has cleared
P.2	The product waste should be below 10%
P.3	The system must produce downtime below 20%

P.4	The system must be supplied by single phase 230V 50Hz
P.5	The system must include an air supply
C.1	Is the project within the budget
T.1	Is the project complete within timescale

4.2 Testing Plan

Table 2 below will include a test plan for whoever will be employed to test the system. This table will act as a guide in order to test all functions and performances of the system to ensure that the system has been built correctly in order to meet the demands of the FDS and requirements of the customer.

Table 2 - Test Plan

Test Plan Table						
Criteria/Ref No.	Requirement	Test Description	Expected Result	Actual Result	Decision Pass/Fail	Evidence
I.1	The new panel must be no smaller than H = 400mm x W = 300mm x D= 200mm.	Use a measuring tape to measure the height, width and depth of the panel box.	The new panel must be bigger than H = 400mm x W = 300mm x D= 200mm			
F.1	Panel must have a Power LED Indicator	Turn on the Isolator for the panel.	Machine will turn on, and the power LED will come on.			
F.2	The new panel will include a Stop control	While the system is running, press the stop button on the new panel.	The system will stop.			

F.3	The new panel will include a LED Reset button	When the reset LED is lit, press it.	The system should reset all faults and be in standby ready to start.			
F.4	A start control will be included on the new panel.	While the system is on stop and all faults have been reset, press the start button on the new panel.	The system will start			
F.5	The system must have a Speed control method to operate from the new panel	Turn the speed control all the way to the left and then all the way to the right.	The system will decrease in speed and then increase in speed.			
F.6	The Stopper cylinders must be able to fire manually	Manually put air into cylinders.	The stopper cylinders will fire.			

F.7	Stoppers must remain closed until pack arrives	Make sure there is no packs on system	Stoppers will be closed			
F.8	Stoppers must Release when pack arrives	Make sure there is a pack on system	Stoppers will release (open) and allow the pack to go through.			
S.1	The Emergency Stop button will be included on the new panel	Press the emergency stop button on the new panel while the system is operating.	Machine should stop running instantly and the reset LED should come on.			
S.2	Isolator will be included on new panel	Turn the isolator switch on new panel to the right	System will turn on			
S.3	A guard will be mounted to cover pack stopper system	Try to manually put a pack into the pack stopper system.	Unable to put the pack into the system as a guard is there to prevent it.			

Switches are best described as either open or closed rather than on/off

what about testing for 1,2,3,4 packs

D.1	The system must be able to know how many packs goes into the machine	Put 5 packs onto the infeed conveyor of the machine.	The HMI of the existing machine shows that 5 packs have entered the sealing station.		
D.2	The system must be able to read the speed of the infeed conveyor in terms of packs per minute	Load up the infeed conveyor full of packs continuously.	The HMI of the existing machine shows the rate of PPM the Infeed conveyor is running at.		
D.3 Repetition	The machine must be able to count how many packs per minute (ppm) the system is actually producing.	Load up the infeed conveyor full of packs continuously.	The HMI of the existing machine shows the rate of PPM the system is producing.		
P.1	Stoppers must count 5 packs then stop until cycle has cleared	Put 5 packs onto the infeed conveyor of the machine.	Stoppers will count 5 packs then stop until cycle has cleared and		

				then continue to feed the machine.			
P.2	The product waste should be below 10%	Run the machine for an hour and record how much waste is produced.		The product waste will be below 10%			
P.3	The system must produce downtime below 20%	Run the machine for an hour and record how much downtime the machine has produced.		The system downtime will be below 20%.			
P.4	The system must be supplied by single phase 230V 50Hz	Ensure all safety measurements, procedures and correct test equipment is carried out, and measure the voltage supply to the machine.		The supply voltage to the system will be 230V.			

P.5	The system must include an air supply of 8 bar going into the air regulator.	Turn on the air supply valve and look at the air gauge on the regulator to measure how much air is going to the system.	The air regulator will have a mains air supply of 8 bar.			
C.1	Is the project within the budget	Calculate the cost of the whole project.	The project will be within the budget.			
T.1	Is the project complete within the timescale given.	Keep record of how long the project takes to be completed.	The project will be completed within timescale given.			

5. Literature Review and Choice of Final Solution

5.1 Literature Review

For this system 3 solutions were created and described in order to find the best solution to use to create the project.

5.2 Solution 1 - Relay Logic controlled

Line spacing should be 1.5

One solution would be to implement ladder logic using simple components such as relays, sensors, pneumatic valves, and basic control circuits without using an interface. In order for this to work an impedance for each relay will need to be created as the signal would drop as it doesn't have an interface with existing impedance or voltage drops.

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Below is a block diagram on how this would work.

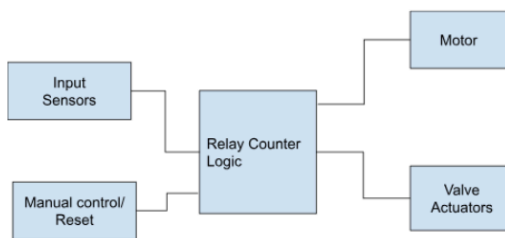


Figure 3 - Solution 1 Block Diagram

In the relay-based solution, the pack stopper system operates using a series of electromechanical relays and proximity sensors to automate the counting of packs, control the stopper, and manage the cycle. The process begins with proximity sensors placed along the conveyor to detect the arrival of each pack. When a pack passes the sensor, it sends a signal to an electromechanical relay that triggers the first relay in the pack counter circuit. (Corporation, 2007) Each time a pack is detected, the relay incrementally activates a series of relays to count up to 5 packs. Once the counter reaches 5, the final relay sends a signal to stop the flow of packs. (Digest, 2023)

The system controls the pneumatic valve that operates the pack stopper. As a pack is detected, the relays open the pneumatic valve, allowing the pack to pass through. When 5 packs have passed, the system sends a signal to close the stopper, effectively blocking further packs from passing. Simultaneously, the cycle done signal is activated, notifying

downstream equipment like the sealing machine that the cycle has been completed. (Ltd, 2024)

The system can be reset using the reset button, which resets all counter relays, allowing the system to begin counting again for the next batch of packs. This reset process ensures that the system is ready to process another set of 5 packs. The use of basic relays and sensors makes this solution cost-effective and simple, providing an efficient method for controlling the pack stopper and ensuring precise cycle control without the need for complex PLCs or microcontrollers. While it lacks the flexibility and programmability of digital controllers, it is highly reliable and well-suited for simple, small-scale applications where straightforward automation is needed.

5.3 Solution 2 - PLC Interface

Another solution that could work to create this system would be to use a PLC interface to control the inputs and outputs of the actuators and solenoids.

Below is a block diagram of how the solution would look in terms of theory.

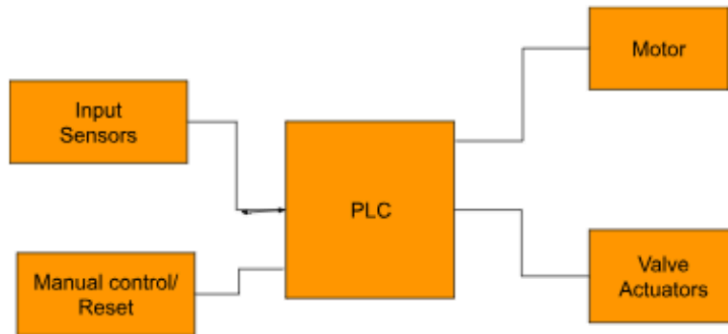


Figure 4 - Solution 2 Block Diagram

In solution 2, the pack stopper system is controlled by a Programmable Logic Controller (PLC), which is the central controller of the process. The system starts with proximity sensors placed along the infeed conveyor to detect the arrival of each pack. These sensors send a digital signal to the PLC whenever a pack is detected. The PLC processes these input signals and increments an internal counter for each detected pack. Initially, the pneumatic pack stopper valve is closed, preventing the packs from passing through the stopper. When the PLC detects the arrival of a pack, it sends an output signal to the

pneumatic valve, activating it to open the stopper and allow the pack to pass. As the pack moves through, the PLC increments the counter by one. (Staff, 2024) Correctly cited

The system is designed to allow only 5 packs to pass through before halting the flow of additional packs. Once the PLC detects that 5 packs have been processed (i.e., the internal counter reaches 5), it sends a signal to stop the flow of packs, either by stopping the conveyor motor or by engaging the pack stopper system to close again. At the same time, the PLC generates a 'cycle done' signal, which can be used to trigger the next stage of the process, such as starting the sealing machine or notifying the operator that the cycle has completed. The process then resets, with the counter returning to zero, and the system waits for the next set of packs to arrive. This entire sequence of detecting packs, counting, controlling the stopper, and signalling the cycle completion is managed by the PLC through its digital I/O (inputs for sensors and outputs for control signals). Citation Needed

5.4 Solution 3 - Arduino Microcontroller

The third and final solution that could work to create this system would be to use an Arduino Microcontroller to control the drivers and outputs of the actuators and solenoids.

Below is a block diagram of how the solution would look in terms of theory.

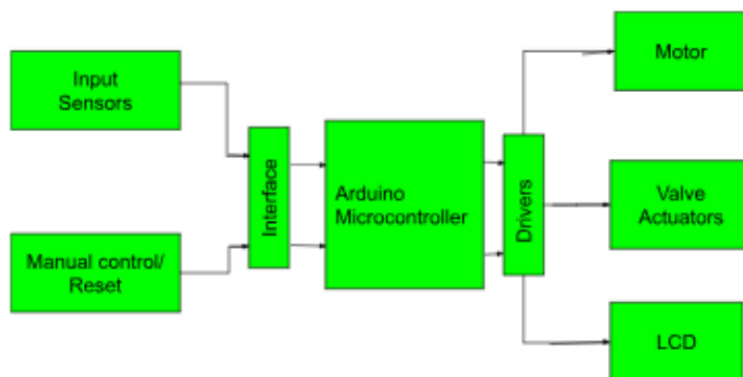


Figure 5 - Solution 3 Block Diagram

In the Arduino-based solution, the system is controlled by an Arduino microcontroller, which manages the entire process. The system begins with proximity sensors placed along the

infeed conveyor to detect when a pack arrives at the pack stopper. These sensors send a digital signal to the Arduino whenever a pack is detected. The Arduino processes these signals and increments a pack counter variable each time a pack passes the sensor. Initially, the pneumatic pack stopper valve is closed, stopping the packs from entering the machine. Once the Arduino detects the arrival of a pack, it sends a signal to a relay, which activates the pneumatic valve to open the stopper, allowing the pack to pass through.

The system is designed to allow exactly 5 packs to pass before halting further flow. Once the Arduino counts 5 packs, it sends a signal to either stop the conveyor motor or close the pack stopper by deactivating the pneumatic valve. Simultaneously, the Arduino sends a 'cycle done' signal to indicate that 5 packs have been processed and the cycle is complete. This signal can be used to trigger the sealing machine to start its next cycle or to notify the operator. The Arduino then resets the counter back to zero, waiting for the next batch of packs. An LCD display can be used to show the current pack count or cycle status, providing real-time feedback to the operator. The entire logic is controlled using the Arduino's programming, which processes inputs from the proximity sensors, manages the counter, and controls the relay to operate the pneumatic valve and stop the conveyor. This solution is simple, cost-effective, and flexible, making it suitable for smaller or prototype applications where a robust but inexpensive control system is needed.

5.5 Comparison of 3 Solutions

5.5.1 Solution 1 - Relay Logic Controlled

Advantages

Since the relay-based system doesn't involve complex programming or electronics, it generally incurs lower labour costs, especially in smaller projects. The relay-based solution is inexpensive as it relies on basic mechanical components. Relays, sensors, and pneumatic valves are all relatively low-cost components compared to PLCs and microcontrollers. Setting up a relay system is relatively quick and straightforward. There is no need for detailed programming or coding, making it easier to implement for small projects. Relays are mechanical devices and are generally very reliable when used in the right conditions. In terms of controlling simple processes, this approach can be highly durable and resistant to failures. The simplicity of the system and the longevity of the mechanical components make this solution sustainable over time, especially in environments where complex automation is not required.

Disadvantages

The system can become complicated as the number of relays used for this system is very high. Troubleshooting and upgrading are more challenging, and the logic can become hard to manage as the system grows. While simple and reliable for small-scale use, the mechanical nature of relays can lead to wear and tear, which could result in failure over time. As the number of sensors or control operations increases, adding more relays to the system could lead to wiring complications and reduced flexibility in operation.

Citation Needed

5.5.2 Solution 2 - PLC Interface

Advantages

PLCs are built to work in tough industrial settings. They are very reliable and last a long time, making them perfect for processes that need to run continuously, where any downtime can be expensive. PLCs are designed for industrial use and meet high standards of quality and strength. They are easy to expand because if you need to add more sensors or automated systems in the future, you can simply add more modules or connect with other PLCs. While setting up PLCs may seem complicated at first, their programming allows for flexible control of complex tasks. PLCs can easily connect with different input/output devices, sensors, and actuators, making them a powerful choice. They also have a low chance of breaking down, as they are a well-tested technology with plenty of support and guides.

Citation Needed

Disadvantages

The initial setup and programming of a PLC require skilled technicians. This adds to the labour cost as specialized knowledge is necessary for setup and troubleshooting. PLCs are typically more expensive compared to microcontrollers like Arduino or basic relay control systems. Though highly efficient in long-term operations, the development and installation of a PLC system may take longer due to its complexity and need for programming.

Citation Needed

5.5.3 Solution 3 - Arduino Microcontroller

Advantages

Arduino-based solutions often have lower labour costs for programming and maintenance. Arduino is a very cost-effective solution in terms of both the microcontroller board and minor components. This is ideal for small-scale projects where budget constraints exist. Arduino-based systems typically have a faster development cycle because they are simple to

program. Arduino is a useful solution that can be used for various types of automation. Its popularity makes it sustainable in terms of development and availability of parts.

Disadvantages

While Arduino is good for small projects, it may not be as strong or dependable as PLCs in tough industrial settings. The parts can be easily damaged, and the system might not last as long or handle heavy-duty work as well as a PLC. Arduino-based systems may be more likely to fail in industrial environments, especially when dealing with high-power equipment or extreme conditions.

Although Arduino systems can be expanded, this can be difficult. The platform may struggle to manage more complex tasks with many inputs and outputs. While Arduino is flexible, it also needs more hands-on work for complicated systems.

5.6 Comparison Conclusion

When comparing the 3 solutions a cost comparison graph was made which can be seen below in figure 6.

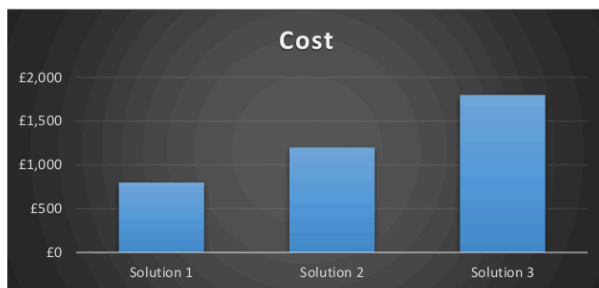


Figure 6 - Cost Comparison

By looking at the graph although solution 1 is the least expensive solution 2 is not much more and is also well within the budget. The matrix scoring system can be found in Table 4 in the appendix from which the following radar diagram was produced.

Since there is no evidence in the report of costing with part numbers, this seems like guess work. In actual fact,

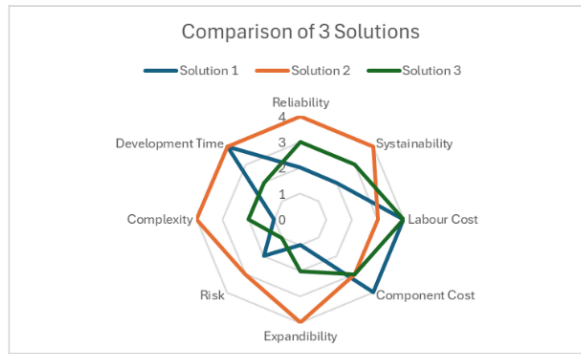


Figure 7 - Radar Chart for 3 Solutions

In conclusion, while the Arduino-based and relay-based solutions are cost-effective and quick to implement for smaller-scale projects, the PLC-based solution is the best choice for industrial applications where reliability, expandability, complexity management, and long-term sustainability are essential. Therefore, after careful consideration the solution that will be implemented to create this project is Solution 2.

6. Project Planning, Work breakdown and Management Techniques

6.1 Project Planning

A good plan but the WBS should hav come first

Below in Figure 7 is a Gantt Chart that was created using excel with each task and their expected dates and actual dates between January – April.



Figure 8 - Project Plan Gantt Chart

6.2 Work breakdown Structure

Below is a Work Breakdown structure (WBS). This layout will give a breakdown on what each task contains and how they are relevant to each other.

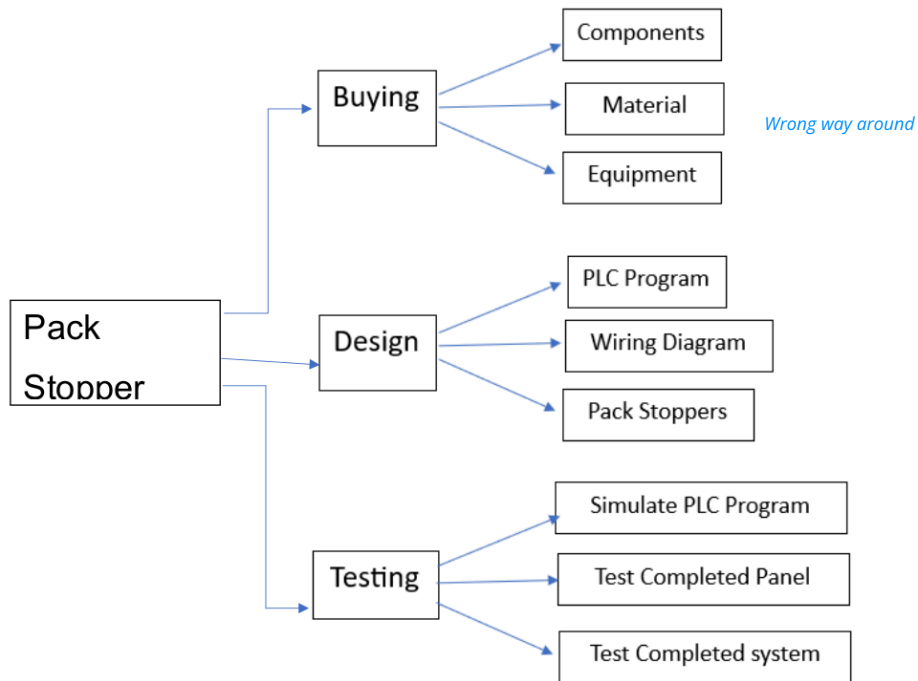


Figure 9 - Work Breakdown Structure

6.3 Risk Assessment Table

A risk assessment has been completed to identify the risks and hazards that are present on the machine and for the installation process of the project. The risk assessment table can be seen in 'table 3' in the appendix.

7. Conclusions and Recommendations

7.1 Conclusion

The project for a Pack stopper upgrade will benefit the efficiency of the production line running as it will decrease the downtime and lower cost of waste product for the line thus making it an environmental benefit to the company also.

After careful and thorough research of the project background, problem definition and legal regulations a better understanding of what solution for the project was acquired. From looking at the data given from the 3 solutions in how each one would work a description of advantages and disadvantages were also listed and discussed. By looking at all 3 solutions the most logical solution to use for the project was solution 2. In order to confirm that this solution was the best and most practical to implement this system a cost comparison graph and scoring matrix radar chart was created to highlight which solution was the best all-rounder. By looking at the final charts it was an obvious choice that solution 2 was the most practical for this system due to it having a lot of benefits and cost being within the budget given.

7.2 Recommendations

The main benefit with this project in terms of improvement is that more components can be added on in the future to increase its durability and increase sustainability.

One recommendation to improve these would be to use a thermal camera to record the temperature of the meat on the conveyor. This would be beneficial because if there was any downtime caused by the machine and the packs with meat were waiting on the conveyor, the thermal camera could detect what temperature the meat is before going into the machine and if it is within tolerance. If the meat temperature was not within the company's tolerance, then the camera could reject the packs. This would decrease waste in product and decrease downtime as production wouldn't have to re-seal the packs or risk discolouration in the packs.

Another recommendation to improve the project would be to fit a new HMI screen onto the stopper system new panel. This would be beneficial when it comes to fault finding as you could see what sensors would fail by looking on the HMI rather than manually testing each one.

8. Citation List

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9. Appendix

PROJECT PROPOSAL DOCUMENT

Student Name: Jack Rogers
Project Title: Pack Stopper Upgrade
Date: 04/10/24
Budget: £2000

Project Description

The project is based in a local meat factory that distributes sealed meat in packaging to the customer. The project will be constructed in the engineering workshop.

Problem

There is a continuous issue that occurs on one of the production lines where a 'Cycle not done' error keeps occurring on the tray sealing machine. This is caused when there are too many packs coming into the machine from a standard conveyor before the cycle has finished sealing. This causes the machine to stop quite frequently and it creates a lot of downtime for the line reducing the profit for the company. Therefore, the project is needed in order to reduce downtime and costs for the company in order to improve efficiency and help meet customer needs.

Involvement in the project

The people that will be involved in this project will be myself as the main engineer who will be designing and constructing the project and making sure that the deadlines are met. The Manager Dylan Jones will also be involved in the project as he will be in charge of the budget and allocating time for the project.

Budget

The budget is £2000.

a poorly scanned image

Completion Date

The project will need to be completed by March 2025, this will include all the planning, design, programming, construction of the panel and project all mounted together. If the project is not completed by this date then a simulated version will be implemented.

Agreement for project proposal

Student Signature: *J. N. Rogers* Date: 04/10/2024

Industrial Supervisor Signature: *D. Jones* Date: 14/10/2024

Figure 10 - Project Proposal

A good risk assessment

Table 3 - Risk Assessment

Hazard Description	Likelihood	Severity	Level of Risk	Control Measures
Jamming hand or fingers in between the pack stoppers	High	Medium	High	Make sure the stoppers are isolated by a guard to stop operations from putting their hands near it. Also, ensure correct and safe isolation for machine is nearby and present.
Electrical shock during installation.	Medium	High	Medium	Electrical safety protocols need to be followed and correct use of PPE must be worn.
Slips, trips, and falls when installing system.	Low	Medium	Low	Ensure that the work area is clean and tidy and guarded off from production.
Noise hazard from vacuum pump for sealing machine	Medium	Medium	Medium	Hearing protection will need to be provided when working in are over 35dB.
Stoppers failing and crushing packs causing plastic trays to damage and break off.	Low	Medium	Low	Ensure that correct PPE and safety glasses are worn.

Table 4 - 3 Solution Comparison Score chart

	Solution 1	Solution 2	Solution 3
Reliability	2	4	3
Sustainability	2	4	3
Labour Cost	4	3	4
Component Cost	4	3	3
Expendability	1	4	2
Risk	2	3	1
Complexity	1	4	2
Development Time	4	4	2

guess work

Where is your costing spread sheet?

SGEL6000
Independent Project
Log Book

Jack Rogers
Pack Stopper Upgrade
2024-2025

Summary of Entries

Log Entry	Date	Brief Description of Activity	Duration (hrs)	Accumulated time (hrs)
1	20/09/24	Discussion with my Manager	2 Hours	2 Hours
2	27/09/24	Discussion with My Lecture about Proposal	4 Hours	6 Hours
3	04/10/24	Created a project proposal	10 Hours	16 Hours
4	11/10/24	Signed off the project proposal	10 Hours	26 Hours
5	18/10/24	Background research into the company	10 Hours	36 Hours
6	25/10/24	Background Research into the machine	10 Hours	46 Hours
7	01/11/24	Look into the problem definition	10 Hours	56 Hours
8	08/11/24	Look at the sustainability and Legal/ commercial side of the project	10 Hours	66 Hours
9	15/11/24	Look into the company standards	10 Hours	76 Hours
10	22/11/24	Research about delivering an FDS	10 Hours	86 Hours
11	29/11/24	Creating an FDS and Test plan	10 Hours	96 Hours
12	06/12/24	Researching 3 solutions and writing a literature review	10 Hours	106 Hours
13	13/12/24	Comparing 3 solutions	10 Hours	116 Hours
14	19/12/24	Created a Project plan and WBS	10 Hours	126 Hours

A good log book but some entries are brief

Log Entry Sheet

Log Number	1
Date	20/09/24
Duration (hrs)	2 Hours
Accumulated time (hrs)	2 Hours

Record of activities and achievements

This week I had a discussion with my manager about a continuous issue we have on one of our production lines. The issue we've been having is that the tray sealer keeps going into error with 'Cycle not done', this error is caused when there are too many packs coming into the tray sealer from a standard conveyor. With this error the machine stops quite frequently and it causes a lot of downtime for the line and affects the costs of profit for the company.

In this discussion I briefly mentioned how we could solve the issues with a few different solutions. These solutions will be discussed with my lecturer in my next log entry.

Plans for next week

Discuss with my lecturer about the problem and come up with a project proposal.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	2
Date	27/09/24
Duration (hrs)	4 Hours
Accumulated time (hrs)	6 Hours

Record of activities and achievements

This week I discussed with my lecturer about the problem I was having that was mentioned in Log entry 1.

Following this conversation we discussed about making a project proposal which will need to include the following:

- Where is the project based?
- Why is the project needed?
- Who will be involved with the project?
- What budget is available?
- When it must be completed by?

Plans for next week

Create a project proposal on an A4 sheet of paper and give to my manager and lecturer.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	3
Date	04/10/24
Duration (hrs)	10 Hours
Accumulated time (hrs)	16 Hours

Record of activities and achievements

This week a project proposal was made after having a further conversation with my manager about the project and what would be needed to make it happen such as costs, time frame etc.

In this proposal the location was suggested that it would be done in the local meat factory in the engineering workshop.

The reason was stated that the project was needed to improve production downtime and save company money.

The people that will be involved in the project will be my manager, my lecturer and myself.

The budget was not confirmed as my manager was going to let me know by next log entry.

The project must be simultaneous working by early 2025.

Plans for next week

Further conversation and agree on budget with manager, get feedback from lecturer and manager with project proposal.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	4
Date	11/10/2024
Duration (hrs)	10 Hours
Accumulated time (hrs)	26 Hours

Record of activities and achievements

Confirmed the budget with the manager and gave him the project proposal to sign.

Researched into the background of the machine and company.

Plans for next week

Write up about the background of the machine and company.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	5
Date	18/10/2024
Duration (hrs)	10 Hours
Accumulated time (hrs)	36 Hours

Record of activities and achievements

This week the background of the company and the machine were described going into great detail on how the machine works. The problem definition was researched further.

Plans for next week

The plan for next week's log entry will be to investigate how the machine works physically and research its manuals on how to operate it.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	6
Date	25/10/2024
Duration (hrs)	10 Hours
Accumulated time (hrs)	46 Hours

Record of activities and achievements

This week a lot of research was conducted on what the machine is and how it operates. This research was a crucial part of the project because a clear understanding of how the machine works and operates is a key factor when trying to diagnose its faults and highlight its issues. The research covered the basic operation all the way to the design and electrical manual.

Plans for next week

The plan for next week's log entry will be to look into the problem definition that is highlighted by the machine, this will give a better understanding on what is causing downtime and be easier to find a solution for.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	7
Date	01/11/24
Duration (hrs)	10
Accumulated time (hrs)	56

Record of activities and achievements

The problem that is at hand is that when the infeed conveyor transfers the pack into the machine it can only cope with 5 packs at a time and when the cycle has completed the next 5 packs will follow creating the next cycle. The issue is when the infeed gets overcrowded with packs and the operator tries to infeed the machine before the cycle has completed, the machine will go into error with cycle not done. As this is a very common issue at hand, although it is a simple one to reset the amount of times this issues occurs this creates a lot of downtime for the line which leads to shortages of production and therefore a loss of profit and potentially loss of customers.

Plans for next week

Next week's plan for the log entry will be to look into the sustainability and Legal/ commercial side of the project.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	8
Date	08/11/24
Duration (hrs)	10
Accumulated time (hrs)	66

Record of activities and achievements

Research was done looking at the different standards that were relevant to the project and describing how they were relevant.

The standards researched were the following :

- Health and safety work Act 1974
- The Electricity at work regulations 1989
- Use of work equipment regulations 1998 (PUWER)
- The Food Safety Act 1990
- Supply of Machinery (Safety) Regulations (2008)

Plans for next week

Next week's plan will be to look into the company standards.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	9
Date	15/11/24
Duration (hrs)	10
Accumulated time (hrs)	76

Record of activities and achievements

This week's log entry was to research the standards of the company as it is a meat processing factory there are a number of different types of food safety regulations that need to be considered.

Plans for next week

Next week's log entry will be to research about delivering an Functional Design Specification.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	10
Date	22/11/24
Duration (hrs)	10
Accumulated time (hrs)	86

Record of activities and achievements

In this week's log entry research was carried out into delivering a Functional Design Specification. This document should be a table full of requirements so that when the project is being implemented the FDS is used as a guideline to follow to make sure that it meets the correct specifications.

Plans for next week

Next week's log entry will be creating the FDS and a test plan for the project.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	11
Date	29/11/24
Duration (hrs)	10
Accumulated time (hrs)	96

Record of activities and achievements

In this week's log entry a FDS was created containing all the custom requirements that the project will need to include. After creating the FDS the test plan could then be created as a test function for each step of the FDS was used.

Plans for next week

Next week's log entry will be to research 3 solutions to implement the project and write a literature review for the project.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	12
Date	06/12/24
Duration (hrs)	10
Accumulated time (hrs)	106

Record of activities and achievements

This week's log entry was to research 3 different solutions for the project and a literature review was written.

The 3 solutions that were researched were:

- Relay logic
- PLC interface
- Arduino Microcontroller

Plans for next week

In next week's log entry, the 3 solutions will be compared.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	13
Date	13/12/24
Duration (hrs)	10
Accumulated time (hrs)	116

Record of activities and achievements

In this week's log entry, the 3 solutions were compared by looking at the advantages and disadvantages and creating a radar chart in order to find the best solution for the project.

After careful consideration the obvious choice was solution 2 with the PLC interface.

Plans for next week

Next week's log entry will be to create a Gantt Chart for the project plan.

Signed *J. Rogers*

Signed *R. Davies*

Log Entry Sheet

Log Number	14
Date	19/12/24
Duration (hrs)	10
Accumulated time (hrs)	126

Record of activities and achievements

In this week's log entry, a Gantt Chart was creating using Excel.

Each task that will need to be done was recorded and an estimated due date for each task was given.

Plans for next week

Next week's log entry will be to look at buying the components needed.

Signed *J. Rogers*

Signed *R. Davies*

50

/100

PAGE 1

Text Comment. There are some good things in this report

Text Comment. Areas of improvement are in the formatting of the text, detail in the solutions, costing, consideration needed for ethical and sustainability, more detailed WBS and planning. In future, start the work sooner and keep on top of it.

PAGE 2

PAGE 3

PAGE 4

QM

Paragraphs should be fully justified text as required in the brief

Text Comment. This reads more like an introduction to the report, your reader will glean little about the project from this summary.

PAGE 5

QM

Paragraphs should be fully justified text as required in the brief

Text Comment. A good introduction

PAGE 6

PAGE 7

Text Comment. This figure should have come earlier

Text Comment. Good image

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

Text Comment. What are the four parts?

PAGE 8

QM

Repetition

Already stated elsewhere, repeating information is considered boring by your reader

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

Text Comment. Not enough detail

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

Text Comment. good explanation

PAGE 9

Text Comment. Are any of the items related to standards

PAGE 10

Text Comment. I am glad you have specified performance figures

PAGE 11

PAGE 12

PAGE 13

PAGE 14

Text Comment. Switches are best described as either open or closed rather than on/off

PAGE 15

Text Comment. what about testing for 1,2,3,4 packs

QM

Repetition

Already stated elsewhere, repeating information is considered boring by your reader

PAGE 16

PAGE 17

PAGE 18

QM

Line spacing should be 1.5

This allows the marker to put comments in between your lines

QM

Paragraphs should be fully justified text as required in the brief

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

PAGE 19

Text Comment. These explanations seem to be repeating the FDS without explaining how it is being implemented, there seems to be no design work here.

PAGE 20

QM

Correctly cited

Citation method conforms to Harvard standard, well done.

QM

Citation Needed

Cite Source:

Please use the link below to find links to information regarding specific citation styles:

<https://www.plagiarism.org/article/citation-styles>

Text Comment. Which microcontroller? Which programming language? How are the interfaces going to be designed?

PAGE 21

QM

Citation Needed

Cite Source:

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<https://www.plagiarism.org/article/citation-styles>

PAGE 22

QM

Citation Needed

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QM

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QM

Citation Needed

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<https://www.plagiarism.org/article/citation-styles>

PAGE 23

Text Comment. Since there is no evidence in the report of costing with part numbers, this seems like guess work. In actual fact, solution 3 may be the cheapest.

PAGE 24

PAGE 25

Text Comment. A good plan but the WBS should hav come first

Text Comment. Wrong way around

QM

Correct method of listing.

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

QM

Small Range of Sources

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

Text Comment. a poorly scanned image

Text Comment. A good risk assessment

Text Comment. guess work

Text Comment. Where is your costing spread sheet?

Text Comment. A good log book but some entries are brief

GRADING FORM: NEW CSG-RUBRIC

JACK ROGERS**50****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 some evidence provided in the report (5/10)

Sections 3, 5 and 8: Extent of reading, use of credible sources, use of Harvard method for listing and citing

A small range of sources listed but correct method of citing and listing used (4/10)

9/20

9**2. KNOWLEDGE AND UNDERSTANDING**

Section 3: Project background and problem definition

A good explanation given (3/5)

Section 3: Project constraints: Ethical.

Not considered (0/5)

Section 3: Project constraints: Sustainability

Not considered (0/5)

Section 3: Project constraints: Legal/Commercial

Good consideration given (3/5)

6/20

6**3. COGNITIVE AND INTELLECTUAL**



Section 4: Functional Design Specification
Clear, brief table supplied giving the expected outcomes of the project (3.5/5)

Section 4: Test planning

A good testing table but not all test procedures are explained in enough detail (3.5/5)

Section 5: Evaluation of solutions and justification of final solution

Briefly explained but not enough detail for each solution given. Costing is guess work. Correct solution chosen (2/5)

Section 7: Conclusions and Recommendations

Good conclusions and recommendations given. (3/5)

12/20

12

4. PRACTICAL APPLICATION



Section 6: Project Plan

Contains a good level of detail (3/5)

Section 6: Working breakdown structure, costing exercise and management techniques

A brief WBS (drawn the wrong way around and should come before the plan). No evidence of costing and explanation given of management techniques (2/5)

Appendix: Risk assessment for implementation phase

Good risk assessment (3/5)

Appendix: Planning phase log-book entries.

Log book contains brief entries (3/5)

11/20

11

5. TRANSFERABLE SKILLS



Section 1: Executive summary

Unfortunately, you have not understood how to write a summary, this reads like an introduction to the report and is very general telling your reader very little. (1/5)

12

All Sections: Presentation quality of the report,
diagrams, charts, tables, figure numbering, page,
and section numbering etc

Generally good (3/5)

All Sections: Quality of the writing style, use of
punctuation and grammar

Generally good (3/5)

Word count limit not exceeded

Not exceeded (5/5)

12/20