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Good Structure

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1. Executive Summary

Throughout the duration of this report, logbooks have been documenting the on-going progress of the industry standard project taking place. A total of 11 logbooks have been recorded starting from the 13th of January to the 31st of March 2023. Each logbook breaks down what exactly has been covered in that week but also at the end of the logbook what is expected to be completed by the next logbook. Each week the logbooks have been discussed with the lecturer to identify current progress against a Gantt chart that was plotted on the previous report. This can help identify whether the student is on the right trajectory.

Carrying over from the past report, this report discusses the chosen solution in great depth. Information like detailed block diagrams have been used along with detailed drawings for electrical or electronic circuits, flow charts & coding where programming is involved. In this section this is where the Functional Design Specification becomes relevant. The FDS will be used as a specification to ensure the project meets all crucial points.

The FDS is always relevant

On the previous report a list of components & a budget was generated to present to the managers of the company. Using these sources, it can be taken forward to start ordering & gathering all materials. The Gantt chart was laid out to help set deadlines to tasks to ensure that all work could be completed by the deadline. The Gantt chart was a useful tool as it allows for any contingencies to be put in place where hindrances occur. The project plan has also been updated to allow for any changes to the milestones. To show the practical side of the project in better context, images have been taken & placed inside the appendix for reference. Throughout the project Engineering management principles, commercial context, project & change management, and relevant legal matters have been applied where necessary.

has been

Once the project is completed the Test Plan constructed on the previous report will be used to ensure that the project can do exactly what has been stated in the first place.

This section should ahve been written in the past tense. Was the project successful?

was

2. Acknowledgments

I would personally like to thank all lecturers that helped during the engineering project.

Did you get help from the company?

From page 26, there must be some involvement from someone in your company.

3. Introduction

How can there be two section 3s?

This is the second report based on the monitoring project. Report 2 will use report 1's Function Design Specification & Test plan to give guidance as to what should be met whilst constructing this project. The Gantt Chart will also be used from report 1 purely as guidance to prevent any slippages.

You could have reminded your reader of what the project was about.

Report no.2 will present to the reader how the project has been implemented & what has been put in place to make this happen.

3. Design

word missing

The chosen solution that was selected in the previous has changed slightly. Due to recommendations from lecturers, it was made clear that the Siemens LOGO! was not the best option to go for. The LOGO offers its own software in comparison to the 1200 which uses TIA portal which is the standardised software used in the college.

What about the company needs?

what do you mean by diversity?

The modified solution now offers more diversity & does not affect any of the other components one bit, it'll be just a simple swap around. The programmes for the Siemens 1200 and the HMI screen can be downloaded from the college for free for all students.

Does this suit the company?

Figure 31 shows the original solution against the figure 32 which shows the modified version which can be viewed in the appendix.

Figure 33 displays a flow diagram for the project being built in work. This flow diagram has been produced to simplify how the project works to the reader. The diagram illustrates how each system interlinks with each other but only shows the control voltage side of the design and can also be seen in the appendix.

Highlighted by figure 34 in the appendix the wiring diagram for the Line 2 machine downtime monitoring system is displayed. This wiring diagram has been constructed to help with the assistance of building the project & ensuring no mistakes are made when constructing the panel.

The system contains 2 different voltages. The 240VAC has been used to energise the power supply because all components take a 24VDC supply apart from the power supply. The power supply is used to covert the 240VAC signal down to 24VDC. It would be safer to just run a 24VDC supply signal into the system instead of the 240VAC signal, but the thought of future modifications has also been thought of thus, by using a 240VAC signal it now makes the project more diverse & adaptable.

what do you mean by diverse?

Punctuation Error

Before the power supply the Live conductor has been run into a 6Amp rated MCB which has been put in place to protect the further components from over voltage. Due to the main supply being run from

a nearby machine some sort of protection needs to be put in place. Each supply from the beacon is 24VDC which is more than suitable for the PLC to handle.

The Ethernet switch has been positioned in the circuit to allow the HMI & PLC to communicate signals back & fourth. The supply ethernet signal has been put in place to allow future downloads to the PLC & HMI remotely from anywhere.

Spelling

TIA PORTAL – Ladder programme

The TIA PORTAL has been used to help construct a ladder programme used to communicate all 4 machine statuses from multiple locations to 1 location.

As discussed in the previous report this project is being built to help understand how much downtime the company is experiencing with all 4 machines running throughout a 12-hour shift. The aim is to compile all the data gathered from the project in the form of counters with the intention to extract the information & data to present to management so that it can be understood where the line lacks the most & how we can reduce the amount of EUPS (Unplanned Breakdowns) more effectively.

Company names should not be included

At Princes Gate the glass line is being pushed harder with the aim to produce more stock to prove to Nestle that the Line can run and hitting targets at the poor state that it is in now. The end goal is to prove its efficiency with the hopes to get a larger budget to spend on the line to make it run better in the future.

Shown in the appendix are screen shots from the TIA PORTAL ladder programme for the Line 2 glass bottle machine downtime counters. Photos from figure 35 onwards display this. This project displays 4 inputs which consist of all 4 machines involved in the project.

Each network (4 total) has the same construction. The aim is the same for each machine therefore there is no need to make each network different apart from the way each component is tagged obviously.

Typically, these inputs would be tagged as inputs (I) however for simulation purposes it has been set as memory bits (m) so that each low & high point can be manually switched on or off from a laptop screen. Please see figure 36 in appendix below.

Once each input goes from 0 > 1 it will energise both timers. There are reset buttons placed before the timers but because the functions are NC (Normally Closed) the signal passes straight through & into the timer until the circuit is broken. An image of the breakdown of each component on the ladder programme can be seen in appendix denoted as Figure 37.

Why the blank page?

Timer %DB1 “Breakdown_Timer_Start_Labeller_Fault” is a TONR timer. A TONR timer stands for “ON DELAY TIMER RETENTATIVE.” This basically means that the timer has a set value that it will count towards, in this situation the timer is counting from 0 > 43200 seconds. It could be asked, why such a large number? The reason why the timer is counting to 43200 is because there are 43200 seconds in 12 hours. 12 hours is the shift duration which one 1 set of values will be recorded.

Thus, once the TONR timer has been energised it will start counting towards it’s set value. In this projects circumstance once a machine goes into fault & changes the beacon status from a green or amber light to red light it will send a signal to the Siemens 1200 PLC. If the Labeller was used as an example and in a situation where a reel of stickers run out, then it would trigger a sensor on the tension roller to tell the machine that the reel of labels is now empty and needs to be replaced. The machine status will go from Green to Red on the beacon & display the fault on the screen. The beacon signal will run in parallel with a cable which runs directly to the monitoring system. The cable will send the signal to the PLC input & energise Network 3. Once Network 3 has been energised the timer TONR & TON will start to count to their set values. Please see figure 39 for images into TONR timers.

No need to plead with your reader

If the labeller is reset & no more faults are displayed, then the input will go from 1 > 0. The network no longer has any power & both timers stop counting. Both timers come into their own at this point. The TONR timer uses ET function (Elapsed Time) to track the counted value from the previous time the network went high and the duration it went high for.

With the name Retentive this means that the timer can store the value without resetting it. This way, the networks can count for the entire shift & retain the amount of downtime that has been accumulated throughout the day. This allows the user who wants to extract the data to come back at the end of the shift and record the data.

The second Timer which is a TON timer stands for “ON DELAY TIMER”. This is the most standard timer and works by counting once energised & resetting once it loses its signal. Please see in figure 38 an image of a TON timer used. If the TONR timer were to ever count to 43200s then it would energise an output “Labeller Timer Complete”. This would signify that the 12-hour shift is over & would need to be reset. The TON timer, “START_BUZZER_LABELLER,” counts to 60 seconds. This timer has been setup to activate a sound beacon to alert the operator when the machine has been in fault for more than 60 seconds. The beacon will continue to sound until the fault has been reset. This aims to reduce the amount of time the system is on stop for & to alert the operator if nobody is close.

The Last output in the Network is a “LABLLER FAULT BULB ACTIVE.” This sends a signal to the HMI screen to guide the operator as to where the fault is in terms of which machines are in fault mode. The signal switches a red bulb on which illuminates.

Network 3 shows the same configuration for the SMI machine. The SMI is a pack bottle wrapping machine. The same process applies, when the system detects a fault, the beacon will go from green (healthy running) to red (unhealthy running), this will additionally send a signal to the input of the downtime monitoring system & energise the Network which will start the timers.

Network 4 has been used for the palletiser. The palletiser is used to build layer of packed bottles by layer. The palletiser is positioned directly after the SMI. The palletiser does allow for both glass and plastic to be packed at the same time so there could be some inaccuracies to do with the timing for this machine.

The Login screen has been created to differentiate between Administrator access & Operator access. The main reason why logins have been given at this point is to avoid losing data from the accumulation counters for the downtime on the machines. By granting the Administrator access to all settings this means that only someone can reset the system if needs be, just to clarify, the operator will not be allowed accessed to reset the counters.

The Home screen is very basic & allows the user to navigate back & fourth between the different screens at ease.

To navigate between the 3 different screens on this project buttons have been accessed from the library & placed on the home page whilst being titled “SCREEN 2” & “SCREEN 3”.

Figure 43 & 44 shows how the screens can be selectable to move back & forward to any location. A simple button has parameters which can be edited. The “Events” section has been selected & furthermore, a release button has been added. Once the release button has been selected an “ActiveScreen” has been used, this then allows any of the 1 / 3 screens to be selected.

The second screen on the HMI is the machine status monitoring page. This page is not an interactive screen & its only purpose is to display the operator with the machine status (Healthy or not healthy). This screen allows the operator to identify if a specific machine is in fault from a long distance away. Please see attached an image of screen no.2. in appendix denoted as figure 45.

This has been set out to reduce the amount of downtime. With a restricted number of operators, it can become a challenge to identify that a machine is in fault.

From the Library Pilot lights have been placed over each machine. These Pilot lights have been assigned different tags to allow the outputs of the PLC to communicate with the HMI. A tag has been created for the PLC output inside the ladder program. Once this is energised it is linked with a separate HMI tag that allows the screen to replicate the PLC output but in the form of an illuminating bulb. See figure 46 for more details.

The library is a very useful tool & all the accessories used on the HMI screens can be found in there. Global Library's offers multiple functions such as pilot lights, buttons, Lever switches, its possible to select a graph to compile whatever information is necessary.

Was this part of your FDS or is it a recommendation? *How will a graph prevent this?*

In time a graph will be added to a fourth screen which will prevent a person gathering data of the downtime. The data will be gathered autonomously that way there will not be any complications & problems regarding inaccuracies.

Highlighted by figure 48 in the appendix a screen can be seen which highlights the live machine downtime counts. This page is used for the user to understand how much downtime has accumulated on the machine from anywhere within the shift duration. Colours have been used to help identify the terminology of the machines easier.

Reset buttons have been placed after each counter to allow the administrator to reset the count after collecting the data ready to start for a new shift. In the future the machine will be able to store & record the information gathered and reset each counter after every shift.

To setup the counter parameters to count properly tags have had to be used & assigned to the PLC & HMI. The PLC tag used have also been assigned to the ET (Elapsed Time) of the TONR timers. Once the timer starts to accumulate the value it also transfers this value to the visible counter on the HMI screen. The HMI also has its own tag (HMI DEPAL/EBI TIMER ACC) which is linked to the PLC tag which is seen in figure 49 in the appendix.

Considering the FDS set previously.

From the Function Deign Specification that had been constructed in the previous report the project being constructed could now be cross referenced to the points in the spec. to ensue all work was being carried out correctly.

ITEM NO.	DESCRIPTION
4.0	To be able to isolate the panel & any connected circuitry from an isolator switch that is easily accessible.
4.1	To visually monitor the statuses of all machines through interactive technology.
4.2	To determine the amount of downtime on the line by gathering data into the depalletiser machine.
4.3	To determine the amount of downtime on the line by gathering data into the EBI machine.
4.4	To determine the amount of downtime on the line by gathering data into the Labeller machine.
4.5	To determine the amount of downtime on the line by gathering data into the Rincer / filler machine.
4.6	To determine the amount of downtime on the line by gathering data into the capping machine.
4.7	To determine the amount of downtime on the line by gathering data into the Heuft system machine.
4. 8	To determine the amount of downtime on the line by gathering data into the SMI machine.

Table 1: Functional Design Specification

Point 4.0 explains that an isolator must be easily accessible & integrated within the circuit of the project. Figure 50 shows an image of the isolator which has been mounted onto the panel.

4.1. explains that the project must have the capability to visually monitor the statuses of all the machines on the line through interactive technology. The HMI has been installed to meet this purpose. The HMI uses a 7" display that allows multiple ways of reviewing the feedback from the PLC. Screen no. 2 has been created for this specification point.

Figure 51 presents an image of the fitted HMI which would be used to display all feedback information from the machines.

Item numbers 4.2 > 4.8 involve gathering information for all the different machines across the production line. Screen no. 3 on the HMI has been built for this purpose. This screen allows the user to monitor live data counts of the machines that are in fault. This screen accumulates the total time that a machine has been down for within a 12-hour period.

The De-palletiser / EBI have been linked together hence why counter has been shared. The labeller, SMI & Palletiser have been set up with their own counters. A switch has been included on the left-hand side of the screen to manually operate the timers. The switch represents the machine fault signal being sent to the project plc.

4. Implementation and Management

At the earliest stages of the project a plan was put in place to help gather all the materials necessary. Throughout the course of the build more materials were required at shorter notice due to unexpected problems, some of these problems were long lead times for materials & the difficulty to plan downtime to work on the line.

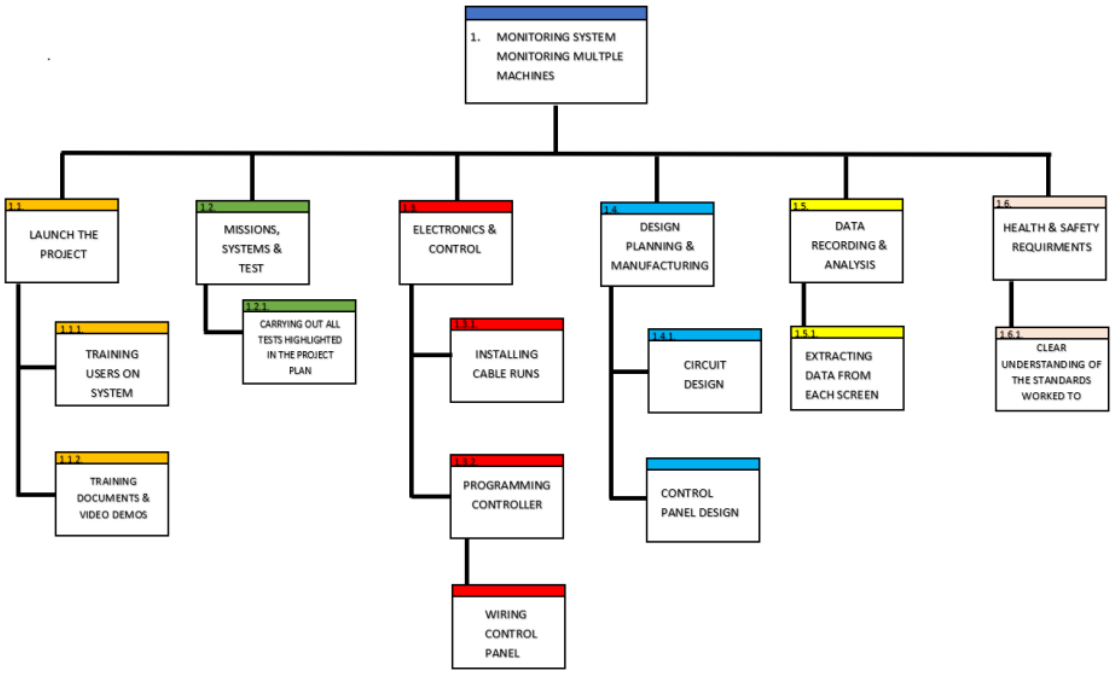
This suggests you could have planned the project better and put more thought into assignment 1

What does pre-planning mean?

A simple table was constructed which included the item description with the pre-planning cost against the actual material costs. The budget cost has been placed underneath both tables to ensure the project stayed within reason.

Work Breakdown Structure

The work breakdown structure has been a necessary part of controlling the implementation stages throughout this project. To be successful throughout the project each subheading underneath the "1. Monitoring system monitoring multiple machines" has been used to ensure each task of the project can be carried out correctly.



You are explaining the importance and usefulness of this but that is an evaluation and you are instructing your reader. It would be better if you explained what it means and why, if any, changes were needed.

Figure 1: Work Breakdown Structure

The work Breakdown Structure become very useful in creating a Gantt chart which could be used throughout the course of the project implementation stages. By tracking the progress through a Gantt chart, it allowed for extra weeks to be planned in if a specific area was running late for example.

The Gantt chart seen in figure 13 is a replica of the one used in the first report except the actual progress has been added alongside it. This allows the reader to understand what was predicted & what the actual time phases were.

The Practical aspects

The most time-consuming part of the project was running the cables from the project location to the multiple machines across the line. Due to the line running most of the time It means that planning time to work on the machines was awkward. Therefore, more accuracy was required when gathering materials for these jobs as when the opportunity did arise to work on the machines it needed to be done quickly.

Did the time match up with the planning?

Another time-consuming part of the project was measuring the lengths of cable required along with ordering cable to the factory. A lot of the runs involved work at height which was a struggle when working around the shop floor staff & the machinery. *Where is your risk assessment?*

Below are photos of the machinery wiring diagrams for the beacon terminal locations specifically. Health & Safety was always the biggest priority here as sometimes if the machines could not be isolated then work would have to be done whilst inspecting live panels containing voltages of up to 415VAC.

Using the wiring diagram, the beacon was in the drawing under “Red Lamp”. The drawing used terminal numbers which made the process of finding the terminals much easier. The drawing can be seen in the appendix denoted as figure 53.

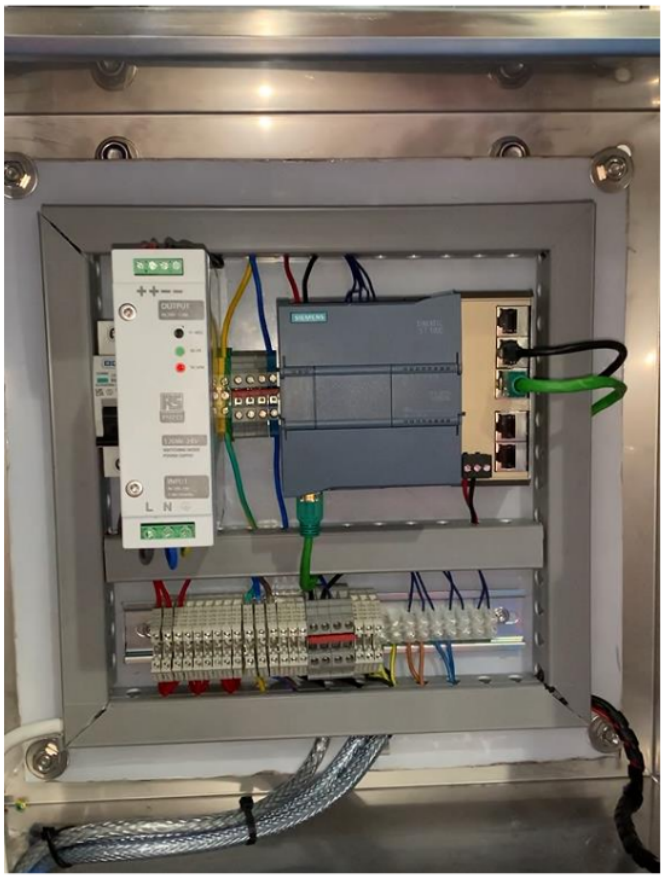


Figure 27: Inside panel

Figure 27 shows the result of the panel that has been constructed over the course of the last few months.



Figure 2: Control panel design

Figure 28 shows an example of what it took to run one of the signal cables into the leg of the machine.

5. Testing and Results

You don't need to explain to your reader why you did a test plan.

The Test plan was set of during the first report. The reason for the Test plan being built was to ensure that the system done as stated & was able to function correctly whilst meeting all the specification.

The first point (4.1.) that the project needed to meet was to test the system for dead. This test would be carried out by initialising the Isolator located on the panel. Once the switch was activated a test for dead needed to be carried out using a multimeter.

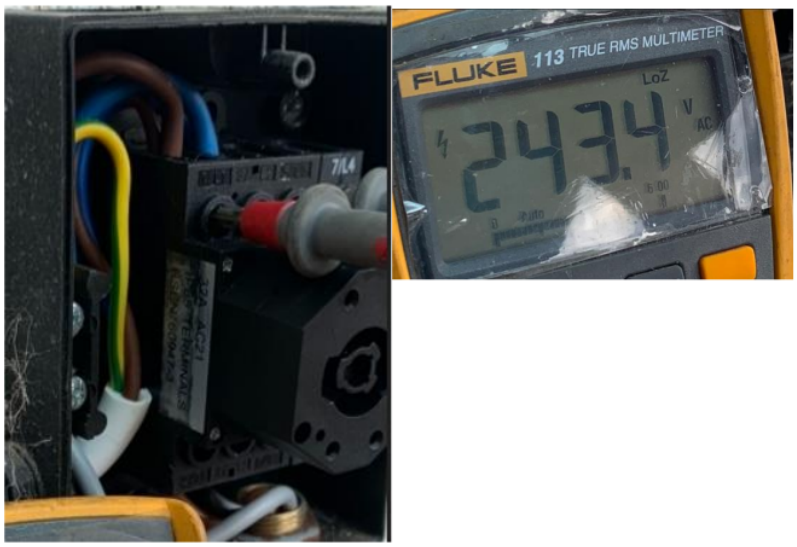


Figure 3: Testing for live

Figure 26 shows an AC voltage test carried out on the isolator in a powered state.



Figure 4: Testing for dead

opened

When the Isolator has been isolated it has been tested again and now displays 0V.

The second test was to be able to view the statuses of all machines through interactive technology. The expected outcome for this test meant that the second page on the HMI screen needed to view all machines with an illuminating LED which energised once a machine was in fault and the third page had to display counters for the machine downtimes.

Figure 30 below displays how the project displays the machine statuses. The software couldn't be displayed on the HMI screen, so a simulation example has been used instead.

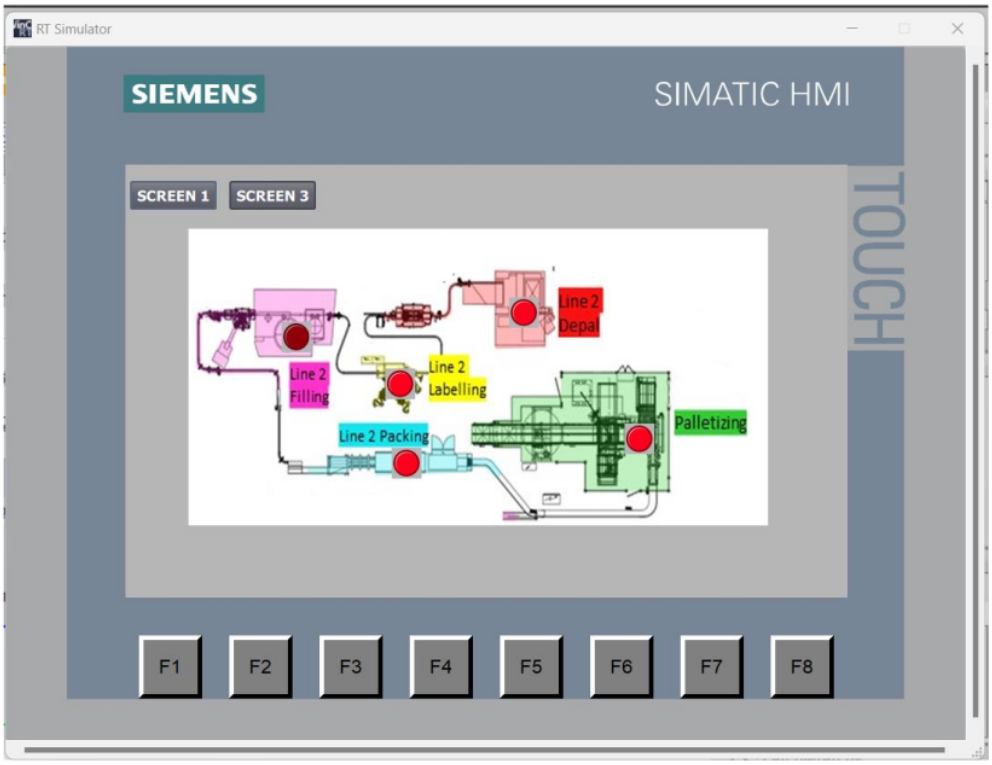


Figure 5: Viewing statuses of machines through interactive technology.

show

Punctuation Error

To demand that the tests for this project were accurate tests were carried out on the machines to force a fault. By opening a guard of the machine this would simulate a fault meaning the beacon of the machine would go from green to red & resulting in sending a signal to the monitoring system.

There are multiple ways of testing the system to check that these tests work. The first being what was explained above. A guard door needs to be opened to force a fault scenario.



Figure 6: Opening a guard door to simulate a fault.

The third test would be to monitor the PLC input LEDs for functionality by watching them switch on & off when the fault is set versus being reset. Unfortunately, problems occurred when trying to download the programme to the PLC which meant the LED's switching on the PLC could not be displayed.



The PLC is in STOP mode but this should not prevent the input LEDs from working and this does not require the programme either.

(McGraw-Hill, 1-9-2013) *This is not Havard*

Research was carried out using lots of sources some of which have been mentioned above & on the citation list.

It is not sufficient to say this, you must state what you learnt and used from the sources and then cite them.

Figure 7: Where the LEDs should be switching on the PLC.

The third test would be to watch the screen visually change as a fault occurs. This will be displayed on screen 2 (Machine fault monitoring page) & screen 3 (Machine downtime counters start & stop).

As mentioned previously the download of software to PLC could not occur therefore, the simulation mode has been used. Seen in figure 30 are screen no.2 & 3 which displays a fault being recognised on the machines & thus starting the timers / counters on screen 3.

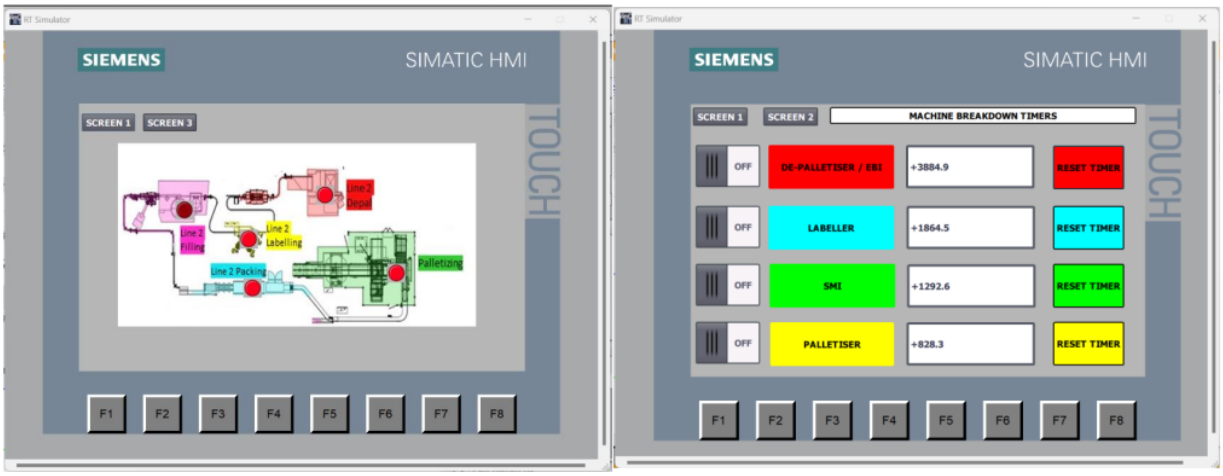


Figure 8: Visually monitoring the HMI screen.

Lastly, a simulation could be conducted using the TIA PORTAL software. This was very useful at the earlier stages of building the report. The software was able to save a lot of time during the building phase & allowed for less mistakes when the final product was being built / installed & tested.

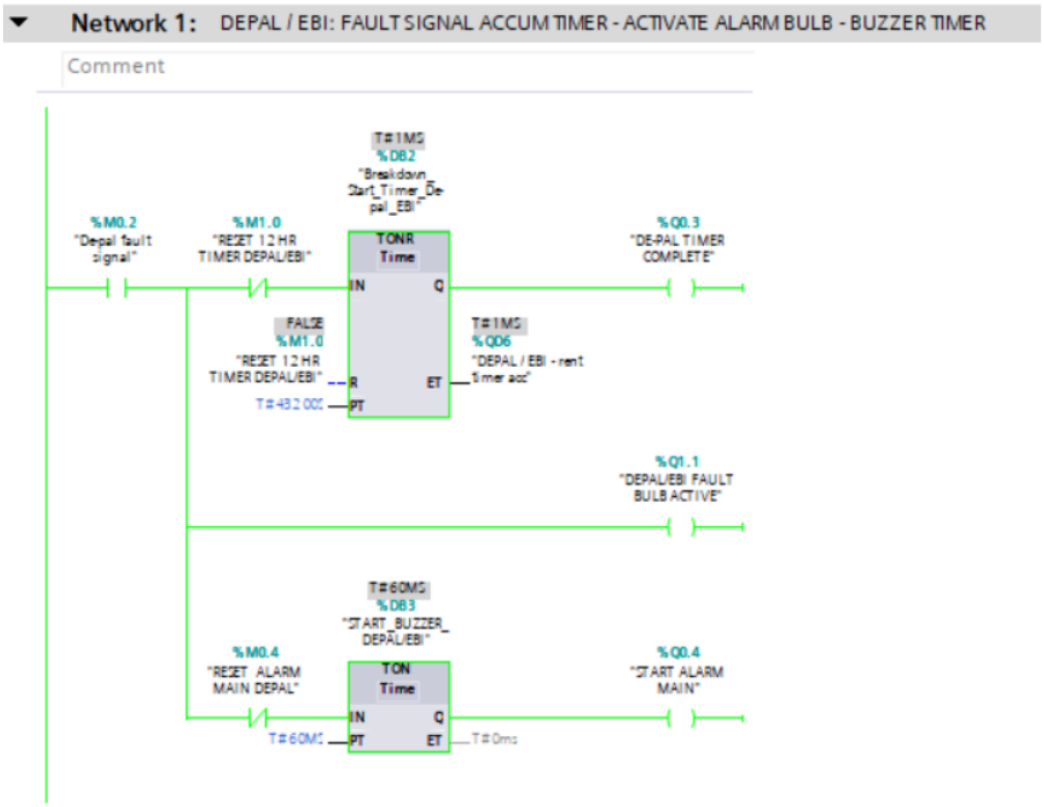


Figure 9: Monitoring the status of the programme using TIA PORTAL simulation mode.

As an example, the Depalletiser / EBI network has been used. As shown by figure 31 all outputs are active. This means that both the alarm counter & the machine downtime accumulation counters have reached their set values. The input has been the reason why the *incomplete sentence*

a testing table should have 5 columns

ITEM NO.	DESCRIPTION OF TEST	ACTUAL OUTCOME
4.1	Testing the system for dead.	- When the isolator is operated, the panel is dead. - The isolator cuts the supply when switched from ON to OFF.
4.2	To view the statuses of all machines through interactive technology	- The statuses can be viewed & the downtimes have been recorded using counters on the TIA portal software.
4.3	To break the interlock of the depalletiser machine to recreate a breakdown signal scenario.	- Interlock on door of external machine is broken & illuminates a RED beacon. - A signal is sent to the monitoring machine. - The PLC input on the device switches & indicates this by illuminating green. (Panel must be open to visualise this) - The user watches the home screen to see that a red LED start flashing on the animation of the line to indicate that the machines are now in fault.
4.3.1	To break the interlock of the depalletiser machine to recreate a breakdown scenario	The below tests have been carried out via simulation mode. - A signal will be sent to the PLC input which will indicate by flashing green. - Activity will be active on the second screen of the monitoring system. - The counter for the faulty machine will start counting in conjunction to when the machine goes into fault. - The test carried out will be expecting the system to show a count for 12 hours.
4.4	To break the interlock of the Labeller machine to recreate a breakdown signal scenario.	- The interlock has been broken and the EBI and determines a fault. - A signal is sent to the monitoring machine. - The PLC input on the device switches & indicates this by illuminating green. (Panel must be open to visualise this) - The user watches the home screen to see that a red LED start flashing on the animation of the line to indicate that the machines are now in fault.

4.4.1	To break the interlock of the Labeller machine to recreate a breakdown scenario	The below tests have been carried out via simulation mode. - A signal will be sent to the PLC input which will indicate by flashing green. - Activity will be active on the second screen of the monitoring system. - The counter for the faulty machine will start counting in conjunction to when the machine goes into fault. - The test carried out will be expecting the system to show a count for 40 minutes.
4.5	To break the interlock of the Filler machine to recreate a breakdown signal scenario.	- The interlock has been broken and the EBI and determines a fault. - A signal is sent to the monitoring machine. - The PLC input on the device switches & indicates this by illuminating green. (Panel must be open to visualise this) - The user watches the home screen to see that a red LED start flashing on the animation of the line to indicate that the machines are now in fault.
4.5.1	To break the interlock of the Filler machine to recreate a breakdown scenario	The below tests have been carried out via simulation mode. - A signal will be sent to the PLC input which will indicate by flashing green. - Activity will be active on the second screen of the monitoring system. - The counter for the faulty machine will start counting in conjunction to when the machine goes into fault. - The test carried out will be expecting the system to show a count for 30 minutes
4.6	To break the interlock of the SMI machine to recreate a breakdown signal scenario.	- To be able to monitor the status of the machine through an LED on the HMI screen. - Visually the operator should be able to determine the machine status through a flashing LED. - The operator can determine that if the LED is red the machine is in fault. - If the LED is in green the machine is in a running state.

4.6.1	To break the interlock of the SMI machine to recreate a breakdown scenario	The below tests have been carried out via simulation mode. - A signal will be sent to the PLC input which will indicate by flashing green. - Activity will be active on the second screen of the monitoring system. - The counter for the faulty machine will start counting in conjunction to when the machine goes into fault. - The test carried out will be expecting the system to show a count for 7 minutes
4.7	To break the interlock of the Palletiser machine to recreate a breakdown scenario	- To be able to monitor the status of the machine through an LED on the HMI screen. - Visually the operator should be able to determine the machine status through a flashing LED. - The operator can determine that if the LED is red the machine is in fault. - If the LED is in green the machine is in a running state.
4.7.1	To break the interlock of the Palletiser machine to recreate a breakdown scenario	The below tests have been carried out via simulation mode. - A signal will be sent to the PLC input which will indicate by flashing green. - Activity will be active on the second screen of the monitoring system. - The counter for the faulty machine will start counting in conjunction to when the machine goes into fault. - The test carried out will be expecting the system to show a count for 18 minutes *if the test was carried out, this would be written in the past tense*

Where is your evidence column and what decisions have you made about pass or fail for each item?

Figure 10: Test plan actual outcome.

6. Evaluation of Project Outcomes

Table 2 below shows the Planned FDS points against the Actual FDS points. From the images used in this assignment it is clear to see those points 4.0, 4.1 have been addressed which were 2 crucial points of the specification. For the machine downtime counter page this included points 4.2 > 4.8. It can be concluded that only 4.2, 4.3, 4.4 & 4.8 have been carried out. During the construction we did not find it necessary to add in the other machines as it is not causing us many problems during the running of the line, thus, we have only included the most problematic machines to start with.

who is the other party?

Write in the third person

ITEM NO.	DESCRIPTION (PLANNED)	DESCRIPTION (ACTUAL)
4.0	To be able to isolate the panel & any connected circuitry from an isolator switch that is easily accessible.	The panel can be isolated when using the isolator located on the panel surface. Please see figure 19 above.
4.1	To visually monitor the statuses of all machines through interactive technology.	3 separate screens can be monitored through the HMI screen, these being a home screen, a machine status screen & a machine downtime counter screen. Please see figure 20.
4.2	To determine the amount of downtime on the line by gathering data into the depalletiser machine.	The downtime can be determined through the machine downtime counter screen on the HMI screen 3.
4.3	To determine the amount of downtime on the line by gathering data into the EBI machine.	The downtime can be determined through the machine downtime counter screen on the HMI screen 3.
4.4	To determine the amount of downtime on the line by gathering data into the Labeller machine.	The downtime can be determined through the machine downtime counter screen on the HMI screen 3.
4.5	To determine the amount of downtime on the line by gathering data into the Rincer / filler machine.	This machine counter has not been included in the project.
4.6	To determine the amount of downtime on the line by gathering data into the capping machine.	This machine counter has not been included in the project.
4.7	To determine the amount of downtime on the line by gathering data into the palletiser machine.	The downtime can be determined through the machine downtime counter screen on the HMI screen 3.
4. 8	To determine the amount of downtime on the line by gathering data into the SMI machine.	The downtime can be determined through the machine downtime counter screen on the HMI screen 3.

Table 2: FDS planned against actual.

How the constraints have been met?

why are you still aiming?

The project that has been built aims to meet the following constraints.

- To offer the ability to improve the overall efficiency along with the H&S of the Line.

By now understanding which machines are causing much of the downtime through the downtime monitoring system It is possible to plan more machines against these machines, furthermore, reducing the breakdowns on the machines during production with the outcome to produce a higher number of pallets per shift.

- To ensure that the customer satisfaction is at 100%

This means that by making sure the machines are running correctly it allows more time to monitor the bottled product before it goes out the door ensuring a 100% standard.

Quality management & continuous improvement

A high degree of quality management is already currently in place which monitors every aspect of the bottle. These include the quality of glass, the quality of label being rolled onto the bottle, the correct fill level & a cap detection unit. The operators will continue to conduct checks as before which involves testing the PH of the water, the conductivity of the water & samples every so often to visually inspect the bottle.

Issues that arose.

- Managing materials arriving late

More cable was needed than first anticipated which led to longer lead times than necessary causing the planned allocated time against the job to go out slightly.

- Lack of understanding setting up TIA Portal software.

Due to the lack of experience with using the software it led to this specific task taking a lot longer than what was thought. Thankfully help could be offered through the college which rectified the issues & lack of understanding.

- Dealing with downtime slots & taking advantage of them

Due to the premisses being a high output plant there is little time to plan against downtime therefore, when there was all materials & products needed to be ready which led to a lack of planning which also cost more time.

7. Conclusions and Recommendations

Overall, the project proved to be unsuccessful because it could not be finished within the time set. During the implementation stages of the tasks where the author had to start gathering all the materials problems did occur. This mainly involved issues regarding lead time of materials which added additional time onto the tasks which was not originally planned on the Gantt chart.

You are telling your reader a story, rather you should be concluding what has been achieved.

However, because a Gantt chart was put in place this then allowed to plan around these problems & deal with time delays accordingly. Although problems were faced with materials, it did not mean that other tasks could be completed whilst waiting for materials to come in. Whilst waiting for other materials the control panel started to take shape. The author found it very awkward to get tasks done during work hours as the project unfortunately took second priority to the primary role within the company. Additionally, the author found it very difficult to plan downtime on the line as the glass line is expected to be running a lot more this year. As the author had to enter panels of the machines to terminate the cable It meant that the author had to always use LOTO (Locking off procedure of machine supply's) to ensure everyone is safe.

Some replanning was required during this project as originally, the author planned to use a different controller. The author did intend to use Siemens LOGO; however, the author was advised to use a 1200 instead due to the ease of access to the programme material which turned out to be a very good idea.

Once sure that the author was now using the 1200 PLC the software was downloaded. The author came across many problems when using the compatible software for the controller, some of these problems were mainly setup. Setting up the software was difficult mainly due to the inexperience with the software & it's functions. This took me some time to try & figure which led to me spending more time on it than necessary. Due to the problems with this the author resorted to seeking advice from the lecturer, thankfully he was able to help rectify the issues that were experienced. The programming side the author found easier to deal with as borrowed a lot of resources from the internet & the college website. The author found YouTube very constructive as it offered ideas quickly at the tap of a finger which the author could implement straight away. Although with all that help, the author still fell short with regards to uploading the programming to the PLC, this unfortunately cost me from progressing further into the project.

Whilst programming at home the was constructing the panel in work. Due to us not having a complete workshop which was currently being installed the author found it awkward to build the panel quickly & efficiently. The author thankfully was able to deal with what we had and built the panel over a couple of night shifts.

Now that the panel was built, the author could focus all efforts on work to run the remaining cables & complete the installation. This took up most of the time as the author had to plan the work around the work schedule which didn't always work in favour.

The installation of the system the author dealt with well & was able to terminate all the cables to the project from the wiring diagram that the author made to avoid any complications. Once the project was installed, the author could then gather all the data necessary to address the FDS that the author set & make sure that each point was made.

The author has learnt from this process that more people n[illegible] advice. There are people who have gone through the exact same problems that I've experienced & by asking them for support the author could get tasks completed a lot quicker. With regards to materials being late then the author should think for the future that the whole process needs to be more organised regarding understanding why the materials are taking longer than expected.

Write in the third person

This is a personal reflection not a conclusion

Did you mean this to be your citation list?

8. Bibliography

This is not Havard. Looks like APA.

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A bibliography is a list of sources you have not cited. Is this what you mean?

9. Appendix

what do the colours mean?

1. Final Gantt chart showing changes that were needed and any slippages.

	06/01/2023 wk 1	13/01/2023 wk 2	20/01/2023 wk 3	27/01/2023 wk 4	03/02/2023 wk 5	10/02/2023 wk 6	17/02/2023 wk 7
1. MONITORING SYSTEM MONITORING MULTIPLE MACHINES	1	1	1	1	1	1	1
1.1. LAUNCH THE PROJECT							
1.1.1. TRAINING USERS ON SYSTEM							
1.1.2. TRAINING DOCUMENTS & VIDEO DEMO'S							
ACTUAL: 1.1. LAUNCH THE PROJECT							
1.1.1. TRAINING USERS ON SYSTEM							
1.1.2. TRAINING DOCUMENTS & VIDEO DEMO'S							
1.2. MISSIONS, SYSTEMS & TEST							
1.2.1. CARRYING OUT ALL TESTS HIGHLIGHTED IN THE PROJECT PLAN							
ACTUAL: 1.2. MISSIONS, SYSTEMS & TEST							
1.2.1. CARRYING OUT ALL TESTS HIGHLIGHTED IN THE PROJECT PLAN							
1.3. ELECTRONICS & CONTROL				1.3.	1.3.	1.3.	1.3.
1.3.1. INSTALLING CABLE RUNS				1.3.1.	1.3.1.	1.3.1.	
1.3.2. PROGRAMMING CONTROLLER							1.3.2.
1.3.3. WIRING CONTROL PANEL							
ACTUAL: 1.3. ELECTRONICS & CONTROL				1.3.	1.3.	1.3.	1.3.
1.3.1. INSTALLING CABLE RUNS				1.3.1.	1.3.1.	1.3.1.	1.3.1.
1.3.2. PROGRAMMING CONTROLLER				1.3.2.	1.3.2.	1.3.2.	1.3.2.
1.3.3. WIRING CONTROL PANEL							
1.4. DESIGN PLANNING & MANUFACTURING	1.4.	1.4.	1.4.	1.4.	1.4.	1.4.	1.4.
1.4.1. CIRCUIT DESIGN	1.4.1.	1.4.1.	1.4.1.				
1.4.2. RESEARCHING SIEMENS LOGO DATA	1.4.2.	1.4.2.	1.4.2.	1.4.2.	1.4.2.	1.4.2.	1.4.2.
1.4.3. CONTROL PANEL DESIGN			1.4.3.	1.4.3.	1.4.3.		
ACTUAL: 1.4. DESIGN PLANNING & MANUFACTURING	1.4.	1.4.	1.4.	1.4.	1.4.	1.4.	1.4.
1.4.1. CIRCUIT DESIGN	1.4.1.	1.4.1.	1.4.1.	1.4.1.	1.4.1.	1.4.1.	1.4.1.
1.4.2. RESEARCHING SIEMENS 1200 DATA	1.4.2.	1.4.2.	1.4.2.	1.4.2.	1.4.2.	1.4.2.	1.4.2.
1.4.3. CONTROL PANEL DESIGN			1.4.3.	1.4.3.	1.4.3.		
1.5. DATA RECORDING & ANALYSIS							
1.5.1. EXTRACTING DATA FROM THE HMI COUNTERS							
ACTUAL: 1.5. DATA RECORDING & ANALYSIS							
1.5.1. EXTRACTING DATA FROM THE HMI COUNTERS							
1.6. HEALTH & SAFETY REQUIREMENTS	1.6.	1.6.	extra week				
1.6.1. CLEAR UNDERSTANDING OF STANDARDS WOKRED TO	1.6.1.	1.6.1.					
ACTUAL: 1.6. HEALTH & SAFETY REQUIREMENTS	1.6.	1.6.	1.6.	1.6.			
1.6.1. CLEAR UNDERSTANDING OF STANDARDS WOKRED TO	1.6.1.	1.6.1.	1.6.1.	1.6.1.			

24/02/2023 wk 8	03/03/2023 wk 9	10/03/2023 wk 10	17/03/2023 wk 11	24/03/2023 wk 12	31/03/2023 wk 13	07/04/2023 wk 14	14/04/2023 wk 15	21/04/2023 wk 16	28/04/2023 wk 17
1	1	1	1	1	1	1	1	1	1
						1.1.	1.1.	1.1.	extra week
						1.1.1.			
							1.1.2.	1.1.2.	
								1.1.	1.1.
								1.1.1.	
									1.1.2.
				1.2.	1.2.	extra week			
				1.2.1.	1.2.1.				
						1.2.	1.2.		
							1.2.1.		
1.3.	1.3.	1.3.	1.3.						
1.3.2.									
	1.3.3.	1.3.3.	1.3.3.						
1.3.	1.3.	1.3.	1.3.	1.3.	1.3.		1.3.	1.3.	1.3.
1.3.1.	1.3.1.	1.3.1.	1.3.1.	1.3.1.					
1.3.2.	1.3.2.	1.3.2.	1.3.2.				1.3.2.	1.3.2.	1.3.2.
				1.3.3.	1.3.3.				
1.4.	1.4.	1.4.	1.4.						
1.4.2.	1.4.2.	1.4.2.	1.4.2.						
1.4.	1.4.	1.4.	1.4.						
1.4.1.	1.4.1.								
1.4.2.	1.4.2.	1.4.2.	1.4.2.	1.4.2.	1.4.2.				
						extra week	1.5.	1.5.	
							1.5.1.	1.5.1.	
						1.5.	1.5.	1.5.	1.5.
								1.5.1.	1.5.1.

Figure 11: Gantt chart planned versus actual

2. Planned & actual spending spreadsheet

What does pre-planning mean?
Did you think about it before your thought about it?

Item No.	Description of item to construct finished project	Pre-planning	Actual planning
1	Siemens LOGO! 230 RCE	£114.75	- - - - - -
2	Siemens 1200 DC/DC/DC CPU	- - - - - -	£200
3	SIMATIC Basic Panel Siemens KTP700 Basic	£572.67	£572.67
4	Unmanaged Ethernet Switch TERZ NITE-RF5-1100	£57.60	£57.60
5	Siemens SIMATIC NET 6XV1850-2GE5	£10.80	£10.80
6	Siemens LOGO! Soft Comfort V8	£43.38	- - - - - - -
7	Siemens 1200 TIA PORTAL software	- - - - - -	£0
8	Siemens SIMATIC WinCC Basic V17	£96.39	£0
9	Single core & Multicore sy cable	£200	£400
10	RS PRO ABS Wall Box, IP65, 400 mm x 300 mm x 165mm	£74.68	- - - - - -
11	Schneider Electric Spacial CRN Series Steel Wall Box 400 x 400 x 300	- - - - - - -	£114.73
12	RS PRO Steel Slotted DIN Rail, Top Hat Compatible, 2m x 35mm x 7.5mm	£7.97	£7.97
13	Weidmuller WDU DIN Rail Terminal Block, 2.5mm², 800 V	£12.78	£12.78
14	CEF DIN rail terminal connectors	- - - - - - -	£25.80
15	RS PRO Green, Yellow Earth Terminal Block, Single level	£3.03	£3.03
16	Eaton, 2P Rotary Switch, 25A	£10.42	£10.42
17	Stainless Steel Cable Gland Kit, M25 Thread, 13.5mm Min, 20mm Max, IP66, IP68	£94.56	£94.56
18	ABB Metallic Nickel-Plated Brass Cable Gland, M25 Thread, 17mm Min, 20mm Max, IP68	£7.31	£7.31
	Total cost Option 1	**£1306.34**	**£1517.67**
	Project Proposal budget:	**£2000**	

Table 3: Cost for Pre-planning & actual planning materials

3. Log entries for the implementation phase

Logbook 1

LOGBOOK NUMBER: #1

Spelling

TITLE: GATHERING REMAINING MATERIASL FOR TEST RIG

LOGBOOK START DATE: 13/01/2023.

LOGBOOK END DATE: 20/01/2022

Record of activities and achievements

17TH DECEMBER 2023

- I had to gather all my remaining materials ready to start constructing my rig.

Time spent on 22/09/2022: 1 hour.

Total amount spent on project development from the 13th – 20th.

1 hour

Plans for next week.

My plan is to have fixed all materials to my process rig.

To complete a wiring diagram ready to implement.

SIGNED _____ SIGNED _____

Logbook 2

LOGBOOK NUMBER: #2

TITLE: WIRING DIAGRAMS AND HOME PANEL BUILD

LOGBOOK START DATE: 21/01/2023.

LOGBOOK END DATE: 27/01/2022

Record of activities and achievements

21ST SEPTEMBER 2022

- I've had to design a circuit ready to implement onto my process rig.

Time spent on 22/09/2022: 2 hours.

24th SEPTEMBER 2022

- I started to construct the layout for my second assignment.

Time spent on 22/09/2022: 2 hours.

27th SEPTEMBER 2022

- I started to fix all my materials to my process rig back board. This took me time to figure out where I wanted the placement of all my materials according to my wiring diagram.

Time spent on 22/09/2022: 4 hours.

Total amount spent on project development from the 21st – 27th January 2023.

8 hours

Plans for next week.

I will have hopefully started to wire all the components to ensure all my components are functioning correctly.

SIGNED _____ SIGNED _____

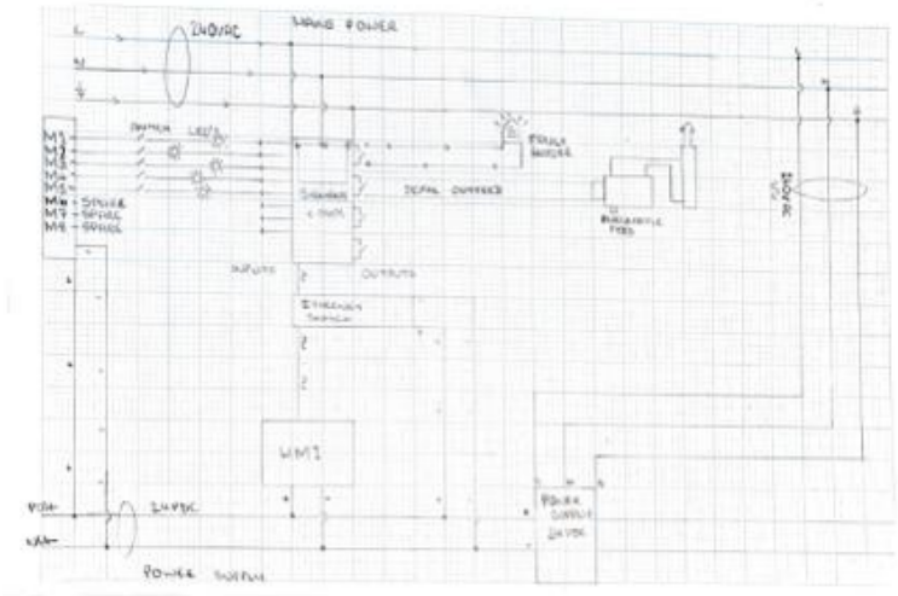
Logbook 3

LOGBOOK NUMBER:	#3
TITLE:	FIXING MATERIALS ONTO PROCESS RIG.
LOGBOOK START DATE:	28/01/2023.
LOGBOOK END DATE:	03/02/2023

Record of activities and achievements

01ST FEBRARAY 2023

- I've had to design a circuit ready to implement onto my process rig.



Time spent on 01/02/2023: 2 hours.

02ND FEBURARY 2023

- I started to fix all my materials to my process rig back board. This took me time to figure out where I wanted the placement of all my materials according to my wiring diagram.



Time spent on 02/02/2022: 4 hours.

Total amount spent on project development from the 28TH of JANUARY – 03RD DECEMBER 2023.

6 hours

Plans for next week.

I will have hopefully started to wire all the components to ensure all my components are functioning correctly.

SIGNED _____ SIGNED _____

Logbook 4

LOGBOOK NUMBER:	#4
TITLE:	HOLIDAYS
LOGBOOK START DATE:	04/02/2023.
LOGBOOK END DATE:	11/02/2023

Record of activities and achievements

No work has been completed between these dates as I was out of the country and was not able to complete any work in this time

Total amount spent on project development from the 04th – 11th February 2023.

Plans for next week.

- To continue building my process board to get ahead of time.
- To finish installing all cable runs from the machines to my process board fitting location.
- To continue researching data for the siemens 1200 ready to programme

SIGNED _____ SIGNED _____

Logbook 5

LOGBOOK NUMBER:	#5
TITLE:	WIRING MY PROCESS RIG
LOGBOOK START DATE:	11/02/2023.
LOGBOOK END DATE:	17/02/2023.

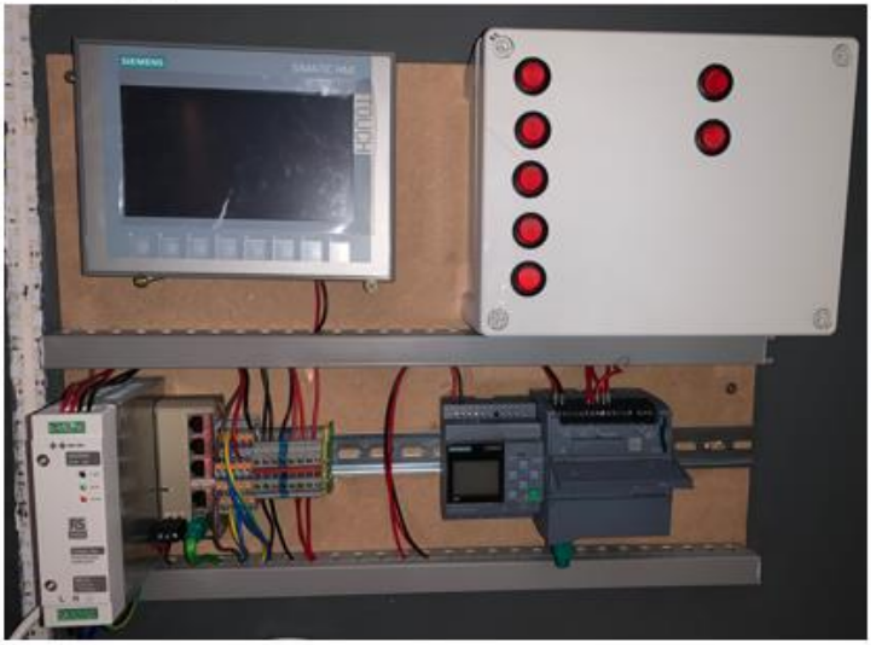
Record of activities and achievements

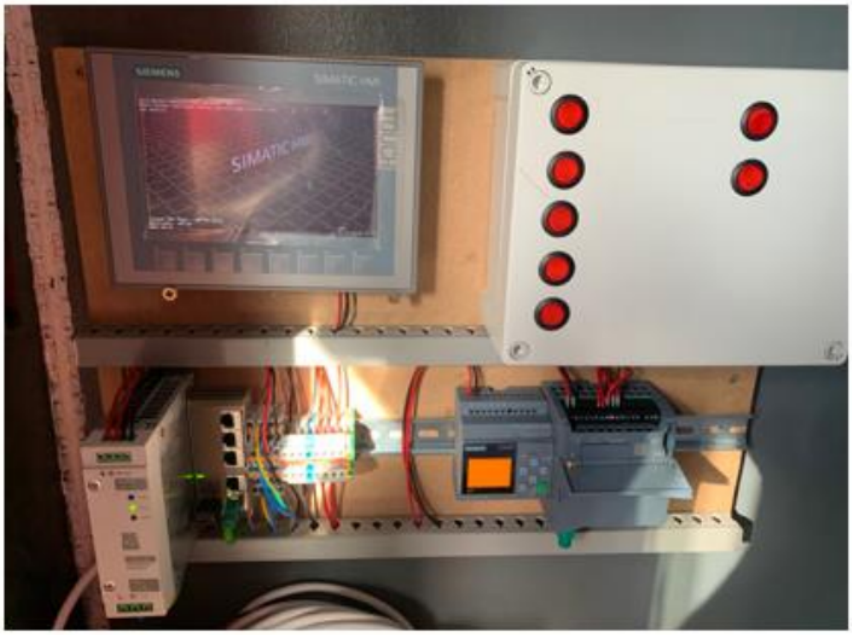
13th FEBRARAY 2023

Today I was able to start wiring my process rig. According to my schedule I did not want to start this until some weeks down the line but seeming as I was not back in work to finish the cable runs, I started this abit early.

The plan was to construct this rig at home to ensure my wiring diagram was correct and start programming my HMI and PLC so that I could just install and fit in work.

The following progress can be seen below....

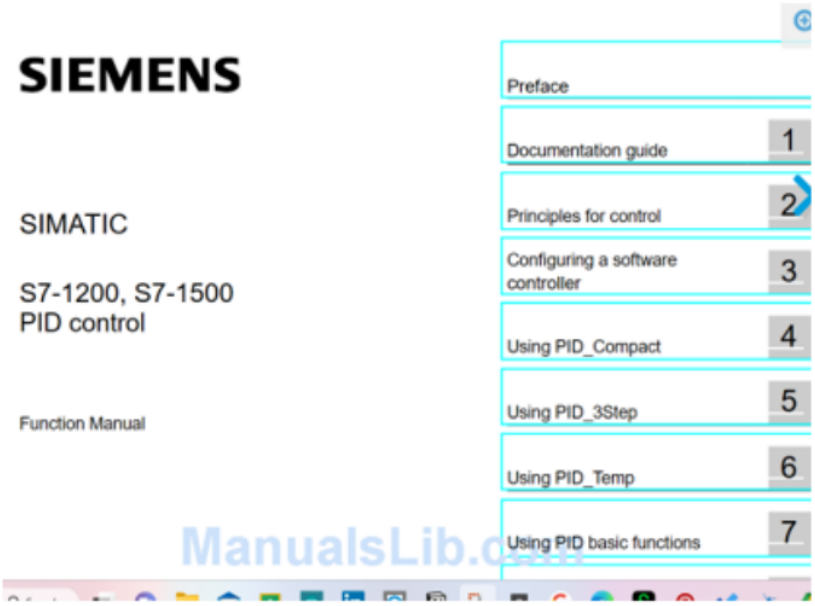




Time spent on 01/02/2023: 4 hours.

14th FEBRARAY 2023

Today I completed my most recent logbooks & read through the siemens 1200 manual as part of my programming revision.



ManualsLib.com

Time spent on 01/02/2023: 2 hours.

Total amount spent on project development from the 04th – 11th February 2023.

TOTAL HOURS COMPLETED – 6 HOURS

Plans for next week.

- To start programming my controller
- To continue researching data for the siemens 1200 ready to programme

SIGNED _____ SIGNED _____

Logbook 6

LOGBOOK NUMBER: #6

TITLE:
- First attempt at connecting my 1200 to my laptop
- Running in control cables from machines

LOGBOOK START DATE: 18/02/2023.

LOGBOOK END DATE: 24/02/2023.

Record of activities and achievements

20th FEBRARAY 2023

> I spent half my day running in cables from our EBI (Electronic Bottle Inspection unit) & Labeller machine.

> I started by using our work tablet to look through the machine wiring diagram to find the beacon lamp terminal connections ready to terminate my signal cable to.

> Drilled a hole ready to install a compression gland suitable to fit my cable.

> I run my cable from the terminal connections leaving a tale ensuring enough length and then run the rest down the machine leg to ensure adequate protection.

> I cable tied the rest of the run through basket trunking which had already been installed previously which housed multiple other cables.

> I repeated this process for our labeller machine.

> I found myself low on cable so had to order another 100metre 1.5mm 3 core SY reel of cable.

Time spent on 19/02/2023: 6 hours.

14th FEBRARAY 2023

Today I completed my most recent logbooks & read through my new siemens book which I bought for help & advice.

I spent time understanding why I couldn't detect my CPU in the TIA portal. I seek advice from my lecturer & he advised me to hardwire my PLC & HMI to the ethernet connection to ensure both were communicating with each other properly.

Time spent on 23/02/2023: 6 hours.

Total amount spent on project development from the 18th – 24th February 2023.

TOTAL HOURS COMPLETED: 12 HOURS

Plans for next week.

- To run in a hardwired network from my router to my PLC & HMI
- To complete another logbook.

SIGNED _____ SIGNED _____

Logbook 7

LOGBOOK NUMBER:	#7
TITLE:	- Setting up a hardwired network connection
	- Completing all logbooks up to date
LOGBOOK START DATE:	25/02/2023.
LOGBOOK END DATE:	02/03/2023.

Record of activities and achievements

25th FEBRARAY 2023

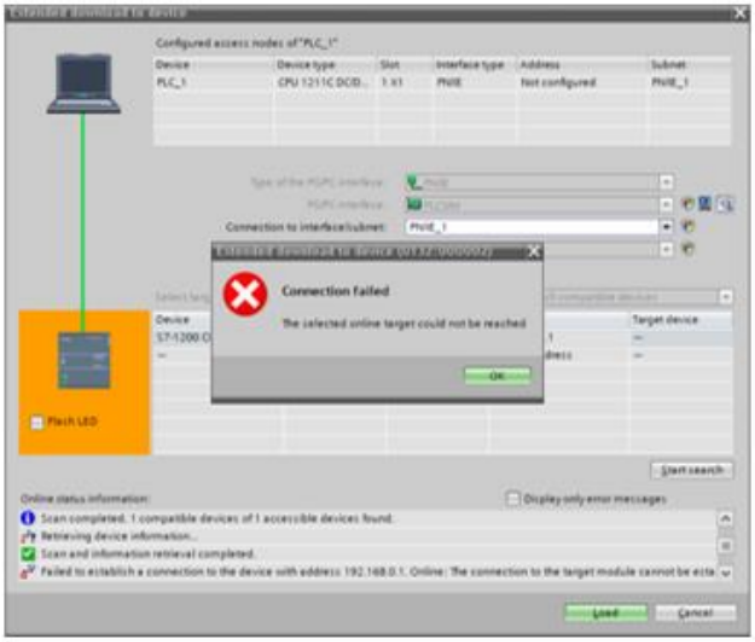
- I completed my logbook from last week.

Time spent on 25/02/2023: 1 hour.

28th FEBRARAY 2023

- I bought a CAT6 network cable ready to hardwire my laptop to connect to my PLC to see if I can improvements on the internet connection issues, I've been experiencing. (I must note that this work today is being done in my house because it allows me to spend more focussed time on the PLC side of things)
  - My first task was to run a 10-metre cable from my EE router downstairs up to my network switch.
  - From the network switch I have a network run taken to my 1200 then to my laptop & additionally to my HMI. Now sure that all my devices are communicating through one hardwired network the next task will be to attempt to connect my laptop to the PLC.

- I spent a lot of time attempting to simulate my device however experienced the same fault which was...



- After attempting to correct these faults my TIA portal was running so slow that I could simply not carry on.

Time spent on 01/03/2023: 6 hours.

Total amount spent on project development from the 25th FEBURARY – 03rd MARCH 2023.

TOTAL HOURS COMPLETED: 7 HOURS

Plans for next week.

- To continue researching data for the siemens 1200 ready to programme from my new TIA portal guide handbook.
- To seek advice from my lecturer & colleagues in college.

Logbook 8

LOGBOOK NUMBER:	#8
TITLE:	- Setting up simulation on TIA portal - Speeding up TIA portal run speed - Downloading to CPU - Downloading to HMI - Set up programme & HMI screens.
LOGBOOK START DATE:	03/03/2023.
LOGBOOK END DATE:	09/03/2023.

Record of activities and achievements

03rd MARCH 2023

- I came to college seeking a lot of help & support.
- I started by getting help to run my TIA portal software to run quicker so that it wasn't so laggy. We removed 2 anti-virus software's which was actually making my PC run at a very high download speed so that when TIA Portal was running the processing speed was much slower.
- I had also been struggling previously with the simulation process & downloading my programme to my PLC.
- My lecturer was able to help me edit some setup parameters to allow me to simulate however I was unable to download due to me not having my PLC in college & not having a finished programme.

Time spent on 03/03/2023: 3 hours.

05th MARCH 2023

- I spent time researching chapter 12 of "PLC & HMI Development w/ Siemens TIA Portal." By Liam Bee. The chapter is titled "Managing Navigation & Alarms", and I was advised to study this chapter by my lecturer ready to setup my HMI.

Time spent on 05/03/2023: 2 hours.

Total amount spent on project development from the 03rd of MARCH – 09th MARCH 2023.

TOTAL HOURS COMPLETED: 5 HOURS

Plans for next week.

- To continue researching data for the siemens 1200 ready to programme from my new TIA portal guide handbook.
- To construct a functioning TIA ladder programme.
- To create another logbook for the week 11th – 17th of March.
- To create individual screens for my HMI along with programming

SIGNED _____ SIGNED _____

Logbook 9

LOGBOOK NUMBER:	#9
TITLE:	Constructing panel ready to install
LOGBOOK START DATE:	11/03/2023.
LOGBOOK END DATE:	17/03/2023.

Record of activities and achievements

11th MARCH 2023

- I continued picking up information from chapter 12 ready to implement into my TIA portal HMI.

Time spent on 11/03/2023: 2 hours.

12th MARCH 2023

- In work I had to move all my components from my home rig and install them onto a panel suitable to enclose all my materials safely.
- This took some time as I had to make all the cuts for the trunking & din rail accurate enough to fit inside the panel.

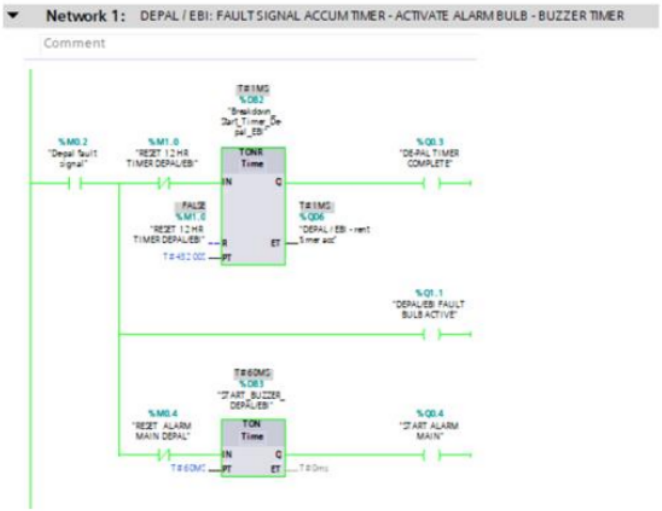
Time spent on 12/03/2023: 12 hours.



14th MARCH 2023

- I was able to start constructing my ladder program & testing it through the simulation mode.

Time spent on 14/03/2023: 3 hours.



Total amount spent on project development from the 11th of MARCH – 17th MARCH 2023.

TOTAL HOURS COMPLETED: 17 HOURS

Plans for next week.

- Complete my ladder programme.
- To Create & tag screens ready for my HMI.

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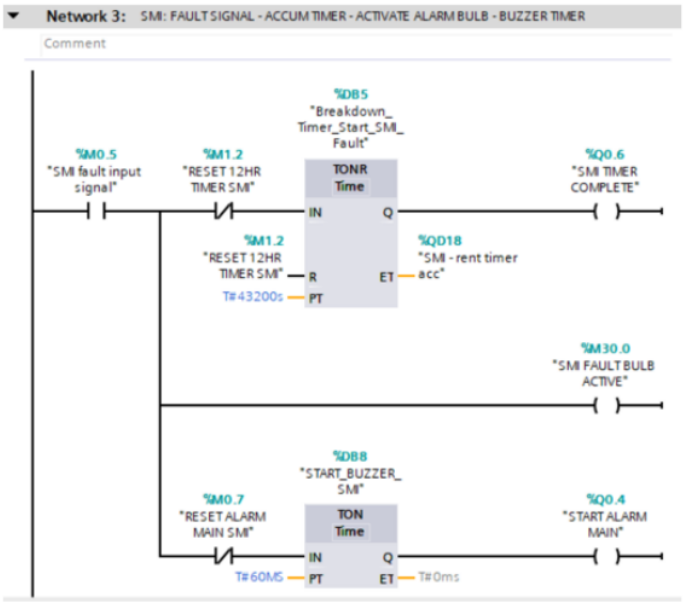
Logbook 10

LOGBOOK NUMBER:	#10
TITLE:	Perfecting my program & HMI screens
LOGBOOK START DATE:	18/03/2023.
LOGBOOK END DATE:	24/03/2023.

Record of activities and achievements

19th MARCH 2023

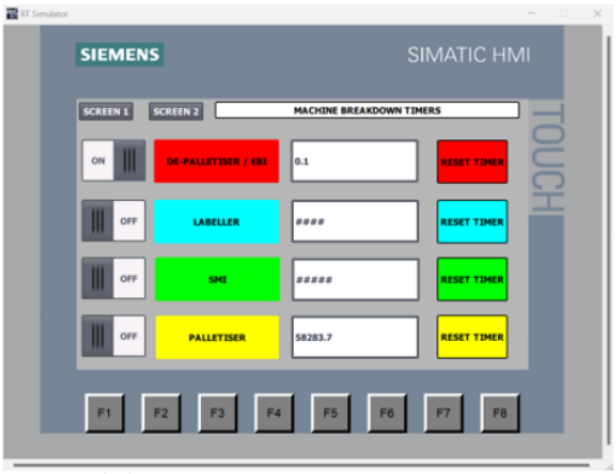
- More focus was carried out on my ladder programme. Previously I had only installed some TON timers which allowed me to count the amount of time the machine was down for however, I could not accumulate the time, therefore, I swapped the TON timers for some TONR timers instead.



Time spent on 19/03/2023: 4 hours.

22nd MARCH 2023

- Once happier with the ladder programme I started to implement the HMI screens. This is where my Liam Bee programming book came in handy as a lot of the information in the book I could implement into the TIA portal.



Time spent on 22/03/2023: 4 hours.

Total amount spent on project development from the 18th of MARCH – 24th MARCH 2023.

TOTAL HOURS COMPLETED: 8 HOURS

Plans for next week.

- To finish both the ladder & HMI screens & download to devices.
- To test both PLC & HMI software using simulation mode
- To install my panel into project location

SIGNED _____ SIGNED _____

Logbook 11

LOGBOOK NUMBER:	#11
TITLE:	Installing panel & wiring in power cable
LOGBOOK START DATE:	25/03/2023.
LOGBOOK END DATE:	31/03/2023.

Record of activities and achievements

25th MARCH 2023

- I attempted to download my software to my PLC & HMI
- I fitted my panel to the project location.
- I run in the power cable to energise all my components.



Time spent on 11/03/2023: 7 hours.

Total amount spent on project development from the 11th of MARCH – 17th MARCH 2023.

TOTAL HOURS COMPLETED: 7 HOURS

Plans for next week.

- To gather images of my project working ready to complete my project write up.
- To understand why I'm having trouble downloading my software to my device.

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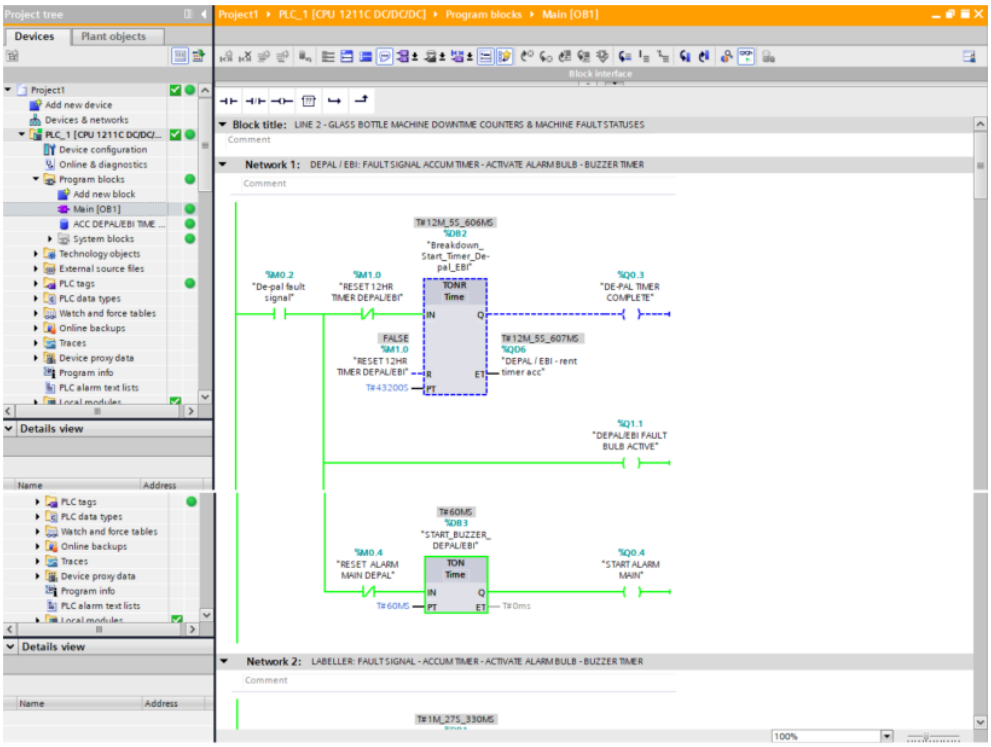


Figure 12: Simulation mode for the Depalletiser network

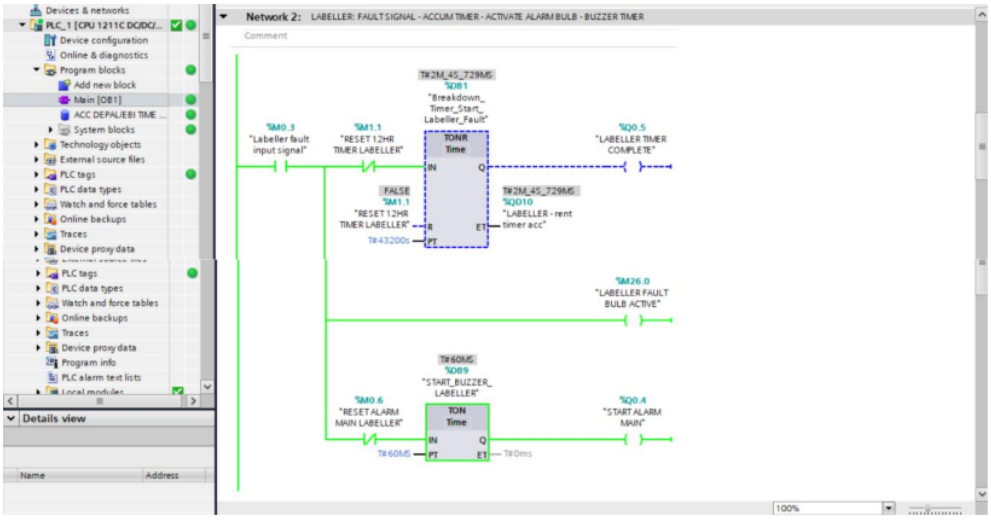


Figure 13: Simulation mode for the Labeller network

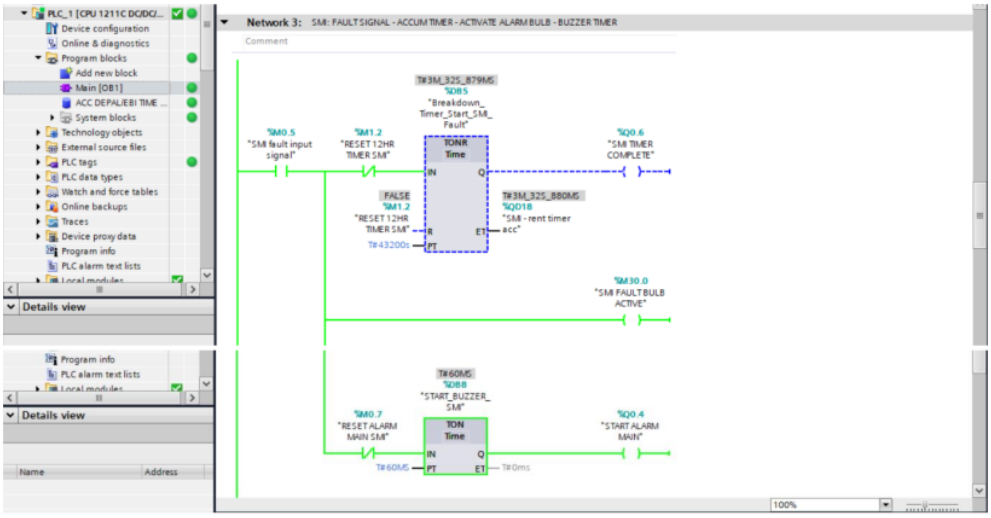


Figure 14: Simulation mode for the SMI network

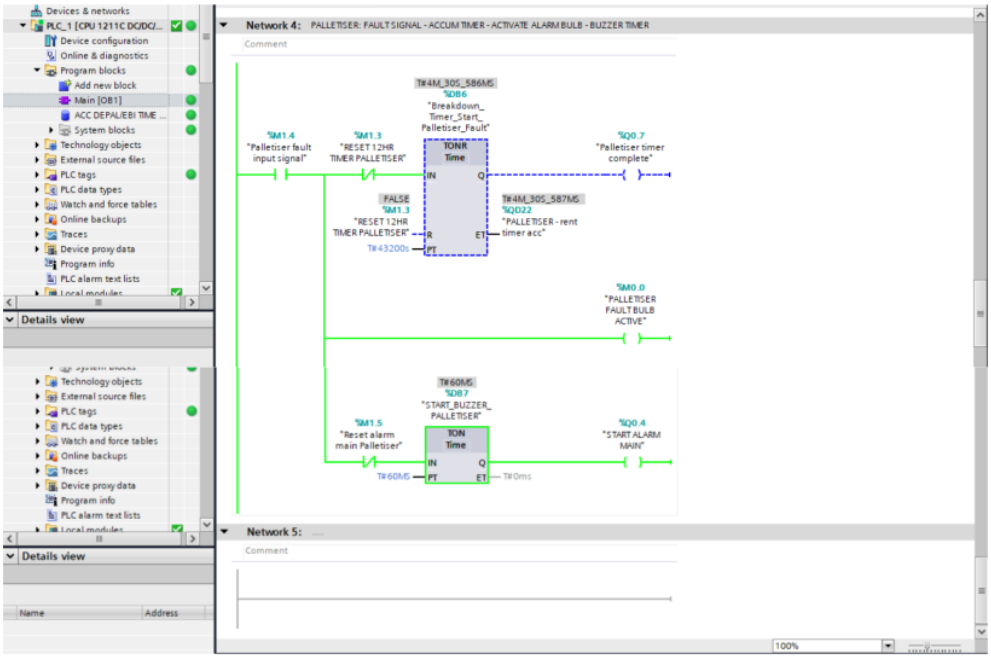


Figure 15: Simulation mode for the Palletiser network

Project1 ▸ PLC_1 [CPU 1211C DC/DC/DC] ▸ PLC tags

PLC tags

	Name	Tag table	Data type	Address	Retain	Acces...	Writa...	Visibl...
1	GREEN_LED	Default tag table	Bool	%Q0.0		☑	☑	☑
2	STOP_PB	Default tag table	Bool	%M0.1		☑	☑	☑
3	De-pal fault signal	Default tag table	Bool	%M0.2		☑	☑	☑
4	Labeller fault input signal	Default tag table	Bool	%M0.3		☑	☑	☑
5	DE-PAL TIMER COMPLETE	Default tag table	Bool	%Q0.3		☑	☑	☑
6	START ALARM MAIN	Default tag table	Bool	%Q0.4		☑	☑	☑
7	RESET ALARM MAIN DEPAL	Default tag table	Bool	%M0.4		☑	☑	☑
8	LABELLER TIMER COMPLETE	Default tag table	Bool	%Q0.5		☑	☑	☑
9	SMI TIMER COMPLETE	Default tag table	Bool	%Q0.6		☑	☑	☑
10	SMI fault input signal	Default tag table	Bool	%M0.5		☑	☑	☑
11	RESET ALARM MAIN LABELLER	Default tag table	Bool	%M0.6		☑	☑	☑
12	RESET ALARM MAIN SMI	Default tag table	Bool	%M0.7		☑	☑	☑
13	RESET 12HR TIMER DEPAL/EBI	Default tag table	Bool	%M1.0		☑	☑	☑
14	RESET 12HR TIMER LABELLER	Default tag table	Bool	%M1.1		☑	☑	☑
15	RESET 12HR TIMER SMI	Default tag table	Bool	%M1.2		☑	☑	☑
16	RESET 12HR TIMER PALLETISER	Default tag table	Bool	%M1.3		☑	☑	☑
17	Palletiser fault input signal	Default tag table	Bool	%M1.4		☑	☑	☑
18	Palletiser timer complete	Default tag table	Bool	%Q0.7		☑	☑	☑
19	Reset alarm main Palletiser	Default tag table	Bool	%M1.5		☑	☑	☑
20	DEPAL/EBI FAULT BULB ACTIVE	Default tag table	Bool	%Q1.1		☑	☑	☑
21	HMI DEPAL/EBI TIMER ACC	Default tag table	Time	%MD2		☑	☑	☑
22	DEPAL / EBI - rent timer acc	Default tag table	Time	%QD6		☑	☑	☑
23	LABELLER - rent timer acc	Default tag table	Time	%QD10		☑	☑	☑
24	RFC - rent timer acc	Default tag table	Time	%QD14		☑	☑	☑
25	SMI - rent timer acc	Default tag table	Time	%QD18		☑	☑	☑
26	PALLETISER - rent timer acc	Default tag table	Time	%QD22		☑	☑	☑
27	LABELLER FAULT BULB ACTIVE	Default tag table	Bool	%M26.0		☑	☑	☑
28	SMI FAULT BULB ACTIVE	Default tag table	Bool	%M30.0		☑	☑	☑
29	PALLETISER FAULT BULB ACTIVE	Default tag table	Bool	%M0.0		☑	☑	☑
31	HMI SMI TIMER ACC	Default tag table	Time	%MD10		☑	☑	☑
32	HMI PALLETISER TIMER ACC	Default tag table	Time	%MD14		☑	☑	☑
33	<Add new>					☑	☑	☑

Figure 16: Total tags used throughout the project

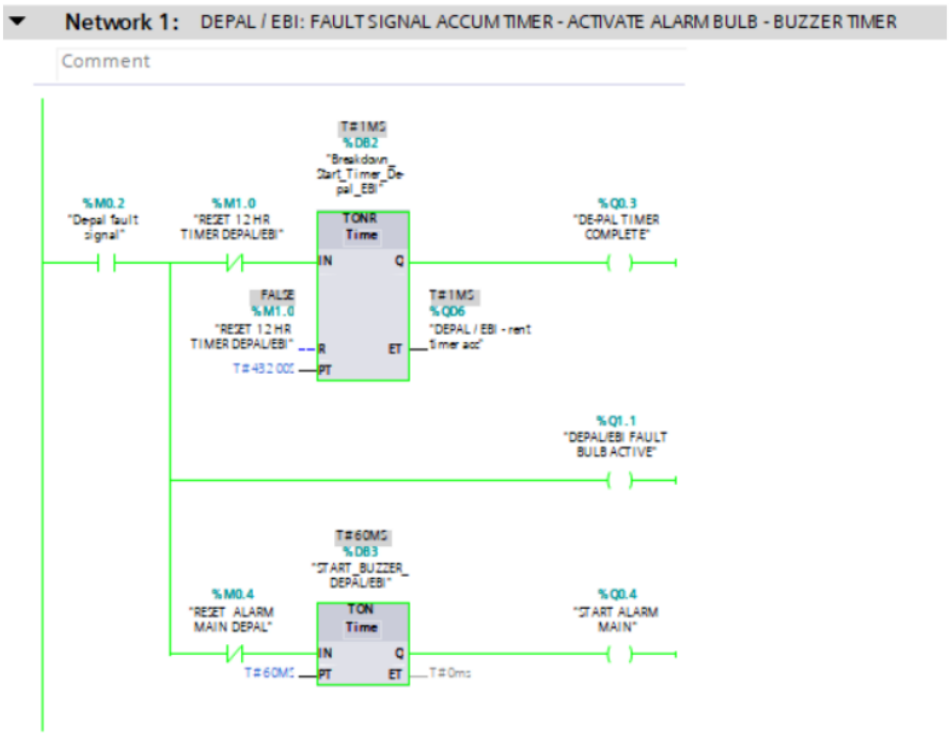


Figure 17: Completely energised network for Depalletiser

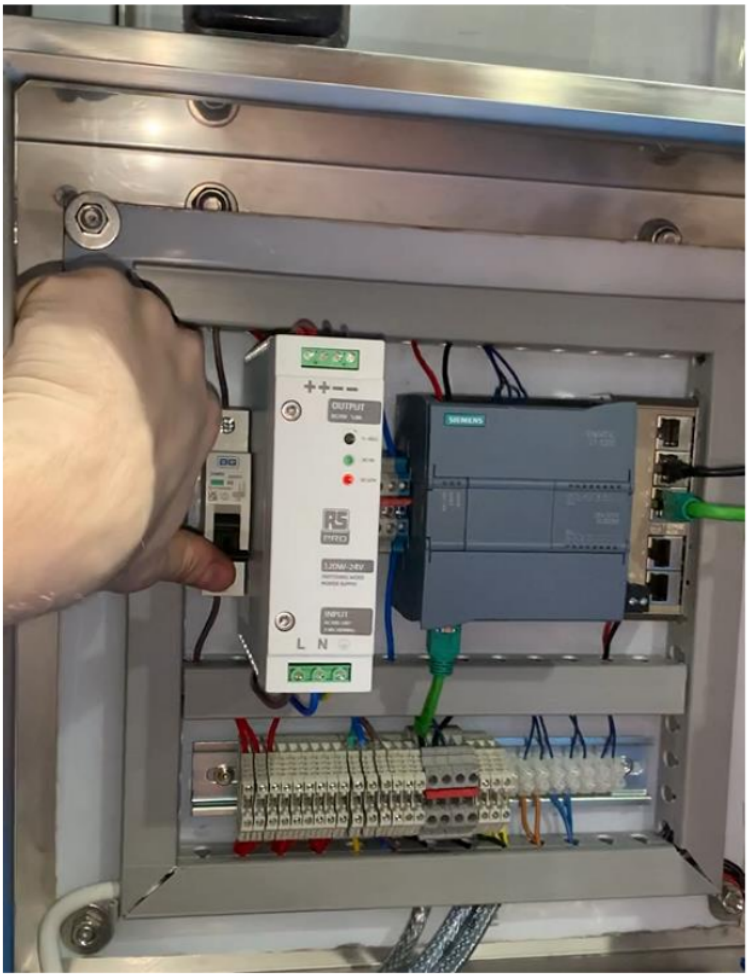


Figure 18: Switching on the supply for the panel



Figure 19: Panel being energised.

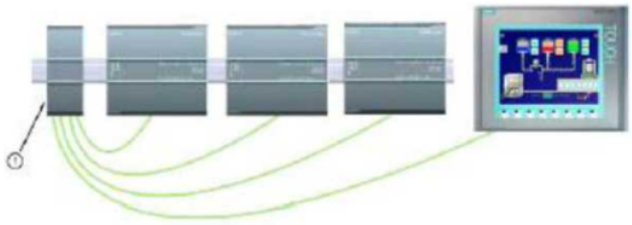


Figure 5.13 Network connection (more than two devices connected).

5.2.2 *PROFINET and Ethernet Protocol*

The S7-1200 CPU has an integrated PROFINET port that supports both Ethernet and direct connections. Direct communication is used when using a programming device, HMI, or another CPU that can still connect to a single CPU. Network communication is used when two or more devices are connecting (e.g., CPUs, HMIs, programming devices, and non-Siemens devices). Figure 5.14 shows a programming terminal connected to an S7-1200 PLC. In a direct connection, it is possible to connect a programming device to an S7-1200 CPU, an HMI to an S7-1200 CPU, and an S7-1200 CPU to another S7-1200 CPU. Multiple PLCs/HMIs can be configured and connected to the same network, each with a unique network address identifier. Use of a PROFINET Ethernet communication/network interface will be assumed in this chapter.

(McGraw-Hill, 1-9-2013)

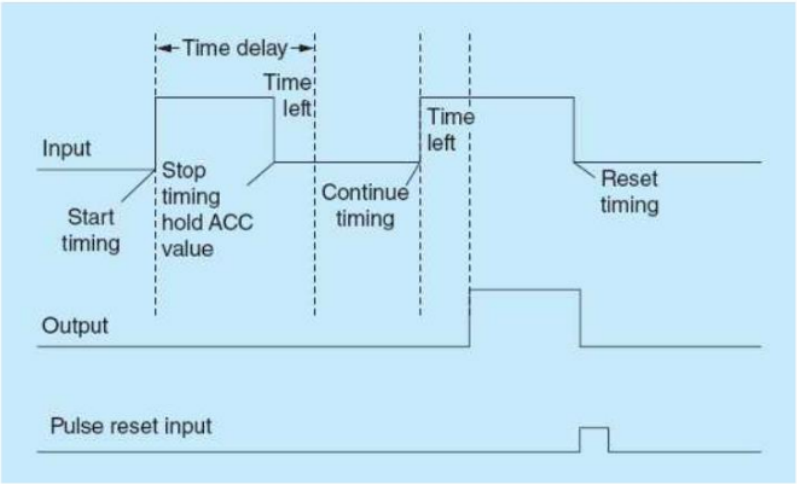


Figure 3.10 TONR delay timing diagram.

(Khaled, 1-9-2013)

Table 2.2 Summary of network classes

Network class	IP address ranges	Network ID	Host ID	Subnet mask
A	0.0.0.0 - 127.255.255.255	1 byte	3 byte	255.0.0.0
B	128.0.0.0 - 191.255.255.255	2 byte	2 byte	255.255.0.0
C	192.0.0.0 - 223.255.255.255	3 byte	1 byte	255.255.255.0

Please note: all devices connected via switches are in the same subnet. A subnet is produced by dividing all possible IP addresses into partial networks. The logical division of the network into subnets usually corresponds to the physical division into local partial networks. The division of a network class into further subnets using network masks is called subnetting. All devices in a subnet can directly communicate with one another. The subnet mask is identical for all devices in the same subnet. A subnet is physically limited by a router.

(Summary of Network Classes, 29-10-2015)

Figure 20: Identifying the correct IP addresses to use

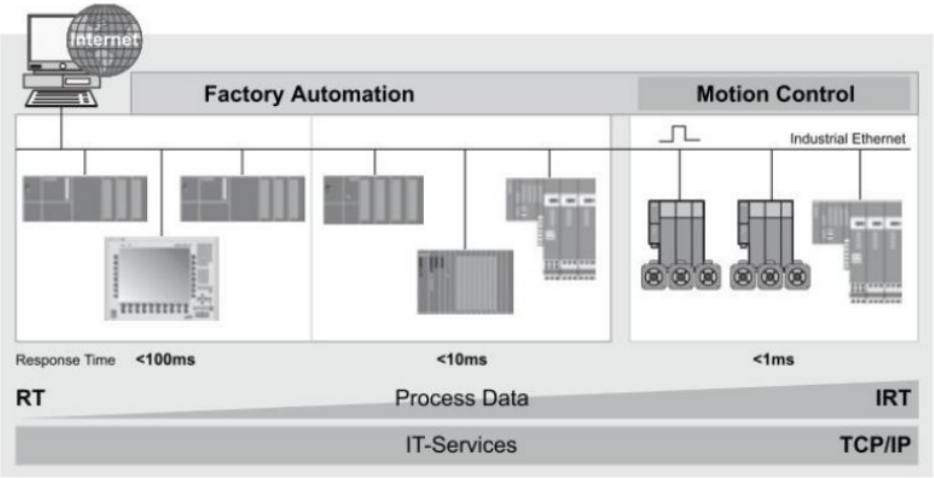


Fig. 3.1 The real-time concept with Profinet communication

(Wiley-Blackwell, 29-10-2015)

Figure 21: Real-time Communication

Shielded TP installation cables for connection to Industrial Ethernet FC Outlet RJ45 / FC RJ45 Plug are available for designing Industrial Ethernet networks (4-core). The cables conform with Profinet and have been assigned UL approval.



Fig. 7.2
FC cables: IE FC 2 × 2 Standard Cable, IE FC 4 × 2 Standard Cable, IE FC 2 × 2 Trailing Cable, IE FC Hybrid Cable

(Wiley-Blackwell, 7.2.4. Bus Cables for fast assembly - IE FC cables, 29-10-2015)

Figure 22: Bus cables for fast assembly

2.1 S7-1200 station components



Fig. 2.1 S7-1200 station with CPU S7-1214, two SMs (right) and one CM (left)

(Berger, 22-04-2013)

Figure 23: Information into the s7-1200

You do not need to include datasheets and manuals. Better to use information from them and then cite using the Harvard method

2.2 S7-1200 CPU modules

There are four types of CPU (CPU 1211, CPU 1212, CPU 1214, and CPU 1215), available in each case in the versions DC/DC/DC, AC/DC/RLY, DC/DC/RLY. The first item of data refers to the module power supply (DC = 24 V direct current, AC = 120/230 V alternating current). The middle item of data refers to the operating voltage of the onboard digital inputs (DC = 24 V direct current). The last item of data refers to the type of digital outputs (DC = 24 V direct current electronic, RLY = up to 30 V direct current or up to 250 V alternating current with relay).



Fig. 2.2 CPU 1214C DC/DC/DC

The four CPU versions mainly differ in the supply voltage, the number of onboard inputs and outputs, the memory size, and the expansion capability with signal modules (Table 2.1).

The CPU 1215C can be integrated in STEP 7 Basic V11 with a hardware support package (HSP).

(Berger, 2.2. S7-1200 CPU modules , 22-04-2013)

Figure 24: Selecting the correct CPU.

2.5.4 SIM 1274 simulator

The simulator module is used to debug the user program. It is connected to the terminal block of the CPU instead of the input signals from the machine.

The simulator module is available with 8 switches (for CPU 1211 and CPU 1212) and with 14 switches (for CPU 1214 and CPU 1215). The power supply is 24 V DC.



Fig. 2.13 SIM 1274 simulator

(Berger, 2.5.4. SIM 1274 Simulator, 22-04-2013)

Figure 25: Simulator device to connect to the S7-1200

3.4 Configuring the network

3.4.1 Introduction

The network configuration permits the graphic display and documentation of the configured networks and their stations. Configuration of the networking is part of the device configuration. If a PLC station is operated on its own – without an HMI station and without data communication to other PLC stations – you do not require network configuration. Connection of a programming device for transfer of the user program and for program debugging does not require network configuration either.

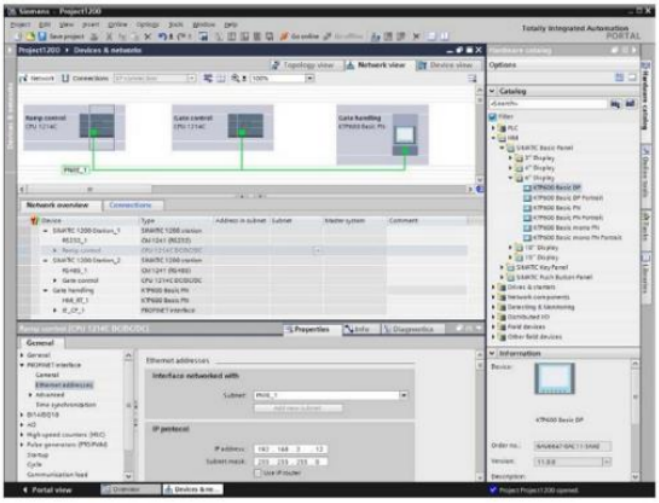


Fig. 3.6 Example of working area of network configuration (network view)

(Berger, 3. Configuring the Network, 22-04-2013)

Figure 26: Configuring the Network

Device name, device number

Every IO controller and every IO device has a device name. The device name is made up as standard from the name of the CPU used, the interface number, and the name of the PROFINET IO system: <CPU>.<Interface>.<IO system>. You can change the name of the respective component in its properties.

The interface number is only used if the CPU has more than one PN interface. The name of the IO system can be automatically appended to the device name, separated by a dot. To do this, activate the *Use name as expansion for PROFINET device name* checkbox in the properties of the PROFINET IO system.

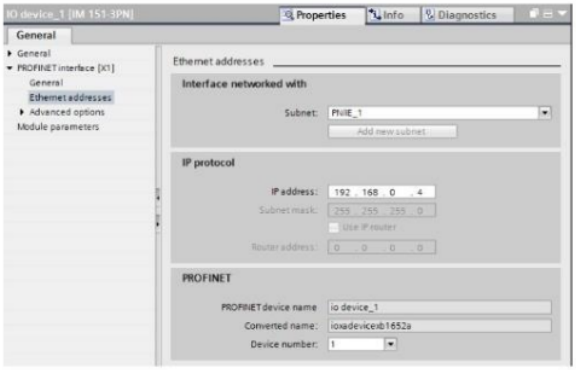


Fig. 3.10 Example of Ethernet addresses for an IO device

(Berger, Device name, device number , 22-04-2013)

Figure 27: Ethernet addresses

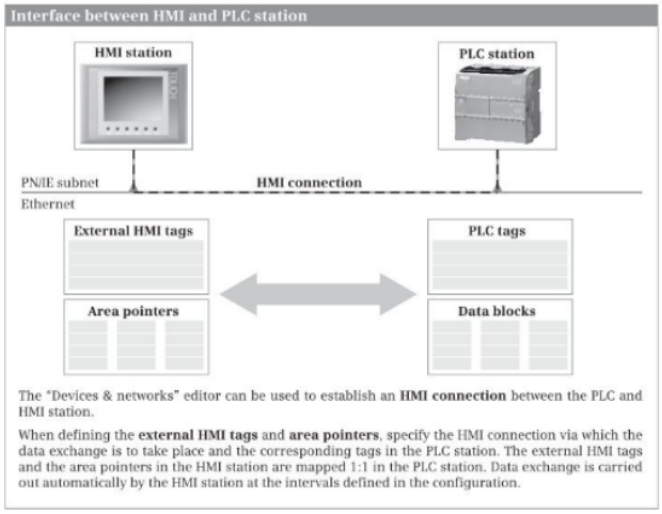


Fig. 16.1 Interface between HMI and PLC station

(Berger, 16.1 Introduction to Visualisation , 22-04-2013)

Figure 28: Interface between HMI & PLC station

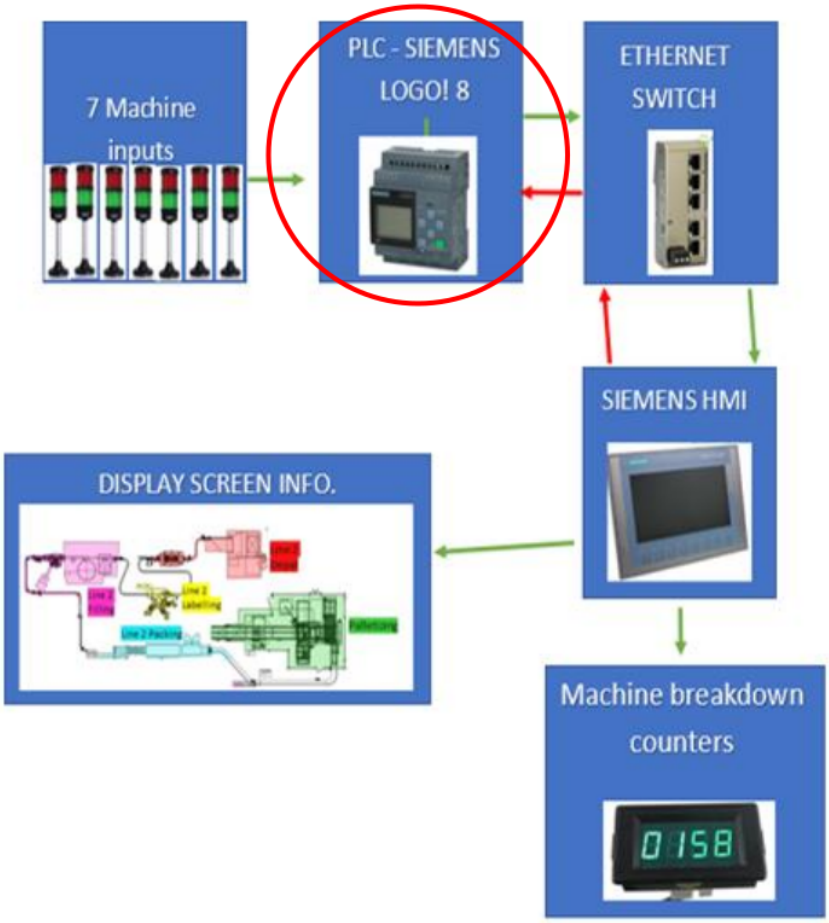


Figure 29: Old final selected solution

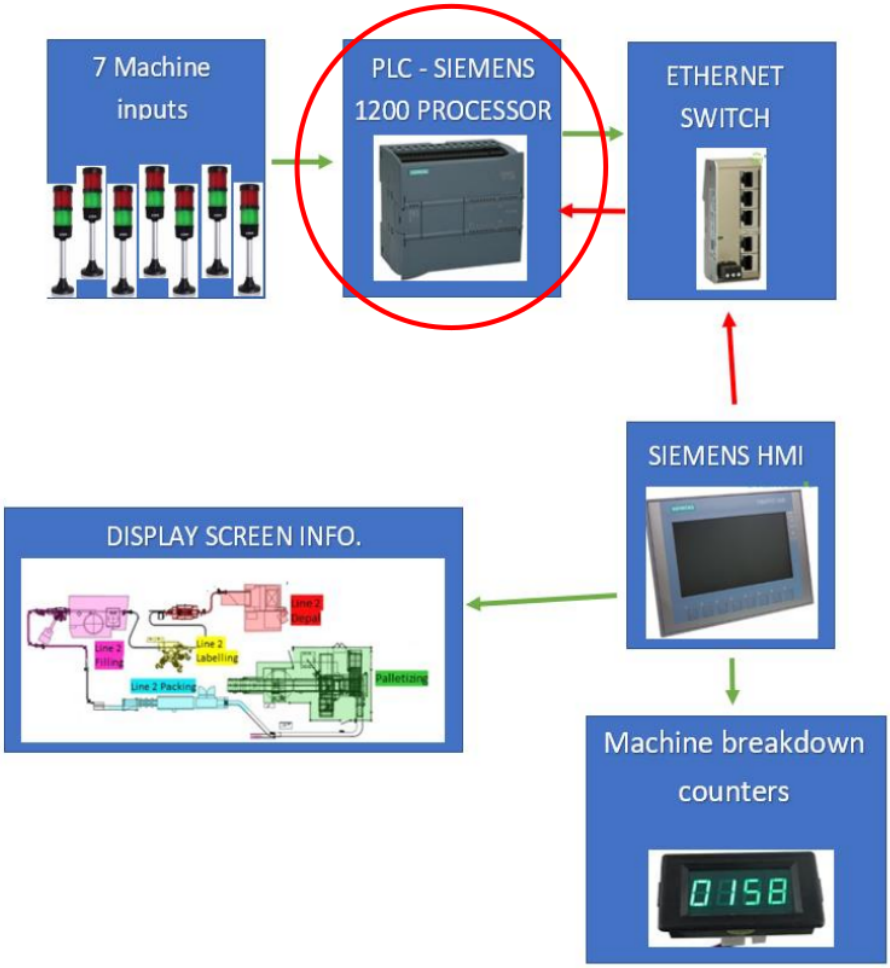


Figure 30: Modified final selected solution.

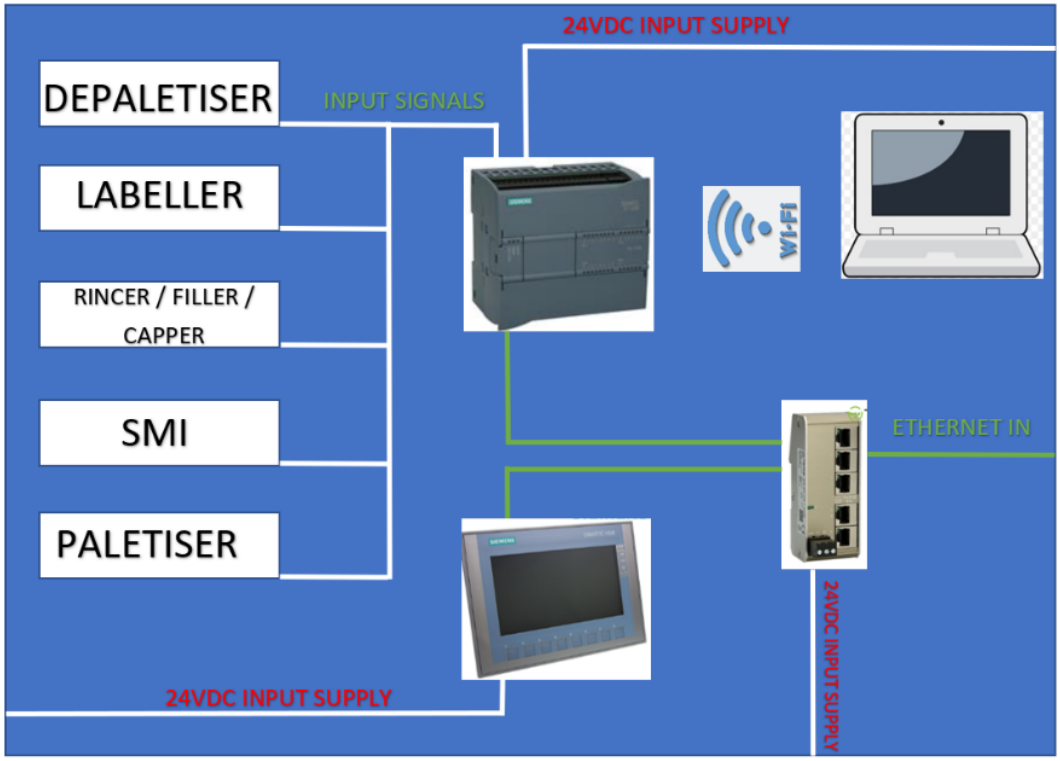


Figure 31: Flow diagram for selected project

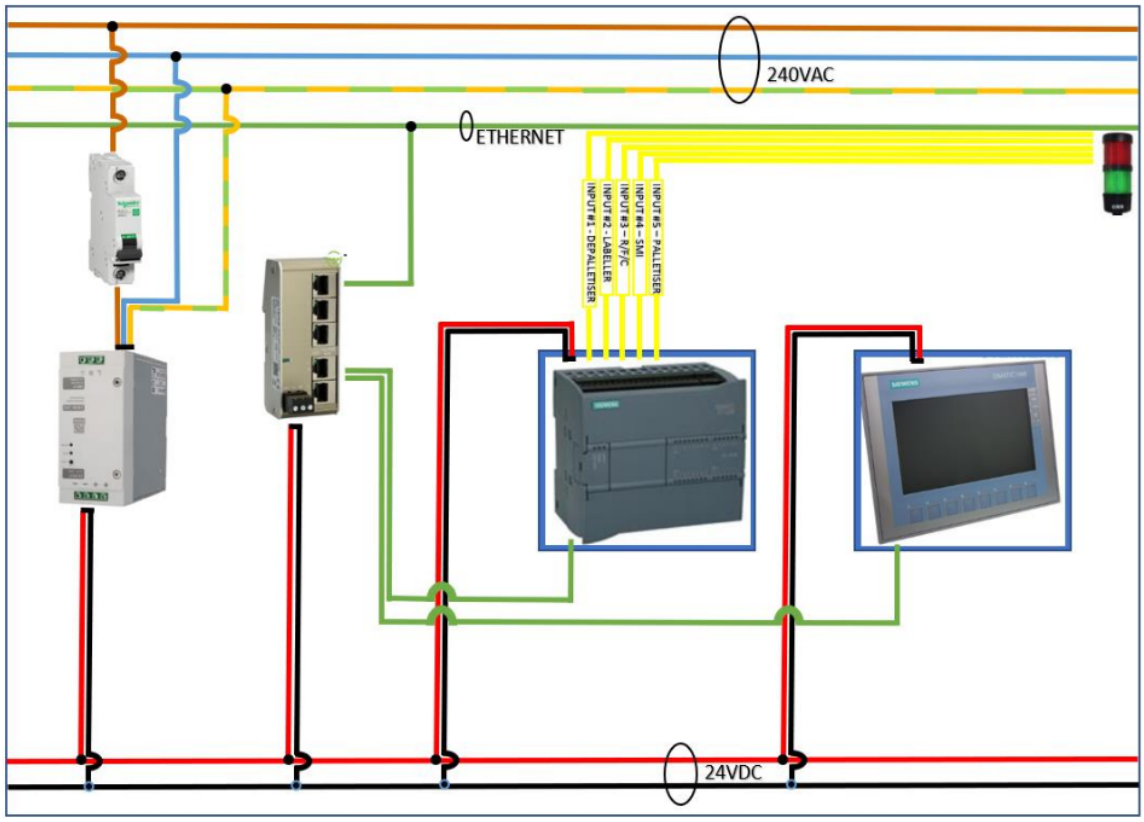


Figure 32: Wiring diagram for project

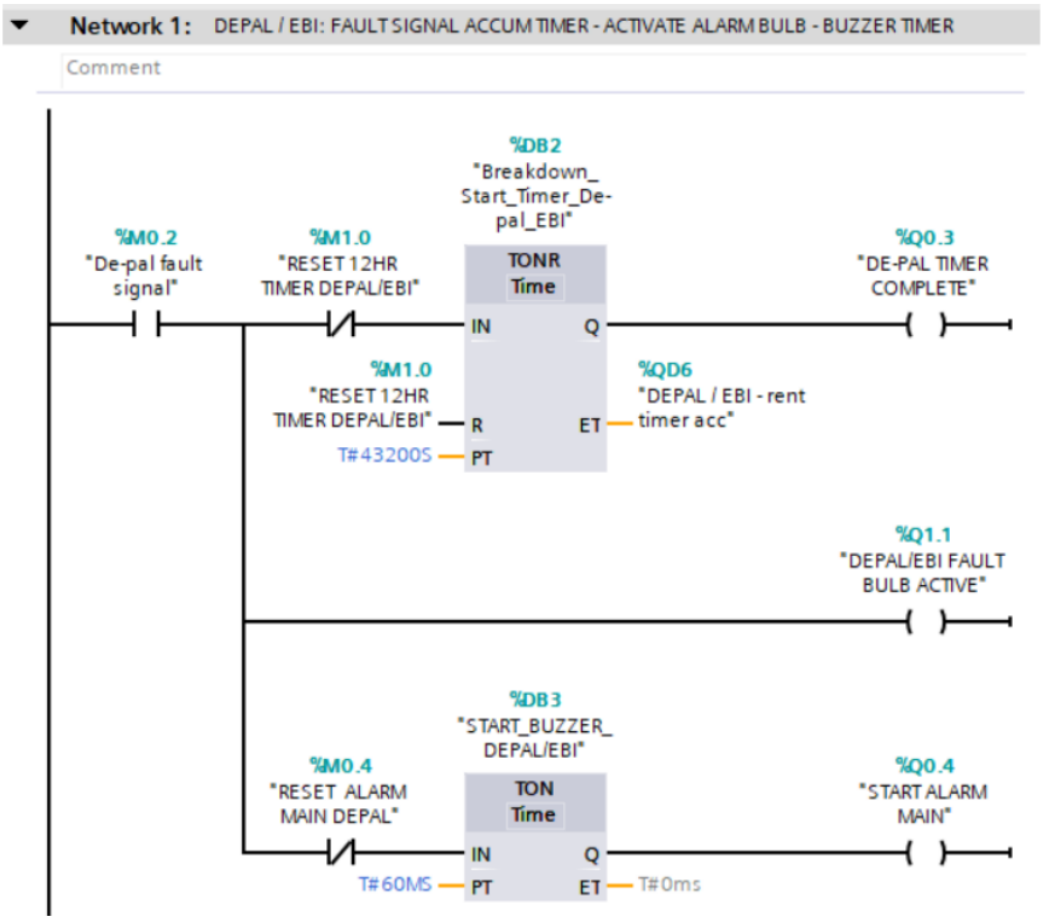


Figure 33: Network 1 – De-Palletiser - Fault Signal – Accumulation timer – Active alarm buzzer – Buzzer timer

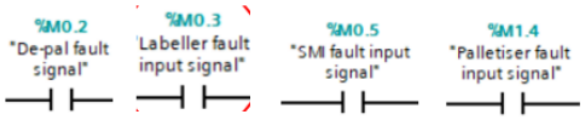


Figure 34: Memory bits used for input gates temporarily.

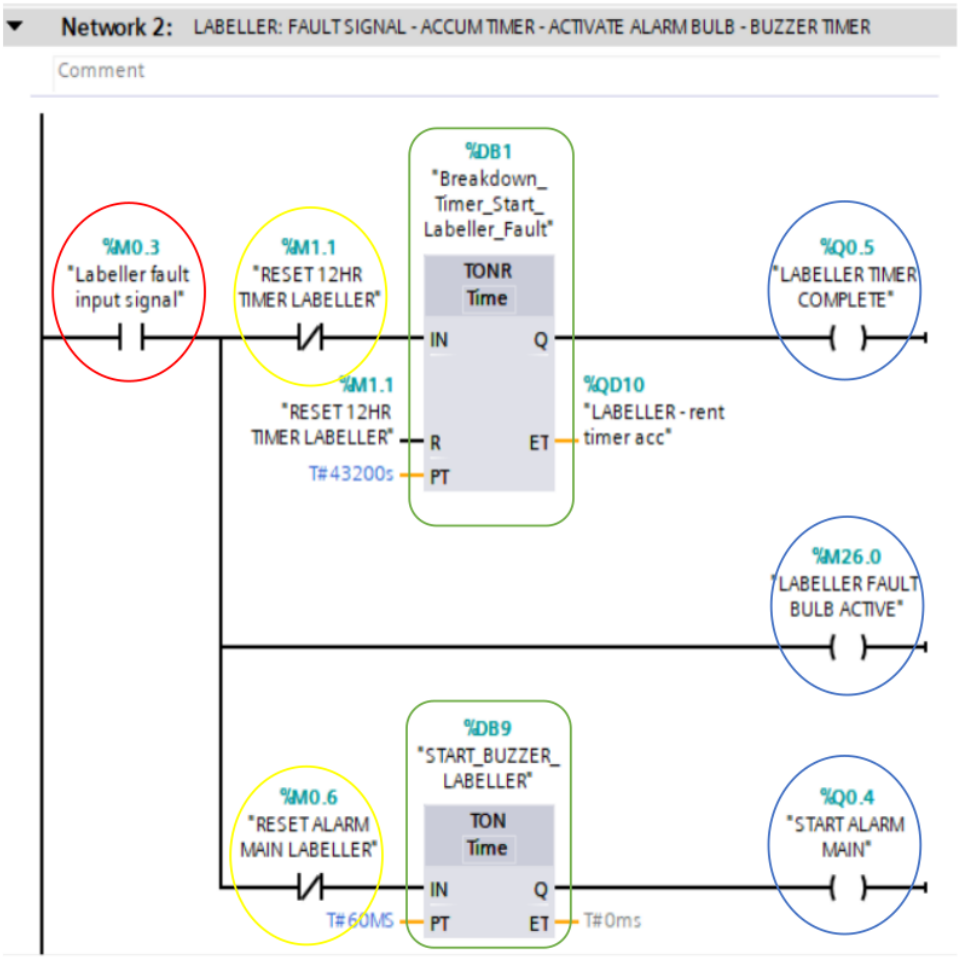


Figure 35: Network 2 - Labeller - Fault Signal – Accumulation timer – Active alarm buzzer – Buzzer timer

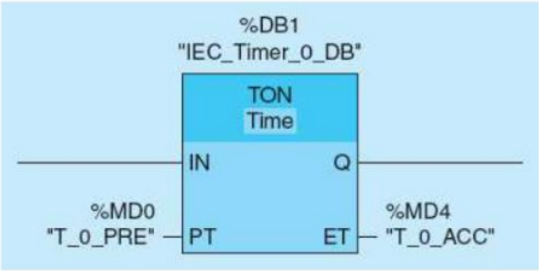
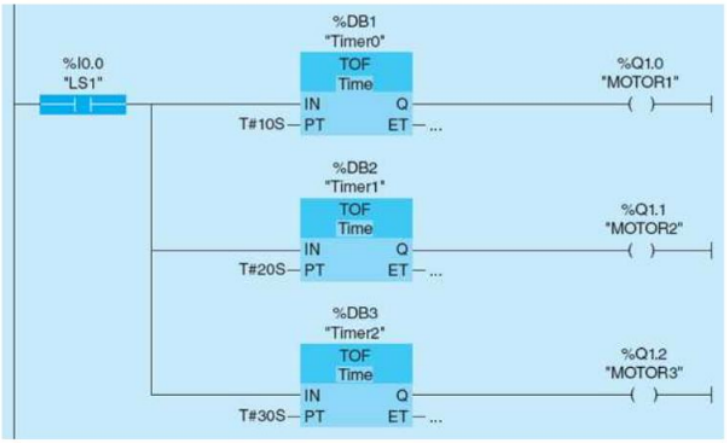


Figure 3.1 ON-DELAY timer (TON).

(Kamel, 1-9-2013)

Figure 36: ON-DELAY timer (TON)



(Kamel, 3.1.3. Retentative / Time accumulator timers (TONR), 1-9-2013)

Figure 37: TONR Timer explained.

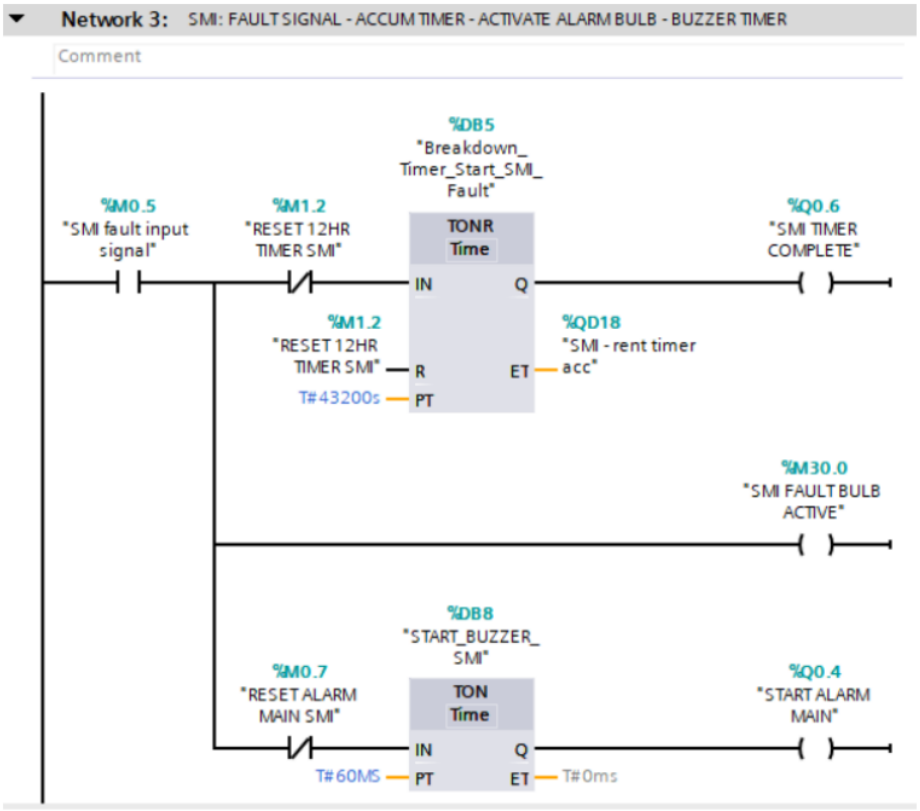


Figure 38: Network 3 - SMI - Fault Signal – Accumulation timer – Active alarm buzzer – Buzzer timer

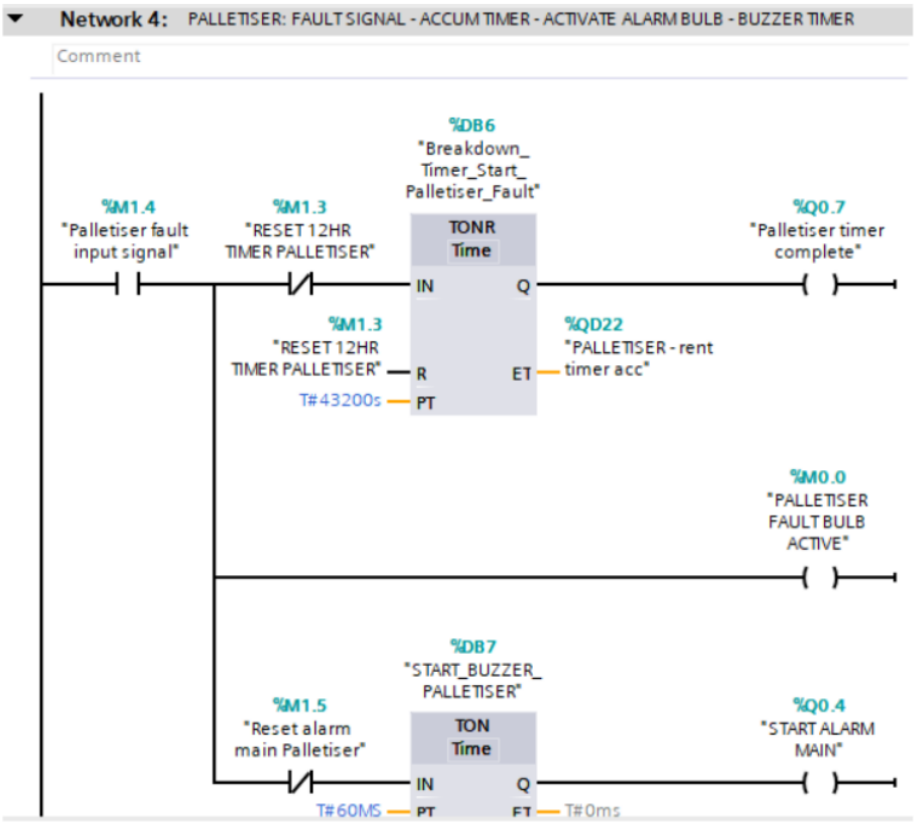


Figure 39: Network 4 - Palletiser - Fault Signal – Accumulation timer – Active alarm buzzer – Buzzer timer

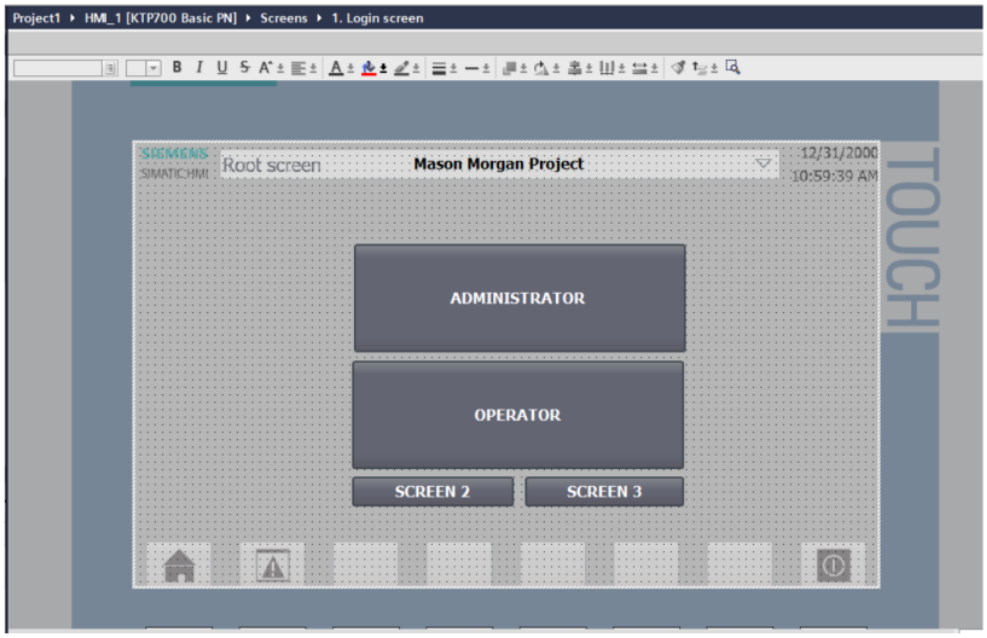


Figure 40: Login screen

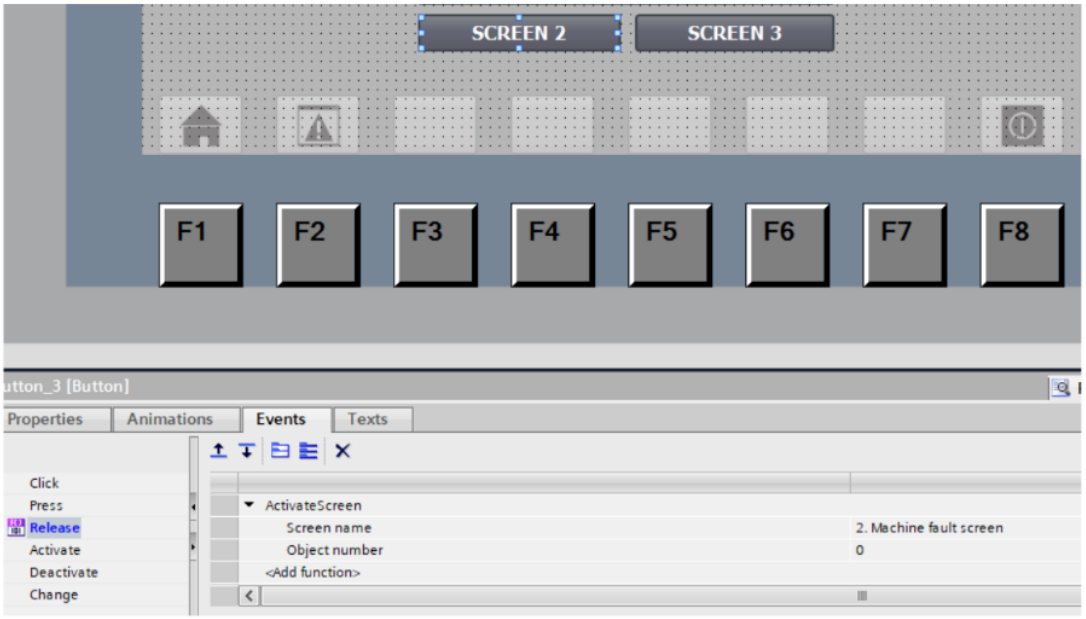


Figure 41: Assigning hyperlinks between different screens. Screen 2 navigation

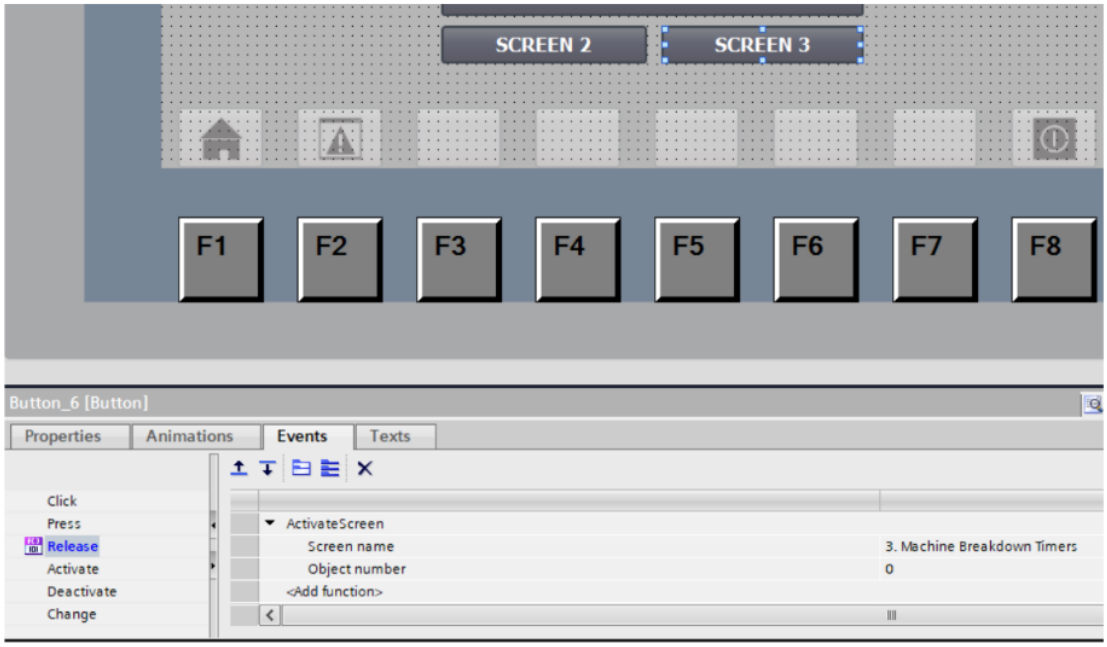


Figure 42: Assigning hyperlinks between different screens. Screen 3 navigation

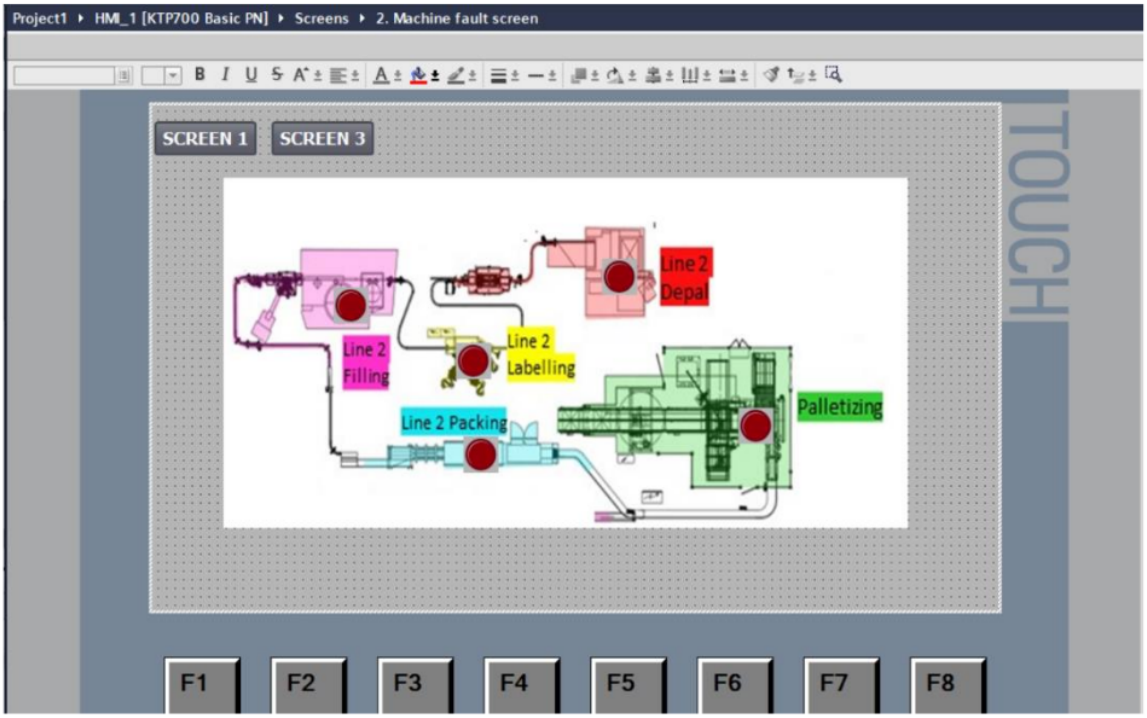


Figure 43: Machine status screen

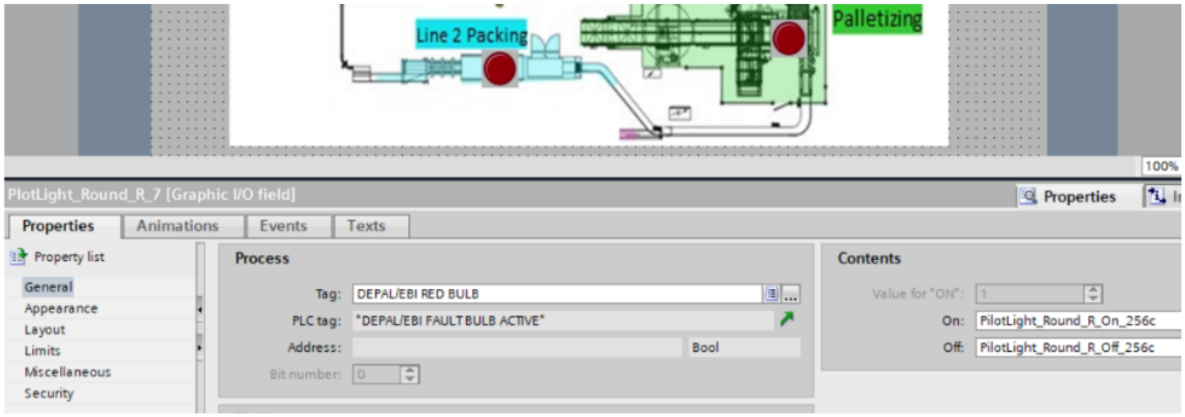


Figure 44: Assigning tags to the pilot light for machine status.

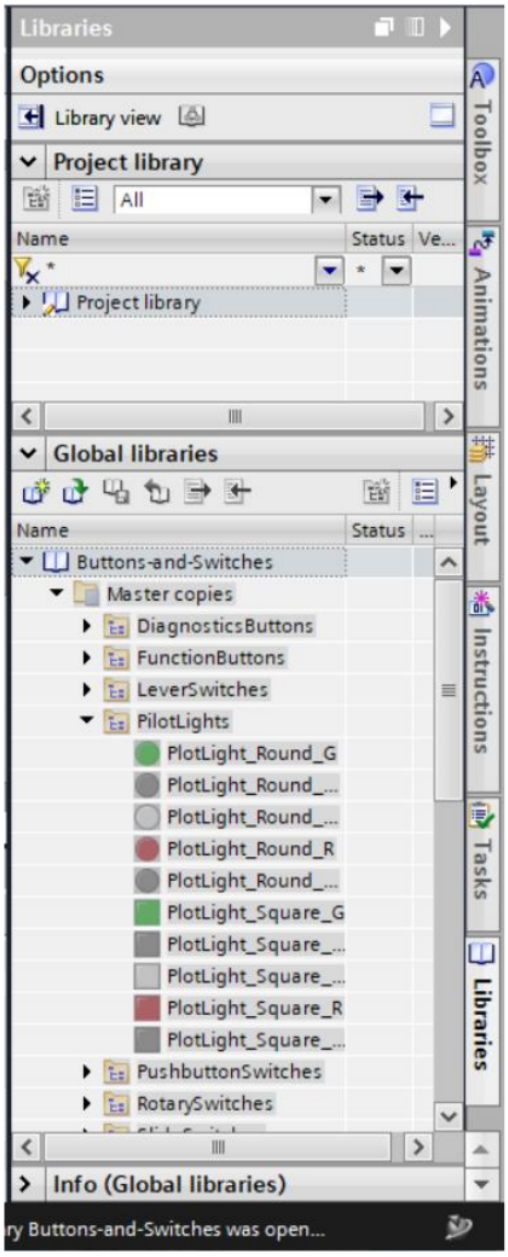


Figure 45: Navigating through the library.

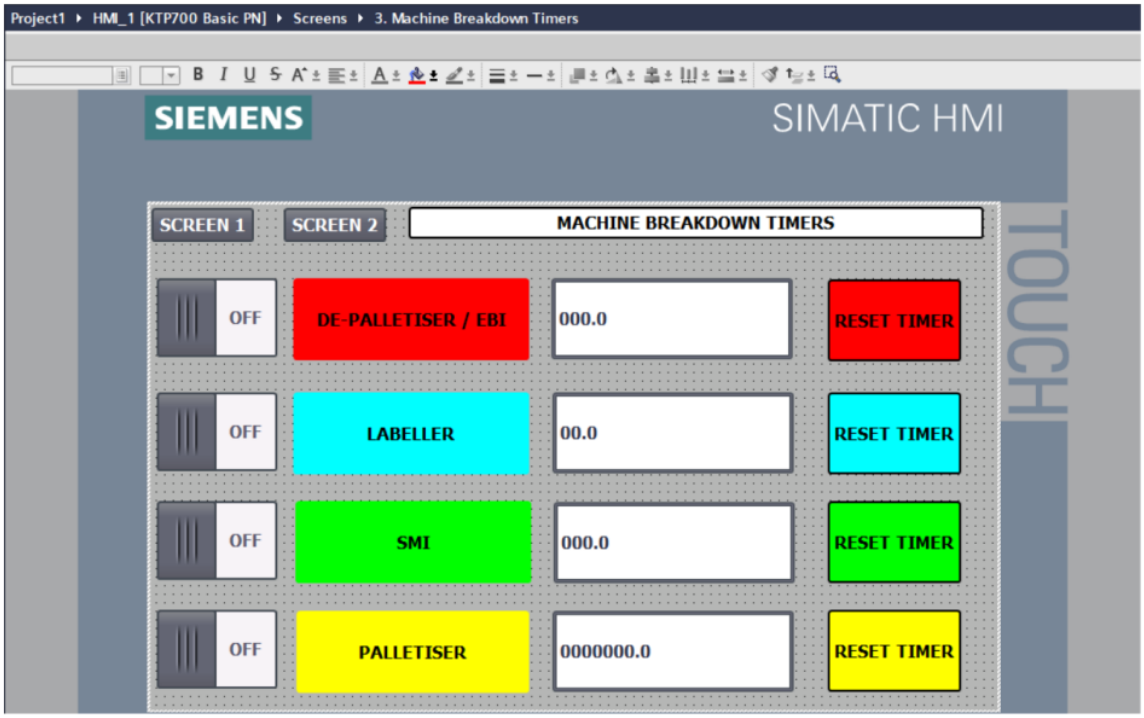


Figure 46: The data collection screen (Screen 3)

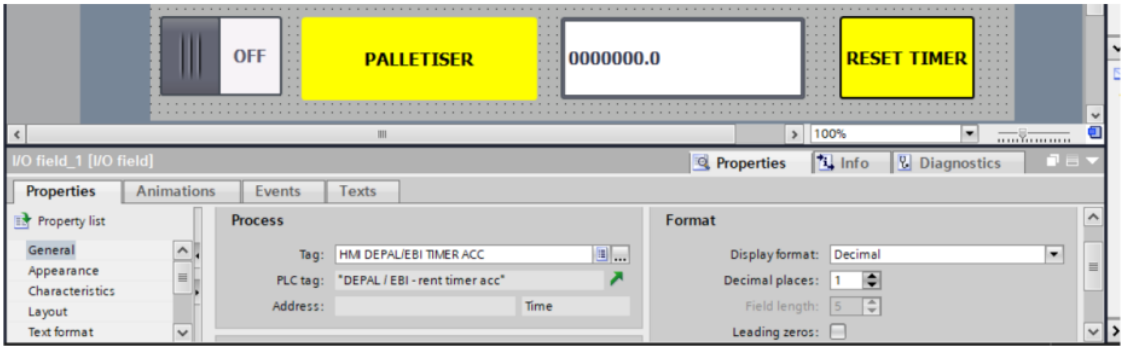


Figure 47: How to setup the counter parameters



Figure 48: Panel mounted isolator location

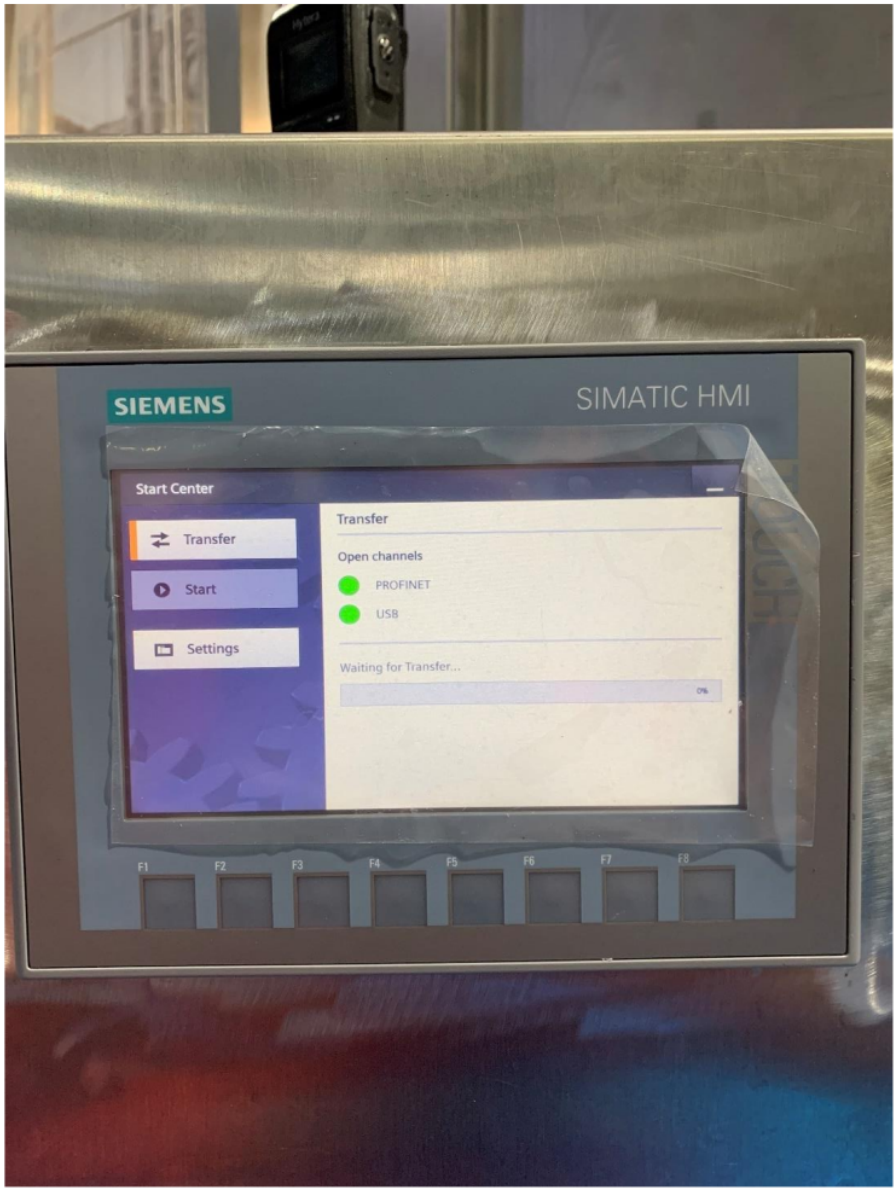


Figure 49: Interactive technology used.

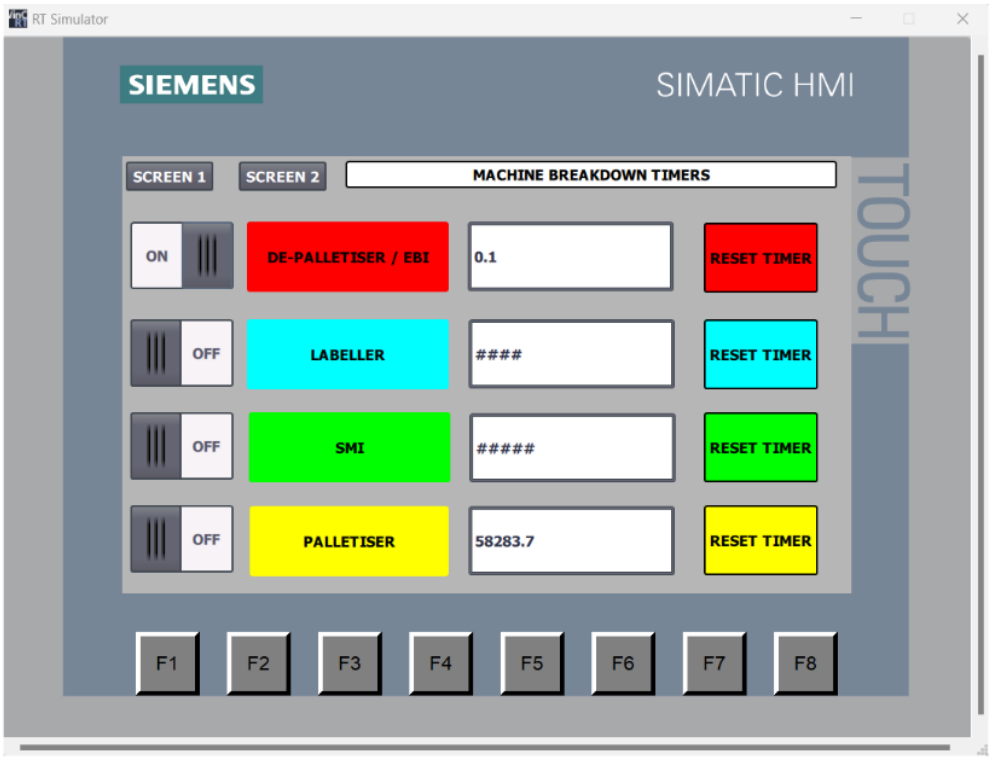


Figure 50: Counters used to compile all accumulated downtime for the machines.

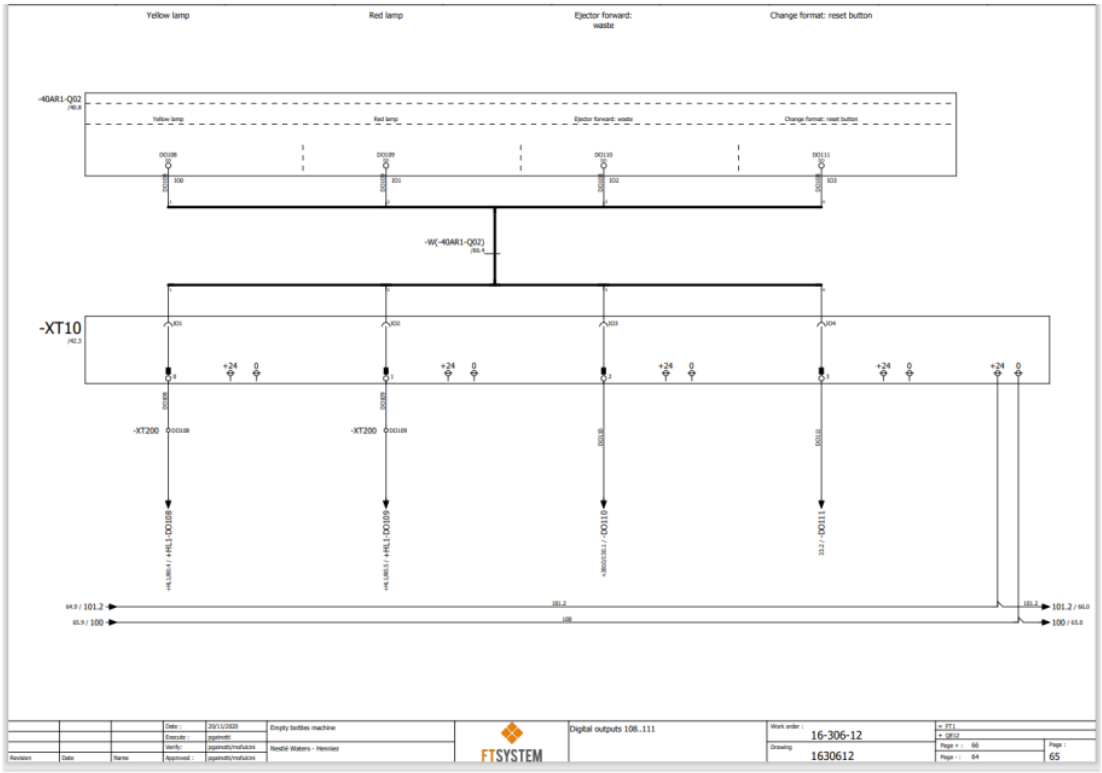


Figure 51: EBI Beacon terminals wiring diagram.

1809802

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

54 /100

PAGE 1

PAGE 2

QM

Good Structure

Report is structured exactly as stated in the assignment brief.

PAGE 3

PAGE 4

Text Comment. The FDS is always relevant

Text Comment. has been

Text Comment. This section should ahve been written in the past tense. Was the project successful?

Text Comment. was

Text Comment. Did you get help from the company?

Text Comment. From page 26, there must be some involvement from someone in your company.

PAGE 5

Text Comment. How can there be two section 3s?

Text Comment. You could have reminded your reader of what the project was about.

Text Comment. word missing

Text Comment. What about the company needs?

Text Comment. what do you mean by diversity?

Text Comment. Does this suit the company?

Text Comment. what do you mean by diverse?

QM

Punctuation Error

Punctuation error

PAGE 6

QM

Spelling

Spelling error

Text Comment. Company names should not be included

PAGE 7

Text Comment. Why the blank page?

PAGE 8

Text Comment. No need to plead with your reader

PAGE 9

PAGE 10

Text Comment. How will a graph prevent this?

Text Comment. Was this part of your FDS or is it a recommendation?

PAGE 11

QM

Punctuation Error

Punctuation error

PAGE 12

PAGE 13

PAGE 14

Text Comment. This suggests you could have planned the project better and put more thought into assignment 1

Text Comment. What does pre-planning mean?

Text Comment. You are explaining the importance and usefulness of this but that is an evaluation and you are instructing your reader. It would be better if you explained what it means and why, if any, changes were needed.

PAGE 15

Text Comment. Did the time match up with the planning?

Text Comment. Where is your risk assessment?

PAGE 16

PAGE 17

PAGE 18

Text Comment. You don't need to explain to your reader why you did a test plan.

PAGE 19

Text Comment. opened

QM

Punctuation Error

Punctuation error

Text Comment. show

PAGE 20

Text Comment. The PLC is in STOP mode but this should not prevent the input LEDs from working and this does not require the programme either.

PAGE 21

Text Comment. This is not Havard

Text Comment. It is not sufficient to say this, you must state what you learnt and used from the sources and then cite them.

PAGE 22

Text Comment. incomplete sentence

PAGE 23

Text Comment. a testing table should have 5 columns

PAGE 24

PAGE 25

Text Comment. if the test was carried out, this would be written in the past tense

Text Comment. Where is your evidence column and what decisions have you made about pass or fail for each item?

PAGE 26

Text Comment. who is the other party?

QM

Write in the third person

Don't refer to your self as I, me, my or others as you etc. Avoid personal references. If absolutely necessary, refer to self as "the author".

PAGE 27

PAGE 28

Text Comment. why are you still aiming?

PAGE 29

Text Comment. You are telling your reader a story, rather you should be concluding what has been achieved.

PAGE 30

QM

Write in the third person

Don't refer to your self as I, me, my or others as you etc. Avoid personal references. If absolutely necessary, refer to self as "the author".

Text Comment. This is a personal reflection not a conclusion

PAGE 31

Text Comment. Did you mean this to be your citation list?

Text Comment. This is not Havard. Looks like APA.

Text Comment. A bibliography is a list of sources you have not cited. Is this what you mean?

PAGE 32

Text Comment. what do the colours mean?

PAGE 33

Text Comment. What does pre-planning mean?

Text Comment. Did you think about it before your thought about it?

PAGE 34

QM

Spelling

Spelling error

PAGE 35

PAGE 36

PAGE 37

PAGE 38

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Text Comment. You do not need to include datasheets and manuals. Better to use information from them and then cite using the Harvard method

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GRADING FORM: NEW CSG-RUBRIC

MASON MORGAN

54

1. ENGAGEMENT WITH LITERATURE

Section 3: Judicial use and critical evaluation of technical literature in the design of the project
The is some evidence of use of technical literature mainly in the appendix. However, there is little evidence of evaluation. (2/5)
Section 8: Extent of reading, range of credible sources and use of Harvard method
There is one citation in the main report and the list given is a Bibliography not in the Harvard style.
There are citations in the appendix but these are mostly extracts from manuals. (2/5)

4

2. KNOWLEDGE AND UNDERSTANDING

Sections 3 and 4: Advanced knowledge and critical understanding demonstrated in the design and implementation of the project.
There is good evidence of this in the report. (6/10)

6

3. COGNITIVE AND INTELLECTUAL

Section 5: Testing and analysis of results.
Some tests have been carried out and some effort has been put into the testing table. (5/10)
Section 5: Critical evaluation of the project

13

outcomes.
There is some evidence of evaluation of the outcomes. (4/10)
Section 6: Conclusions and recommendations
This section is more of a personal reflection and the difficulties encountered. (4/10)

4. PRACTICAL APPLICATION



Section 4: Deployment method, use of material, tools, equipment and techniques in the construction of the project
There is very good evidence of correct use of these and also in the design of the software even though you were not able to download the programme, the simulation demonstrated its functionality. (6/10)
Section 4: Quality of the final product or system
The panel appears to have been built to a high standard and the HMI screens are clear for an operator to use. (7/10)
Sections 5, 6 and appendix: Management of the design process including use of plans, costing spreadsheet and log book.
Good evidence contained in the report including the log-book. However, better planning would have produced a better result. (5/10)

18

5. TRANSFERABLE SKILLS



Section 1: Acknowledgements, executive summary and introduction
The acknowledgements do not include the help you received from colleagues in the company and

13

the summary is rather long. Your introduction should have included a review of the project outcomes. (3/5)
All Sections: Presentation quality of the report, diagrams, charts, tables, figure numbering, page and section numbering etc..
Report is generally well structured (though there are 2 section 3s) and presented. (3/5)
All Sections: Quality of the writing style, use of punctuation and grammar.
Writing style could be better, there are many punctuation errors and you sometimes write in the first or second person. Much of the report uses the wrong tense and much reads like a story or reflection. It should be more objective and focussed on the final product. (2/5)
Word count limit not exceeded (5/5)