

Assignment 1 Aled Edgell

by Aled Edgell

FILE	9746_ALED_EDGELL_ASSIGNMENT_1_ALED_EDGELL_139106_28878226 8.DOCX (156.34K)		
TIME SUBMITTED	23-JAN-2018 07:28PM (UTC+0000)	WORD COUNT	2612
SUBMISSION ID	82285650	CHARACTER COUNT	12025

Assignment 1

Aled Edgell

Individual Project

PSDE5007

23/01/2018

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Word count: 2613

1: Project Proposal

This project will be carried out in the felinfach factory. In the factory we use and create powdered products, because of this there are several areas which run the risk of the powder in the air exploding. In addition to the current procedures that are in place a Fire Trace system has been implemented in the factory, not only in these areas but in most of all the panels on site.

The Fire Trace system is a fire suppressant method which requires a fire extinguisher to be fitted to the outside of the panels, and tubes linked to the fire extinguisher to be run into the panel across all the electrical devices. When a fire or a hot spot is created it will break the Fire Trace tube and the fire suppressant will be dispersed onto that area.

At the moment while most of the fire trace bottles have not been commissioned and are not in use, an engineer is regularly required to go around and inspect the bottles (that are active) to make sure they haven't been discharged, or isolated (without reason). Not only is this a very time costly activity it is also very ineffective as the bottle could discharge shortly after the inspection.

The purpose of this project is to connect each Fire Trace system to the WinCC network, this is the system that all the operators use to control the plant, which also allows other users to inspect the condition of the factory and individual items.

When the Fire Trace System is linked through the WinCC network a screen will be created which will allow all Fire Trace Systems to be inspected by looking on the screen and not required to go to each one locally. Additionally, alarms will be created so that when a bottle is discharged it will inform the operators and send an email to those who are required to be informed. In addition to monitoring the Fire Trace bottle itself the doors on the panel and the extraction fans will be monitored as the fire suppressant is less effective when the doors are open or the extraction fans are running, as it will remove the fire suppressant. In addition to the WinCC screen local pilot lamps will be used on the doors so that if an engineer is resolving an issue with the system they can easily identify what the issue could be.

The project will be completed with a combination of research at Volac and at college, while the majority of the project will be spent implementing the project at Volac. To achieve the goals of the project local inputs from a PLC will be connected to all the Fire Trace bottles and the door sensors which will be linked to the WinCC system. Any panel that doesn't have any I/O available will have Input/Output cards added to the current PLC's. However, if they don't currently have a PLC in the area one will be added and connected to the Ethernet network.

The budget for this project is £8000. While most of the cables and the I/O required are already available this will greatly reduce the amount needed to complete the project.

The 2 possible methods to complete this project are to either fit a standard terminal row fitted to a piece of Din rail to the side of the panels which will be used to connect the PLC, Fire Trace bottle and the pilot lights. The alternative method will be to create a separate panel that will have the terminals and the pilot lights fitted next to the Fire Trace bottle which will not require the use of any space in the other panels. However, it will cost more to do this and there might not be enough space to do this for some of the panels. A site survey will be carried out to determine the best course of action

2: Background research

For the research into the project a site survey was carried out to determine the course of action require below are the results of the panels found that require a monitoring system to be implemented.

Firetrace Ref	Location	Panel Names	Panel dims	Bottle size
1	First Aid Room	First aid room. General Ottermill sw / fuse	2.4 x 1.2 0.4 (largest <1 cubic metre)	FS1DLP1230INT
34	Blending area	Perspex covered starter panel	3.24 x 2.0 x 0.3 (largest <2 cubic Metre)	FS2DLP1230INT
36	Air compressor house	Compressor 1 Atlas Copco	0.47 x 1.95 x 1.1	FS2DLP1230INT
37	Air compressor house	Compressor 2 Atlas Copco	0.47 x 1.95 x 1.2	FS2DLP1230INT
38	Air compressor house	Compressor 3 Atlas Copco	0.47 x 1.95 x 1.3	FS2DLP1230INT
3	Area 1	Area 1 Sub Station DB2	4.0 x 2.1 x 0.9 (largest < 4 cubic metre)	FS4DLP1230INT
4	Area 1	DB32	1.2 x 1.4 x 0.25	FS1DLP1230INT
7	Area 1 Motor Store	Area 1 Motor Store	4.2 x 2.0 x 0.5 (largest 3.0 x 2.0 x 0.5)	FS4DLP1230INT
33	Area 1 NF	Mcc panel	2.44 x 2.1 x 0.6	FS4DLP1230INT
5	Area 1 NF/RO Substation	Area 1 MCC DB9 / NF MCC	3.6 x 2.0 x 0.4	FS4DLP1230INT
6	Area 1 NF/RO Substation	DB 39 / RO Polisher	1.2 x 2.0 x 0.6	FS2DLP1230INT
49	Area 2	DB86 MCC (4 sections)	3.2 x 2.1 x 0.55	FS4DLP1230INT
13	Area 2 Sub under control room	New DB 72-77	2.4 x 1.4 x 0.4 (largest <1 cubic metre)	FS1DLP1230INT
50	Area 2	Feed & Outlet Fan 1 & 2 plus incomer	3.4 x 2.6 x 0.6	FS6DLP1230INT
15	Steam Boiler House	Ottermill Dis Board	2.0 x 1.2 0.4 (largest <2 cubic metre)	FS2DLP1230INT
54	Area 2	DB87 - WPC homogeniser	0.8 x 2.1 x 0.6	FS2DLP1230INT
17	T2/T3 Sub	T2 Dis board (Sensient)	3.0 x 0.8 x 2.1 (largest <2 cubic metre)	FS2DLP1230INT
18	T2/T3 Sub	T3 Dis board (Volac)	4.0 x 0.8 x 2.1 (largest <2 cubic metre)	FS2DLP1230INT
55	Area 2	DB88 - Perm homogeniser	0.8 x 2.1 x 0.6	FS2DLP1230INT
45	Area 2 Control Room	DB 94 - CIP Panel	0.8 x 2.1 x 0.6	FS2DLP1230INT
46	Area 2 Control Room	DB 91 & 93 - SATT Panels	2.8 x 2.1 x 0.6	FS4DLP1230INT
47	Area 2 Control Room	Area 2 PLC	0.6 x 2.1 x 0.6	FS1DLP1230INT
14	Area 2 Sub under control room	Small Ottermill dis boards	4.8 x 1.2 0.4 (largest <1 cubic metre)	FS1DLP1230INT

53	Area 2 Upper Sub Station	DB79 & Stork Dryer MCC - Klockner suite	5.0 x 2.3 x 0.4 (largest <2 cubic Metre)	FS2DLP1230INT
11	Area 3 Substation 11	Offermill Sw/ fuse (multipal)	2.4 x 1.2 x 0.4 (largest <1 cubic metre)	FS1DLP1230INT
10	Area 3 Substation 11	DB63,62 & 70	4.2 x 1.9 x 0.4 (largest 1.8 x 1.9 x 0.4)	FS2DLP1230INT
12	Area 3 Substation 11	PLC panels	1.02x 2.1 x 0.4	FS2DLP1230INT
67	Attic (office)	WINCC Scada System (mesh front)	1.0 x 1.2 x 0.6	FS2DLP1230INT
8	Feeds Packing Line	Feeds Packing line BTH / DB69	2.2 x 2.0 x 0.5 (largest 1.2 x 2.0 x 0.5)	FS2DLP1230INT
9	Feeds Packing Line	DB68 BTH Bag	1.6 x 2.1 x 0.6	FS2DLP1230INT
41	Feeds Thermal Heater	Babcock Boiler 1	1.0 x 1.4 x 0.3	FS1DLP1230INT
42	Feeds Thermal Heater	Babcock Boiler 2	1.0 x 1.4 x 0.3	FS1DLP1230INT
61	Food	DB181	1.2 x 1.1 x 0.3	FS1DLP1230INT
62	Food	DB179	0.8 x 2.0 x 0.6	FS1DLP1230INT
63	Food packing Line	DB131 Boiler panel	1.2 x 0.8 x 0.25	FS1DLP1230INT
64	Food packing Line	DB183 Packing Wrapper Panel	1.0 x 1.2 x 0.45	FS1DLP1230INT
65	Food packing Line	DB184 Palletiser Panel	1.8 x 2.2 x 0.5	FS2DLP1230INT
59	Food packing Line	Food packing line panel (Dry prod Area)	1.8 x 2.1 x 0.5	FS2DLP1230INT
60	Food packing Line	DB180 LACT Mini	1.58 x 0.8 x 0.45	FS1DLP1230INT
19	Fridge Plant	Comp 1 + common control	4.2 x 2.3 x 0.6 (largest 2.0 x 2.3 x 0.6)	FS4DLP1230INT
20	Fridge Plant	Comp 2	2.0 x 2.3 x 0.6 (largest 1.2 x 2.3 x 0.6)	FS2DLP1230INT
21	Fridge Plant	Comp 3 + controls	4.0 x 2.3 x 0.6 (largest 1.2 x 2.3 x 0.6)	FS2DLP1230INT
24	Lactose MCC	Panel 7 & 8	3.6 x 2.1 x 0.5	FS4DLP1230INT
25	Lactose MCC	Panel 3,4,5 & 6	3.6 x 2.1 x 0.6	FS4DLP1230INT
26	Lactose MCC	Panel 1 & 2	3.6 x 2.1 x 0.7	FS4DLP1230INT
27	Lactose MCC	Panel 9 & 10	3.6 x 2.1 x 0.8	FS4DLP1230INT
28	Lactose MCC	Main LV Dis board + MR1 (LPG)- 2 panels	2.6 x 2.0 x 0.5 and 1.2 x 1.4 x 0.4	FS4DLP1230INT
48	Area 2	DB85 EVAP MCC	2.0 x 2.1 x 0.6	FS4DLP1230INT
29	Lactose MCC	MG disboard DB 151, 152 & 153 + Rittal PLC Enclosure	1.2 x 2.1 x 0.4	FS2DLP1230INT
58	Lactose MCC	LNG Control Panel (Prod. Area Workshop)	1.4 x 1.0 x 0.3	FS1DLP1230INT
51	Area 2	DB80 STORK EVAP	2.88 x 2.2 x 0.4	FS4DLP1230INT
52	Area 2	STORK DRIER MCC	1.6 x 2.25 x 0.6	FS4DLP1230INT

66	Main Office IT Room	Office Server (twin 42U common)	1.8 x 1.1 x 1.94	FS4DLP1230INT
43	Old refrigeration MCC	Old refrigeration plant MCC plus DB117	2.2 x 2.1 x 0.6	FS4DLP1230INT
35	Pump House	Ring Main Water pumps (Next to DJT) 3 panels	2@0.74 x 0.3 x 0.54 & 1@0.65 x 0.15 x 0.47	FS1DLP1230INT
56	T5 Transformer	T5 Enclosure LV end	1.6 x 1.4 x 0.4	FS2DLP1230INT
57	T4 Transformer	T4 Enclosure LV end	1.6 x 1.4 x 0.5	FS2DLP1230INT
44	Pump House	Mcc4 Pump House	1.8 x 2.1 x 0.4	FS2DLP1230INT
16	Steam Boiler House	MCC3 Cooling Tower	2.0 x 2.1 x 0.4	FS2DLP1230INT
39	Steam Boiler House	Cochran boiler control panel 1	0.4 x 2.0 x 1.0	FS2DLP1230INT
40	Steam Boiler House	Cochran boiler control panel 2	0.4 x 2.0 x 1.0	FS2DLP1230INT
2	Volac ETP	ETP	3.0 x 2.1 x 0.5	FS1DLP1230INT
31	WPI Dry	DB121 + DB123	1.2 x 2.1 x 0.6 (largest 0.8 x 2.1 x 0.6)	FS1DLP1230INT
32	WPI Dry	DB122	2.4 x 2.1 x 0.5	FS4DLP1230INT
30	WPI Dry Service Area	DB120 MCC	7.0 x 2.1 x 0.6 (largest 0.8 x 2.1 x 0.6)	FS4DLP1230INT
22	WPI Wet area	DB119 Riverside MCC	4.8 x 2.0 x 0.5 open	FS4DLP1230INT
23	WPI Wet area	DB 169 MF1 MCC	3.0 x 2.0 x 0.5 open	FS4DLP1230INT
69	Feeds Dryer	Munters MDU3500 Main Demudifier		

3: Project Specification

To comply with the standards of Volac and to successfully meet the aims set the following specification has been created which will detail how things will be carried out and what components will be used, as where possible components already kept in stores will be used to reduce the amount of new parts required to maintain the system.

Hardware specifications:

For the hardware inductive sensors supplied from IFM will be attached to each door as far away from the hinge side of the door as possible, if there are two doors that overlap the inductive sensor will be placed on the outer most door. This will ensure that the most accurate reading is taken when monitoring the doors status. To connect the Sensors to the Terminals a 5M cable also supplied by IFM will be used as this screws on to the end of the sensor and can be cut to length when wired into the terminals.

The terminals used will be 0.75mm ² terminals supplied from RS to match those that are already kept in stock, as a base 12 terminals must be fitted in a panel to allow for all the connections, with an additional 2 terminals for every door on the panel.

Pilot lamps from Schneider electric will be used which require a 24VDC supply and a 0V to operate. These will be used as local feedback so an engineer can fault find without login onto the WinCC system.

Software Requirements:

Using the TIA portal a function block will be created using the Ladder logic. This is so that a standard block can be used in all areas, and once one is confirmed working all the block should be working as intended.

The function block will require 4 inputs:

- Isolated Feedback
- Low pressure Feedback (7 bar falling)
- Discharged Feedback (5 bar Falling)
- Door status Feedback

The function block also require 3 Outputs to WinCC:

- Isolated
- Pressure Status
- Extraction/Cooling

The output for the extraction/cooling is included into the function block, however it will not be ready to use until the next phase in the project which will be taken over by another engineer. However, it has been included so that when the logic is needed it will already be ready without fear of corrupting the functioning blocks.

4: Testing plan

To test the system is functioning correctly the following checks will be carried out:

- Once the system has been tested when it is dead to make sure it has no issues, the 24VDC will be turned on to power the circuit, the first check would be a visual one to make sure that the Pilot lights are showing correctly.
- The second test will be to check the safety aspect as the bottle will be isolated to inspect if the lamp changes state and then the WinCC screen will be inspected to make sure it has successfully changed in both areas.
- The third test will be using a simulation to test the system recognises the change in pressure of the fire extinguisher this will be reduced to 6 bar where the Low pressure alarm should be shown and once that has been confirmed working the simulation will be set to 0 bar to test the isolation feedback on both the local pilot lights and the WinCC alarm, before this test the Email recipients will be changed so that only I receive an email to make sure that it is functioning correctly, and once the Email has been received about the discharged fire extinguisher the original settings will be restored.
- The final test for the system will be to make sure the status light for the doors and the feedback is working correctly so engineers are aware the doors have been left open as this makes the fire suppressant redundant.

5: Plan for the Project

Below is the plan that will be followed to achieve the aim of the project. During the time allotted to each area the system will be implemented and tested in the method stated above.

1	Week	Objective
2	2	Create a parts list and confirm with Graham before ordering.
3	3	Work on creating the logic and the WinCC screen.
4	5	Install and test the system in the powder silo room as a test area. If successful make the WinCC screen visible.
5	7	Install the project in Area 1
6	9	Install the project in Area 2
7	11	Install the project in Area 3
8	13	Install the project in the Boiler room
9	15	Install the project in the Lactose MCC
10	17	Install the project in the WPI MCC
11	19	Install the project in the Dryer MCC
12	21	Install the project in the Evaporator MCC
13	23	Install the project in the Tank farm
14	25	Install the project in the Effluent treatment plant
15	27	Install the project in the Intake bay MCC
16		
17		

Any issues that come up will be recorded and explained how they were overcome, if the issue was so severe that it caused a delay in the Gantt chart. The time delay will be recorded and a new time schedule will be created to replace it.

6: Conclusion

At the current point in time, tests have been carried out using the feedback switch which was supplied by the Fire trace company to make sure they are suitable for the task required, this also provided an opportunity to find the best way that they could be implemented into the circuit.

The function block for the project has also been created and compiled into the Volac software, However it has not been added into any Areas as so it will not affect any processes until it is ready to be connected to the WinCC system. However, they will be moved into OB1 (The main block) when the hardware is in place and connected up ready for testing.

Assignment 1 Aled Edgell

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

38/100

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GRADING FORM: CSG-RUBIC

ALED EDGELL

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RESEARCH-INFORMED LITERATURE



Nowhere near enough and zero refs. Background research - very weak - 4/15 Research - none - 0/10

4/25

KNOWLEDGE AND UNDERSTANDING

 Proposal is reasonable.- 5/10 Spec is good. 3/5 Not much in this and should have a separate section.- 3/10

11/25

ANALYSIS

 Testing plan is ok. - 6/10 Not much on conclusion - 3/10

9/20

PRACTICAL APPLICATION AND DEP.

 Should use Gant chart and use time comparison methods Project plan needs improving - 2.5/5
Quality of work needs improving - 2.5/5

5/10

SKILLS FOR PROFESSIONAL PRAC.

 More needed in all sections. - 4/10 Presentation 5/10

9/20