

Final Report

by Iwan CostelloDowns

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1. Executive Summary

Some sentences are overly complex

This report entails a detailed breakdown of the implementation phase of the project undertaken during this academic year. The report is divided into sub sections detailing the different elements of the implementation.

Firstly, the design of the solution is discussed, this entails a look at how the program works as well as a look at the electrical drawings. This entails the drive and motor used as well as the control method via a PLC. The design section elucidates how the automated functions operate as well as showing the graphics for the new page. Then the project management techniques were reviewed, it was summarised that the planning itself was sufficient, however it was observed that testing ran overdue because of complications on receiving some test equipment. The project itself stayed within budget, however.

The project was also reviewed against a testing table of criteria to evaluate the performance of the solution, the solution managed to meet all its criteria. Using the Factory Acceptance Test was an invaluable way to execute testing of the project and allowed the focus of the design to stay within scope.

unnecessary words

Finally, relating to, the outcomes of the project were evaluated, this included an evaluation that the project met its specification outlined in the proposal, however a more rigorous testing method could have been employed and this has been noted as a potential improvement for any more projects the author will conduct.

A conclusion was then drafted, combining both the industrial and personal Wrong choice of word/s experiences and reflections of the author regarding what has been garnered in experience during the interim of this project development. In summary the author is pleased with their performance, however for a future recommendation it has been proposed that a more technically laborious project would be beneficial to undertake as there are many more complex and variable nuances to tackle that would expand the authors level of expertise. Overall thought, the project was deemed a success as it delivered what it was originally designed to undertake.

A good summary that covers all aspects of the project

2. Introduction

You should have reminded your reader of what the project is about

This second report will look at the solution delivered in relation to the objectives outlined in the first report. The report first goes into the design of the solution delivered, this entails the technical breakdown of the electrical design and program structure as well as miscellaneous parts used in the design. From this design the planning in relation to what was delivered is looked and analysed in relation to what was expected to be produced to what is delivered. Finally, a testing table drafted in the first assignment will be used to empirically test the solution in regard to functionality and features it must possess. Then finally a conclusion based on everything that was learnt during the exercise. Finally, some acknowledgements are in order for the help received in the planning and implementation phase from my colleagues. That being Dean Hamer for his PLC program consultation support and Gareth Stacey for allowing me to undertake the project and managing purchasing.

3. Design

You have lost your paragraph format, 1.5 line spacing with fully justified text

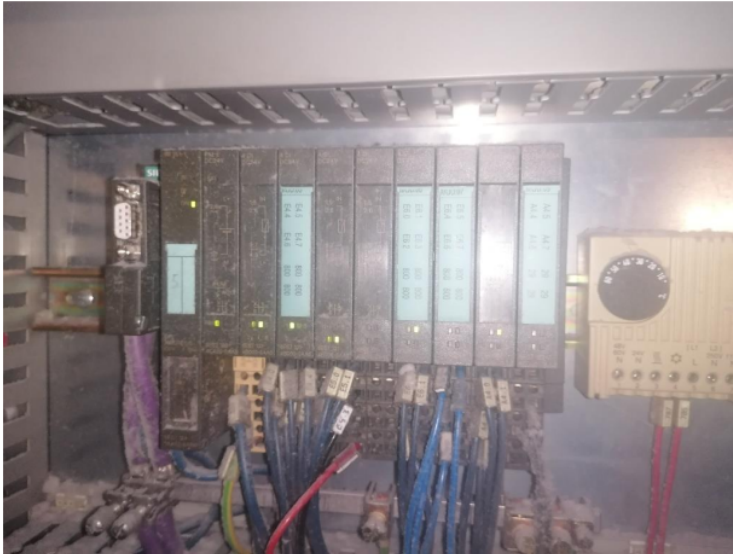
The electrical drawings for the panel can be viewed in appendix 3.

Incomplete sentence

Due to the installation of the new VFD controlled panel for dust extraction, using a signal cable run from an output card from the Line Panel S7 PLC. As selected for in the last report the drive used to control this motor is the IMO HD1-200A-23 and the spec sheet may be viewed in appendix 1. (LED Controls, 2022) The motor used in this operation is a WEG 3 Phase motor with 4 poles, the datasheet may also be viewed in appendix 2. (Bearing Depot, 2020)

It is not necessary to include datasheets.

Your reader want to know the relevant information so that they don't have to browse through it. Also, your tutor needs to know that you have read and understood and extracted design information from it.

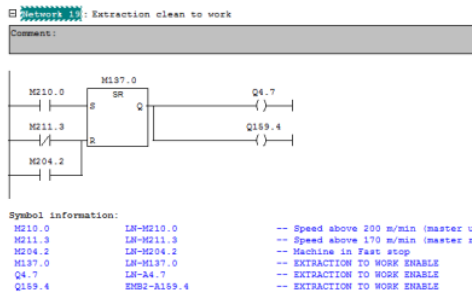


All images should be figure referenced in the text.

The original control panel on the line that was used for stop/starting the motor remotely has now had all the control start/stop buttons removed along with the LED to display when the motor is on standstill.

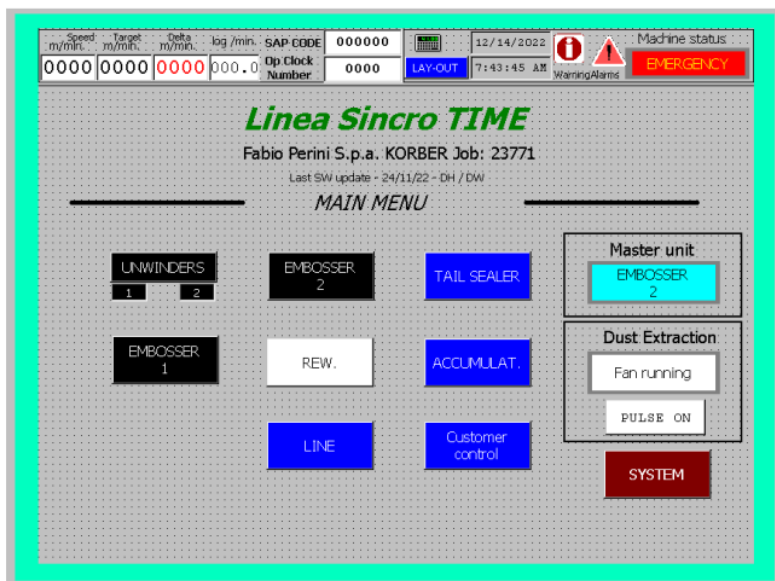
Inside this junction box, a new connection strip and a multicore cable has been run from this junction box to a remote I/O module under the +LN operator control panel.

The original wiring which sent a signal to the dust extraction unit to switch from clean to work when the machine speed increased over 200mt/m has remained and has not been modified.

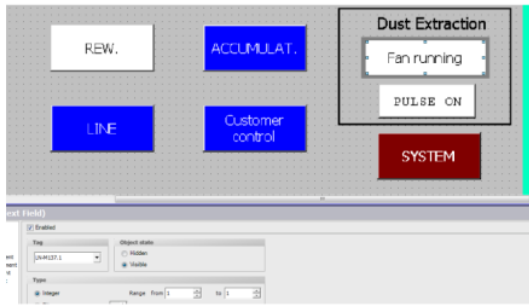


Figures should be numbered and explained in the text

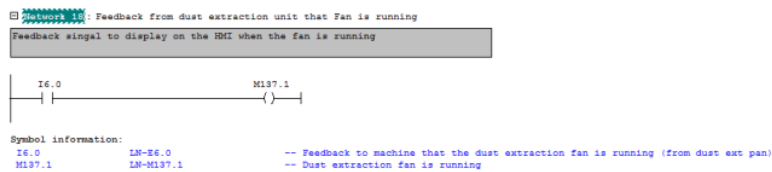
The graphics have also been modified, the HMI main menu screen now displays when the motor is running, along with adding a button below this display to manually force the dust extraction motor to start in the event of when the machine needs to be cleaned, when the machine is not running.



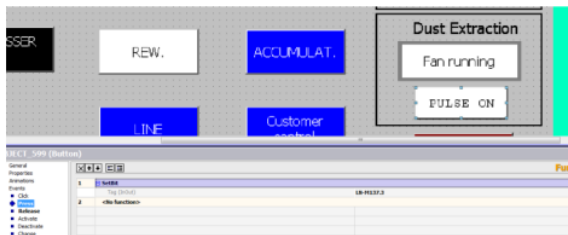
Fan running is displayed when M137.1 is TRUE.



When input I6.0 is TRUE (relay in dust extraction unit closes when fan is running) this then sets M137.1 to TRUE.



'PULSE ON' button created to replicate when machine is running. This is used to start the dust extraction motor for cleaning. M137.3 is set to TRUE when pressed.



This sentence is unclear. What is A6.0?

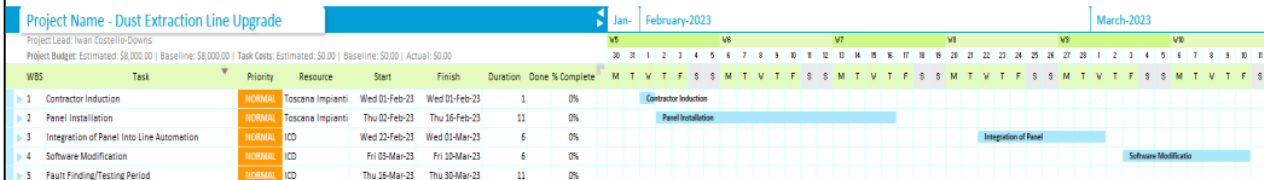
PLC software below controlling A6.0 (Relay in +LN Panel) controlling the start of the dust extraction panel. 1 minute time off delay after machine stops. A 15-minute time off delay after operator presses the PULSED ON button. For Ease of use and inclusive purposes the panel graphic has both Italian and English HMI displays so it is user friendly for both native and non-native operators. (Dawn Bonfield, 2020)

There is no PLC software below

Why is this page blank?

4. Implementation And Management

The Gantt chart drafted in the planning phase was kept roughly to schedule, there was a slight delay in the contractor arrival and the testing phase was extended over time. A full account of the implementation phase can be found in the attached logbooks in appendix 4.



The costings of the project were kept to, the licence to the software was already owned by the site so the only costings were the contractor fees.

Predicted costing	Actual costing
SIMATIC STEP 7 Prof. Combo V16 - £2,589.00 (Parmley Graham, 2022)	Already Acquired – N/A
Panel Design and Installation Cost - £8000	£8000

Overall, the implementation and planned breakdown coincided with almost perfect synchronicity, testing overlapped somewhat. This transpired because it took a long period of investigation to detect whether the vacuum suction was sufficient at 40Hz motor operation. The planning was valuable as a guidance to the author in executing the implementation phase.

5. Testing and Results

Drafted in the first report was the test table of criteria under the guidance of a Factory acceptance test (FAT), from this metric the solution delivered may be tested empirically for its suitability in regard to the specification and proposal. As evidenced earlier references 1.1 to 1.8 except for 1.2, this is covered later. As can be seen from the design, all aspects of the specification were implemented fine, then tested for correct functionality. The testing phase took longer than anticipated as it was originally intended to be conducted via a power quality analyser, however due to lead times this was not possible. Instead, energy readings were taken against an existing line with out the upgrade and can be seen below. The testing extended as the motors had to be running for sufficient time to ascertain whether the suction would be adequate at 40Hz, this was an extended period of time in which the quality department had to investigate the efficiency of this frequency. After it was deemed acceptable readings were took late into the implementation phase.

Reference	Criteria
1.1	The new solution must use a VFD drive to replace the star-delta starter.
1.2	The new solution must be monitored for energy saving feedback to review its performance.
1.3	The original control panel for start/stopping the extraction motor must be removed.
1.4	The start/stopping of the motor must be controlled via an I/O module under the line operator panel.
1.5	The dust extraction running mode should still engage at 200mt/m when the machine is running therefore the remaining wiring and code should still allow this after the modification.
1.6	The HMI must display when the motor is running.
1.7	The cleaning function must be engaged by keeping the extraction running 1 minute after the machine stops.
1.8	The cleaning function must be displayed on the HMI and last for 15 minutes after activation.

To ascertain the power saved by the new upgrade, two sets of current measurements were taken on each incoming phase, one on the upgraded VFD panel on line 6 and one of line 1 using the extant star-delta starter. From these tests the following results were found.

Measured Phase	Line 6	Line 1
Phase 1	40.7A	59.8A
Phase 2	41.7A	60.1A
Phase 3	41.5A	60.5A

From these results we observe that the average current at full speed is 40A whereas the existing system pulls 60A per phase on aggregate. With these readings the following calculations can be conducted.

$$P = \frac{I \times V \times pf \times \sqrt{3}}{1000}$$

Using the mean current for I in the equation the following results are obtained. Note that power factor is assumed to be unity for the purpose of this calculation.

Your calculation assume that the voltages were the same. However, when an inverter reduces its frequency, it usually reduces its voltage to maintain the V/F ratio for optimum flux. Power factor will also be affected

Line 6.

$$P = \frac{40 \times 400 \times 1 \times 1.73}{1000}$$

voltage will be lower here

Induction motors will not have a power factor of 1 due to

$$P = 27.68 \text{ kW}$$

inductance and it will vary with the load

Line 1.

$$P = \frac{60 \times 400 \times 1 \times 1.73}{1000}$$

you should have measured PF

$$P = 41.52 \text{ kW}$$

Power

$$\text{Energy Saved} = 42.52 - 27.68$$

It is likely that your system is more efficient than you realise if the voltage is dropped as well.

$$\text{Energy Saved} = 13.84 \text{ kW}$$

Energy is measured in KWh or Joules

From these power results we can now conduct potential saving calculations. On average the company pays 0.2816 £/kWh. As it is difficult to find a mean time of operation for individual lines, we will assume the motors run continuously annually for this calculation.

$$\text{Energy Saved (£)} = \text{Hours of Operation kWh} \times \text{kWh Rate}$$

$$\text{Energy Saved (£)} = 8760 \times 13.84 \text{ kWh}$$

$$\text{Energy Saved (£)} = 121238 \text{ kWh} \times 0.28 \text{ kWh}$$

$$\text{Energy Saved (£)} = £33,946.75$$

The actual figure will be more due to the reduction in voltage and possible improvements in power factor

6. Evaluation of Project Outcomes

From the testing and evaluation section the functional aspects of the project succeeded in fulfilling its technical criterion, however it is unfortunate that the testing section could not be conducted as intended due to the inability to acquire a power analyser. Fortunately, all technical aspects of the specification were successfully implemented.

The costing and planning synchronised well, therefore costing stayed within its given budget, all technical parts used such as cabling and output cards were stock items and did not cost against the project.

7. Conclusion and Recommendations

Write in the third person

To begin I will look at the industrial experience draw from this project. Being an independent project, it has been invaluable in experience relating to managing and planning a project, as previously looked at the planning that was done was fairly good, if not lacking detail in some aspects of the Gantt chart. However, the real issues came with actual implementation, by not receiving the testing tool I needed for the final phase it delayed things while an alternative method was discovered. The acquisition of everything else required was hassle free, being planned beforehand. The project design itself has garnered the author with experience using WinCC viewer and PLC logic, as well as adding in output controls. The project itself would have benefited the report and given a larger scope of activity and a greater and in depth manifest, for example, being able to feedback to the drive with a sensor to control the frequency proportional to dust particles would have been an excellent addition as it would be a system with feedback control. Despite the impediments encountered the project still delivered a solution that fulfilled the FDS and satisfied the company by providing a more energy efficient solution to their problem. The FDS proved invaluable when testing, the only recommendation to make is that the method by testing the dust particulate in the environment was long and tedious and a much better test could have been devised, such as the dust sensor to feedback frequency control.

On a personal level, the experience has garnered the author with experience in managing and directing a project, especially in regard to liaising with colleagues and researching solutions on an independent basis. One recommendation going forward in regards to the authors performance is to be more authoritative and demanding when it comes to putting ideas and requests forward, as intrapersonal social skills often take precedence over aspiring intellectual ability in a corporate environment.

This last paragraph is a reflection not a conclusion

8. Works Cited

Bearing Depot, 2020. *WEG Three Phase Electric Motor, 55kW, 75HP, IE3, Flange Mounted (B5) 1500 RPM (4 Pole), 250 S/M Frame, Cast Iron Body*. [Online]

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[Accessed 22 1 2023].

A small range of sources for a level 6 project

9. Appendix

Appendix 1 – IMO Drive Specification

Options & Ordering Codes

HD1 - 75A - 43					
Series			Input		
HD1 Inverter Drive			400V		
HD1			Three Phase		
Output Power kW (HP)					
1.5kW (2HP)	3.7A	30kW (40HP)	60A	185kW (250HP)	340A
2.2kW (3HP)	5A	37kW (50HP)	75A	200kW (270HP)	380A
4.0kW (5.5HP)	9.5A	45kW (60HP)	92A	220kW (300HP)	425A
5.5kW (7.5HP)	14A	55kW (75HP)	115A	250kW (335HP)	480A
7.5kW (10HP)	18.5A	75kW (90HP)	150A	280kW (375HP)	530A
11kW (15HP)	25A	90kW (125HP)	180A	315kW (420HP)	600A
15kW (20HP)	32A	110kW (150HP)	215A	350kW (470HP)	650A
18.5kW (25HP)	38A	122kW (175HP)	260A	400kW (535HP)	720A
22kW (30HP)	45A	160kW (215HP)	305A	500kW (670HP)	860A

HD1 - 130A - 23			
		Input 200V	
		Three Phase	
Output Power kW (HP)			
0.75kW (1HP)	4.5A	15kW (20HP)	95A
1.5kW (2HP)	7A	18.5kW (25HP)	108A
2.2kW (3HP)	10A	22kW (30HP)	120A
4kW (5.5HP)	16A	30kW (40HP)	150A
5.5kW (7.5HP)	20A	37kW (50HP)	165A
7.5kW (10HP)	30A	45kW (60HP)	180A
11kW (15HP)	42A	55kW (75HP)	200A

HD1 - 52A - 63			
		Input 600V	
		Three Phase	
Output Power kW (HP)			
18.5kW (25HP)	27A	55kW (75HP)	86A
22kW (30HP)	35A	75kW (90HP)	98A
30kW (40HP)	45A	90kW (125HP)	120A
37kW (50HP)	52A	110kW (150HP)	150A
45kW (60HP)	62A		

HD1 Ratings & Specifications

Model	HD Mode (150% Overload - 1 min)				ND Mode (120% Overload - 1 min)			
	Rated Power kW (HP)	Carrier Frequency (kHz)	Rated Input Current (A)	Rated Output Current (A)	Rated Power kW (HP)	Carrier Frequency (kHz)	Rated Input Current (A)	Rated Output Current (A)
HD1-3.7A-43	1.5 (2)	8	5	3.7	-	-	-	-
HD1-5A-43	2.2 (3)	8	5.8	5	-	-	-	-
HD1-9.5A-43	4 (5.5)	8	13.5	9.5	5.5 (7.5)	4	19.5	14
HD1-18.5A-43	5.5 (7.5)	8	19.5	14	7.5 (10)	4	25	18.5
HD1-25A-43	7.5 (10)	8	25	18.5	11 (15)	4	32	25
HD1-32A-43	11 (15)	8	32	25	15 (20)	4	40	32
HD1-37A-43	15 (20)	4	40	32	18.5 (25)	2	47	38
HD1-45A-43	18.5 (25)	4	47	38	22 (30)	2	56	45
HD1-52A-43	22 (30)	4	56	45	30 (40)	2	70	60
HD1-60A-43	30 (40)	4	70	60	37 (50)	2	80	75
HD1-75A-43	37 (50)	4	80	75	45 (60)	2	94	92
HD1-92A-43	45 (60)	4	94	92	55 (75)	2	128	115
HD1-115A-43	55 (75)	4	128	115	75 (90)	2	160	150
HD1-150A-43	75 (90)	2	160	150	90 (125)	2	190	180
HD1-180A-43	90 (125)	2	190	180	110 (150)	2	225	215
HD1-215A-43	110 (150)	2	225	215	132 (175)	2	265	260
HD1-260A-43	132 (175)	2	265	260	160 (215)	2	310	305
HD1-305A-43	160 (215)	2	310	305	185 (250)	2	345	340
HD1-340A-43	185 (250)	2	345	340	200 (270)	2	385	380
HD1-380A-43	200 (270)	2	385	380	220 (300)	2	430	425
HD1-425A-43	220 (300)	2	430	425	250 (335)	2	485	480
HD1-480A-43	250 (335)	2	485	480	280 (375)	2	545	530
HD1-530A-43	280 (375)	2	545	530	315 (420)	2	610	600
HD1-600A-43	315 (420)	2	610	600	350 (470)	2	625	650
HD1-650A-43	350 (470)	2	625	650	400 (535)	2	715	720
HD1-720A-43	400 (535)	2	715	720	500 (670)	2	890	860
HD1-860A-43	500 (670)	2	890	860	-	-	-	-

Model	Output Power kW (HP)	Carrier Frequency (kHz)	Input Current (A)	Rated Output Current (A)
HD1-4.5A-23	0.75 (1)	2	5	4.5
HD1-7A-23	1.5 (2)	2	7.7	7
HD1-10A-23	2.2 (3)	2	11	10
HD1-16A-23	4 (5.5)	2	17	16
HD1-20A-23	5.5 (7.5)	2	21	20
HD1-30A-23	7.5 (10)	2	31	30
HD1-42A-23	11 (15)	2	43	42
HD1-55A-23	15 (20)	2	56	55
HD1-70A-23	18.5 (25)	2	71	70
HD1-80A-23	22 (30)	2	81	80
HD1-110A-23	30 (40)	2	112	110
HD1-130A-23	37 (50)	2	132	130
HD1-160A-23	45 (60)	2	163	160
HD1-200A-23	55 (75)	2	200	200

Model	Output Power kW (HP)	Carrier Frequency (kHz)	Input Current (A)	Rated Output Current (A)
HD1-27A-63	18.5 (25)	4	35	27
HD1-35A-63	22 (30)	4	40	35
HD1-45A-63	30 (40)	4	47	45
HD1-52A-63	37 (50)	4	52	52
HD1-62A-63	45 (60)	4	65	62
HD1-86A-63	55 (75)	4	85	86
HD1-98A-63	75 (90)	2	95	98
HD1-120A-63	90 (125)	2	118	120
HD1-150A-63	110 (150)	2	145	150

HD (Heavy Duty) and ND (Normal Duty) offer 150% and 120% overload respectively and are easily selectable with one configuration parameter.

IMO rating data is based upon default carrier frequency and 40°C ambient temperature. Please contact IMO for further support in selecting and sizing a comparable drive for your application.

Appendix 2 – Motor Specifications

Product Information

KW	55
HP	75
Frame	250
Mount	Flange B5
Material	Cast Iron
Input	Three Phase
Output Speed	1500
Shaft Diameter	60/65
Shaft Length	140
Part Number	WEG
Product Group	Electric Motors
Brand Label	WEG
a	406
b	311/349
c	168
m	500
n	450
p	550
t	5
s	19
efficiency	IE3

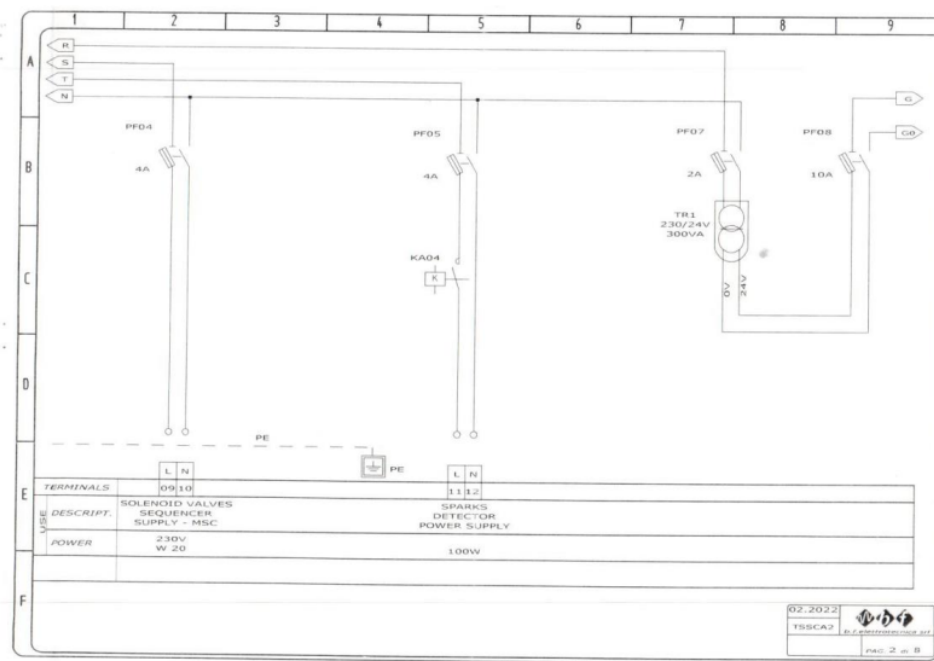
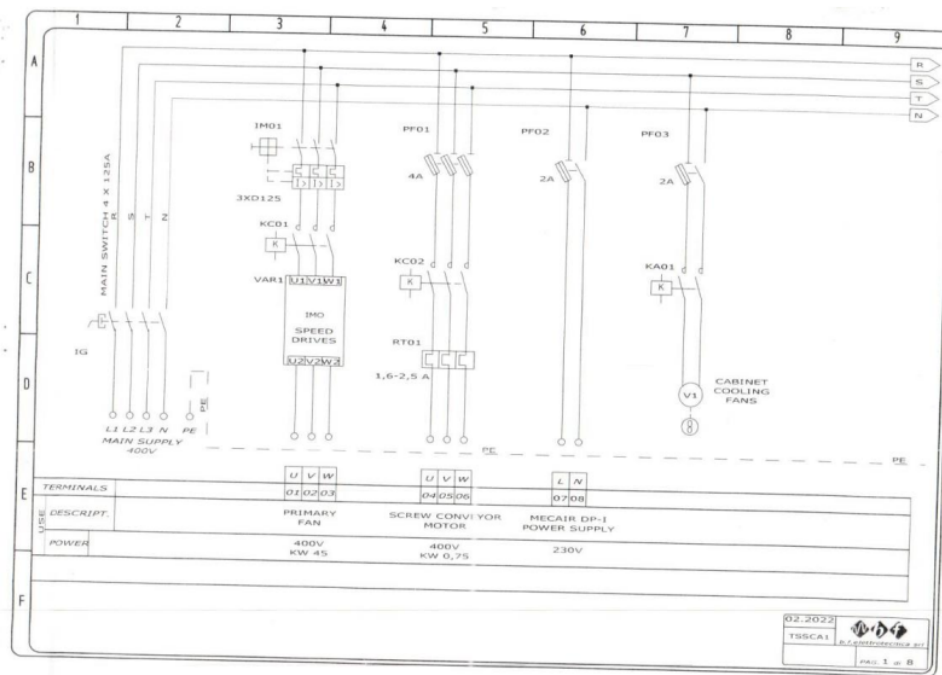
Product Description

This High efficiency electric motor is a 55kW of WEG manufacture with an output speed of 1500 RPM. Note: 1500 RPM is the standard speed of the motor. The output speed is dictated by the Hz frequency and therefore this motor will also be appropriate to use if your output speed is 1375rpm, 1400rpm, 1425rpm, 1450rpm etc. Three Phase Electric Motor, 55kW, 75HP, IE3, Flange Mounted (B5) 1500 RPM (4 Pole), 250 S/M Frame, Cast Iron Body

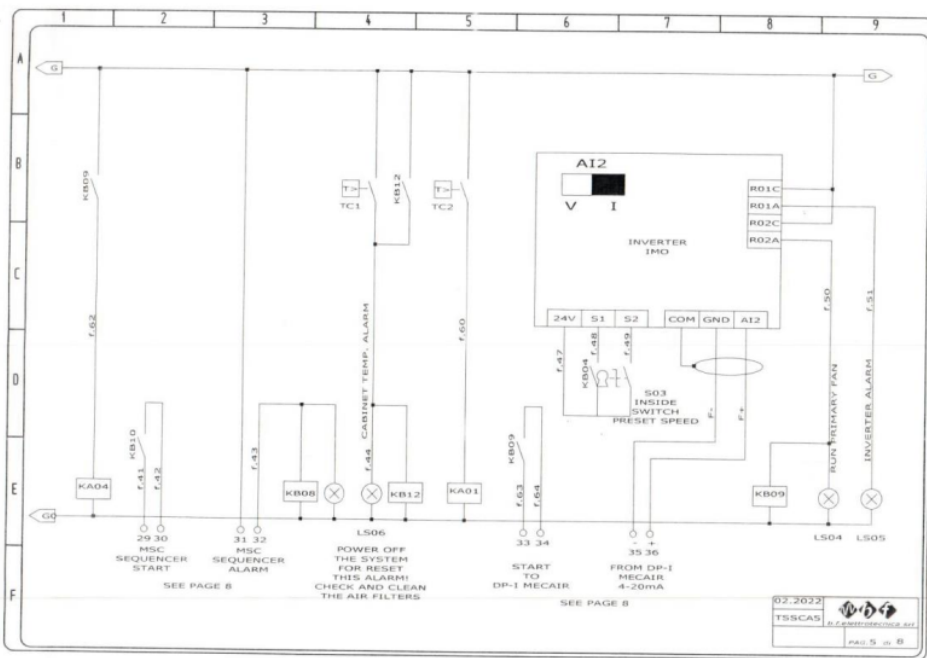
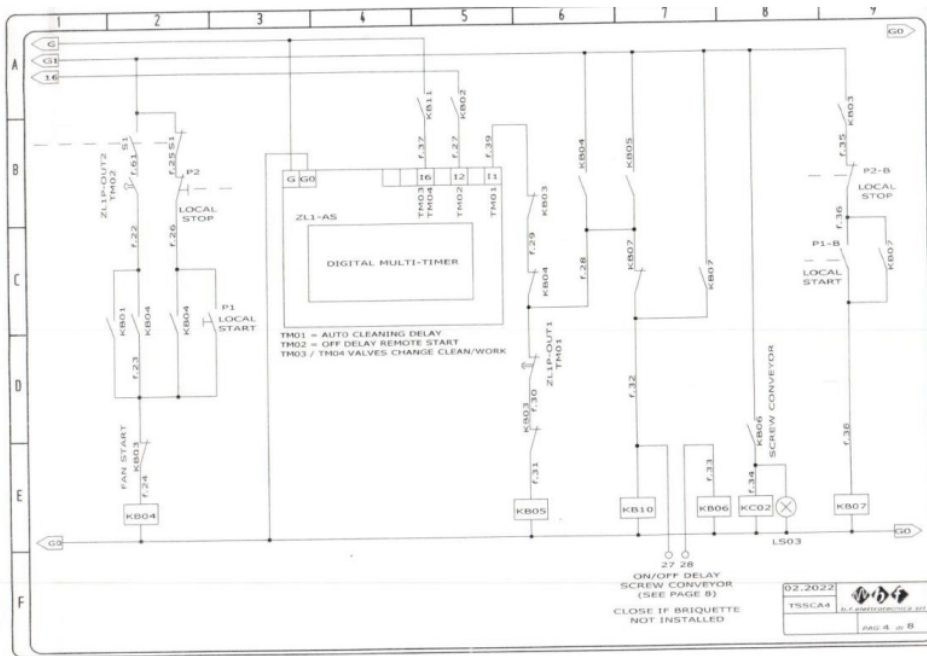


Appendix 3 – Electrical Drawings

1 2 3 4 5 6 7 8 9									
A									1
B									
C									
D									
E									
F	b.f. elettrotecnica s.r.l. Via di Montecarlo 117 Castellare di Pescaia PI Tel. 0572 452923 WWW.BFELETTROTECNICA.IT CONSETOCCIO TOSCANA IMPIANTI TECNOLOGIE AMBIENTALI S.R.L. Via di Montecarlo 117 - 56021 Pescia (PI) Tel. 0572 452923 - Fax 0572 452924 ORDER 02/2022 REFERENCE QAS DATE 24.02.2022 DRAWN F.S. RELEASE 1 0 DESCRIPTION 45KW FAN (INVERTER) 0,75KW SCREW CONVEYOR WORK./CLEAN. SOL VALVES ELECTRIC CONTROL BOARD MATR. TS00422 								









Log Entry Sheet

Log Number	16
Date	3/2/23
Duration (hrs)	2
Accumulated time (hrs)	80

Record of activities and achievements

Last week I gave a presentation on the project with my lecturers present. I have also completed disconnecting the existing panel, now all that is left is the physical removal of the panel.

Plans for next week

The plan for next week is to begin installing the panel and organising the contractors work permits to visit the site.

Signed _____

Signed _____

Log Entry Sheet

Log Number	17
Date	10/2/23
Duration (hrs)	10
Accumulated time (hrs)	90

Record of activities and achievements

Over the last week I have removed the old panel and arranged for it to be disposed of. I have also run new cables for the analog input to control the drive from the plc.

Plans for next week

By next week I intend to have the contractors come in and fix the panel in place. This will involve doing inductions and risk assessments.

Signed _____

Signed _____

Log Entry Sheet

Log Number	18
Date	17/2/23
Duration (hrs)	10
Accumulated time (hrs)	100

Record of activities and achievements

Over the last week I have assisted the contractors with installing the panel, now it has been installed I conducted a trial run to test the operating performance and take energy readings.

Plans for next week

By next week I intend to have the panel connected to the plc drive under the operator panel to automate the start function.

Signed _____

Signed _____

Log Entry Sheet

Log Number	19
Date	17/2/23
Duration (hrs)	5
Accumulated time (hrs)	105

Record of activities and achievements

Over the last week I have connected the drive to the PLC via an analogue output connection from the plc output cards to the dust extraction room. I have also begun writing the program for the automated function of the dust extraction.

Plans for next week

By next week I intend to have the program written ready to test. I also need to integrate the panel into the existing safety circuit, so I will endeavour to do this by next week as well as installing the output card back to the plc for the automated control.

Signed _____

Signed _____

Log Entry Sheet

Log Number	20
Date	24/2/23
Duration (hrs)	10
Accumulated time (hrs)	115

Record of activities and achievements

Over the last week I have finalised the program and adapted the wiring for the safety circuit. As well as running the output signal cable from the S7 1200 to IMO drive.

Plans for next week

By next week I intend to upload the program to the plc during the next line downtime to test functionality.

Signed _____

Signed _____

Log Entry Sheet

Log Number	21
Date	3/3/23
Duration (hrs)	10
Accumulated time (hrs)	120

Record of activities and achievements

Over the last week I have uploaded the program to the plc and graphics to the HMI. As well as removing the old switch button junction box.

Plans for next week

Over the next week I shall have put in a request for a power quality analyser to test the power consumption of the motor.

Signed _____

Signed _____

Log Entry Sheet

Log Number	22
Date	10/3/23
Duration (hrs)	5
Accumulated time (hrs)	125

Record of activities and achievements

Over the last week I have put in a request for a power quality analyser to test the energy efficiency of the system. So far it is being run at 40Hz and seems to provide sufficient extraction, I will continue to monitor this to ensure the current motor speed is sufficient to remove dust particulate.

Plans for next week

Over the next week I shall begin writing the final report as well as monitoring the extraction and liaising with the quality department to ensure dust extraction is sufficient on the line.

Signed _____

Signed _____

Log Entry Sheet

Log Number	23
Date	17/3/23
Duration (hrs)	5
Accumulated time (hrs)	130

Record of activities and achievements

Over the last week I have continued to monitor the dust extraction as well as drafting the final report.

Plans for next week

Over the next week I intend to continue the report and monitor the project still.

Signed _____

Signed _____

Log Entry Sheet

Log Number	24
Date	24/3/23
Duration (hrs)	5
Accumulated time (hrs)	135

Record of activities and achievements

I have continued writing the report and overseeing the extraction levels, so far quality is happy with the performance. I have also been notified that there is a large lead time on the power analyser meaning it may be months before I receive one.

Plans for next week

I will continue as planned for next week and continue the report as well as devising an alternate test method to ascertain energy saving.

Signed _____

Signed _____

Log Entry Sheet

Log Number	25
Date	31/3/23
Duration (hrs)	15
Accumulated time (hrs)	150

Record of activities and achievements

Over the last week I have continued the monitoring and report writing as well as taking power readings of the drives phases to test for energy saving.

Plans for next week

Over the next week I shall endeavour to continue the monitoring, report write up and continue to take readings.

Signed _____

Signed _____

Log Entry Sheet

Log Number	26
Date	7/4/23
Duration (hrs)	15
Accumulated time (hrs)	165

Record of activities and achievements

I have completed the energy readings and added them to the report, work continues on the report write up and quality has finally deemed the extraction sufficient so 40Hz will be the final operating frequency.

Plans for next week
Over the next week I shall collect the last evidence I need for testing and carry out the Factory acceptance test to ascertain a pass/fail metric for the project.

Signed _____

Signed _____

Log Entry Sheet

Log Number	27
Date	14/4/23
Duration (hrs)	15
Accumulated time (hrs)	180

Record of activities and achievements
--

I have now completed all testing and evidence collection, now I shall finalise the report over the next two weeks ready for submission.

Plans for next week

Continuing the report is now the priority now the implementation phase has ended.

Signed _____

Signed _____

Final Report

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

38/100

PAGE 1

PAGE 2

PAGE 3

QM

Good Structure

Report is structured exactly as stated in the assignment brief.

PAGE 4

Text Comment. Some sentences are overly complex

Text Comment. unnecessary words

QM

Wrong choice of word/s

You could have chosen a better word to express your thought here

Text Comment. A good summary that covers all aspects of the project

PAGE 5

Text Comment. You should have reminded your reader of what the project is about

PAGE 6

Text Comment. You have lost your paragraph format, 1.5 line spacing with fully justified text

Text Comment. Incomplete sentence

Text Comment. It is not necessary to include datasheets. Your reader want to know the relevant information so that they don't have to browse through it. Also, your tutor needs to know that you have read and understood and extracted design information from it.

Text Comment. All images should be figure referenced in the text.

PAGE 7

Text Comment. Figures should be numbered and explained in the text

PAGE 8

Text Comment. This sentence is unclear. What is A6.0?

Text Comment. There is no PLC software below

PAGE 9

Text Comment. Why is this page blank?

PAGE 10

PAGE 11

PAGE 12

Text Comment. Your calculation assume that the voltages were the same. However, when an inverter reduces its frequency, it usually reduces it voltage to maintain the V/F ratio for optimum flux. Power factor will also be affected

Text Comment. voltage will be lower here

Text Comment. Induction motors will not have a power factor of 1 due to inductance and it will vary with the load

Text Comment. you should have measured PF

Text Comment. Power

Text Comment. It is likely that your system is more efficient than you realise if the voltage is dropped as well.

Text Comment. Energy is measured in KWh or Joules

PAGE 13

Text Comment. The actual figure will be more due to the reduction in voltage and possible improvements in power factor

PAGE 14

PAGE 15

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 last paragraph is a reflection not a conclusion

PAGE 16

QM

Correct method of listing.

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

Text Comment. A small range of sources for a level 6 projecy

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GRADING FORM: NEW CSG-RUBRIC

IWAN COSTELLODOWNS

38

1. ENGAGEMENT WITH LITERATURE



Section 3: Judicial use and critical evaluation of technical literature in the design of the project
There is some evidence of the use of literature for the design process (2/5)
Section 8: Extent of reading, range of credible sources and use of Harvard method
Extent of reading is small but sources are credible and corrected cited and listed (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 some evidence of advanced knowledge and critical understanding demonstrated in the program, HMI and panel designs (5/10)

5

3. COGNITIVE AND INTELLECTUAL



Section 5: Testing and analysis of results
Poor evidence of testing and there are errors in the analysis with no measurement taken of voltage or power factor. Testing table is minimum and does not cover all the outcomes from the FDS. (3/10)
Section 5: Critical evaluation of the project outcomes
Some evidence of evaluation (4/10)
Section 6: Conclusions and recommendations
Some conclusions drawn and recommendations.

11

However, this section is more of a reflection on the author's experience. (4/10)

4. PRACTICAL APPLICATION



Section 4: Deployment method, use of material, tools, equipment and techniques in the construction of the project

7

Good methods appear to be employed but no evidence included of the final product, wiring of panel, configuration of the inverter, HMI running or even the motors themselves. (3/10)

Section 4: Quality of the final product or system

This is difficult to assess since the final product has not been included. (1/10)

Sections 5, 6 and appendix: Management of the design process including use of plans, costing spreadsheet and log book

There is some evidence with the planning chart, costing and log book entries for implementation phase. (3/10)

5. TRANSFERABLE SKILLS



Section 1: Acknowledgements, executive summary and introduction

11

A good summary but no acknowledgements and introduction should have reminded the reader of the project purpose. (2/5)

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

Report has a good structure and some parts of the report are formatted and presented correctly.

However, figures have not been numbered. (2/5)

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

Writing style is good in parts but is often awkward and some sentences are incomplete with unusual choice of words. (2/5)

Word count limit not exceeded

(5/5)