

Tomos Rhys Williams 2117073 project presentation

by Rhys Williams

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No. 2
Effluent
Sump
Upgrade
by Tomos Rhys Williams



Company Background

TATA STEEL

Tata Steel Europe

- Was once one of the biggest steel producers in Europe
- We produced up to 3.5 million tonnes of hot rolled and cold rolled annealed steel coils per annum
- These would then be sent to consumers in roll form or sent to our downsite plants for further processing
- Currently producing rolled steel products from imported steel slabs



Project Background and Aims

- The effluent management system plays a critical role in treating water before it is discharged to sea through the Long Sea Outfall
- There are 12 pumping sumps and key details such as temperature, pH and flow rate are monitored on SCADA system
- Current manual system has caused various issues with malfunctions that are causing damage, more downtime and limited control

Main aims:

- To automate and modernise the system using level transmitters, PLCs and HMI controls to improve reliability, safety and efficiency
- To reduce downtime and operator intervention to help with cost saving and compliance with environmental regulations



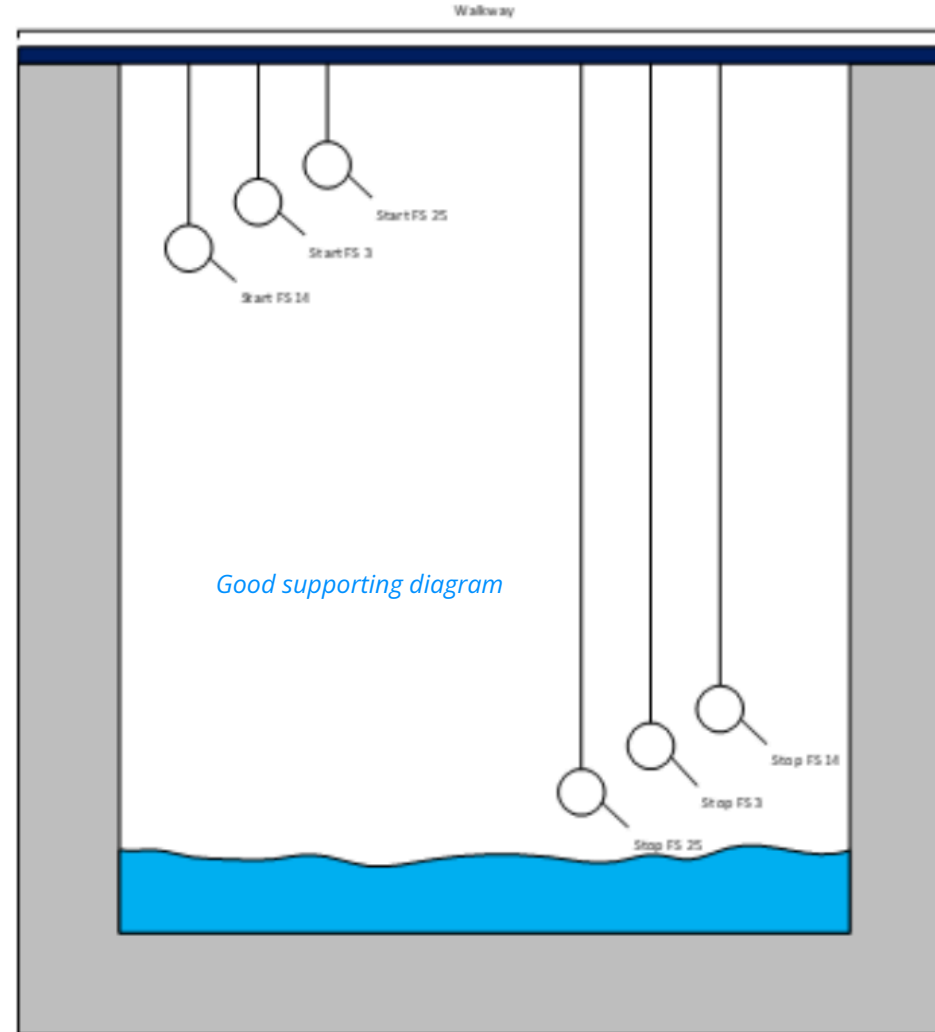
Solution 1

This solution:

- Utilises existing level transmitters and float switches
- Overload protection and auxiliaries with NO/NC contacts for the PLC
- Retains existing HMI layout
- Is very affordable

Risks:

- The lack of advanced features and limited data collection capabilities could lead to undetected issues
- Outdated components
- Still reliant on manual operator checks



Solution

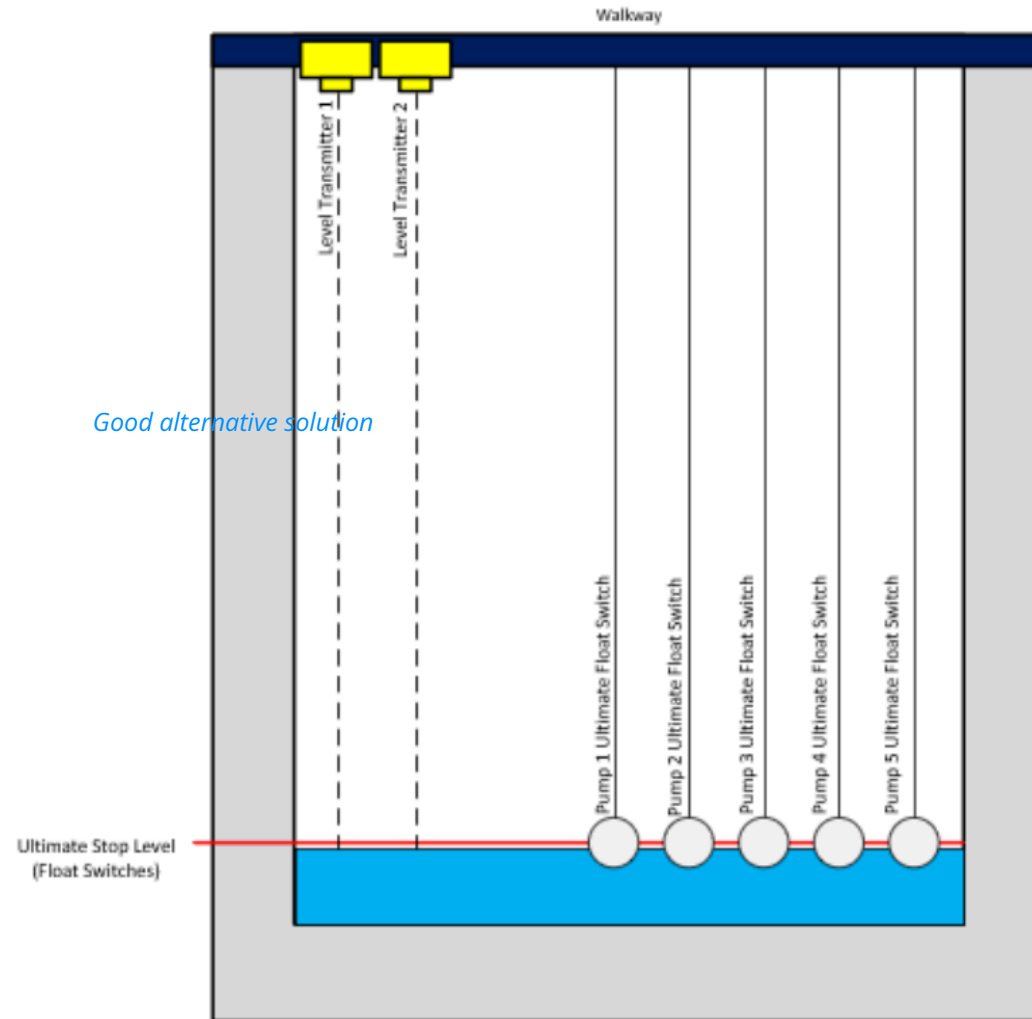
2

This solution:

- Installs accurate level transmitters and overload protection and contactors with ethernet connectivity for increased reliability
- Upgrades panels and HMI
- More expensive but with more advanced features such as monitoring of voltages and currents

Risks:

- Higher costs could stress proposed budget
- Complexity of solution could cause delays



Solutio n 3

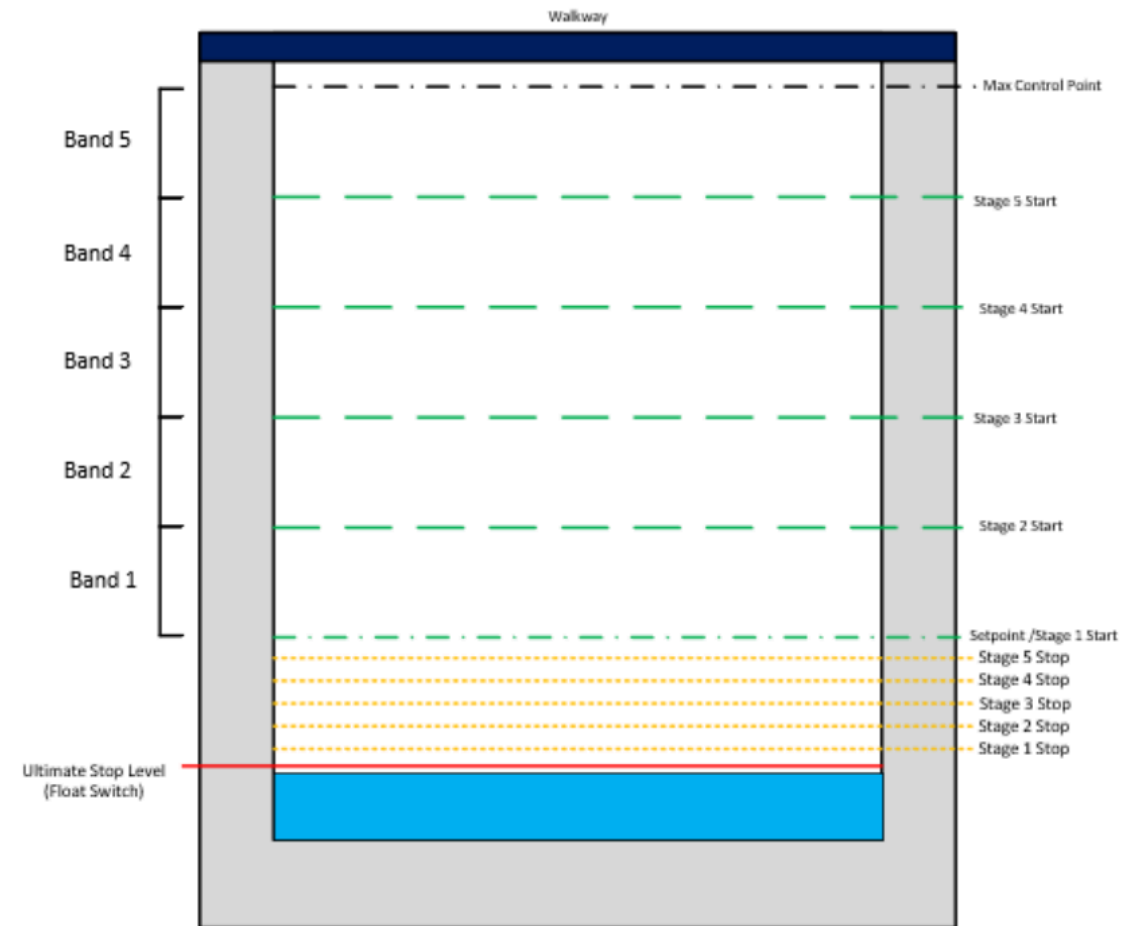
- Ultrasonic sensor
- PLC ultrasonic sensor
- 5V ultrasonic sensor
(adaptable for PLC 0-10V)
- Advantages of this method
are cost due to the fact
only 1 sensor needed, and
this sensor will be non-
contact resulting in a
longer life span



Chosen Solution

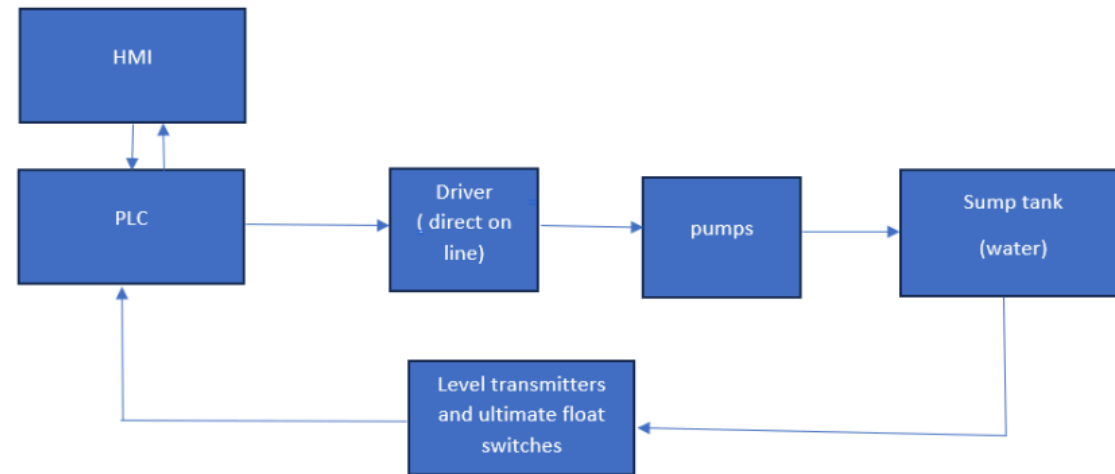
The final solution will take advantages from the first two proposed projects solutions to ensure the project is completed to the highest standard with advanced features and increased reliability while within budget constraints

- Existing level transmitters will be introduced
- Existing float switches used as ultimate limits for each pump for reliability
- Upgraded panels and HMI
- New PLC for automatic pump control within specified bands



tion

- Enhance the safety, reliability and efficiency of the sump system
- Each pump must have its own designated MCC panel and float switch as an ultimate limit
- Two level transmitters for level indication and control
- Reduce operator intervention and downtime
- Auto/manual switch for each pump on updated HMI



Good block diagram

Budget

- The proposed budget for the project is £20,000
- Initial costs for resources total at £10,147.80 including a quote from Rexel

Equipment / Item	Qty	Price	Cost
10 pair type 143 + Consumables	1	1,026.21	1,026.21
19 Core cable 1.5mm 50m	1	412	412
3M GPT -020F Clear Double Sided Plastic Tape, 0.202mm Thick, 11.3 N/cm, PP Backing, 100mm x 50m	1	55.69	55.69
3M Scotchfil Black Synthetic Rubber Electrical Tape, 38mm x 1.6m	5	12.38	61.9
3M VALUE DUCT 1900 Scotch 1900 Duct Tape, 50m x 50mm, Black	1	4.91	4.91
A4 316 Stainless Steel Mudguard Washers, M5	5	7.42	37.1
Advance Tapes AT7 Assorted PVC Electrical Tape, 19mm x 33m	4	10.9	43.6
Allen Bradley Blue Pilot Light Head, 22mm Cutout 800F Series	4	3.26	13.04
Allen Bradley for Use with 800FM Series, 1NO	10	3.71	37.1
Bahco 150 mm Carbon Steel Hacksaw Blade, 32 TPI	6	3.38	20.28
Dymo Black on White Label Printer Tape, 5.5 m Length, 12 mm Width	2	26.4	52.8
Entelec CPV Series Clear Cover for Use with DIN Rail Terminal Blocks	3	19.69	59.08
Entelec SCFCV Series End Cover for Use with DIN Rail Terminal Blocks	10	2.68	26.8
Finder 48 Series Interface Relay, DIN Rail Mount, 24V dc Coil, DPDT, 2-Pole	6	15.23	91.38
Finder 58 Series Interface Relay, DIN Rail Mount, 24V dc Coil, 4PDT, 4-Pole	3	20.49	61.47
HellermannTyton Cable Tie, 200mm x 3.4 mm, Black Polyamide 6.6 (PA66), Pk-100	2	5.51	11.02
HellermannTyton Cable Tie, 200mm x 4.6 mm, Black Polyamide 6.6 (PA66), Pk-100	5	3.97	19.85
HellermannTyton Cable Tie, 300mm x 4.6 mm, Black Polyamide 6.6 (PA66), Pk-100	10	10.4	104
HellermannTyton Cable Tie, 390mm x 4.6 mm, Black Polyamide 6.6 (PA66), Pk-100	5	10.88	54.4
HellermannTyton Spiral Wrap, I.D 9mm, 100mm Polyethylene SBPE Series	1	24.67	24.67
Klaue Uninsulated Ring Terminal, M8 Stud Size, 70mm² to 70mm² Wire Size	50	2.18	109
Knipex 70 06 160 VDE/1000V Insulated Side Cutters	1	23.97	23.97
MCC Panel Plates	1	197	197
MECATRACTION, N Insulated Ring Terminal, M6 Stud Size to 2.5mm² Wire Size, Blue	100	0.13	13
MODULE-DIS IO:FIELD POTENTIAL,1734-PPD,P	1	211.02	211.02
NewLink NLMS-224W 3 Button Wireless Ergonomic Optical Mouse Black	3	7.18	21.54
Rexel Quote - 0092014249	1	416	416
Rexel Quote - 0092061614	1	1,810	1,810
Rexel Quote 0091678961 (Welding cable)	1	565.25	565.25
Rexel Quote - 0091752954	1	2,493.80	2,493.80

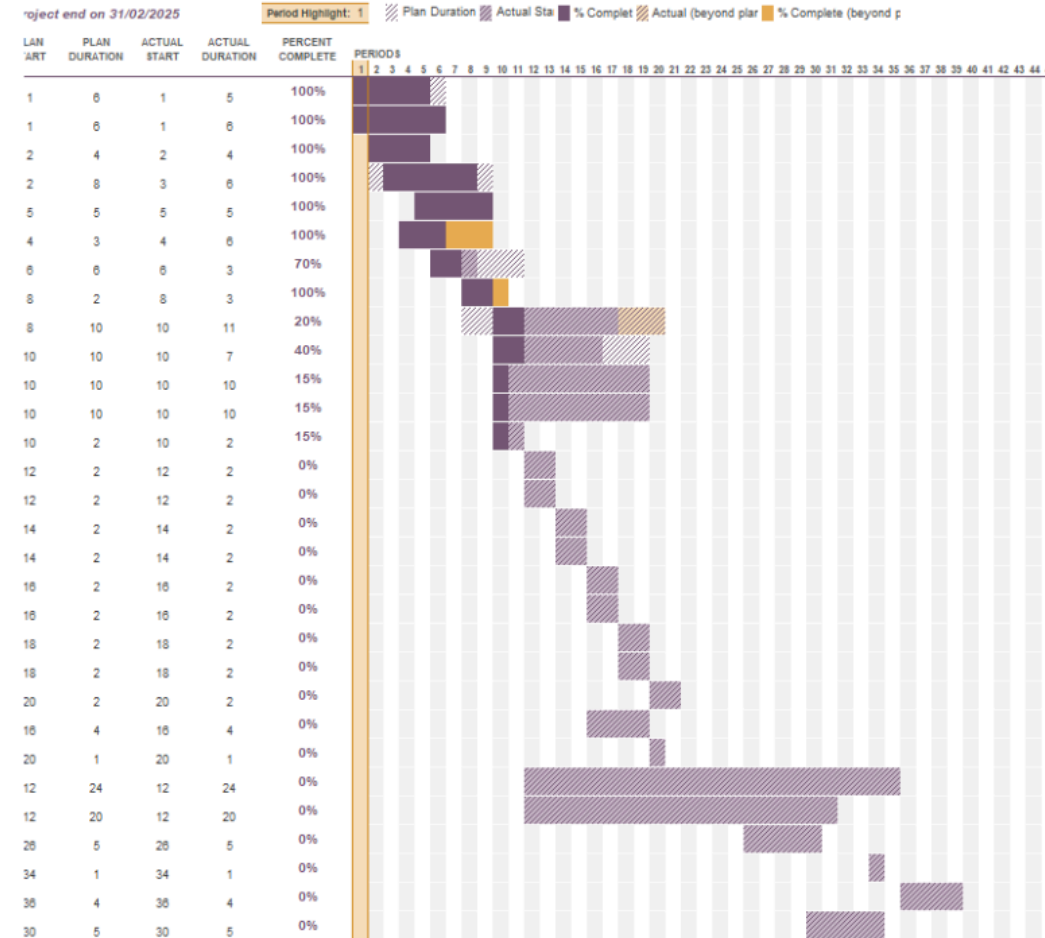
Gantt Chart

- This is the official Gantt chart for the project showing the development and commissioning deadlines

5.2 Sump Upgrade

Project end on 31/02/2025

Period Highlight: 1



Test Procedure

There are several tests that will be carried out prior to commissioning such as fault alarm tests, sequencing tests, start/stop tests and band tests.

I will focus on the band tests which prove that the specified bands bring in the correct number of pumps, so the system works correctly.

Grouping	Test/Check	Success?	Notes
Calculation Verification	Does the Op range equate to Max-Min Op level?		
	Does the start bandwidth equate to Op range/Number of pumps available?		
	With any number of pumps available, is the start level of the first pump the min Op level?		
	With 2 pumps available, is the start level of the second pump = min Op level + (1/2) Op range		
	With 3 pumps available, is the start level of the second pump = min Op level + (2/3) Op range		
	With 4 pumps available, is the start level of the second pump = min Op level + (3/4) Op range		
	With 5 pumps available, is the start level of the second pump = min Op level + (4/5) Op range		
	Does the Stop range equate to Min Op level - Ult Stop level?		
	Does the stop bandwidth equate to Stop Range/(Number of pumps + 1) available?		
	With 1 pumps available, is the stop level of the second pump = Ultimate Stop Level + (1/2) Stop range		
	With 2 pumps available, is the stop level of the second pump = Ultimate Stop Level + (2/3) Stop range		
	With 3 pumps available, is the stop level of the second pump = Ultimate Stop Level + (3/4) Stop range		
	With 4 pumps available, is the stop level of the second pump = Ultimate Stop Level + (4/5) Stop range		
	With 5 pumps available, is the stop level of the second pump = Ultimate Stop Level + (5/6) Stop range		
Pump Calling	With 1 pump available, and all pumps off, set the sump level to the max op level - does the pump turn on?		
	With 2 pumps available, and all pumps off, set the sump level to the max op level - do the pumps turn on in sequence, with a (seq) delay between each ?		
	With 3 pumps available, and all pumps off, set the sump level to the max op level - do the pumps turn on in sequence, with a (seq) delay between each ?		
	With 4 pumps available, and all pumps off, set the sump level to the max op level - do the pumps turn on in sequence, with a (seq) delay between each ?		
	With 5 pumps available, and all pumps off, set the sump level to the max op level - do the pumps turn on in sequence, with a (seq) delay between each ?		
	With 1 pump available, and running, set the sump level to the min level - does the pump turn off?		
	With 2 pumps available, and all available pumps running, set the sump level to the min level - do the pumps turn off?		
	With 3 pumps available, and all available pumps running, set the sump level to the min level - do the pumps turn off?		
	With 4 pumps available, and all available pumps running, set the sump level to the min level - do the pumps turn off?		
	With 5 pumps available, and all available pumps running, set the sump level to the min level - do the pumps turn off?		

Any
Questions
?



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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

72/100

PAGE 1

PAGE 2

PAGE 3

Text Comment. Good background research

PAGE 4

Text Comment. Good supporting diagram

PAGE 5

Text Comment. Good alternative solution

PAGE 6

Text Comment. Good alternative method

PAGE 7

Text Comment. The explanation here is specific to the industry and uses the existing components

PAGE 8

Text Comment. Good block diagram

PAGE 9

Text Comment. Detailed budget breakdown

PAGE 10

Text Comment. Good plan

PAGE 11

Text Comment. Good test plan

PAGE 12

GRADING FORM: CSG-RUBIC

RHYS WILLIAMS

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RESEARCH-INFORMED LITERATURE

 Project background was explained clearly and included good relevant detail. 8/10
Good evidence of research carried out. 7/10

15/20

KNOWLEDGE AND UNDERSTANDING

 Project purpose was identified and explained in good detail. 4/5
Project constraints and risks were explained and associated with company policy along with codes of practice and standards. 3/5
Environmental and sustainability were covered very well in the question section. 3.5/5
Functional design was explained clearly and demonstrated a good understanding of what the application involved. 3.5/5
Response to questioning was good and included relevant detail. 8/10

22/30

ANALYSIS

 Project was defined clearly and a good explanation was given. 3/5
Functional design was understood and the specification was explained from the block diagram, and covered in detail. 7.5/10
A good argument given for the choice of final solution. 3.5/5

14/20

PRACTICAL APPLICATION AND DEP.

 Design spec was explained in detail with relevant additional components identified. 3.5/5
Critical choice has been justified through evaluation and showed an understanding of PLC's. 7.5/10
Project plan with breakdown of activities was included and explained with management methods.
3/5

14/20

SKILLS FOR PROFESSIONAL PRAC.

 Slides included good relevant content. 3/5
Delivery of content demonstrated a good understanding of the project. 4/5

7/10