

SGEL6000 Independent Project

DOUBLE MARKING SHEET AND COMBINED STUDENT FEEDBACK

Assessment 4 of 4

Presentation 2: Project Design, Implementation and Evaluation

2020-2021

Agreed mark

68

Link to Presentation: https://youtu.be/sU_z_cE66LY

Link to Questions: <https://youtu.be/bq6pSpSDaXQ>

Student Name: **Daniel Ince**

Student Number **1602836**

Generic Assessment Criteria	Marks available	1st Marker (RD)	2nd Marker (MH)	Agreed Mark
1. Engagement with Literature Skills.				
Section 3: Use of technical literature in final design solution: Very good use of literature throughout the design A limited range of sources primarily consisting of company documentation.	5	4	3	4
Total	5	4	3	4
2. Knowledge and Understanding Skills				
Section 1: Introduction: Clear introduction given Project introduced as an improvement to the Valour Recovery Unit which had performance limitations.	5	4	4	4
Section 2: FDS: Clearly explained FDS was shown on a slide and explained covering aspects such as performance, ergonomics, reliability and standards.	5	4	4	4
Section 3: Advanced knowledge and critical understanding demonstrated in the design of the project: Good evidence presented. Knowledge and critical understanding was very evident from the highly detailed explanations. Far too much time was spent on this and some detail could have been summarised or omitted given the time constraints.	10	8	5	7
All sections: Response to questioning: Very good answers showed a clear appreciation of the issues All questions were answered in detail.	10	7	8	7
Total	30	23	21	22
3. Cognitive and Intellectual Skills				
Section 5: Testing and analysis of result: Good evidence presented with consideration given to restrictions. Testing was explained in detail, but again some points could have summarised or omitted. Testing was talked about for over 5 minutes.	10	7	7	7

Section 6: Critical evaluation of the project outcomes and comparison with the FDS: Outcomes evaluated in a lot of detail and compared with the FDS Evaluation needed to be rushed, but did state that all the FDS criteria were met.	10	8	6	7
Section 8: Overall conclusions and recommendations: Very good conclusions and recommendations given. Conclusions were also rushed, but did state that Covid and work demands had been detrimental.	10	7	6	6
Total	30	22	19	20
4. Practical Application Skills				
Section 3: Formulation of innovative and creative design solution to the project problem: Very good work The chosen solution satisfied all aspects of the FDS, with consideration for future maintenance and reliability.	5	3	4	3
Section 4: Deployment method, use of material, tools, equipment and techniques in the construction of the project: Mainly software based with some practical aspects. The project was primarily software based and a detailed explanation primarily focused on the DeltaV Configuration was given.	5	3	4	4
Section 4: Quality of the final product or system: Excellent in terms of software, little available for practical aspects. The final product is to be used in the oil industry, so quality cannot be in doubt.	5	3	4	3
Section 5: Use of test equipment and presentation of results of the project: Good use of appropriate test equipment Test equipment is primarily computer-based monitoring, although some direct observations were evident.	5	3	4	3
Section 7: Management techniques and planning, comparison with initial plan: Very well managed considering the restrictions of Covid and the TAR planned maintenance schedule. A detailed Gantt chart was used and updated throughout the project's timeframe. A S-curve was produced to track man hours and a spreadsheet showing expenditure was included.	5	4	4	4
Total	25	16	20	17
5. Transferable Skills for Life and Professional Practice				
All sections: Quality of the presentation slides: Good quality slides presented Slides were well presented and legible.	5	4	4	4
All sections: Quality of the delivery style: Too much detail, overran by double the time. You need to learn how to summarise and get to the main points. Style was not very interesting, audience was easily lost in all the detail presented. No attempt to keep the presentation within the designated 8 minute time limit and was asked to bring the presentation to an end after 16 minutes.	5	1	0	1
Total	10	5	4	5

Grand Total	100	70	67	68
-------------	-----	----	----	----

Daniel Ince 1602836 Project Presentation 2

by Daniel Ince

FILE	14401_DANIEL_INCE_DANIEL_INCE_1602836_PROJECT_PRESENTATION_2_179209_1107065005.PPTX (4.39M)		
TIME SUBMITTED	21-MAY-2021 10:15AM (UTC+0100)	WORD COUNT	540
SUBMISSION ID	154241719	CHARACTER COUNT	3328

VRU Compressor Upgrade 2020/2021

DANIEL INCE

A solid blue horizontal bar spanning the width of the slide, located at the bottom.

Introduction

The VRU (Vapour Recovery Unit) is small unit designed to reduce the sphere pressures by compressing and condensing excess propane vapour.

Existing system is controlled through relay logic and a pneumatic pressure controller. This outputs to a series of pressure switches to control the loading and starting.

Recognised target areas:

- Compressor automatic cut-in and pneumatic controller.
- Compressor selection and loading.
- Control and timing relay logic.

Functional Design Specification

Summary

- Performance
 - Compressor automatic start and loading sequence
 - Start/stop and trip functionality
- Ergonomics
 - Must fit in B&S racking room cabinet
 - Operator ease of use and alarm management
- Reliability and maintenance
 - Must be suitable for industrial use and continual running
 - Designed with maintenance in mind
- Applicable standards
 - IEC 61511 Functional Safety
 - IEC 61508 Safety Instrumented Systems

Company procedures

- Business need review with relevant personnel.
 - Engineering work request raised (PM09) on system.
 - Submitted an Approval for Fixed Expenditure (AFE) form. Classification of <£100k.
 - Review of Process Hazard Analysis (PHA).
 - Management of Change (MoC) process.
-
- Approval process underway for site implementation. (Technical evaluation)
 - Approval given for factory test rig with engineering support. £25k budget.

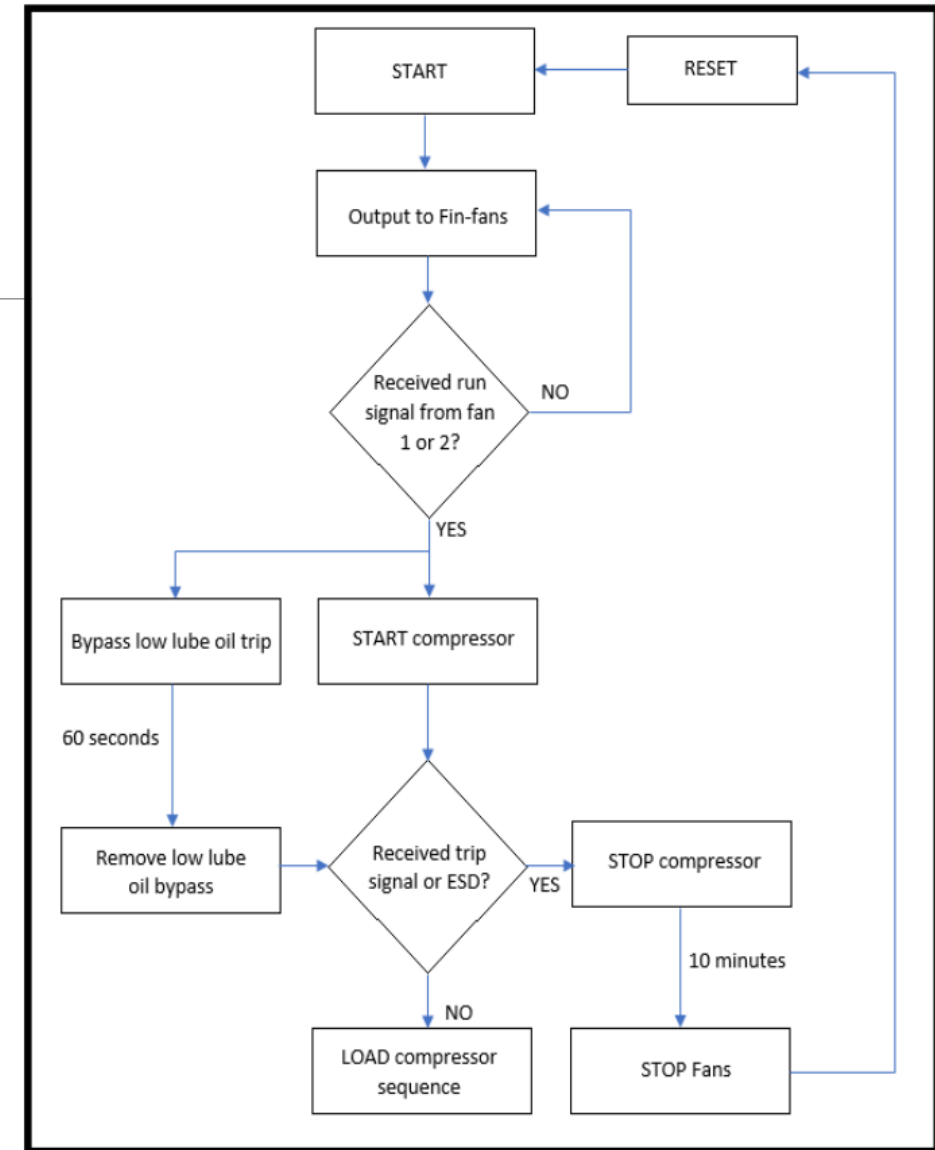
Existing control logic

- Compressors automatically cut in and load at 4.4kg/cm² to 4.7kg/cm² based on sphere vapour line pressure.
 - Start up bypass for lube oil pressure.
 - Starting interlocks and conditions.
 - Fin-fan 10 minute shutdown delay.
-
- The old pneumatic controller will be replaced with a 0 – 6.0kg/cm² electronic transmitter.
 - Utilise existing Bently Nevada 3500 rack to perform vibration trips.

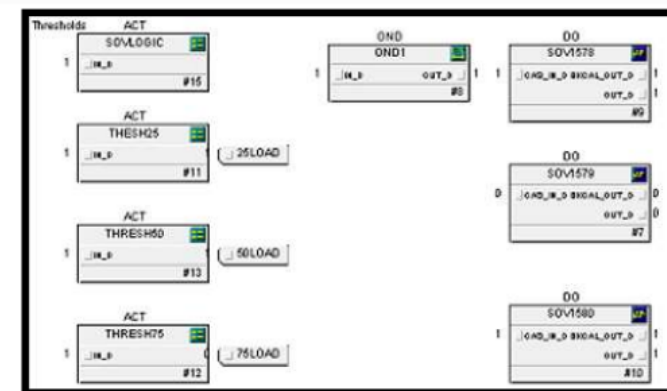
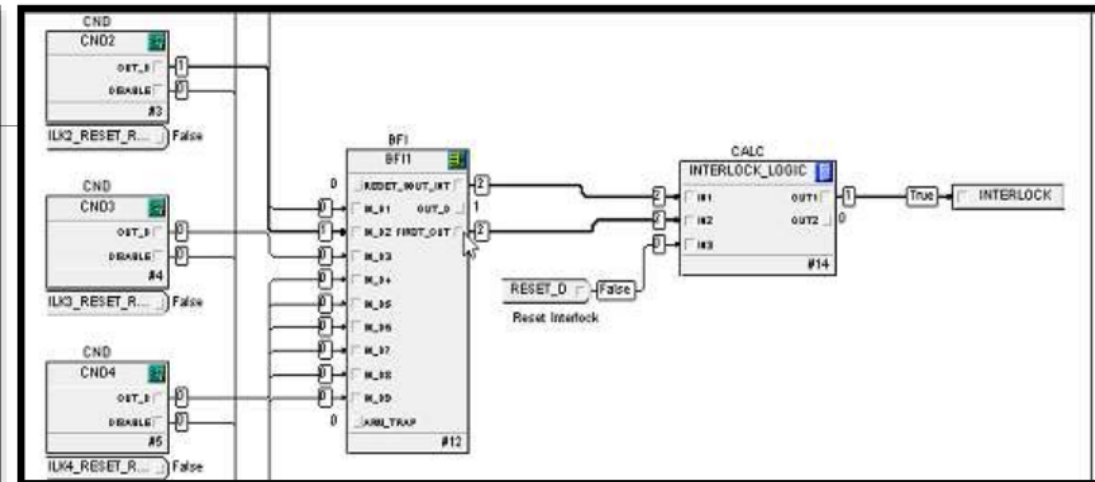
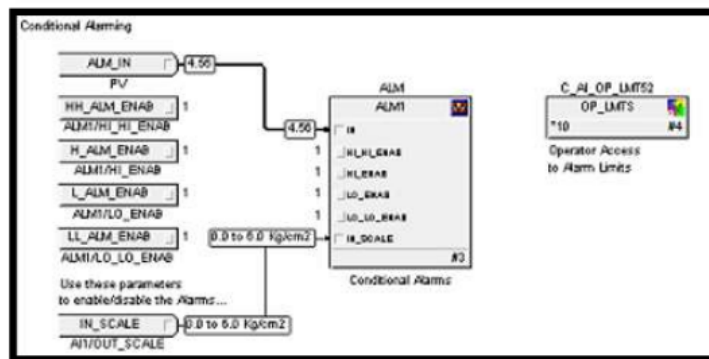
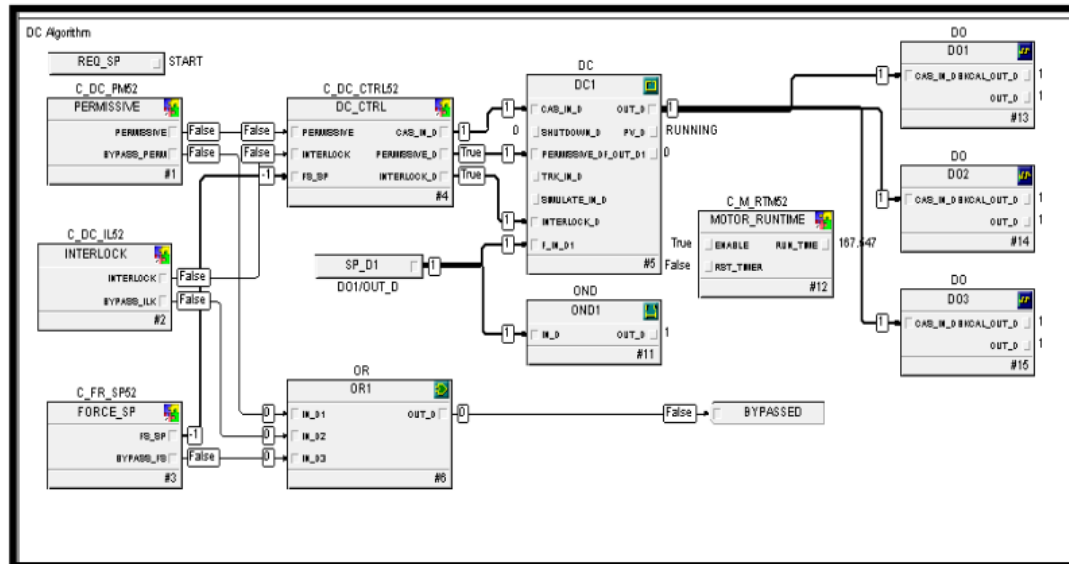
Logic flow diagram

Loading	Switch Point Rising (Falling)	Pressure Switch VRU1 (VRU2)	Loading SOVs Energised VRU1 (VRU2)	Cylinders Active
0%	6.5psi (3.5psi)	PS-1577A (1677A)		
25%	6.5psi 10sec delay (3.5psi)	PS-1577A (1677A)	SOV-1578 (1678)	1 & 5
50%	10psi (7.8psi)	PS-1577B (1677B)	SOV-1578 (1678) SOV-1580 (1680)	1 & 5 2 & 6
75%	12.3psi (10.3psi)	PS-1577C (1677C)	SOV-1578 (1678) SOV-1579 (1679)	1 & 5 3 & 7 and 4 & 8
100%	15psi (13psi)	PS-1577D (1677D)	SOV-1578 (1678) SOV-1579 (1679) SOV-1580 (1680)	1 & 5 3 & 7 and 4 & 8 2 & 6

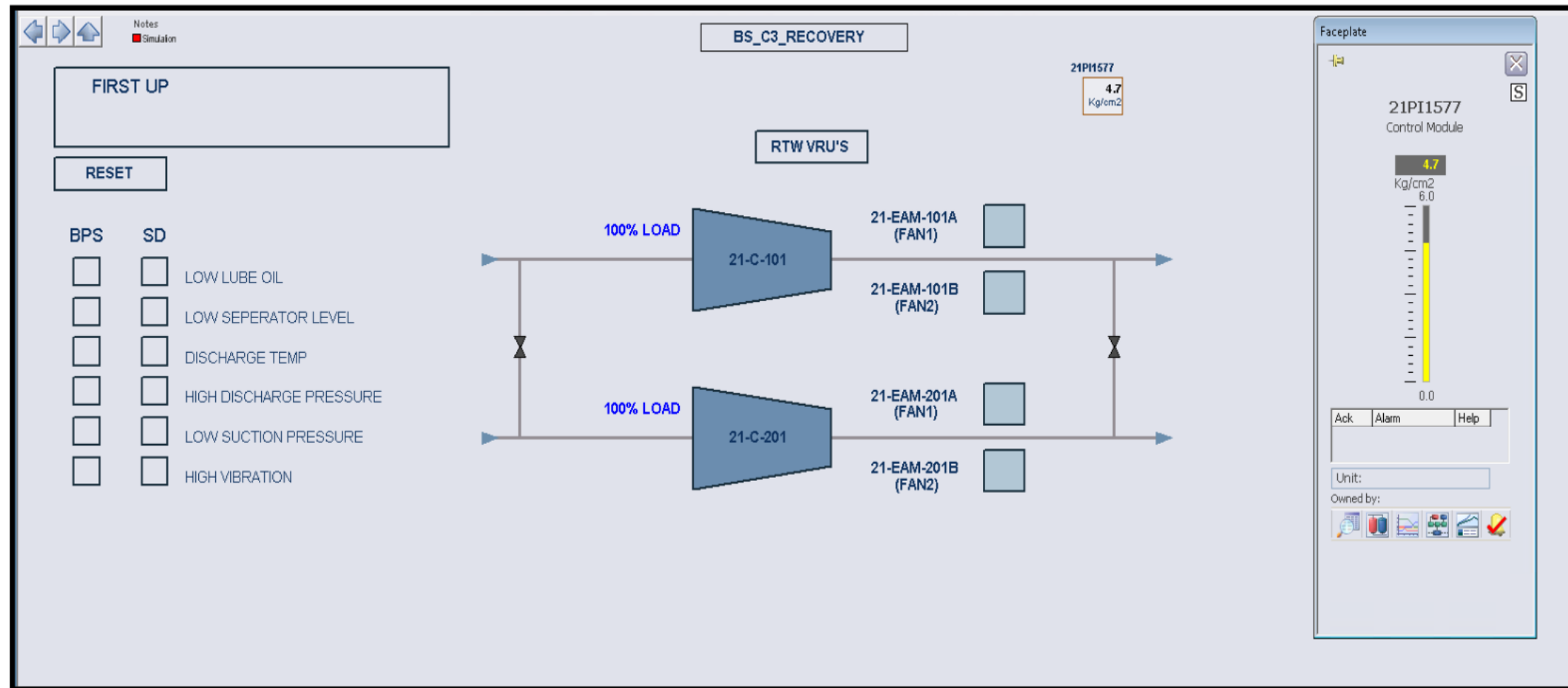
New loading values [Tx range 0 to 6kg/cm2]				New Unloading values [Tx range 0 to 6kg/cm2]			
	Pressure (kg/cm2)	Current (mA)	% Range		Pressure (kg/cm2)	Current (mA)	% Range
0%	4.42	15.787	73.67	0%	4.317	15.512	72
25%	10 second delay 4.42	15.787	73.67	25%	4.317	15.512	74.33
50%	4.53	16.08	75.5	50%	4.46	15.893	74.33
75%	4.61	16.293	76.83	75%	4.543	16.115	75.72
100%	4.7	16.528	78.3	100%	4.633	16.352	77.2



DeltaV Configuration



DeltaV Graphic

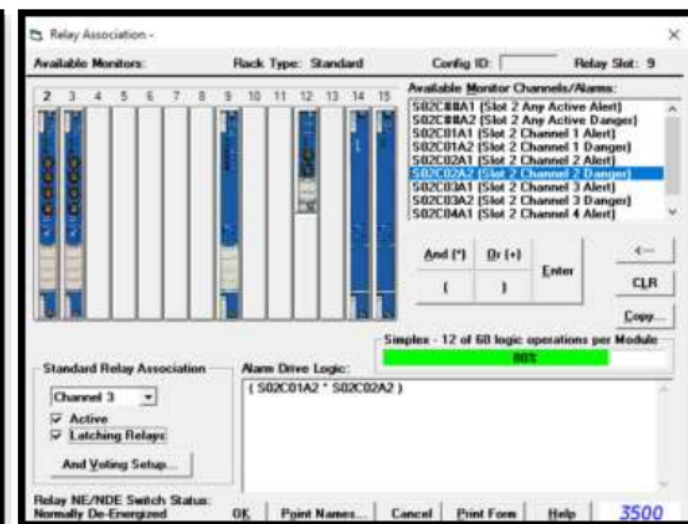
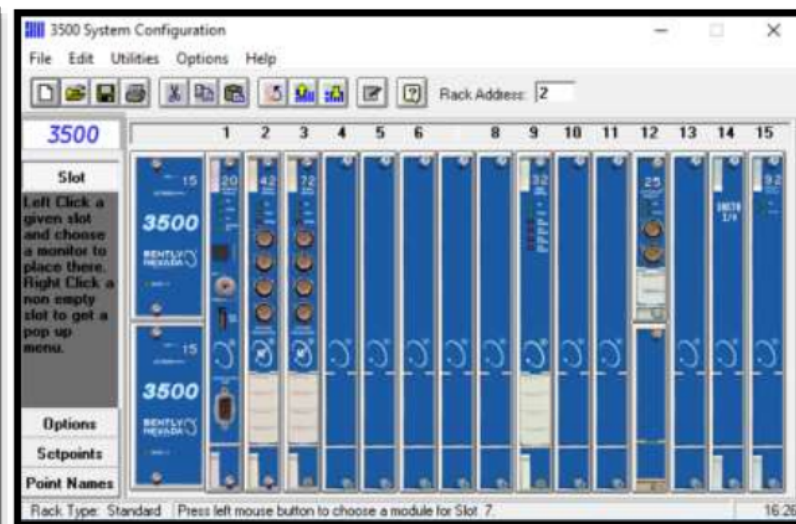
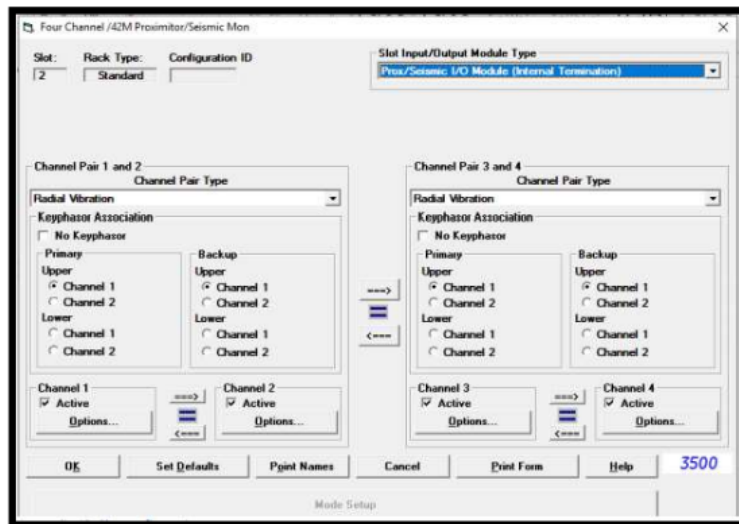


Bently Nevada

Rack configured and proximator installation.

Probe linearity and scale factor checks.

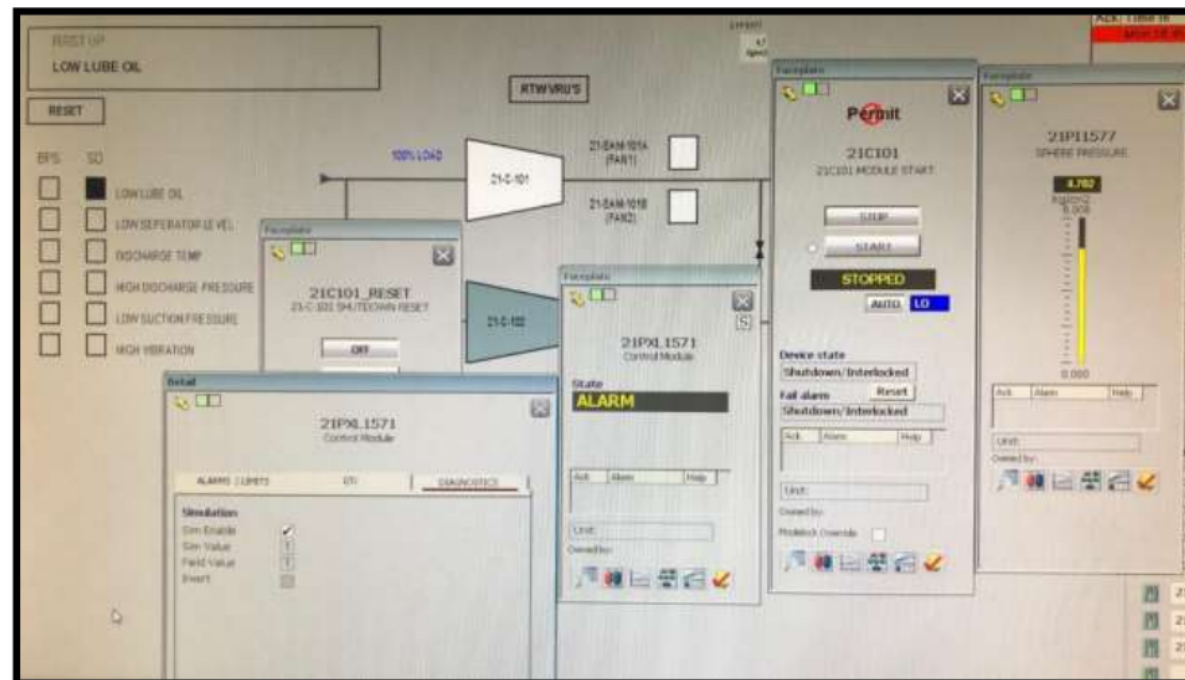
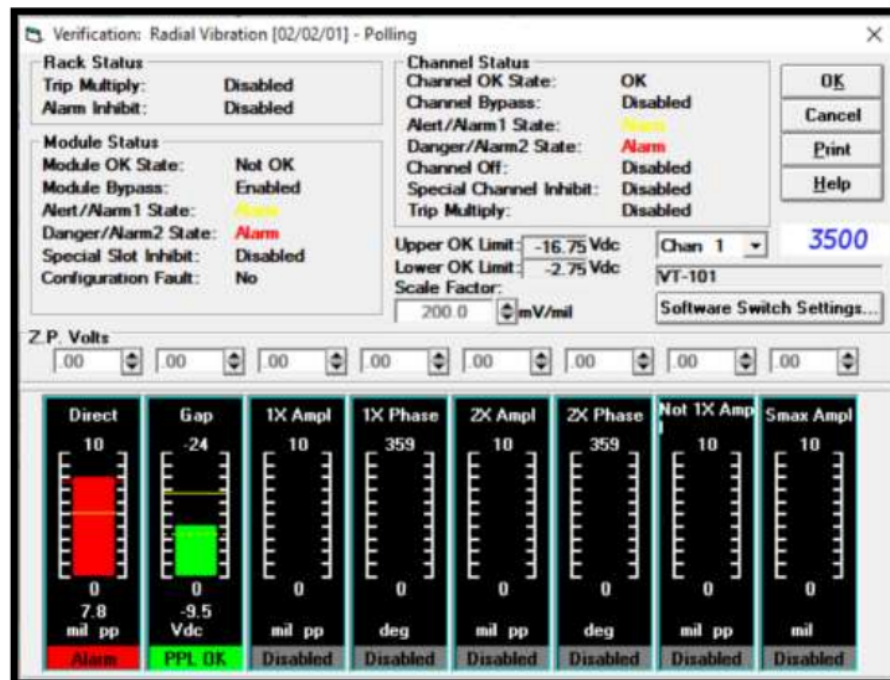
Voting logic set up and relay card configuration.



Testing and results

Test plan devised in accordance with FDS.

Company 'Live working' procedure IE/GEN/18 adhered for carrying out tests.



FDS item	Test	Expected result	Actual result	Pass (Y/N)	Amendment required/Notes
4.1.1.2, 4.1.2.4	Simulate an open circuit trip condition during healthy VRU1 compressor operation for TSHH-1569. Repeat for all VRU1 trips.	Output to VRU1 compressor immediately de-energises to shutdown equipment. VRU1 loading SOV outputs de-energise. Compressor will not start until trip made healthy again.	VRU1 Compressor shuts down when trip active, first up alarm displays the initial trip. Compressor will not restart until trip clear and reset pressed.		Vibration trips activate on Bently rack and provide visual indication to channel. The relay output is direct to DeltaV where the operator interface provides alarm and trip information.
	PSHH-1574				
	PSLL-1571	Indication for each alarm and trip must operate			
	PDSLL-1571				
	FAN-1 Vibration				
	LSHH-1561				

Current Output (mA)	Pressure value (kg/sqcm)	Compressor status	Pass (Y/N)
8.0	1.499	Offline	Y
15.85	4.420	Online, 0% loading for 10 seconds, then 25%	Y
16.10	4.533	Online, 50% loading	Y
16.45	4.645	Online, 75% loading	Y
16.55	4.702	Online, 100% loading	Y
16.40	4.646	Online, 100% unloading	Y
16.25	4.589	Online, 75% unloading	Y
16.05	4.514	Online, 50% unloading	Y
15.9	4.458	Online, 25% unloading	Y
15.6	4.346	Online, 25% unloading	Y
15.5	4.308	Offline	Y

Test	Query	Pass?	Rectification	BSU/ASU
4.1.1.5	Manual starting of compressor will always start fin fans. Unable to inhibit fans and force compressor output without entering control studio. From studio, either compressor or fans can be forced. However, compressor will not start without fans from faceplate.	Y	Verify operations user area unable to access control studio.	BSU
4.1.2.3	No loading bypass present on DeltaV.	Y	Manually lock out loading solenoids in the field to prevent loading and test when compressor operational. This ensures field operator presence when bypassing loading.	ASU

Maintenance and reliability

- Maintenance

- Simple isolations
- Fault lights
- Modular design
- Clear indication and access
- Overrides
- Familiar



- Reliability

- Protection built in
- Redundancy features
- Designed to run continuously for years
- Logic voting



Evaluation

DCS Solution

- Proven
- Familiar to maintenance and operations
- Ease of integration
- Modern improvement on old system

Outcomes

- All FDS criteria met
- Criteria 4.1.1.5 & 4.1.2.3 successful with addition punch list items

Changes

- Addition of Bently Nevada rack and equipment for vibration trips successfully integrated

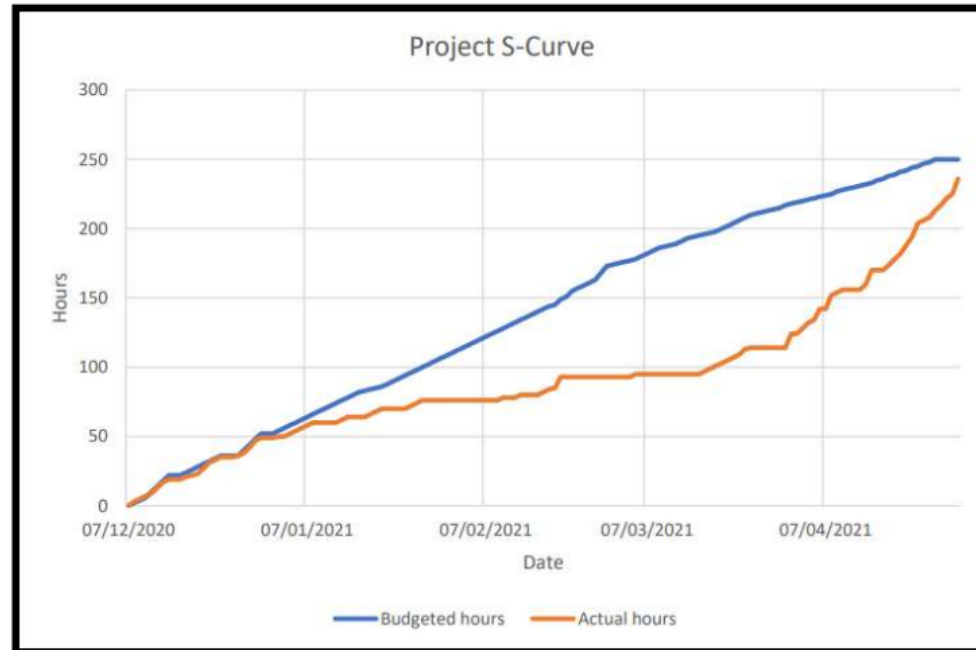
Plan review

Initial project plan

- Large deviation from initial.
- Stages and milestones still applicable.

Project execution S-curve

- Updated 'budgeted hours' spread evenly.
- 'Actual hours' discrepancy reflect plan deviation.



Planning oversights and obstacles

COVID-19

- Restriction of access to equipment and locations
- Reduced personnel on site – increased communication times/processes take longer

Turnaround

- Working week increase from 37 to 80 hours (including nights)
- Shift in company priority
- Workload and fatigue management
- Irregular schedule increased planning difficulty

Plan stage duration

- Overrun in some areas due to unfamiliarity

Managing costs

Material costs

- Vendor
- On-site store surplus
- Existing equipment

Item	Manufacturer	Vendor	Price each	Quantity	Total
48 CHARM CIOC Controller enclosure	Emerson	Emerson	£15,000	1	£15,000
DI CHARM	Emerson	Emerson	£100	10	£1,000
DO CHARM	Emerson	Emerson	£100	12	£1,200
AI CHARM	Emerson	Emerson	£300	2	£600
Rosemount 2051 (Instrument Surplus)	Emerson	Emerson	£2,100	2	N/A
Bently Nevada 3500 8mm probe	Bently Nevada	Bently Nevada	£220.00	4	£880
Bently Nevada 3500 Proximitior	Bently Nevada	Bently Nevada	£300.00	4	£1,200

Table 8: Materials costing

Total: £19,880

Cost budgeting and tracking

- Labour hours across scope (£15/Hr)
- Materials and labour below budget

Description	MWO No.	Original Budget	Current Budget	Current Forecast	2020				2021				
					Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21
Construction Total	Various	£0	£0	£0									
Manhour Costs Total	Various	£6,000	£6,000	£4,860		600	750	750	750	1,050	1,050	1,050	
						600	750	1,050	1,050	1,050	750	750	
						600	750	735	375	255	315	1,830	
Materials Total	Various	£26,000	£17,800	£19,880				15,000	5,000				
								15,000	2,800				
									15,000	4,880			
Overall Total		£26,000	£23,800	£24,740	0	600	750	15,750	5,750	1,050	1,050	1,050	0
					0	600	750	16,050	3,850	1,050	750	750	0
					0	600	750	735	15,375	6,135	315	1,830	0
Accumulative Total					0	600	1,350	17,100	22,850	23,900	24,950	26,000	26,000
					0	600	1,350	17,400	21,250	22,300	23,050	23,800	23,800
					0	600	1,350	2,085	17,460	22,595	22,910	24,740	24,740
					Sep-20	Oct-20	Nov-20	Dec-20	Jan-21	Feb-21	Mar-21	Apr-21	May-21
Original Commitment					0	600	1,350	17,100	22,850	23,900	24,950	26,000	26,000
Current Commitment					0	600	1,350	17,400	21,250	22,300	23,050	23,800	23,800
Actuals Commitment					0	600	1,350	2,085	17,460	22,595	22,910	24,740	24,740
Frozen Forecast Commitment					0	600	1,350	2,085	17,460	22,595	22,910	24,740	24,740

Conclusions and Recommendations

Design & Execution

- Conformance to FDS
- Pass of acceptance test
- Optimum solution
- Additional workscope implemented

Plan

- Nonconformance to plan
- Plan accordingly and expand/freeze project execution timeline
- Time management

Costing

- Adequate budgeting of labour and materials

Daniel Ince 1602836 Project Presentation 2

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

Instructor

68/100

PAGE 1

PAGE 2

PAGE 3

PAGE 4

PAGE 5

PAGE 6

PAGE 7

PAGE 8

PAGE 9

PAGE 10

PAGE 11

PAGE 12

PAGE 13

GRADING FORM: NEW CSG-RUBRIC

DANIEL INCE

68

1. ENGAGEMENT WITH LITERATURE

 Section 3: Use of technical literature in final design solution: Very good use of literature throughout the design A limited range of sources primarily consisting of company documentation. (4/5)

4

2. KNOWLEDGE AND UNDERSTANDING

 Section 1: Introduction: Clear introduction given Project introduced as an improvement to the Valour Recovery Unit which had performance limitations. Section 2: FDS: Clearly explained FDS was shown on a slide and explained covering aspects such as performance, ergonomics, reliability and

22

standards. Section 3: Advanced knowledge and critical understanding demonstrated in the design of the project: Good evidence presented. Knowledge and critical understanding was very evident from the highly detailed explanations. Far too much time was spent on this and some detail could have been summarised or omitted given the time constraints. All sections: Response to questioning: Very good answers showed a clear appreciation of the issues All questions were answered in detail. (22/30 All sections: Response to questioning: Very good answers showed a clear appreciation of the issues All questions were answered in detail.

3. COGNITIVE AND INTELLECTUAL

 Section 5: Testing and analysis of result: Good evidence presented with consideration given to restrictions. Testing was explained in detail, but again some points could have summarised or omitted. Testing was talked about for over 5 minutes. Section 6: Critical evaluation of the project outcomes and comparison with the FDS: Outcomes evaluated in a lot of detail and compared with the FDS Evaluation needed to be rushed, but did state that all the FDS criteria were met. Section 8: Overall conclusions and recommendations: Very good conclusions and recommendations given. Conclusions were also rushed, but did state that Covid and work demands had been detrimental. 20/30

20

4. PRACTICAL APPLICATION

 Section 3: Formulation of innovative and creative design solution to the project problem: Very good work The chosen solution satisfied all aspects of the FDS, with consideration for future maintenance and reliability. Section 4: Deployment method, use of material, tools, equipment and techniques in the construction of the project: Mainly software based with some practical aspects. The project was

17

primarily software based and a detailed explanation primarily focused on the DeltaV Configuration was given. Section 4: Quality of the final product or system: Excellent in terms of software, little available for practical aspects. The final product is to be used in the oil industry, so quality cannot be in doubt. Section 5: Use of test equipment and presentation of results of the project: Good use of appropriate test equipment Test equipment is primarily computer-based monitoring, although some direct observations were evident. 17/25

5. TRANSFERABLE SKILLS

 All sections: Quality of the presentation slides: Good quality slides presented Slides were well presented and legible. All sections: Quality of the delivery style: Too much detail, overran by double the time. You need to learn how to summarise and get to the main points. Style was not very interesting, audience was easily lost in all the detail presented. No attempt to keep the presentation within the designated 8 minute time limit and was asked to bring the presentation to an end after 16 minutes. 5/10

5