

2017197

by Aeron Smitham

Submission date: 24-Jan-2025 09:58AM (UTC+0000)

Submission ID: 249381881

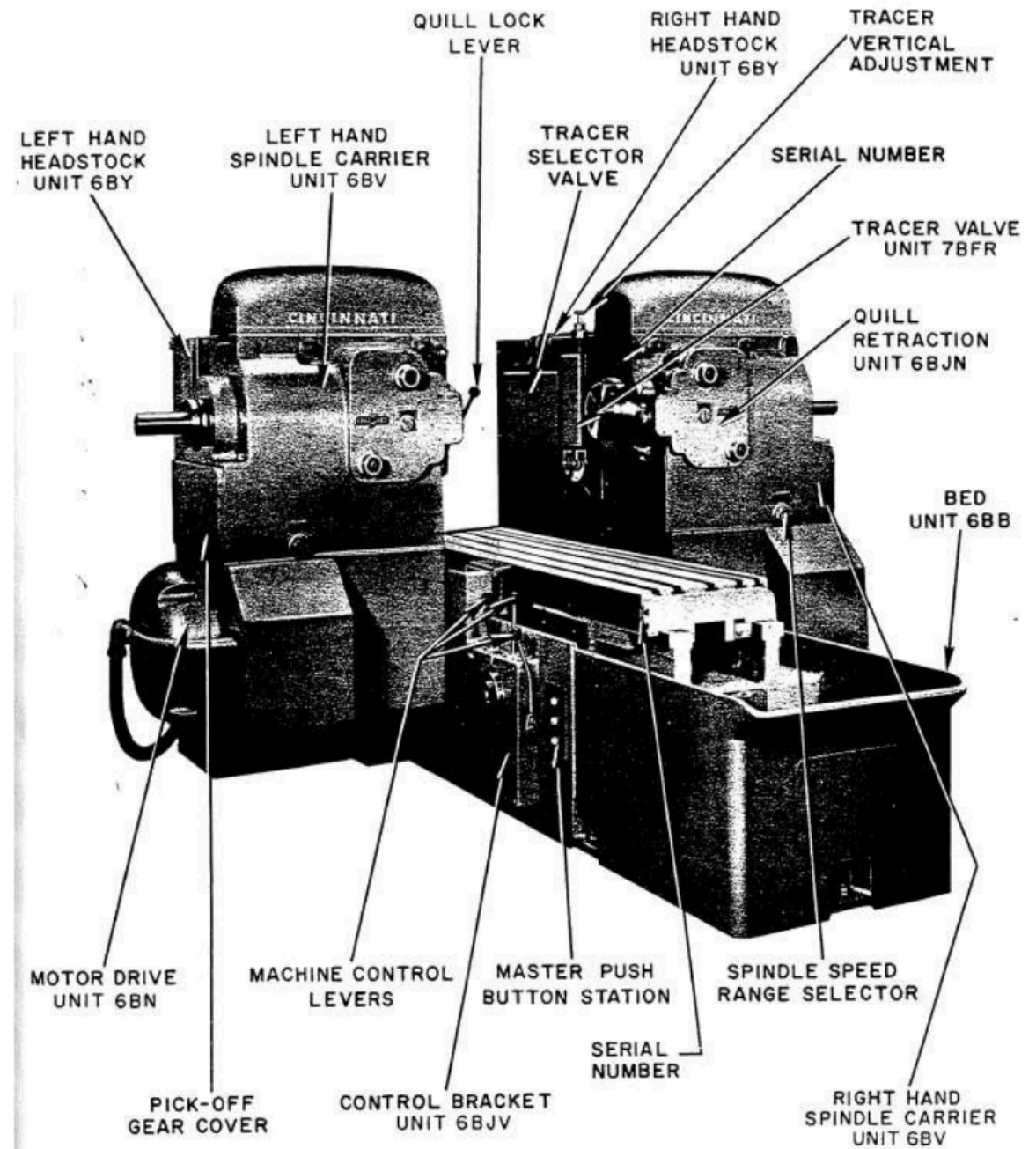
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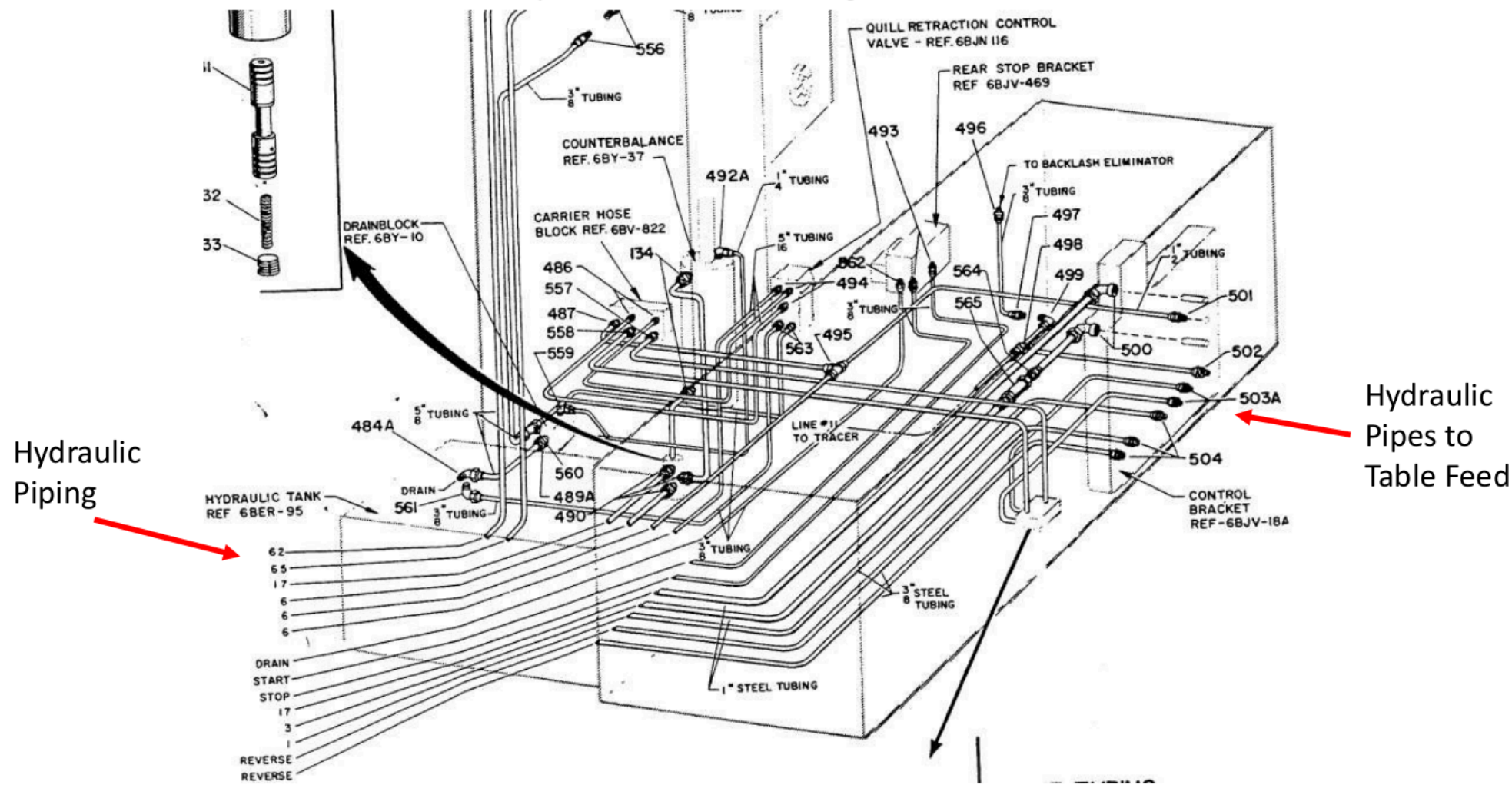
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Miller 3 ICS Upgrade

Aeron Smitham
2017197

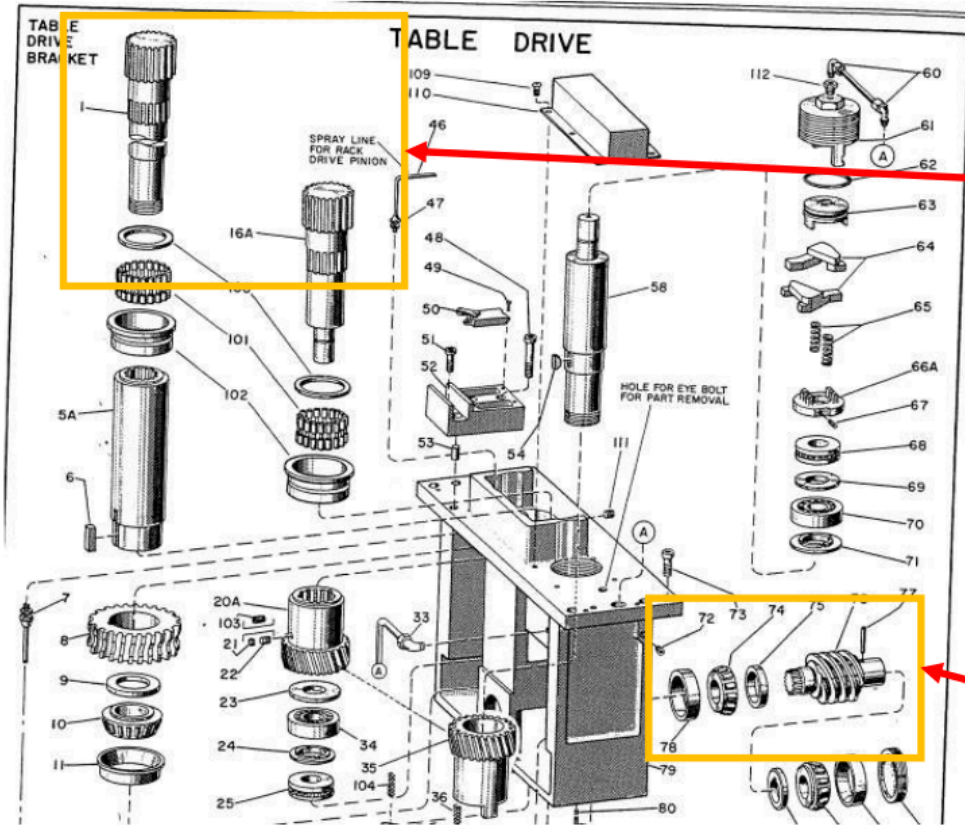


Project Background



Problem Definition

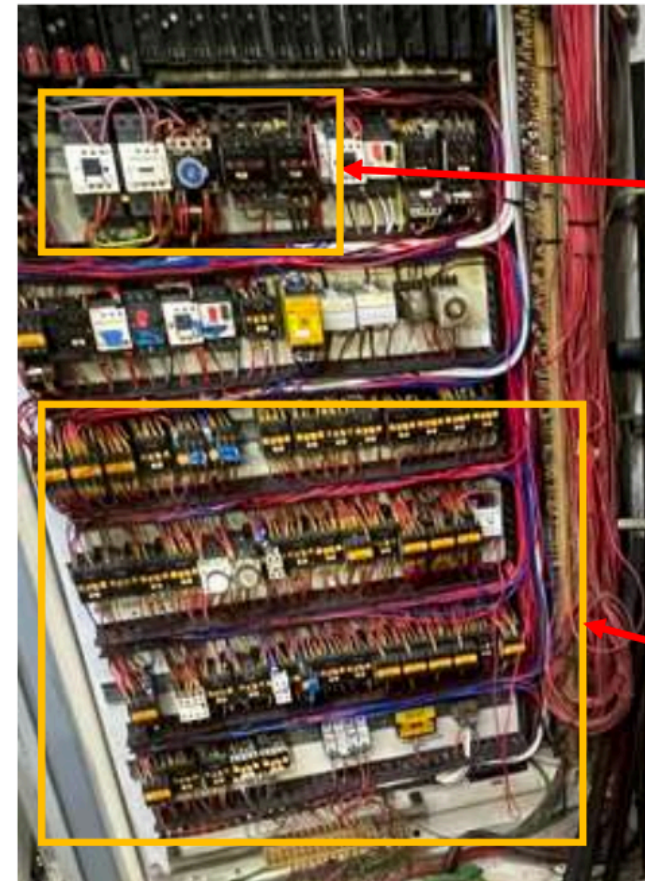
Table Drive



Pinion
Gears

Splined
Shaft

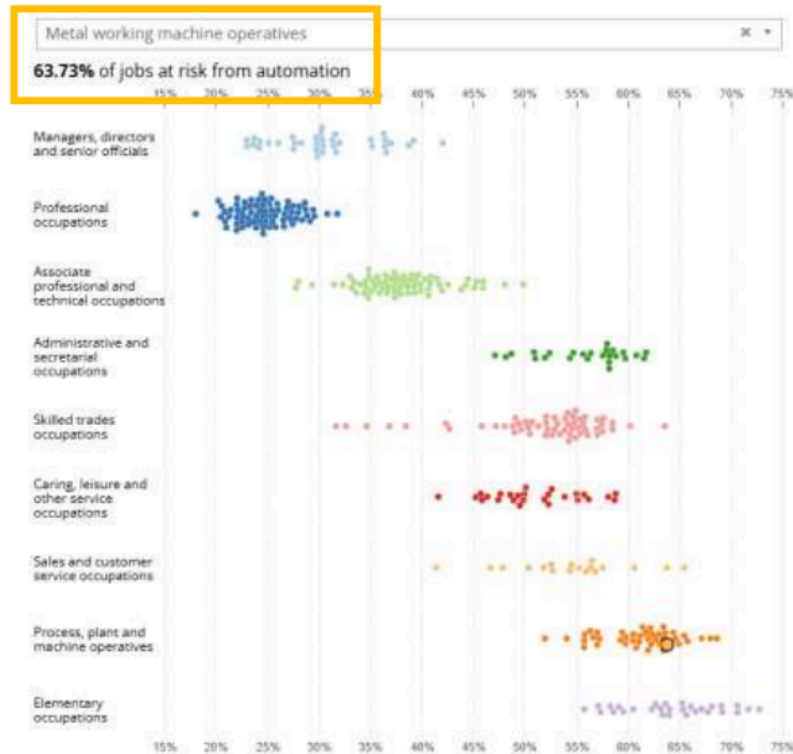
Control Panel



Star-Delta
Starters

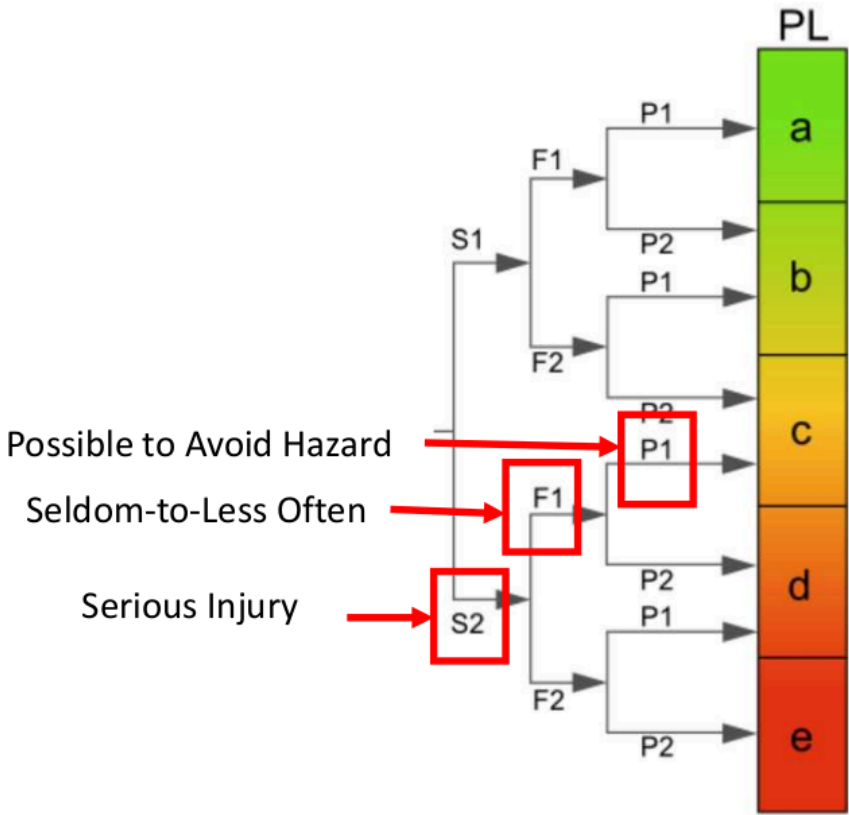
Relay Logic
Control

Constraints



Project Risks and Health & Safety

Access to Miller Cutting Heads



Benchmarked Values for Customer Approvals

Process	Value
Table Feed	10mm/s
Miller Cutting Heads	30rpm
Coolant Flow	20L/min

Functional Design Specification

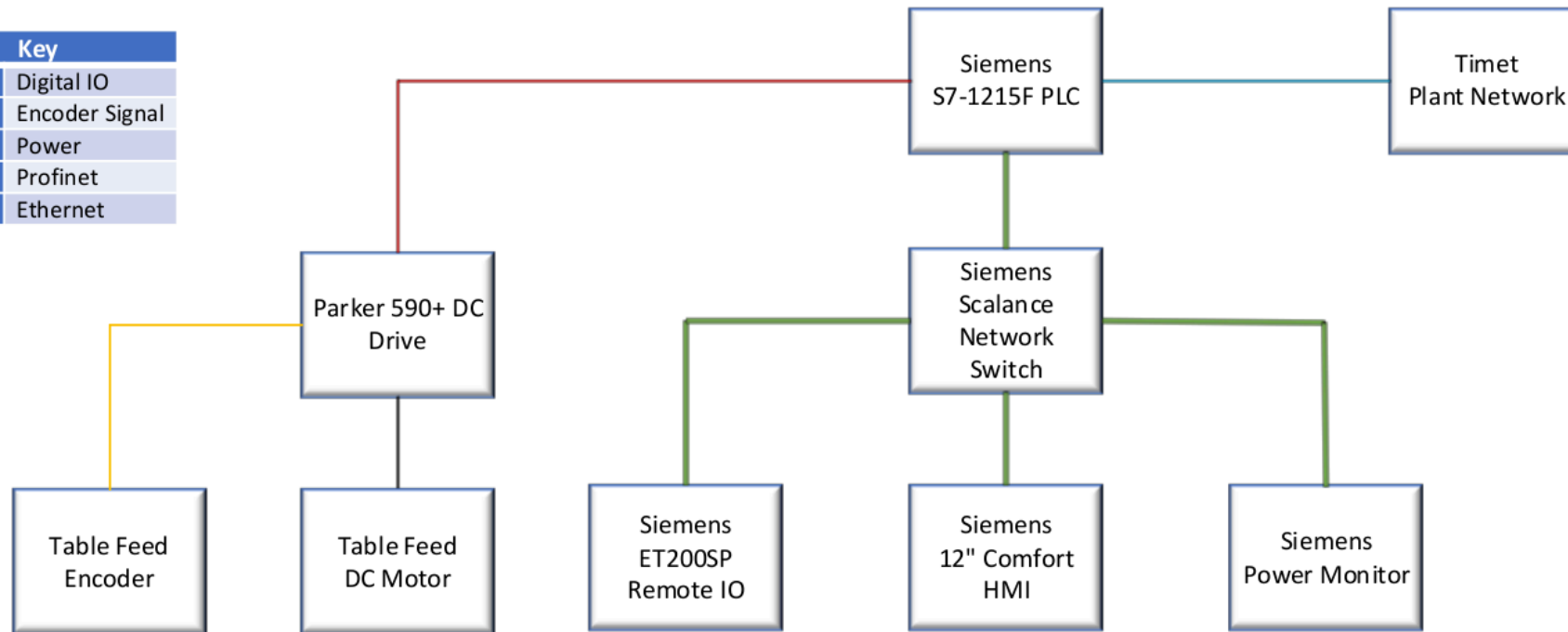
Functional Design Specification		
FDS Reference	Design Requirement	Reference
B.1	Live alarms to be displayed to operator and logged	Customer Requirement
B.4	Displayed alarms to come with information on how to rectify fault	Customer Requirement
F.1	Table speed when milling must be 10mm/s	Customer Requirement
F.2	Table speed in rapid must be 100mm/s	Customer Requirement
F.3	Milling cutters must rotate at 30rpm	Customer Requirement
F.4	Coolant flow must be above 20L/min	Customer Requirement
F.5	Vacuum must be less than -700psi	Customer Requirement
F.6	Spindle clutch hydraulic pressure must be above 1bar	Customer Requirement
G.3	Vacuum, coolant flow, and hydraulic pressure must be present before milling cutter motors can start	Customer Requirement
H.3	Operation cannot be restarted after an emergency stop until the reason has been cleared and system reset	BS EN 13850:2008

Test Planning

Test Plan			
Test No.	FDS Reference	Description of Test	Expected Outcome
10	B.1	All live motor circuit breaker tripped alarms to be displayed to operator. I.e. "Motor Circuit Breaker -1Q1 has tripped"	Live alarms displayed to operator
13	B.4	Motor circuit breaker tripped alarms to come with prompts on how to rectify fault. I.e. "Reset -1Q1 Motor Circuit Breaker"	Prompt appears with each alarm on how to rectify fault
20	F.1	Test that table speed is 10mm/s when milling with a handheld Tacho	Table speed when milling must be 10mm/s
21	F.2	Test that table speed is 100mm/s when in rapid with a handheld Tacho	Table speed in rapid must be 100mm/s
22	F.3	Test that milling cutters are rotating at 30rpm with a handheld Tacho	Milling cutters must rotate at 30rpm
23	F.4	Test that coolant flow is above 20L/min on the IFM SM8000 sensor	Coolant flow must be above 20L/min
24	F.5	Test that vacuum is less than -700psi on the IFM PN 2092 sensor	Vacuum must be less than -700psi
25	F.6	Test that spindle clutch hydraulic pressure is above 1bar on the IFM PN2099 sensor	Spindle clutch hydraulic pressure must be above 1bar
28	G.3	Test that the milling cutters cannot be started without vacuum, coolant flow and hydraulic pressure at or above their setpoints	Vacuum, coolant flow, and hydraulic pressure must be present before milling cutter motors can start
32	H.3	Test that the machine operation cannot be restarted until alarms are cleared and the system has been reset	Operation cannot be restarted after an emergency stop until the reason has been cleared and system reset

Solution 1 – DC Drive

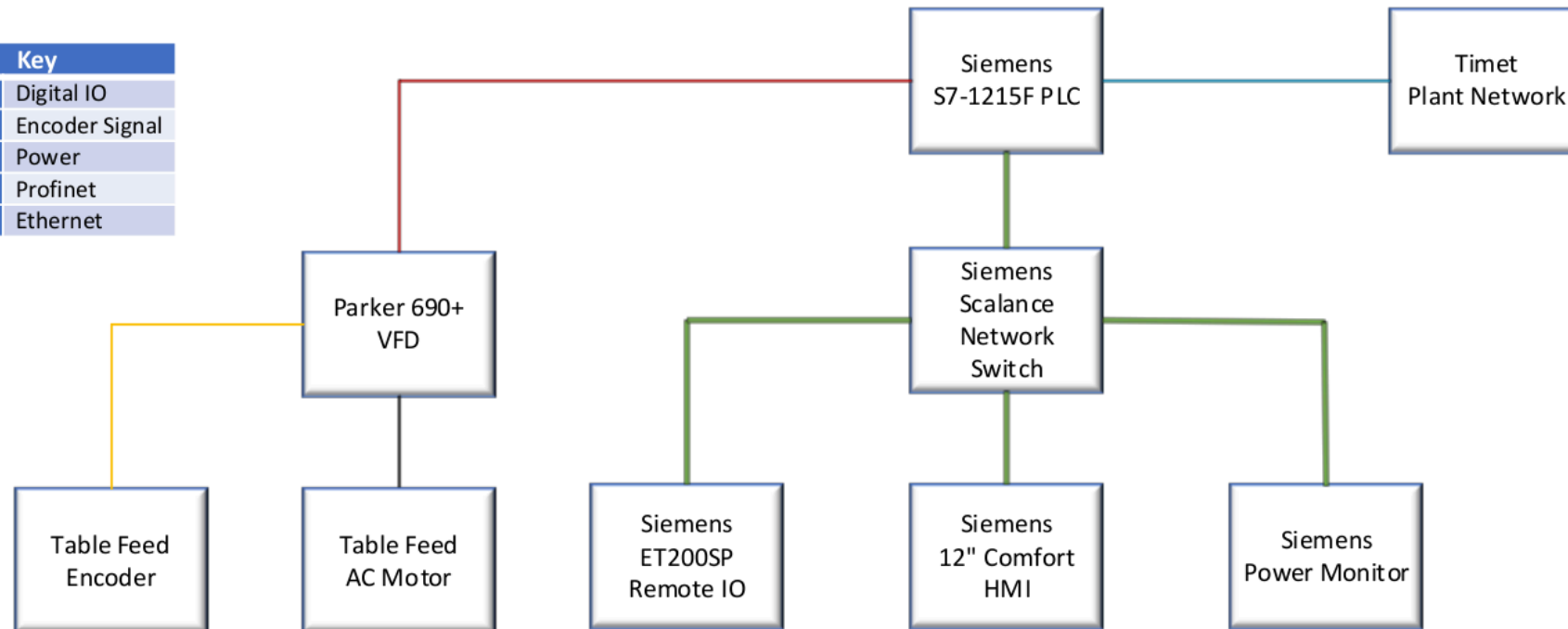
Key	
Red	Digital IO
Orange	Encoder Signal
Black	Power
Green	Profinet
Blue	Ethernet



£31200

Solution 2 – VFD

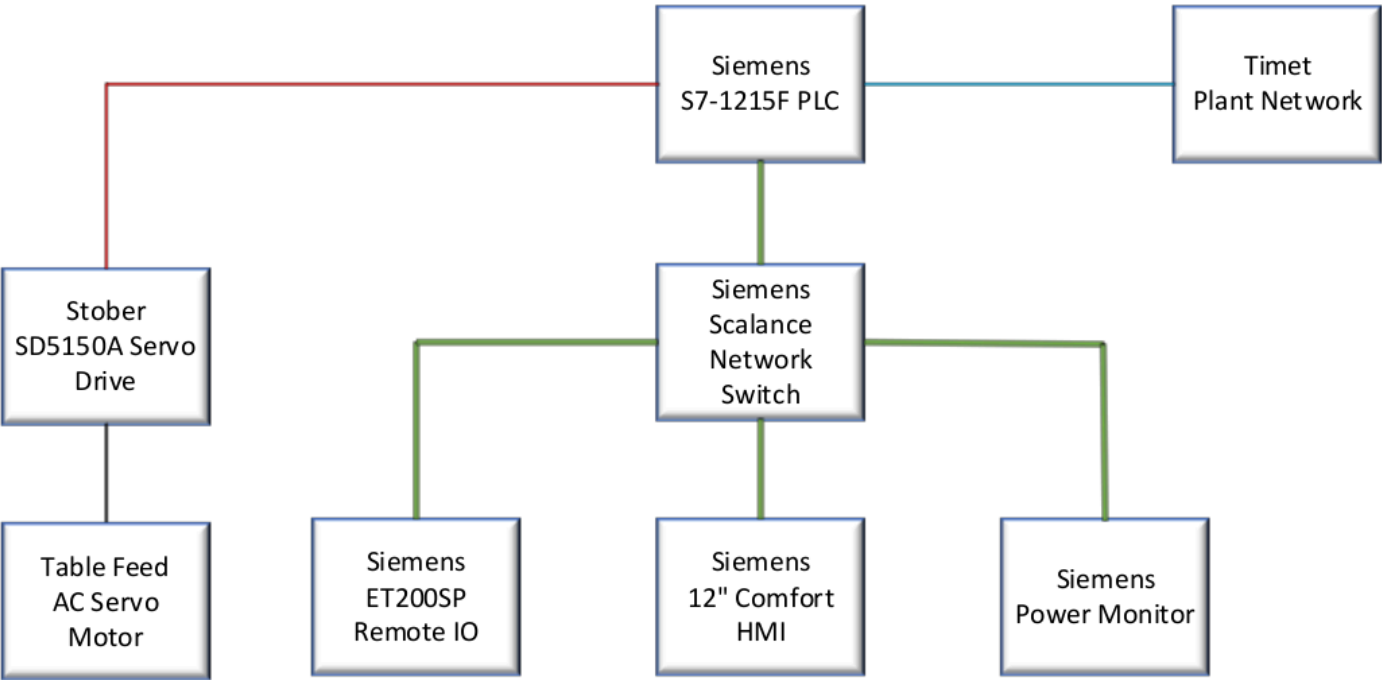
Key	
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Orange	Encoder Signal
Black	Power
Green	Profinet
Blue	Ethernet



£27900

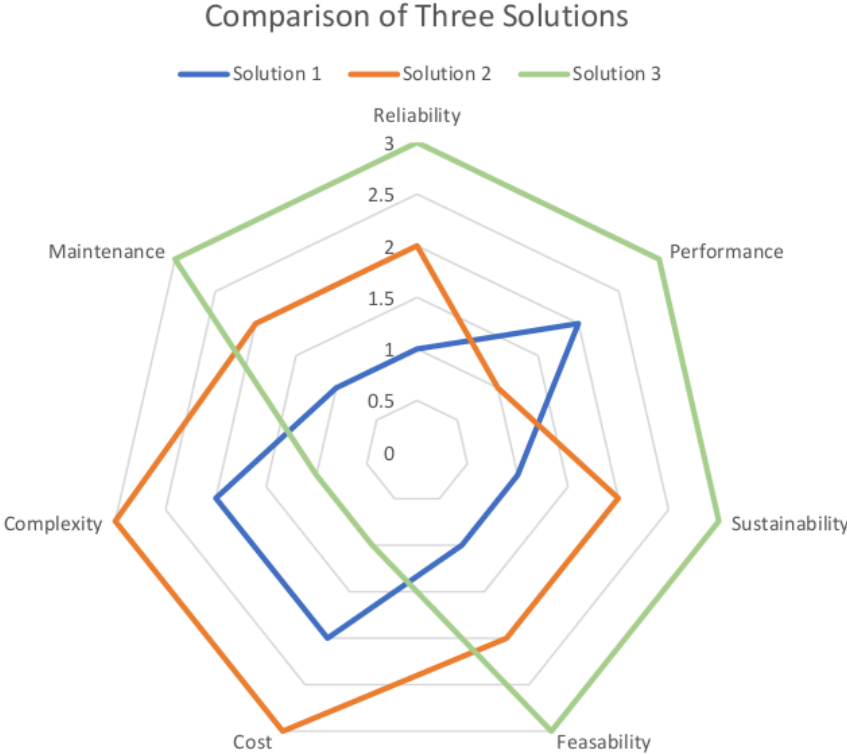
Solution 3 – AC Servo Drive

Key	
Red	Digital IO
Orange	Encoder Signal
Black	Power
Green	Profinet
Blue	Ethernet

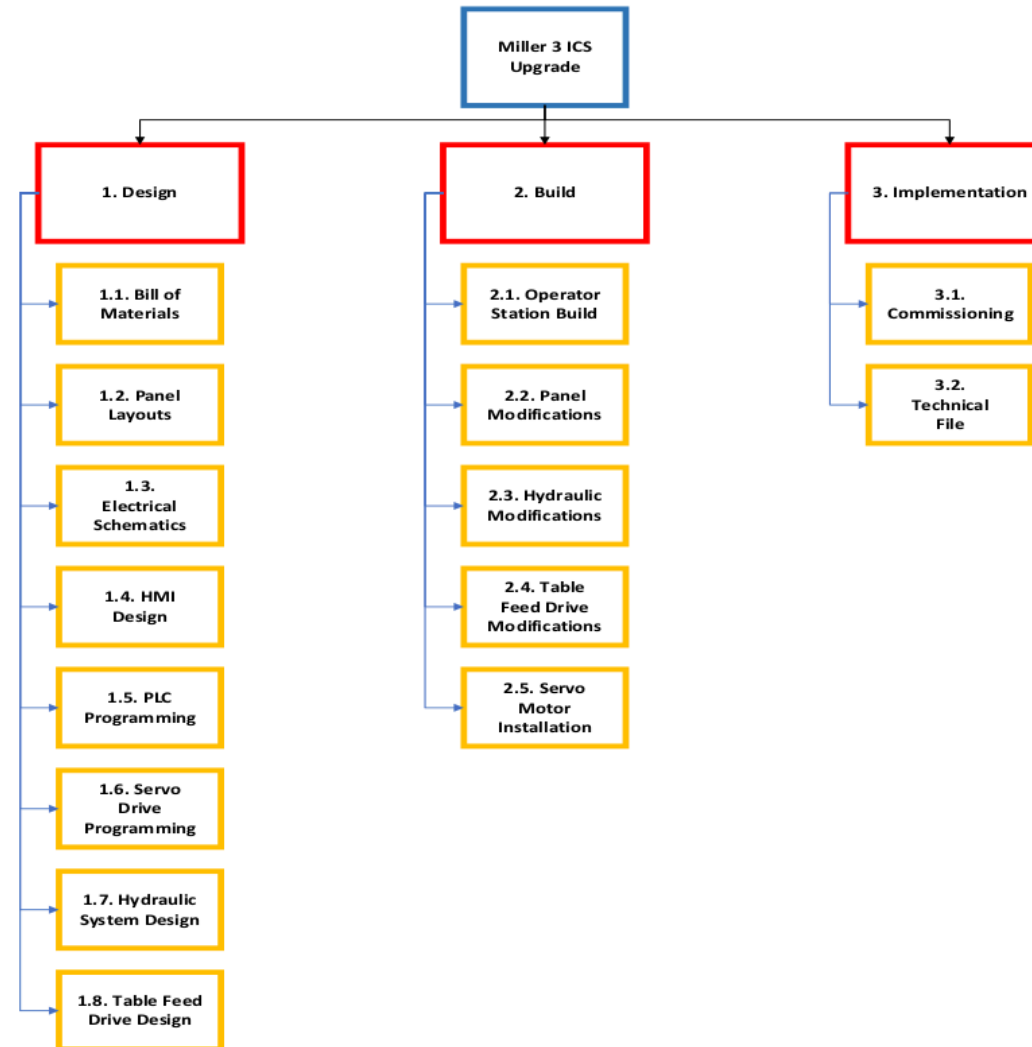


£36215

Radar Diagram



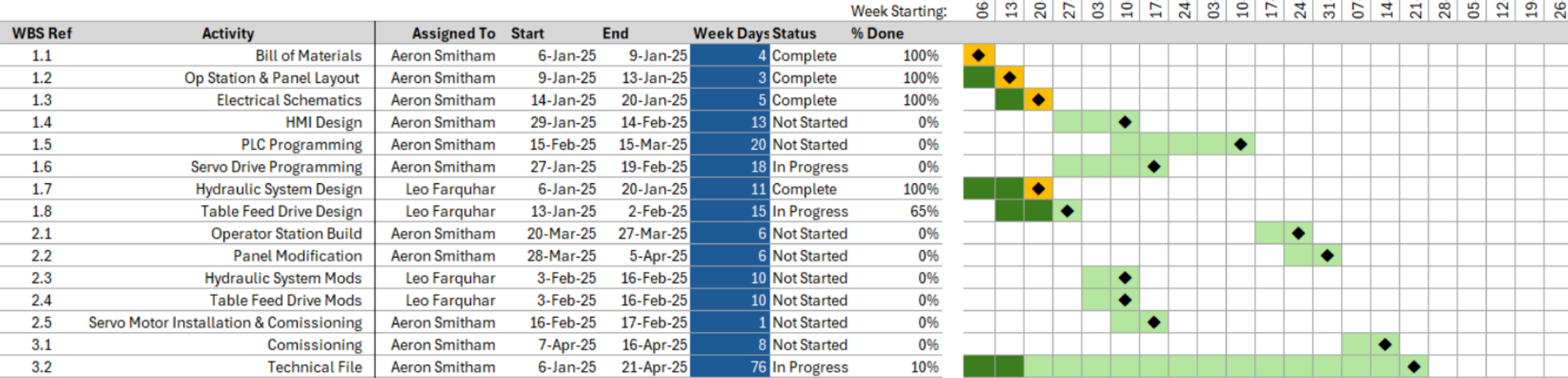
Work Breakdown Structure



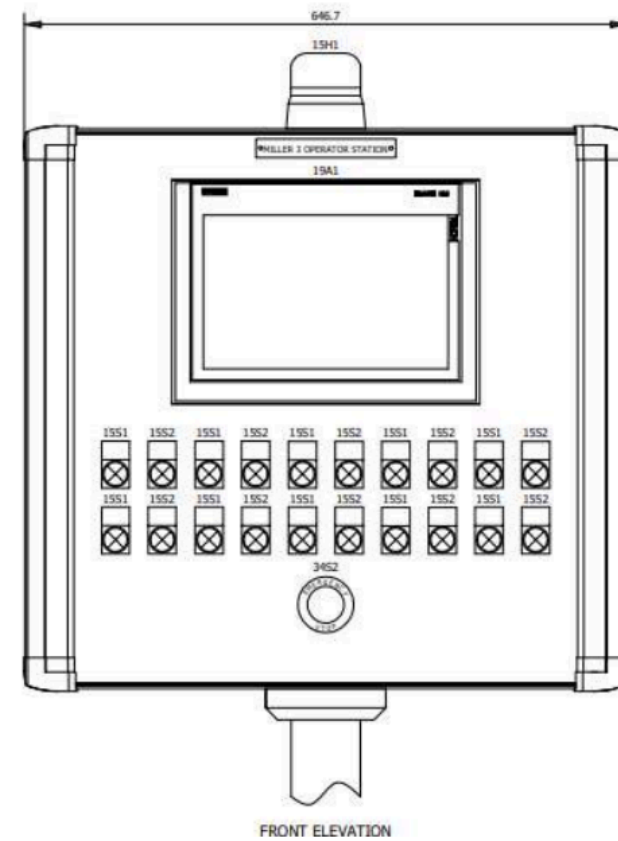
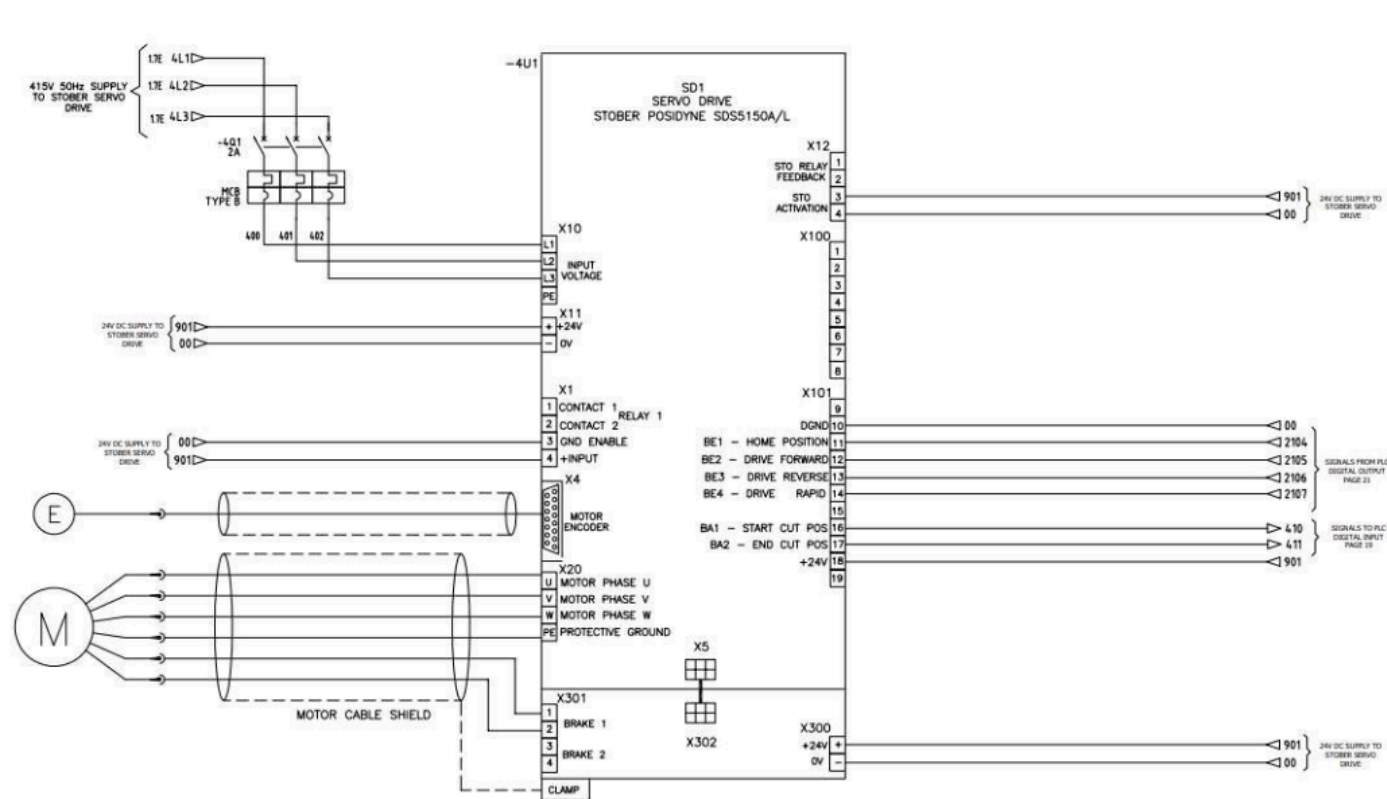
Gantt Chart

Project Start Date: 06-Jan-25

Project Name: Miller 3 ICS Upgrade



Progress Made to Date



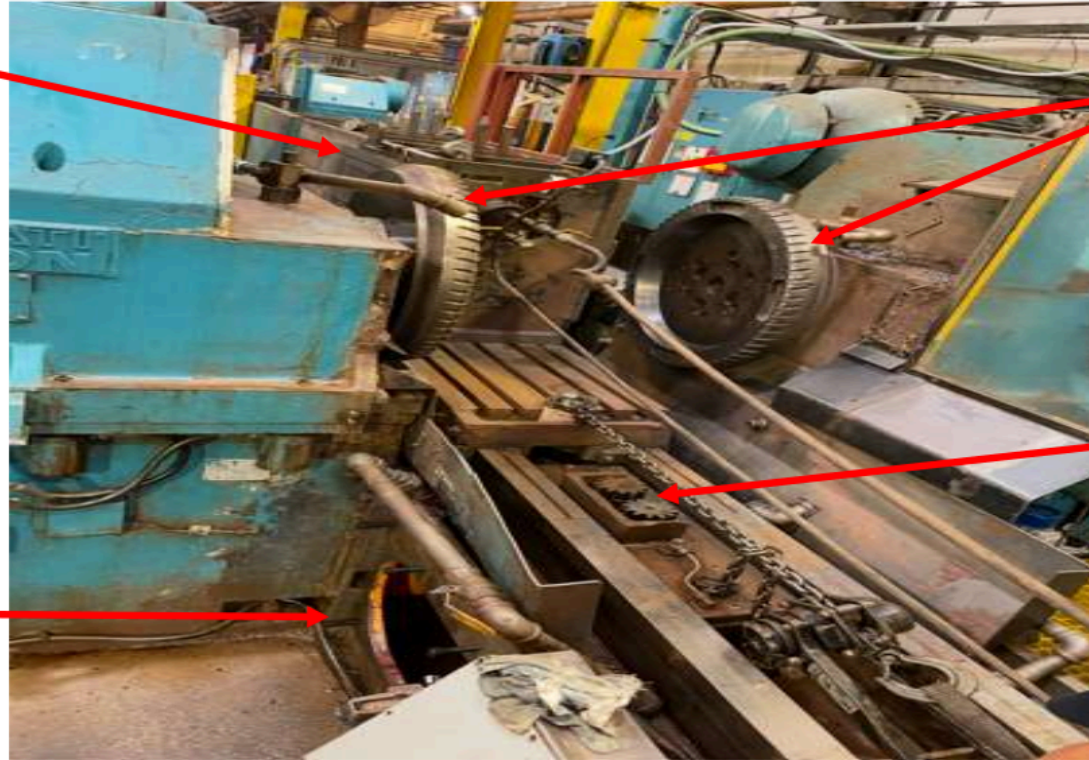
Progress Made to Date

Bed Vacuum Chuck

Cutting Heads

Gears that move the vacuum chuck

Servo motor to be mounted here.
Source of oil leak.

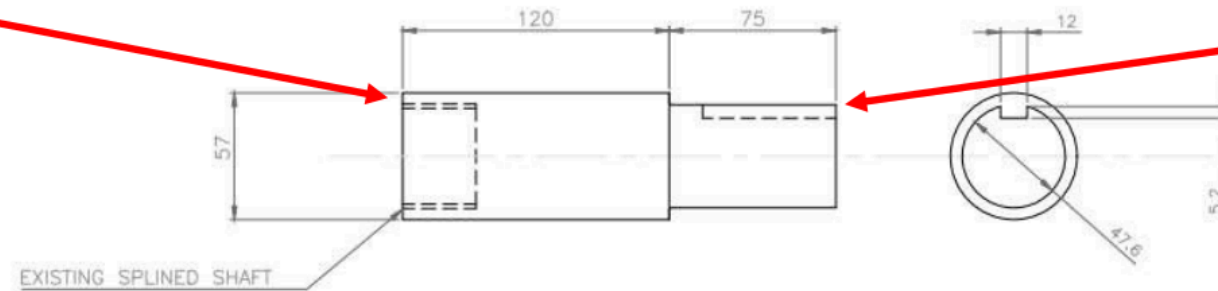


Progress Made to Date

Connection to splined shaft
seen in the picture below.

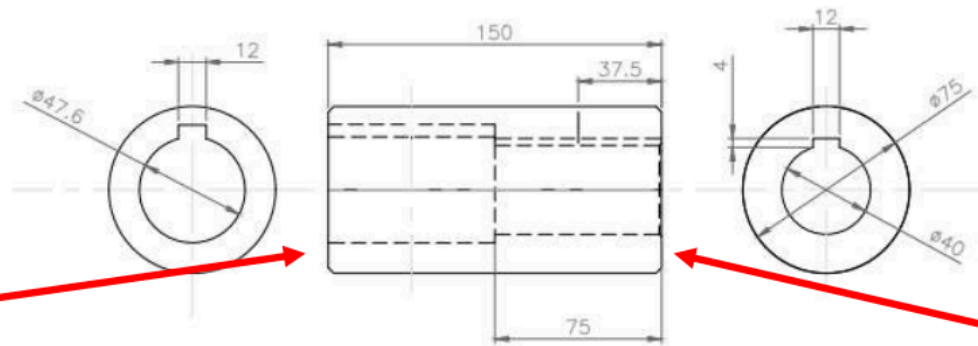


Splined Shaft Coupling



Connection to
motor coupling.

Motor Shaft Coupling



Connection to
splined shaft
coupling.

Connection to
motor shaft.

FINAL GRADE

GENERAL COMMENTS

75/100

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GRADING FORM: NEW CSG-RUBRIC

AERON SMITHAM

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1. ENGAGEMENT WITH LITERATURE



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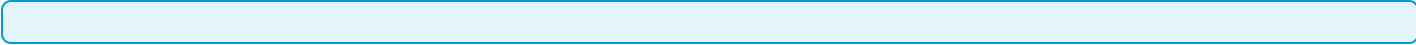
2. KNOWLEDGE AND UNDERSTANDING



- Project background and problem definition (8/10)
Project constraints, risks, health and safety (7/10)
Response to questions (8/10)
- 23

23/30

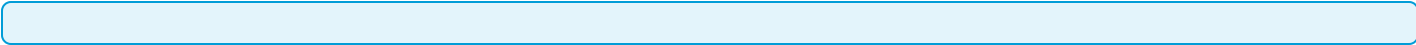
3. COGNITIVE AND INTELLECTUAL



- Functional Design Specification (8/10)
Test planning (8/10)
Project Planning and management methods (7/10)
- 23

23/30

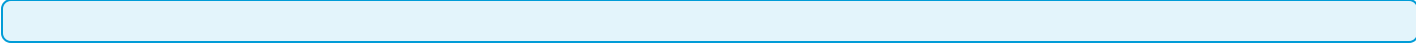
4. PRACTICAL APPLICATION



- Review of Solutions (8/10)
Justification of final solution (7/10)
- 15

15/20

5. TRANSFERABLE SKILLS



 Quality of the presentation slides (7/10)
Quality of the delivery style
Good (7/10)

14

14/20