

PRESSURE CHAMBER DEVELOPMENT AND TESTING



BUSINESS CASE

- Purpose of this document - Of Pressure Chamber
- To get a clear picture about the project (pressure chamber) proposition and alignment to business scope.
- To build confidence with investor or sponsor and thereby approve formal project initiation
- What is/are the need to go for it ?

S.no	Need drivers	Comment	Appraisal method	Business area alignment
1	Overcome operational constraints	30% weekly downtime affecting daily operations	Workflow audit report	30%
2	Customer value addition	Automated pressure testing, Digital reports	Check sheet	20%
3	Quality improvements	Quality of the reports, Failure analysis	Check sheet	40%
4	Technological upgrades	Automated operation	Check sheet	10%

- High level technical risks and redressal
- Top 5 risks (3 threats or 2 opportunities or whatever)

Category and exposure	Risks Item	Expected time	Response strategy
High threat	1 Reliable OEM 2 Scope creep 3 Product Delivery conformance with standards	At start Pre closure	Vendor Analysis Agreed terms and conditions Delivery terms and conditions
Medium threat	1 Statutory Compliance 2 Operational feasibility 3 Resource availability	At start	HR Plan
Low threat	1 Long term Vendor support	Near term	Agreed terms and condition Positive vendor relationship
High opportunity	1 Improved product testing 2 Compliance to standards 3 Testing reliability	Middle term	Verification and validation via 7QC tools
Medium opportunity	1 Endurance testing (static & dynamic) 2 External testing	Pre-closure	Verification and validation via 7QC tools
Low opportunity	1 R&D testing	Closure	

REVENUE PLAN

Projections			500%	600%
Revenue Channel	Year 1	Year 2	Year 3	Year 4
Direct	0	1320000	6600000	39600000
Partners	0	1450000	7250000	43500000
Reference	0	900000	4500000	27000000
Total	0	3670000	18350000	110100000
NPV (IRR 14%)	$FV/(1+k)^t$	$FV/(1.14)^1$	$FV/(1.14)^2$	$FV/(1+0.14)^3$
PV		3219398	14119729	74314363
NPV				91653490
Investment				15546000
Difference or safe value more than investment ? yes =				76107490
Sponsor may take risks even if it is 50% revenue loss				38053745
Difference or safe value more than investment ? yes =				22507745

MARKET STUDY

- Generally applicable if we are making Pressure Chamber as a product for sales or services.
- Internal demand (market survey) details can be provided. Example, number times Pressure Chamber being used for zero-defect policy in Operations and / or maintenance. Highlighting such examples can create avenues for value (internal) addition or savings in operation cost as well bringing in improvements

COST ROM ESTIMATE

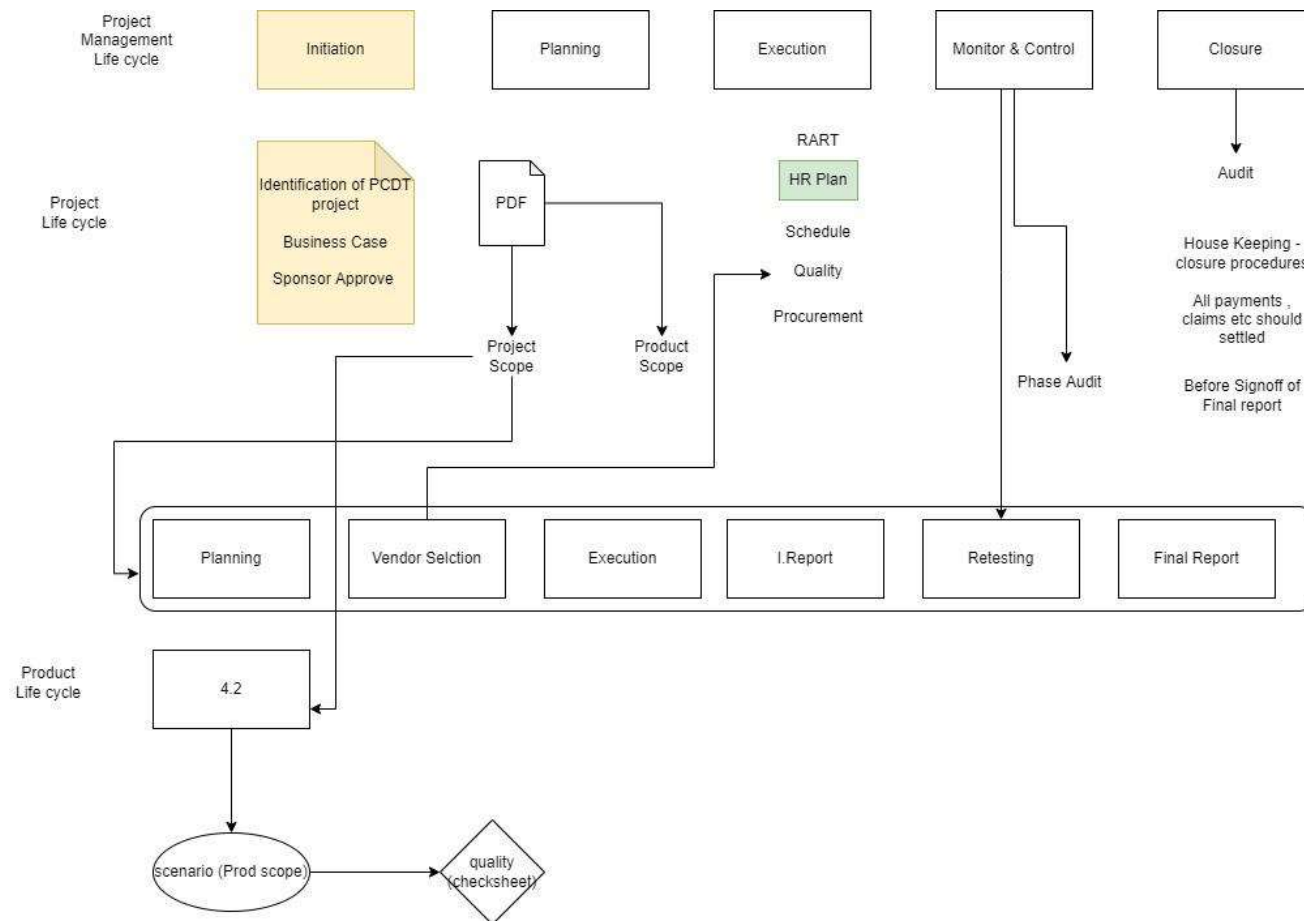
Project cost - 2000000 (Rough order of magnitude)

Category	Highlight descriptions	Cost
Raw Material		700000
Manufacturing		500000
Assembly		300000
Installation		100000
Piloting		50000
Testing		30000
Training		20000
Implementation		10000
Maintenance		50000
Spares		100000
Misc.		50900
Contingency		89100
Total Estimate		2000000

BUDGET MILESTONE

Items	At start	Milestone 1 (approx. 6 months)	Milestone 2 (approx. 12months)	Total
Raw Material	100000	200000	400000	700000
Manufacturing	50000	150000	300000	500000
Assembly	15000	100000	185000	300000
Installation	4000	50000	46000	100000
Piloting	5000	20000	25000	50000
Testing	1000	10000	19000	30000
Training	1000	10000	9000	20000
Implementation	2000	4000	4000	10000
Maintenance	5000	20000	25000	50000
Spares	10000	30000	60000	100000
Misc.	5000	20000	25900	50900
Contingency	15000	25000	49100	89100
Total	213000	639000	1148000	2000000

PROJECT FLOW DIAGRAM



PROJECT MANAGEMENT LIFE CYCLE

- Project life cycle
- Product life cycle

PROJECT LIFE CYCLE

- Planning
- Vendor selection/Contract
- Execution
- Interim Reporting of Post execution activities.
- Retesting
- Final Report

STAKEHOLDER ANALYSIS

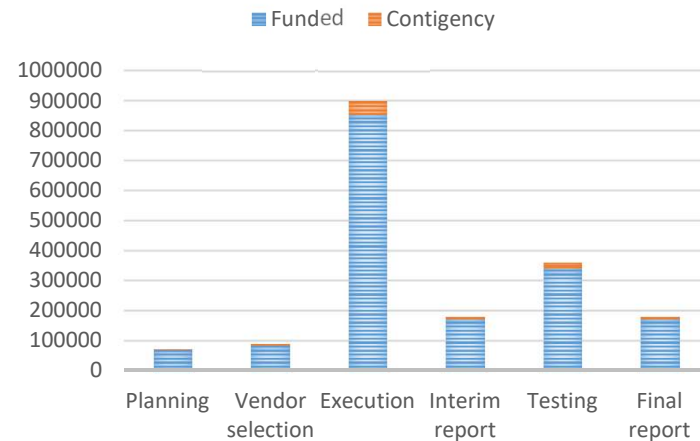
Sl.No	Stakeholder	Nature	Phase/Component development	strategies to manage	
				Verbal	Written
1	Vasanth	Positive	Planning	Presentation	Business case
				Briefings	
2	Ajmal	Positive	Vendor selection	Product demo	Progress report
3	Padmanaban	Positive	Execution	Project review	Progress report
4	Raja prakash	Positive	Interim report	Presentation	Project documents
5	padmanaban	Positive	Testing	Project review	Progress report
6	Srikanth	Positive	Final report	Presentation	Project documents

COST BREAKDOWN STRUCTURE

Overall project budget	2000000
Management buffer or reserve	200000
Total project cost(Revealed budget)	1800000
Contingency buffer or reserve	
Planning	
planning/approved	5%
	72000
Contingency	5%
	3600
Funded	68400
Vendor selection	
planning/approved	5%
	90000
Contingency	5%
	4500
Funded	85500
Execution	
planning/approved	50%
	900000
Contingency	5%
	45000
Funded	855000
Interim report	
planning/approved	10%
	180000
Contingency	5%
	9000
Funded	171000
Testing	
planning/approved	20%
	360000
Contingency	5%
	18000
Funded	342000
Final report	
planning/approved	10%
	180000
Contingency	5%
	9000
Funded	171000

	Planning	Vendor selection	Execution	Interim report	Testing	Final report
Funded	68400	85500	855000	171000	342000	171000
Contingency	3600	4500	45000	9000	18000	9000

COST BREAKDOWN STRUCTURE



SCHEDULE

[illegible]

HR PLAN

SL.NO	PROGRAM ACTIVITIES	PROJECTS	COST	RESOURCE PLANNING	
1	Planning	Identify all stakeholders	68400	6 Weeks	3
2		Define roles and responsibilities			
3		Hold a kickoff meeting			
4		Define project scope, budget, and timeline			
5		Set and prioritize goals			
6		Define deliverables			
7		Create a project schedule			
8	Vendor selection	Define and Analyze Business Requirements	85500	6 Weeks	3
9		Identify Third Party Vendor Candidates			
10		Develop Evaluation Criteria (with weighting)			
11		Evaluate Vendors and Schedule Demos			
12		Complete Vendor Selection			
13	Execution	Project deliverables	855000	23 Weeks	12
14		Change requests			
15		Performance data			
16		Issue log			
17		Documentation updates			
18	Interim report	Executive Summary	171000	6 Weeks	3
19		Statement of Scope			
20		Statement of Methodology			
21		Limitations			
22		Segmentations			
23		Summary of test results			
24		Recommendations			
25		Tools Used			
26	Testing	Clean up	342000	8 Weeks	8
27		Gauge calibration			
28		Motor earth leakage test			
29		Motor load test			
30		Pressure chamber wall thickness measurement			
31		Pressure chamber capability test			
32		Pressure chamber material strength test			
33		Pressure chamber fasteners torque test			
34		Overload current rating between relay and motor			
35		Wire terminal tightness test			
36	Final report	Test the electronic safety protection	171000	3 Weeks	3
37		Test the mechanical safety protection			
38		Executive Summary			
39		Statement of Scope			
40		Statement of Methodology			
41		Limitations			
42		Segmentations			
43		Summary of test results			
44		Recommendations	1692900		
45		Tools Used			
46		Clean up			

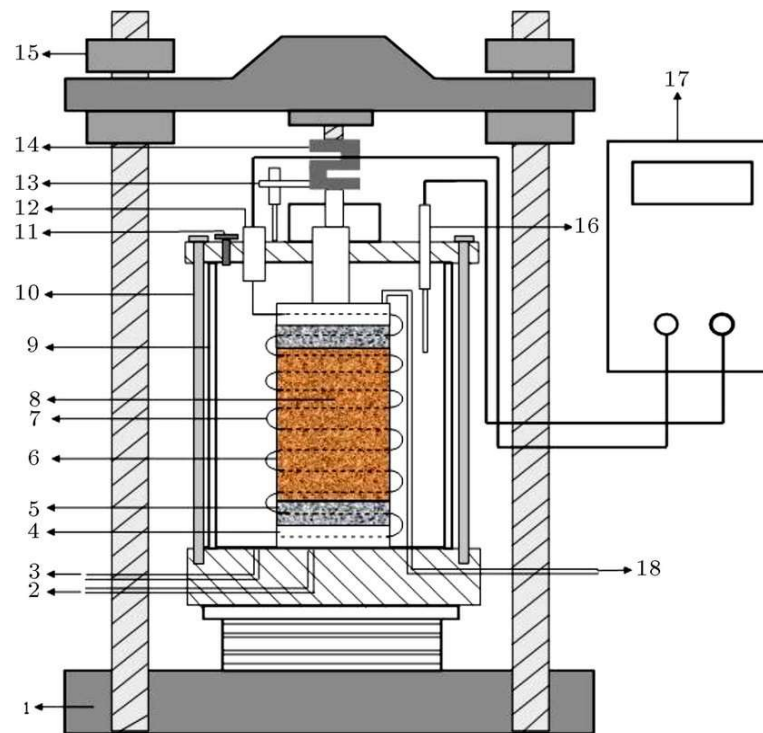
RISK ASSESSMENT AND RISK TREATMENT

Process	Risk	Classification	External/Internal	4.2 Needs & expectation of interested parties	Effect of occurrence of issue	Severity	Likelihood	Risk Exposure (Sev x Likelihood)	Priority	Business Continuity Plan			Action Plan	
				Direct Impact on Interested Parties						Control Method / Process	Mitigation Plan	Opportunity Description	Action to be taken	Responsibility
PAC	Material price increase	Commercial	Internal/External	Organization	Material used in the pressure chamber cost may be increased due to nature disaster	2	2	4	Low	Terms and condition need to ensure with the vendor what will be applicable	After manufacturing phase PAC can increase the material cost max 20% from the quote based on the agreement	So that we can maintain healthy relationship with the vendor for on material price for 2 years(min)	Study should be done	Vendor
	Shortage of Human Resources	HR	Internal/External	Organization	Technicians unavailability for the jobs	4	2	8	High	Proactive hiring and closing gaps through good grievance redressal	Creating an long term vision plan linked with competency matrix	Operation Technicians, junior engineer can be trained to mitigate bottlenecks in the job calendar	Closing of existing positions and creating a roadmap for future positions	PAC/Vendor
	PPE Compliance	Patent/legal/standards	Internal/External	Organization	Improper PPE Can lead to LTI, Increase in unsafe incidences and Near Miss	4	3	12	High	Toolbox talks/Trainings	Discuss with vendor	Brainstorming during toolbox sessions	Follow PPE standards	PAC/Vendor
	Leakage in the enclosures	Frictional	Internal/External	Organization	Increase in down time of ROV and equipment failures.	4	2	8	High	High pressure test	Discuss with vendor	Testing enclosures at high pressures	Periodic testing of the enclosures	PAC/Vendor
	Work disruption during pandemic time/ and during disaster	Patent/legal/standards	Internal/External	Organization	Frequent floods, cyclone and occurrence of pandemic affects work	4	2	8	High	Encourage more work from home	Providing buffer time	Completion of documentation related work and putting foundation stones for process related initiatives	Adaption to digital mode of working also to identify employees who are nearby who can support at tough times	PAC/Vendor
	Pressure chamber risk while testing during reengineering	Functional	External/Internal	Organization	While testing due to some software and code malfunction feedback fails in the pressure chamber	4	2	8	High	Adding to additional safety interlocks to pressure chamber	KT from vendor in each phase of troubleshooting and making trial testing with the help of vendor during development stage	Several safety interlocks and feedback mechanisms added in the development phase to reduce the risk(Eg. PRV)	Most of the safety interlocks incorporated in the pressure chamber and making the chamber to work in upcoming month	PAC/Vendor
	Transportation	operational	External	Organization	While transporting the finished goods, the challenges faced in the transporting the goods to the PAC What type of vehicle need to be used? What safety precaution need to be followed?	4	2	8	High	Transportation and installation planning method need to be discussed	KT should be done to vendor about transportation and installation process	Proper plan can help us to save time in transportation and installation and the process can be completed without delay.	Proper roadmap has to be created and need to be validated before the starting of the process	PAC/Vendor
	Health and safety	Patent/legal/standards	External/Internal	Organization	Handling of hazardous materials • Conditions under which work activities take place i.e., whether it is conducted indoors or outside • Different locations/workstations where the level of risk varies • Times during the day when the risks may be higher • Direct exposure of workers to risks or high risk-prone equipment • Activities that are hazardous or physically dangerous • Possibilities of people other than workers to be affected by the work activities	4	2	8	High	general hazards, equipment risk, substance risk, machinery handling risks, electrical failure risk, and fire risk.	Discuss with vendor and safety officer need to be appointed for the particular project	Last five year individual project and data of unsafe act need to be provided by the vendor.	Appointing safety officer for the project	Vendor/PAC

PRODUCT LIFE CYCLE

- Gauge calibration
- Motor earth leakage test
- Motor load test
- Pressure chamber wall thickness measurement
- Pressure chamber capability test
- Pressure chamber material strength test
- Pressure chamber fasteners torque test
- Overload current rating between relay and motor test
- Wire terminal tightness test
- Test the electronic safety protection
- Test the mechanical safety protection

PRESSURE CHAMBER



CHECKSHEET FOR CALIBRATION

Certificate Number-Unique ID:

ULR Number:

Mechanical Calibration

Nominal Value (UOM – psi)	UUC Reading (UOM – psi)	Master Reading (UOM – psi)	
		Increment 1	Decrement 1
0	0		
100	100		
400	400		
600	600		
800	800		
1000	1000		

UUC Reading (UOM – psi)	Average Reading (Master) (UOM – psi)	Error (UOM – psi)	Hysteresis (UOM – psi)	Expanded Uncertainty (UOM – psi)
0				
100				
400				
600				
800				
1000				

CHECKSHEET FOR CALIBRATION

Remarks

1. Pressure Conversion 1 psi = 6894.74 Pa
2. UOM - Indicates Unit of Measurements

Opinions and interpretations:			
Calibrated		Accepted / Valid for use	
Limited use		Reject / Out of use	

Calibrated by		Reviewed & authorized by	
Identification		Identification	
Signature		Signature	

CHECKSHEET FOR MOTOR EARTH LEAKAGE TEST

LOAD Details		Earth leakage relay details	
Load description		Make	
Unit		Model no	
MCC & Cell no		Range	
Full load current	Amps	Aux volts	110 V AC
Test done date		Setting current	

Test equipment used details:

Equipment	Make and model No	Eqpt. Sl. No	Calibration Due date
Testing Kit			
Clamp on meter			
Multimeter			

CHECKSHEET FOR MOTOR EARTH LEAKAGE TEST

Checks on earth leakage relay:

Sl.no	Item Description	Excepted	As found	As left	Remarks/Reason
1	Check physical condition of earth leakage relay	No damage			

S. No	Set current (m. A)	Test current (m. A)	Excepted optd. time (Sec)	Actual optd. time (Sec)	Operation of contacts		Relay optd. Indication status	Remarks
					NO	NC		
			02:35					

Note:

1. Apply 110V AC supply, ensure relay should not pickup and apply current gradually and ensure relay operation at set current only.
2. Ensure test result were within the tolerable limit.
3. After testing paste calibration sticker along with details.

Testing done by name with signature	Checked by name with signature

CHECKSHEET FOR MOTOR LOAD TEST

Model	
Serial Number	
Delivery date	

Name plate data:

Brand		Voltage	
Type		Current	
Connection		Protection	
No of phases		RPM	
Frequency		Power	
S. No			

CHECKSHEET FOR MOTOR LOAD TEST

Measurements:

Make sure the motor is running at full speed

If the motor has two speeds check both and take note of the measurement

Full load current (Rack installed)

Current phase 1	A	Voltage phase 1	V
Current phase 2	A	Voltage phase 2	V
Current phase 3	A	Voltage phase 3	V

No load current (Remove rack)

Current phase 1	A	Voltage phase 1	V
Current phase 2	A	Voltage phase 2	V
Current phase 3	A	Voltage phase 3	V

Make sure the motor is shut down and electrically disconnected

Insulation between ground and winding	MOHM
Insulation between winding	
Between U & V	MOHM
Between U & W	MOHM
Between V & W	MOHM

CHECKSHEET FOR MOTOR LOAD TEST

Winding resistance of each winding (With a milli-ohm meter)	
Winding U	OHM
Winding V	OHM
Winding W	OHM
Net frequency	HZ

Testing done by name with signature	Checked by name with signature

CHECKSHEET FOR WALL THICKNESS MEASUREMENT TEST

Test equipment used details:

Equipment	Make and model No	Eqpt. Sl. No	Calibration Due date
Testing Kit			
DFT (Dry film thickness)			
UT (Ultrasonic thickness)			

Checks on Pressure chamber body:

Sl.no	Item Description	Excepted	As found	As left	Remarks/Reason
1	Check physical condition of pressure chamber body	No damage			
2	Pressure chamber wall thickness (0-90) (90-180) (180-270) (270-360)	30mm			
3	Pressure chamber lid thickness (0-90) (90-180) (180-270) (270-360)	30mm			

Note:

- Pressure chamber wall thickness need to measure minimum 50 for (0-90) deg.
- Pressure chamber wall thickness need to measure minimum 50 for (90-180) deg.
- Pressure chamber wall thickness need to measure minimum 50 for (180-270) deg.
- Pressure chamber wall thickness need to measure minimum 50 for (270-360) deg.
- Pressure chamber lid wall thickness need to measure minimum 50 for (0-90) deg.
- Pressure chamber lid wall thickness need to measure minimum 50 for (90-180) deg.
- Pressure chamber lid wall thickness need to measure minimum 50 for (180-270) deg.
- Pressure chamber lid wall thickness need to measure minimum 50 for (270-360) deg.

CHECKSHEET FOR WALL THICKNESS MEASUREMENT TEST

Testing done by name with signature	Checked by name with signature

CHECKSHEET FOR PRESSURE CHAMBER CAPABILITY TEST

Sl.no	Description	Set pressure	Set duration	Cycle	Actual	Duration	Leakage	Remarks
1	Pressure test	2 bars	2 hours					
2		4 bars	2 hours					
3		6 bars	2 hours					
4		8 bars	2 hours					
5		10 bars	2 hours					
6		12 bars	2 hours					
7		14 bars	2 hours					
8		16 bars	2 hours					
9		18 bars	2 hours					
10		20 bars	2 hours					
11		22 bars	2 hours					
12		24 bars	2 hours					
13		26 bars	2 hours					
14		28 bars	2 hours					
15		30 bars	2 hours					

Testing done by name with signature	Checked by name with signature

CHECKSHEET FOR TRANSPORTATION OF MATERIAL TO SITE

INSPECTION ITEMS	N/A	Corrective Action	Corrected at time of inspection	Date completed
Job Design				
When possible, jobs are designed to minimize manual material handling.				
When possible, mechanical lifting devices (forklifts, hoists, cranes, and block and tackle) are used.				
Manual lifting and carrying devices (dollies, hand trucks, pry bars, and hooks) are available and in good condition.				
Where possible, materials and equipment are used that are easy to lift and carry (for example, bricks with handholds or fiberglass ladders).				
Where possible, materials are ordered in small, light quantities (for example, 3-foot drywall or small packages of cement).				
Lifting tasks are divided among workers to reduce repetitive lifting.				
Heavy materials which must be lifted manually are stored off the ground, no lower than knee height. (This limits the height of the lifting required and reduces pressure on the spine.)				
Heavy materials are stored where there is enough space to lift them safely, without reaching or twisting.				
When possible, jobs are designed to minimize manual material handling.				
Training				
Workers have been trained about all identified lifting hazards on the job.				
Workers have been trained in safe lifting techniques.				
Work Practices				
Materials are delivered as close as possible to where they will be used.				
Loads are split up to reduce weight.				
Walkways are kept clear to allow use of material handling devices like carts and dollies.				
Testing done by name with signature	Checked by name with signature			

CHECKSHEET FOR TRAINING

Skill	Date	Trained by	Signed by	
			Trainer	Employee
If motor got tripped how to check relay and contactor and MCB				
How to check the compressor oil level				
If any sudden malfunction in PC how to troubleshoot from manual method				
While running condition what are the safety precaution need to be done.				
While working conditions. How can safety interlocks be troubleshooted if they fail?				
Indicate in which places does man handling needs to be performed and where it is not required needed				

Testing done by name with signature	Checked by name with signature

CHECKSHEET FOR DOCUMENTATION

Documentation	Date	Handover by	Signed by	
			Vendor	PAC
Wiring diagram				
Pressure chamber Bill of material				
Pressure chamber material warranty and AMC				
Pressure chamber SOP				
Pressure chamber troubleshooting points				
Pressure chamber drawing files (Part files)				
Periodic maintenance checkpoints and duration				

Testing done by name with signature	Checked by name with signature

CHECKSHEET FOR SPARES

Spares	Quantity	Warranty period	Bill	Date	Signed by	
					Vendor	PAC
Gasket	1					
Solenoid Valve	2					
Limit Switch	2					
Overload relay (OLR)	2					
Compressor oil	1000ml					
Compressor air filter	1					
O-ring	2					
Keyboard	1					
Dial gauge	1					
Mouse	1					

Testing done by name with signature	Checked by name with signature

PROJECT CLOSURE

- Based on the data received from the testing phase and it was verified and validated from the PAC team.
- Once the received data is based on the schedule the final report is prepared.
- Audit will happen to confirm the task and payment are completed as per schedule.
- Final Kick off meeting will be happen based on the audit.