

Mechanical Engineering Design Portfolio

Akash Suhagiya (B.Eng Mechanical)

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Projects :-

- 1) Hydrogen storage system (solid storage)
- 2) Smart hydrogen gas network (Production, storage and utilatiation)
- 3) Shelters Integration and Fabrication
- 4) HVAC (Heating and ventilation air conditioning)
- 5) CEMS (Continuous emission monitoring system)
- 6) SWAS (Steam and Water Analysis Syastem)

❖ Welcome, and thank you for taking the time to view my portfolio. The Goal of this portfolio is to give you a deeper insight into my experiences and skills I have gained over my recent history. It is my hope that this will allow you to better assess how my skills can be applied to your company. I would be happy to talk in more detail and can be reached using the contact information at the bottom of this page.

Product design :-

- 1) Industrial and process valves
- 2) Pressure regulators for Gas and Hydro applications
- 3) Gas Analysis Components
- 4) Thermal products solution
- 5) Plastics Products

About Me

- ❖ Intend to build a career with leading corporate environment with committed & dedicated people, which will help me to explore myself fully and realize my potential willing to work as a key player in challenging and creative environment.
- ❖ I am a motivated Mechanical Design Engineer with over 10 years of experience. Offering expertise in designing Hydrogen storage systems, Hydrogen production system through electrolyser, industrial HVAC and AC, refineries products, power plant products, oil and gas products, and industrial valves. My strong problem solving abilities and practical approach to implementation ensure that technical delivery and fostering the development of the system engineering activities across various industries sectors.

Objective :

- ❖ I am looking for a position as a Senior Mechanical Design Engineer in a company that is growing and giving me the opportunity to improve my abilities and learn new things therefore I want to give my expertise along with problem solving skills to the company.

CORE QUALIFICATION

- SolidWorks, Solid Edge, DraftSight, AutoCAD (2D and 3D), FEA (Ansys 2021 R2), Inventor, Basic knowledge of Catia V5
- Solid & Parametric 3D Modelling
- Geometric Dimensioning & Tolerance (GD&T)
- Design for Manufacturability (DFM)
- PDM system such as 3D experience.
- ISO9001, BS8888, BS31.3, B16.5, B16.10, B16.11, B16.34 Standards
- ATEX standards Directive 2014/34/EU and Directive 1999/92/EC
- EN IEC 60079-0:2018, IEC 60079-1, IEC 60079-2, EN BS 60079-10, CGA G5.5, EIGA DOC 211/17, BS ISO 22734:2019.
- Hydrogen system design
- System efficiency calculations
- Piping (P&IDs) and tubing designing for industrial AC units and hydrogen storage systems
- Well versed with HAZOPs, HAZIDs and LOPAS
- Knowledge of Machine directives and PED directives
- Proficient with CFD, FEA and hand calculations
- Die and tool designing
- Plastic injection molding
- CNC and lathe machine experience
- Extrusion design
- Understanding of API, BS and ASME valves standards and valves drawings
- Ability to decode of technical documentation
- Adaptability of new technologies
- Good attention to detail
- Quickly and efficiently understand and organize information necessary to make engineering decisions
- Self-motivated, team management, project management
- HVAC, chiller, cooler and industrial AC mechanical designing with duct design
- Expertise in sheet metal and fabrication works
- Microsoft Office (Excellent IT skill)
- Strong communication skill

PROJECTS

Hydrogen storage system (solid storage)



Smart hydrogen gas network
(Production, storage and utilisation)

- ❖ This is **£4.3m Solid hydrogen at low pressure project** to develop a novel and innovative solid state hydrogen storage system (**1MWh**); developing the system from a blank piece a paper all the way through to commissioning and testing.

Key Responsibilities:

- ❖ Involved all phase of the development from concept to commissioning.
- ❖ Collaborating with stack holders such as mtc, Emec, HSSMI, and ARC to improve the process and worked with them of project requirements and managing them including scope and requirements.
- ❖ Involved DFMEA, PFMEA.
- ❖ Specified components, designing architecture, P&ID and PFD.
- ❖ Created 3d models from concept stage detailed design.
- ❖ Make sure requirements had been implemented in design with constantly liaising with stakeholders.
- ❖ Procurement of all components for the system.
- ❖ Prepared Gant charts for the build plan, project spending and resource allocation for the projects.
- ❖ Compiling standards for ATEX in the H₂ storage system. Preparing hazardous area classification drawing for DSEAR assessment.
- ❖ Compiling BoMs, part selection, and part sourcing and using PDM systems such as 3D experience platform.
- ❖ Participated and prepared safety assessments such as PFMEAs, DFMEAs, Method Statement, and Risk assessments.
- ❖ Creating technical drawings, including engineering drawings, GA drawings, Assembly Drawings, PFD and P&ID diagrams.
- ❖ Liaising with subcontractors and suppliers for the building of the system included site visits for the inspections.
- ❖ Led the build and commissioning of the system (FAT and SAT) and was responsible for managing and liaising with the manufacturing partner.

Hydrogen storage system (solid storage)



Smart Hydrogen Gas Network

This is £4m innovative Smart Hydrogen Gas Network project with **Northern Gas Networks (NGN)** which included hydrogen storage, hydrogen production through electrolysis (**Enapter**) and utilization via H₂ boiler (**BAXI**) from concept to manufacture; to demonstrate an end-to-end hydrogen fuel switching application in industrial environment.

Key Responsibilities:

- ❖ Involved all phase of the development from concept to commissioning.
- ❖ Collaborating with stack holders such as mtc, NGN, Baxi, Emec, HSSMI, ARC and DNV to improve the process and worked with them of project requirements and managing them including scope and requirements.
- ❖ Involved DFMEA, PFMEA.
- ❖ Specified components, designing architecture, P&ID and PFD.
- ❖ Created 3d models from concept stage detailed design.
- ❖ Make sure requirements had been implemented in design with constantly liaising with stakeholders.
- ❖ Procurement of all components for the system.
- ❖ Prepared Gant charts for the build plan, project spending and resource allocation for the projects.
- ❖ Compiling standards for G17, ATEX and CE approval in the H₂ storage system. Preparing hazardous area classification drawing for DSEAR assessment.
- ❖ Compiling BoMs, part selection, and part sourcing and using PDM systems such as 3D experience platform.
- ❖ Participated and prepared safety assessments such as HAZID, HAZOPs, LOPAs, PFMEAs, DFMEAs, Method Statement, and Risk assessments.
- ❖ Creating technical drawings, including engineering drawings, GA drawings, Assembly Drawings, PFD and P&ID diagrams.
- ❖ Liaising with subcontractors and suppliers for the building of the system included site visits for the inspections.
- ❖ Led the build and commissioning of the system (FAT and SAT) and was responsible for managing and liaising with the manufacturing partner.

Analyser Shelter



Integrated Shelter

- ❖ I have successfully delivered more than 5Nos. of analyser shelter worth of 1 million pound of each to the customer according to requirements.

Key Responsibilities:

- ❖ Involvement in all phase of project such as Pre-Sale Support, Proposal Support, Detail Engineering and Design, Project Management, Fabrication & integration, Quality check, FAT & SAT and Customer Training.
- ❖ Inspection of client site and developing engineering drawings.
- ❖ Liaising with clients and suppliers for project inputs and progression.
- ❖ Involvement of technical specification of projects such as material selection, bespoke product, Costing and sizing calculation, Testing of project and products, Material procurements, SAP Erp system.
- ❖ Designing of Project tracking sheet and make sure projects completion within time frame and according standards.
- ❖ Arranging, attending and leading meetings with technical and commercial stakeholders.

HVAC (Heating and ventilation air conditioning)



- ❖ I have successfully delivered more than 20Nos. of HVAC (3TR, 5TR, 7.5TR, 10TR, 12TR) worth of appr. 0.5 million pound of each to the customer according to requirements.

SWAS (Steam and Water analysis system)



- ❖ I have successfully delivered more than 5Nos. of SWAS Panels worth of appr. 0.2 million pound of each to the customer according to requirements. And all build in house of company under my design.

Continuous emission monitoring system (CEMS)



Key Responsibilities:

- ❖ Involvement in all phase of project such as Pre-Sale Support, Proposal Support, Detail Engineering and Design, Project Management, Fabrication & integration, Quality check, FAT & SAT and Customer Training.
- ❖ Inspection of client site and developing engineering drawings.
- ❖ Liaising with clients and suppliers for project inputs and progression.
- ❖ Involvement of technical specification of projects such as material selection, bespoke product, Costing and sizing calculation, Testing of project and products, Material procurements, SAP Erp system.
- ❖ Designing of Project tracking sheet and make sure projects completion within time frame and according standards.
- ❖ Arranging, attending and leading meetings with technical and commercial stakeholders.

PRODUCTS

Industrial and Process Valves

(Designing, Drawings, Documentation, As-built & Testing)



Gate Valve



Globe Valve



Triple offset
Butterfly Valve
with hand wheel



Butterfly Valve
Actuator operated



Check Valve



Forged Valve



Ball Valve

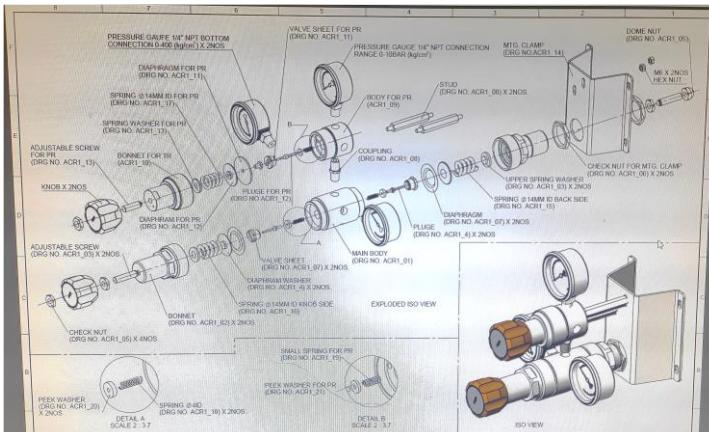
Key Responsibility at Flotek Industry :-

- ✓ Designed Valve's 2D and 3D models using of AutoCAD and Solidworks software.
- ✓ Preparing proposal, Pre-Machining, Machining, Casting, As-built drawings, Parts & Assembly drawings and BOM .
- ✓ Liaising to QC Team, Production Team, Store Team and Vendors for technical query & inputs for betterment of products.
- ✓ Maintain company regulation and standards.
- ✓ Valve Wall Thk. Calculation, Pipe Sizing calculation, Hydro and pneumatic test, NDT testing.
- ✓ Involvement in ISO audits, TPI and FAT.
- ✓ Designing of $\frac{1}{2}''$ to 24" sizes and 150# to 2500# of valves and having knowledge of different manufacturing Processes and material.

Pressure regulators for Gas and Hydro applications



Auto-change Over Pressure regulator



Exploded View
Auto-change Over Pressure regulator



Back
Pressure
regulator
assembly



Pressure
regulator
Assembly



Direct
acting
Pressure
regulator

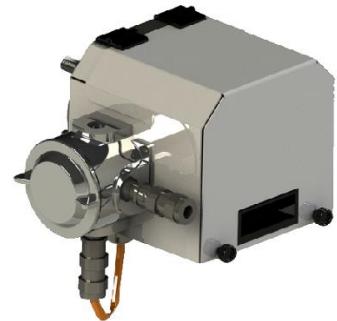


Auto Shut
off Valve

Key Responsibility:

- ✓ Selection of material (SS316, SS316L, SS304, Nylon, Peak, M.S.)
- ✓ Concept design and developing of drawings. (Auto-Cad, Solidworks, Draft sight)
- ✓ Selection of seat according to pressure and temperature.
- ✓ Machining processes (Turning, Drilling, sheet cutting, Lapping, Grinding, Threading)
- ✓ Develop Proto Unit of product.
- ✓ Testing of Pressure regulators (Hydro pressure test, temperature test)
- ✓ Designed plastic knob.
- ✓ Designing flow path of Pressure regulators. (Simulation in Ansys Software)
- ✓ Involved in appearance of pressure regulator and surface finishing processes such as Glass Blasting, Sand Blasting and Laser Marking.

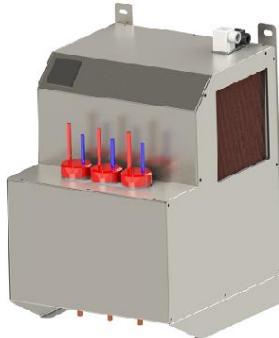
Gas Analysis Components



Atex Sample Gas Probe



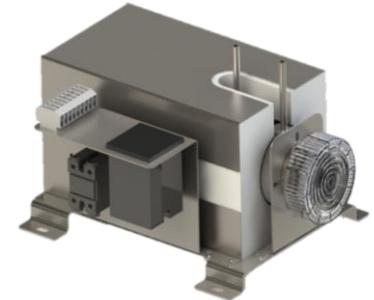
Sample Gas Probe



Sample Gas Cooler



Atex Sample Gas Cooler



Nox converter



Universal scrubber



Auto liquid drainer



Peltier Sample Gas Cooler

Key Responsibility:

- ✓ Involvement in all phase of product development cycle.
- ✓ Concept design and developing of drawings. (Auto-Cad, Solidworks, Draft sight)
- ✓ Detail Design, validation of data and analysis or simulation.
- ✓ Thermal Load and static load calculation.
- ✓ Develop Proto Unit of product.
- ✓ Testing under actual environment and rigorous testing.
- ✓ Create manual and datasheet.
- ✓ Involved in appearance of Products and surface finishing processes such as Powder coating, Buffing, Glass Blasting, Sand Blasting and Laser Marking.
- ✓ Hand over product drawings and details to Production and quality team.

Thermal products solution



HVAC



Ex AC



Safe Area
Indoor AC



Safe Area Out
Door AC



Heat Exchanger



Safe Area Chiller



Peltier AC

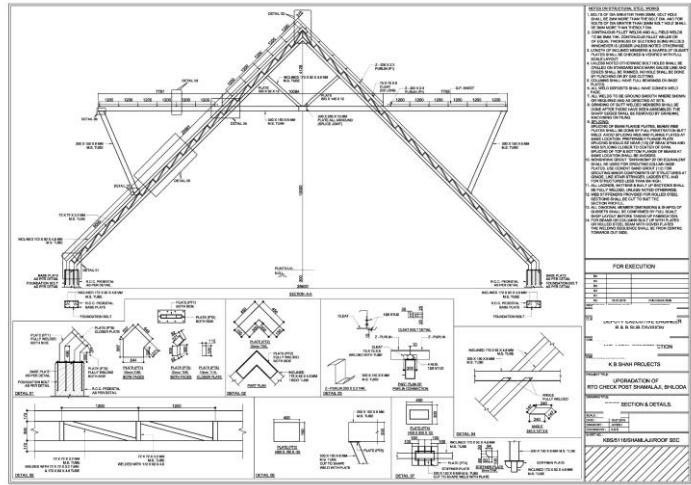


Vortex Cooler

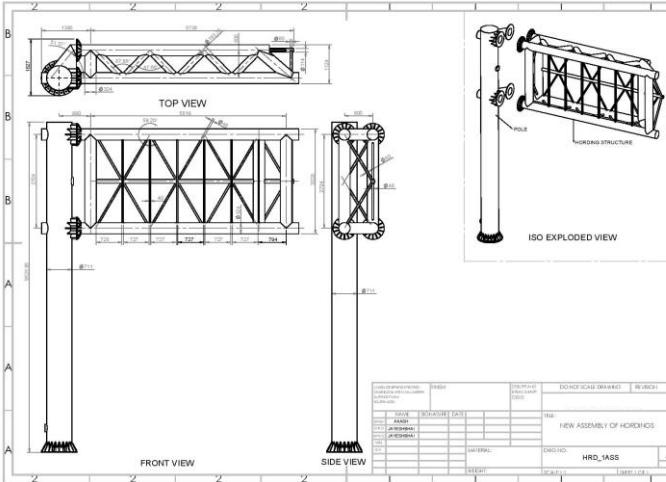
Key Responsibility:

- ✓ Involvement in all phase of product development cycle.
- ✓ Heat Load, cooling load, Fan selection, CFM, Air Flow Calculation, Coil Selection and static load calculation.
- ✓ Concept design and developing of drawings. (Auto-Cad, Solidworks, Draft sight)
- ✓ Detail Design, validation of data and analysis or Thermal simulation.
- ✓ Develop Proto Unit of product.
- ✓ Testing under actual environment (up to 50°C ambient) and rigorous testing.
- ✓ Create manual and datasheet. Hand over product drawings and details to Production and quality team.

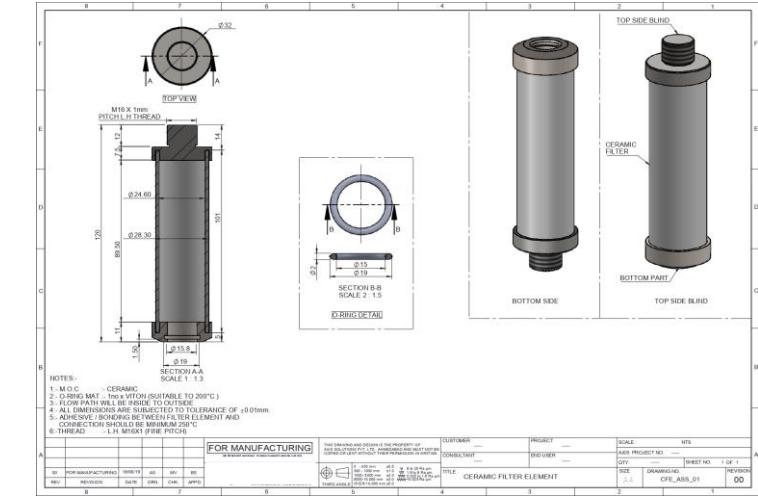
2D Drawings Samples



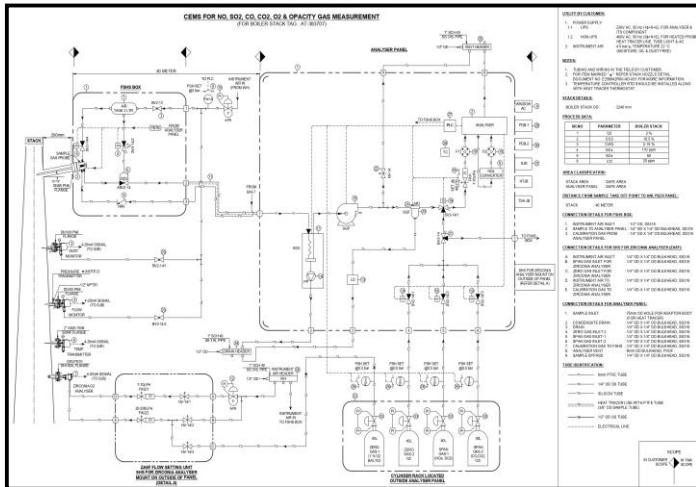
Structure Drawing



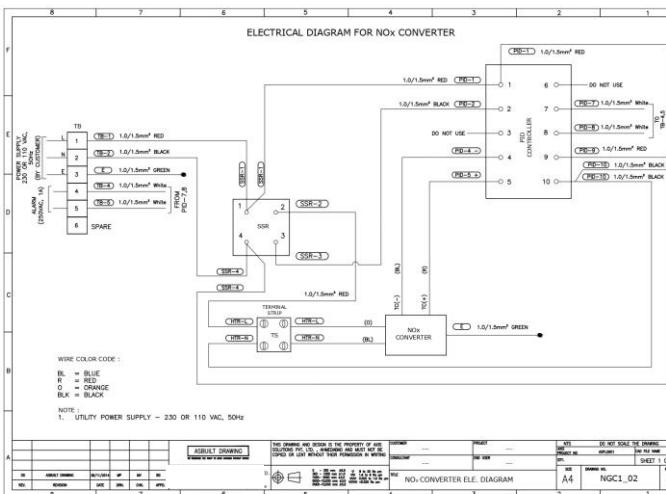
Led Pole Assembly Drawing



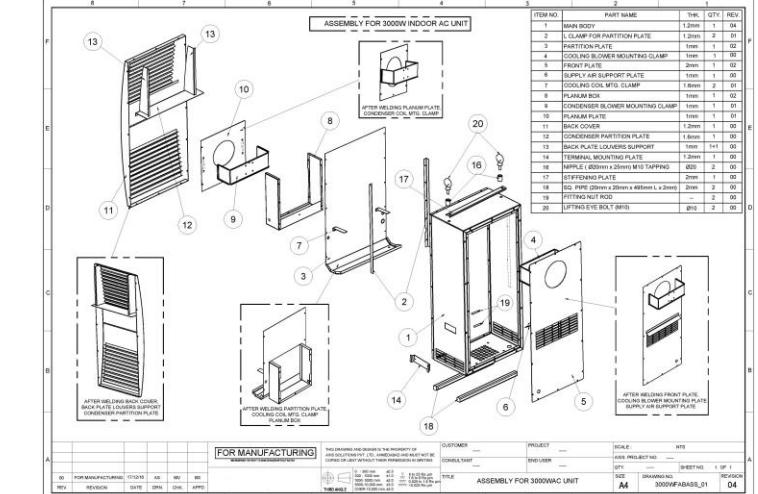
Machining Drawing



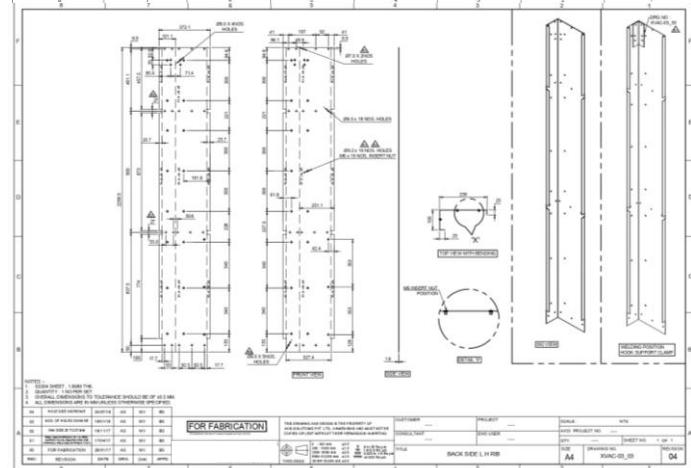
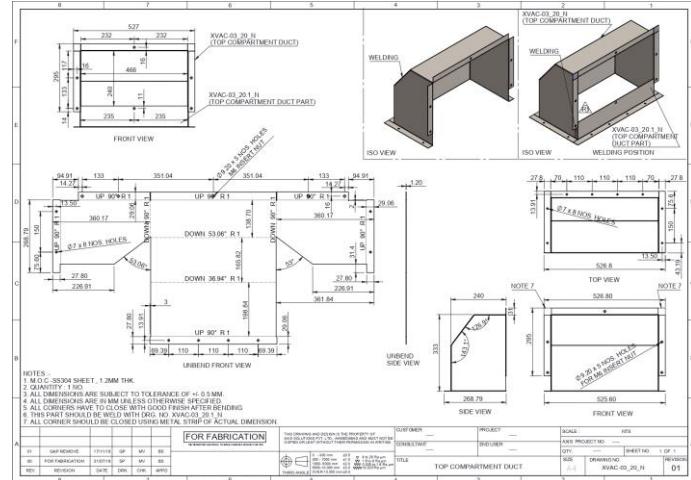
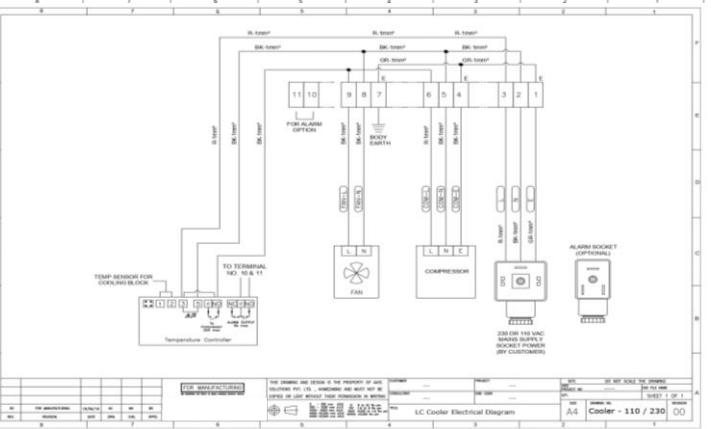
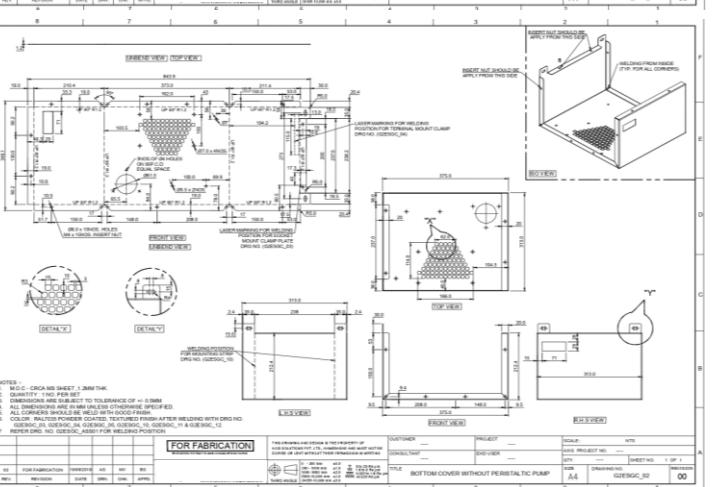
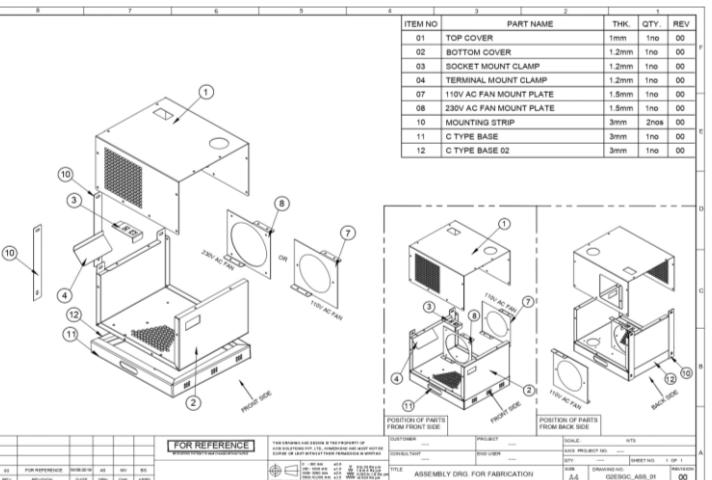
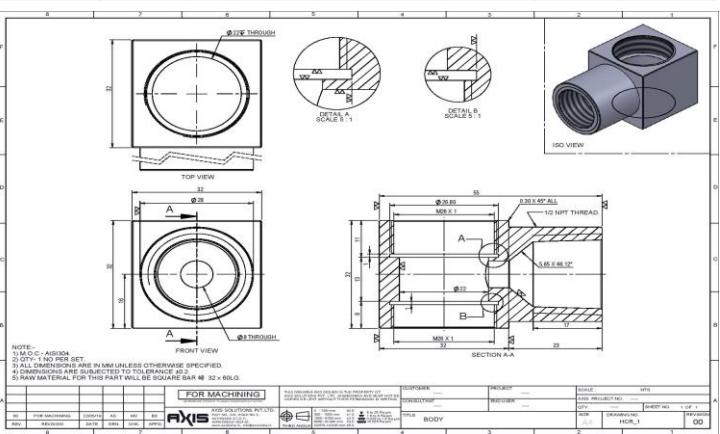
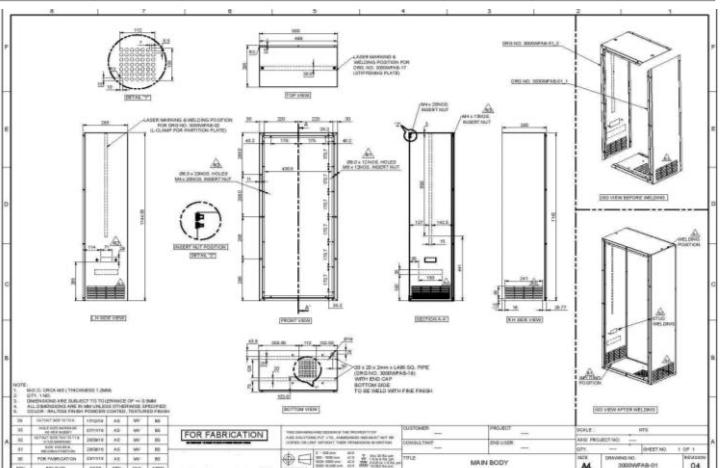
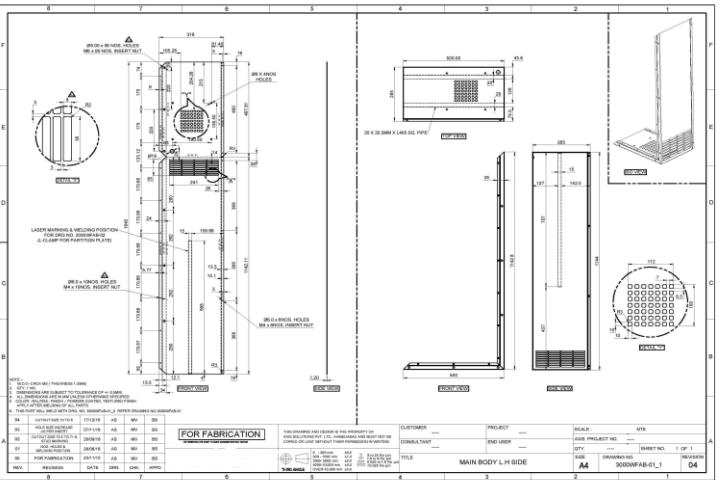
P & ID Drawing



Electrical Wiring Drawing



Fabrication Assembly Drawing



Note:

- ❖ Drawings samples of assembly, welding position and parts drawings for fabricated or sheet metal products from SS316, SS304 and MS CRCA Sheets.

Plastics Products



Air Flow monitor
Housing from
ABS material



Pan Box for Gift
From ABS material



Electric box from
Nylon material



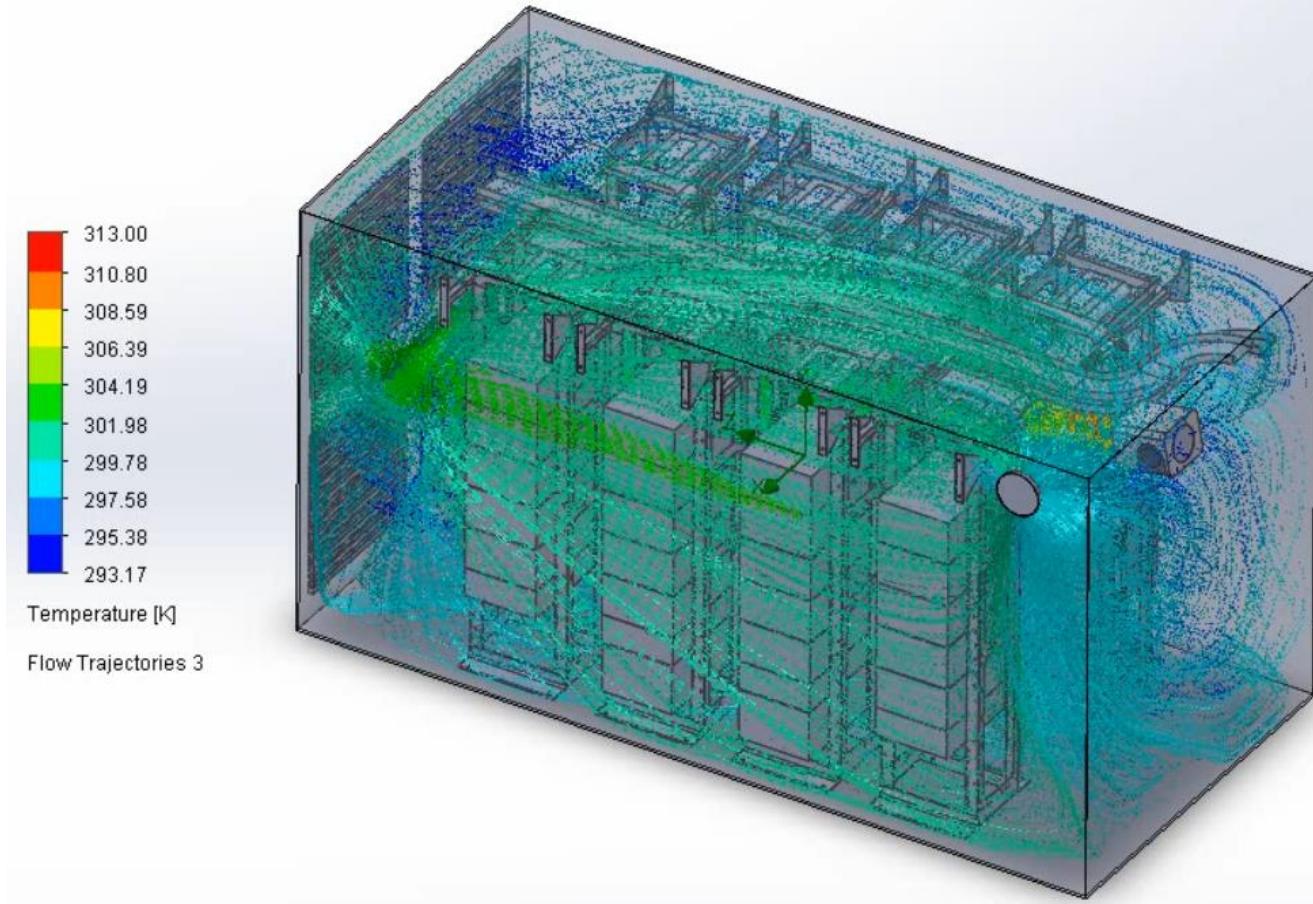
Knob from Nylon
material

Key Responsibilities:

- ✓ Designing of Product in Solidworks 3D and 2D models.
- ✓ Designing of Core and Cavity.
- ✓ Selection of correct material according application.
- ✓ Material sourcing from suppliers.
- ✓ Involvement in die trials and weight calculation of particle.
- ✓ Designing of object as per manual die and automatic die.
- ✓ Designed single cavity and 4 cavity mould die.

Air ventilation simulation in container

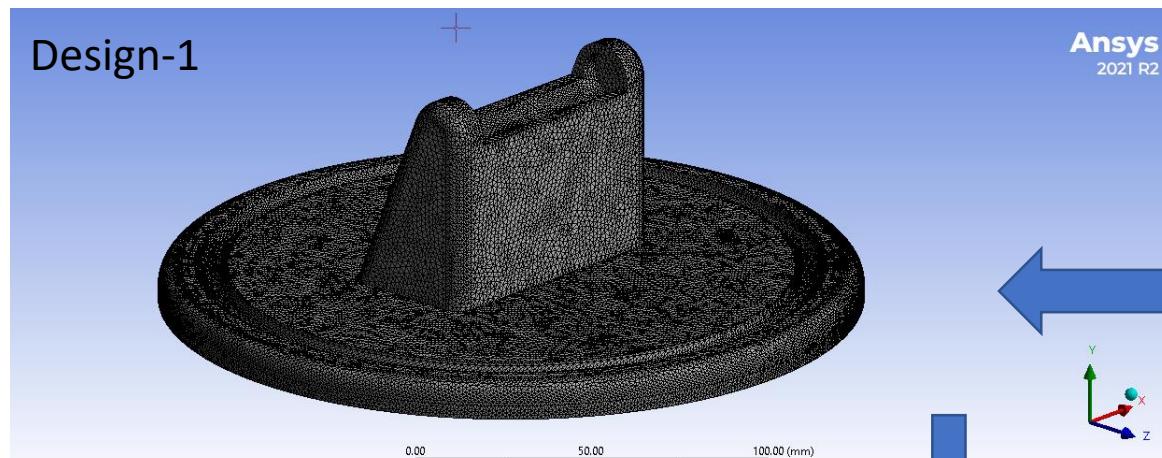
- ❖ Aim: Identify heated air distribution when heater and ventilation fan is running for the containerised system.



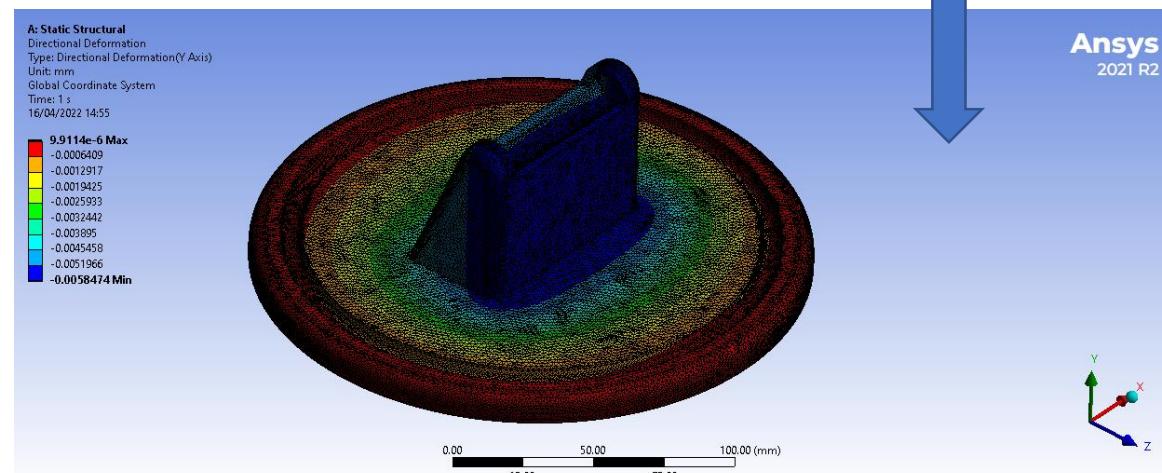
✓ This is containerised electrolyser storage system, it is important to keep internal temperature above 5degree during the winter for keep running the electrolyser and produce the hydrogen, so it is necessary to distribute even heat inside. This simulation work showing the air flow inside the container.

Led TV monitor Stand design Modification and FEA Static Analysis

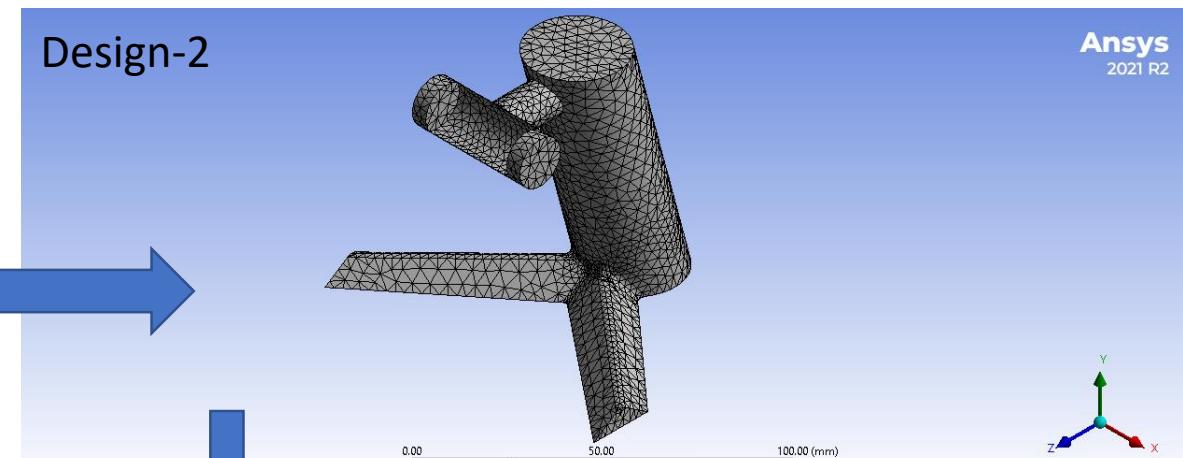
❖ **Aim:** Re-designing of LED TV stand. Stress, Strain and Deformation analysis in Ansys software. 50N Bearing load apply downward.



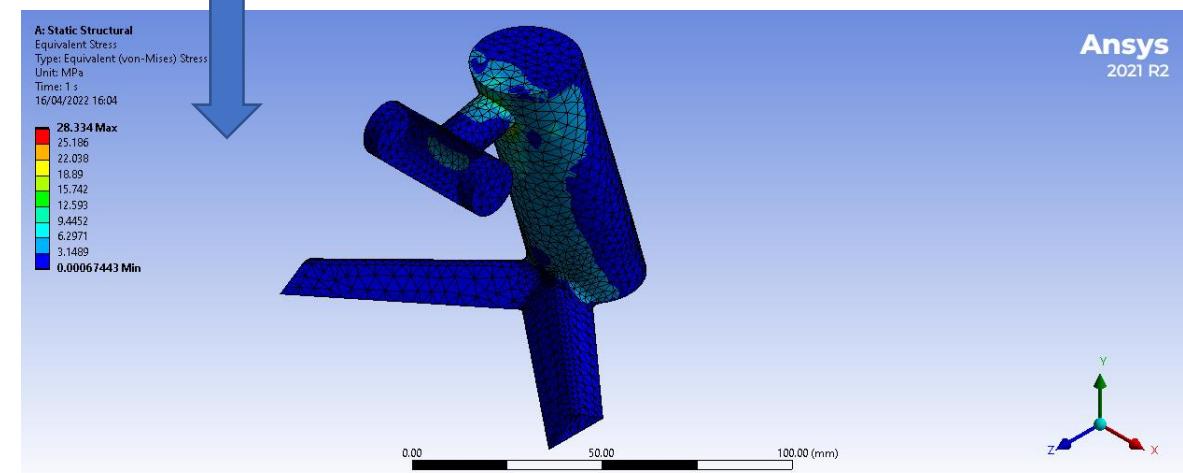
Mesing tetrahedral elements



Stress analysis result

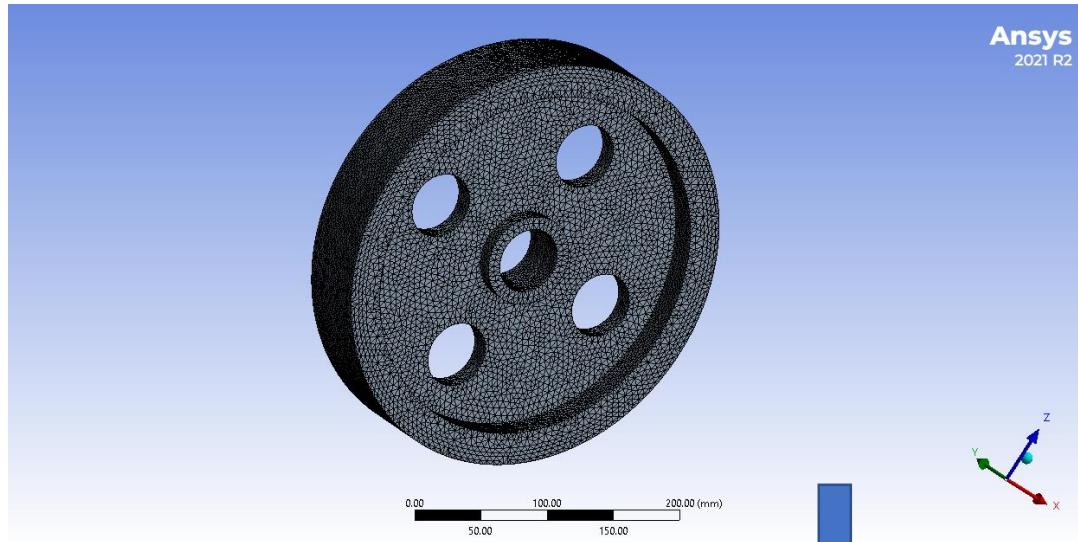


Mesing tetrahedral elements



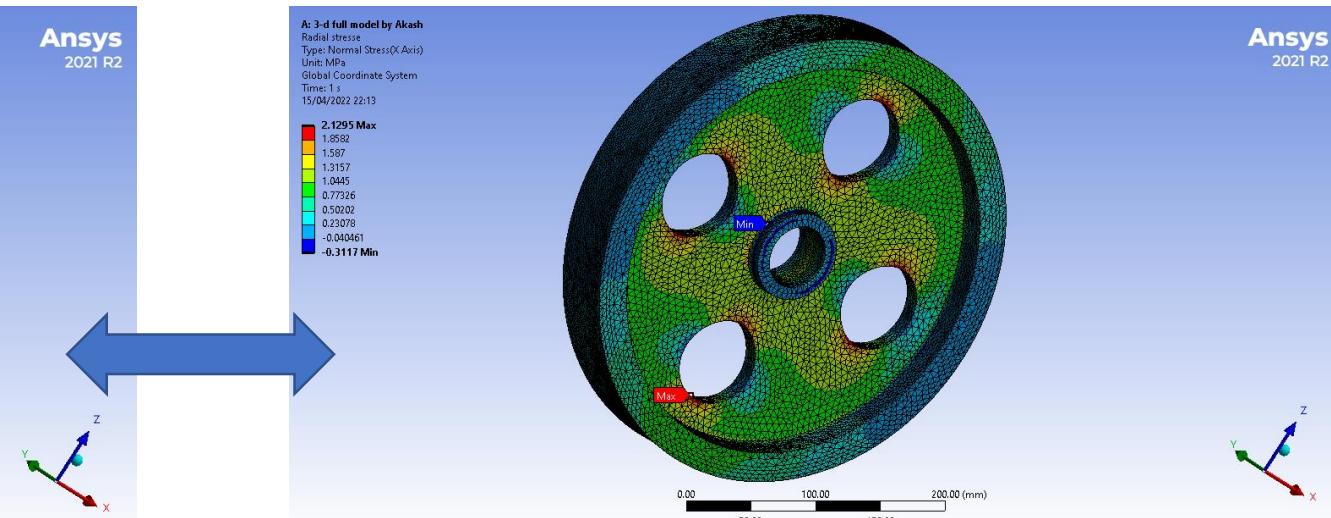
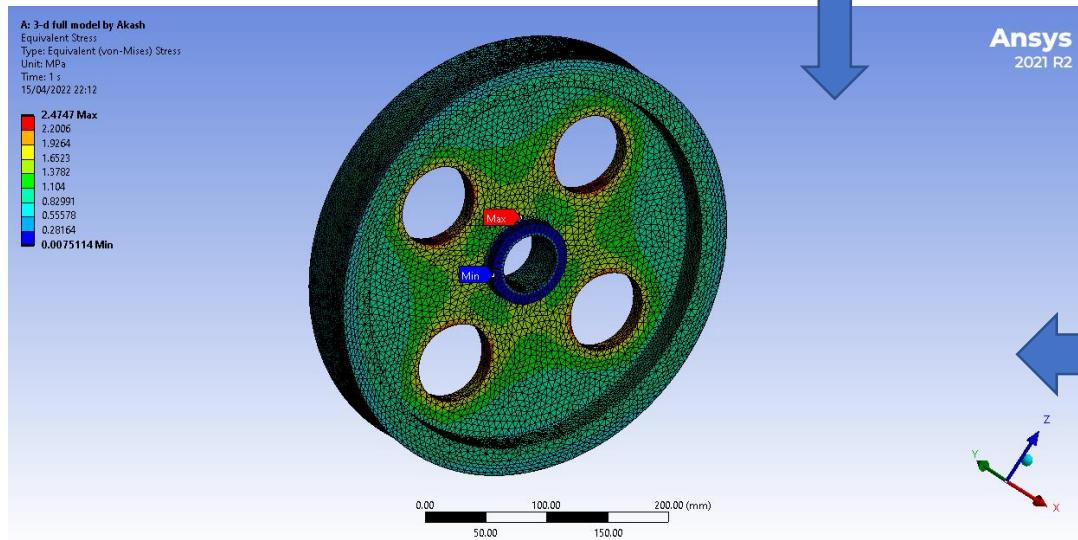
Deformation analysis result

Flywheel FEA Analysis

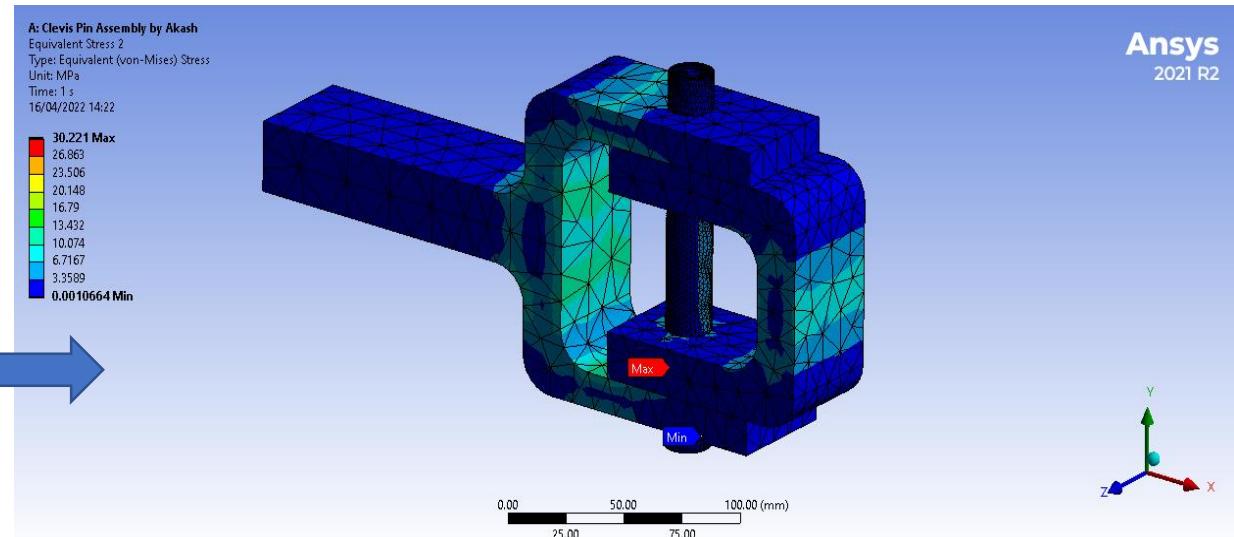
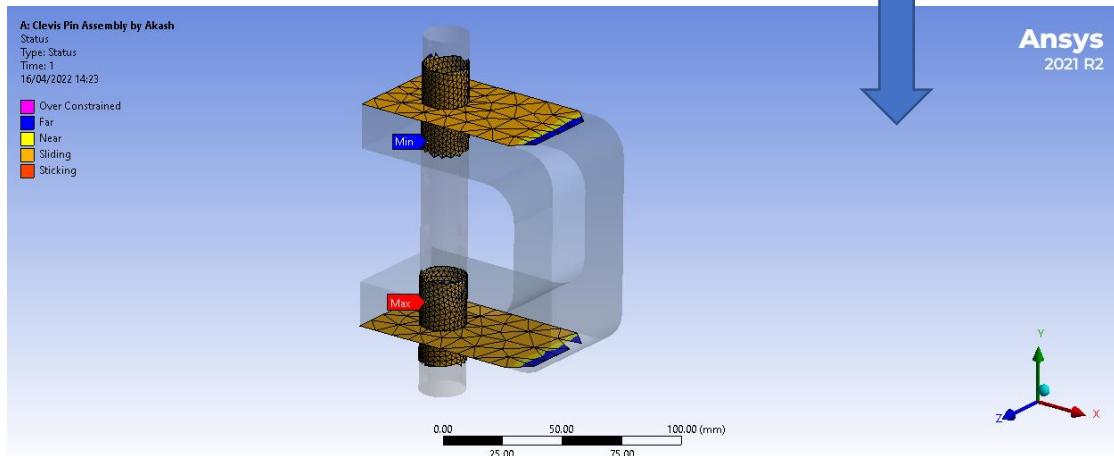
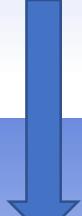
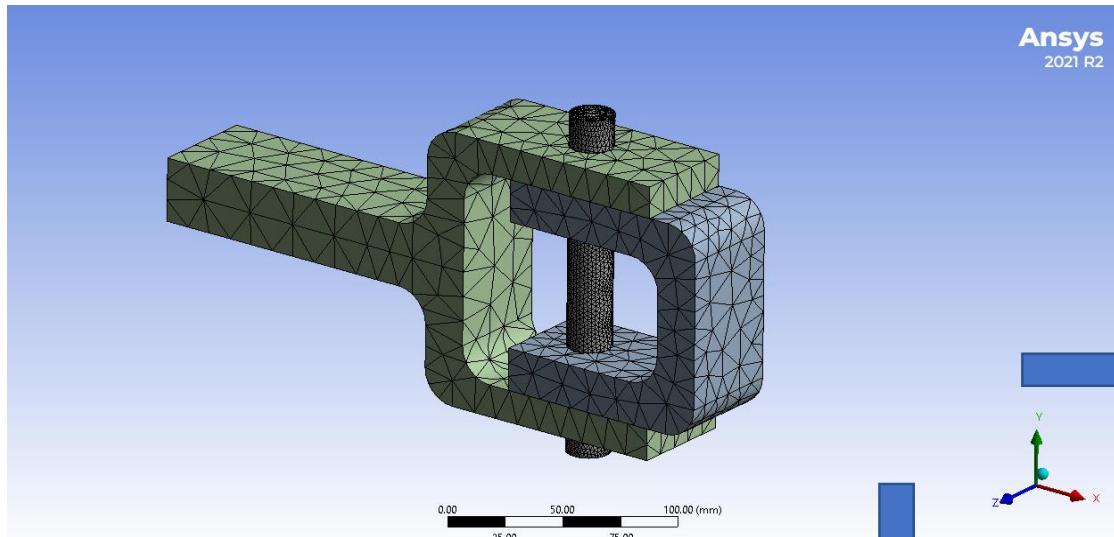


❖ Aim:

- ✓ Determine centrifugal, axial and internal stress generated in Fly wheel at speed of 100 rad/sec. Material of fly wheel SS316.
- ✓ Calculation of FOS and Weight reduction of flywheel.



Lifting Hook FEA Analysis (Bolt Pretension)

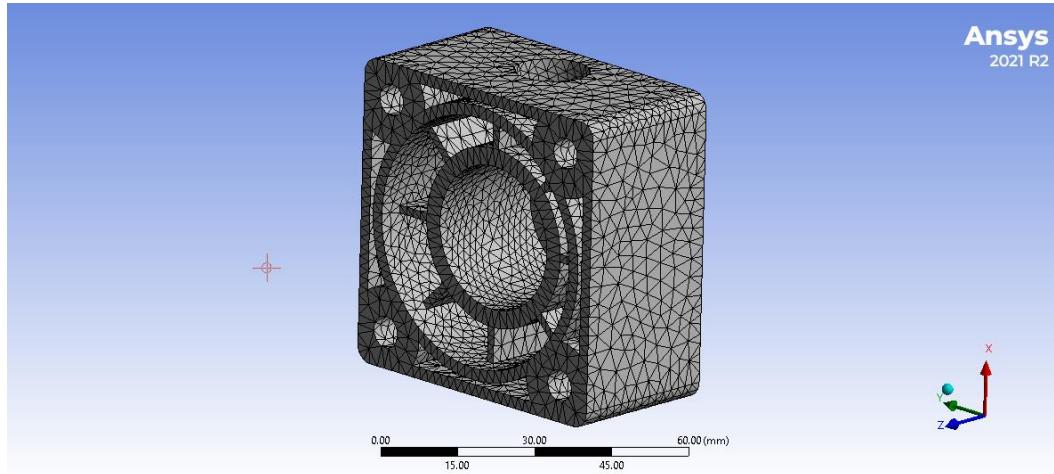


❖ Aim:

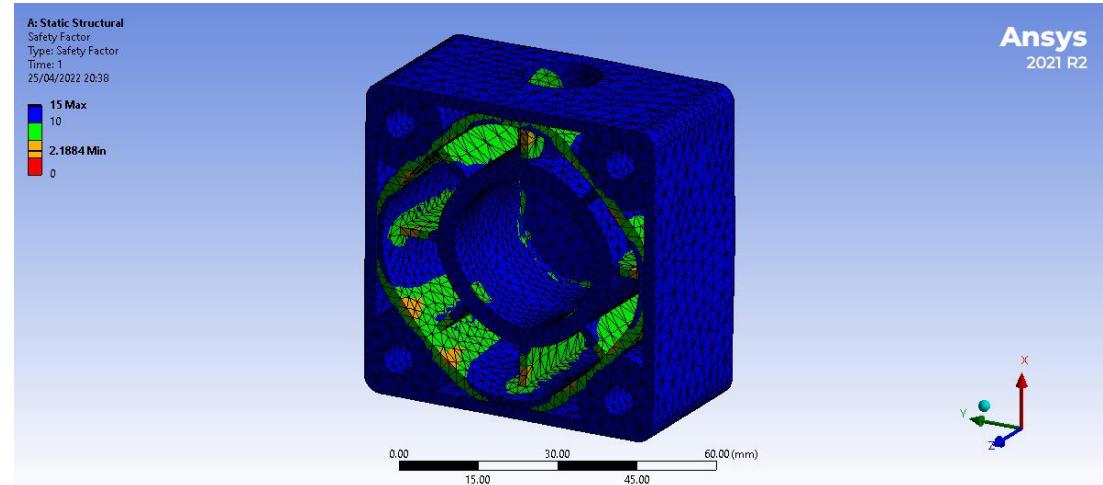
- ✓ Calculated stress and strain in clevis pin assembly by applying 10MPa force load.
- ✓ Calculated stress in contact surface.
- ✓ Assembly material structural steel.

Pneumatic Cylinder Cover

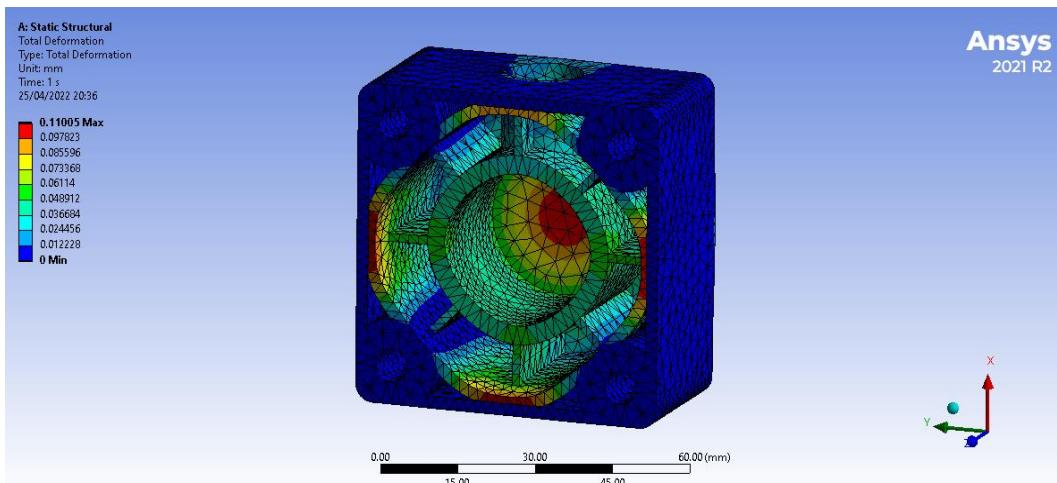
❖ Aim: Analysis of stress and strain with air Pressure at 0.5M Pa and Define Factor of safety of Cover



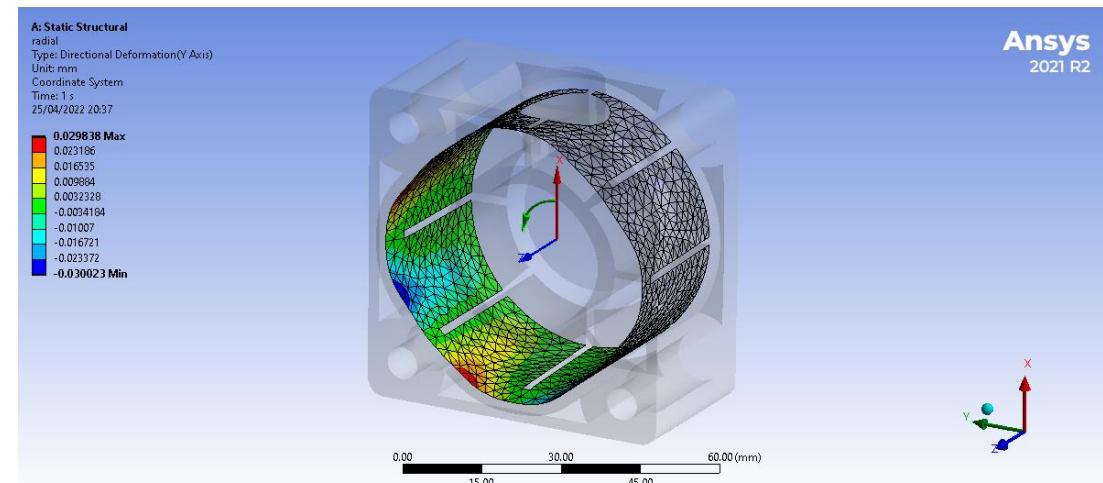
Meshering of pneumatic cylinder cover



Factor of safety calculation of pneumatic cylinder cover

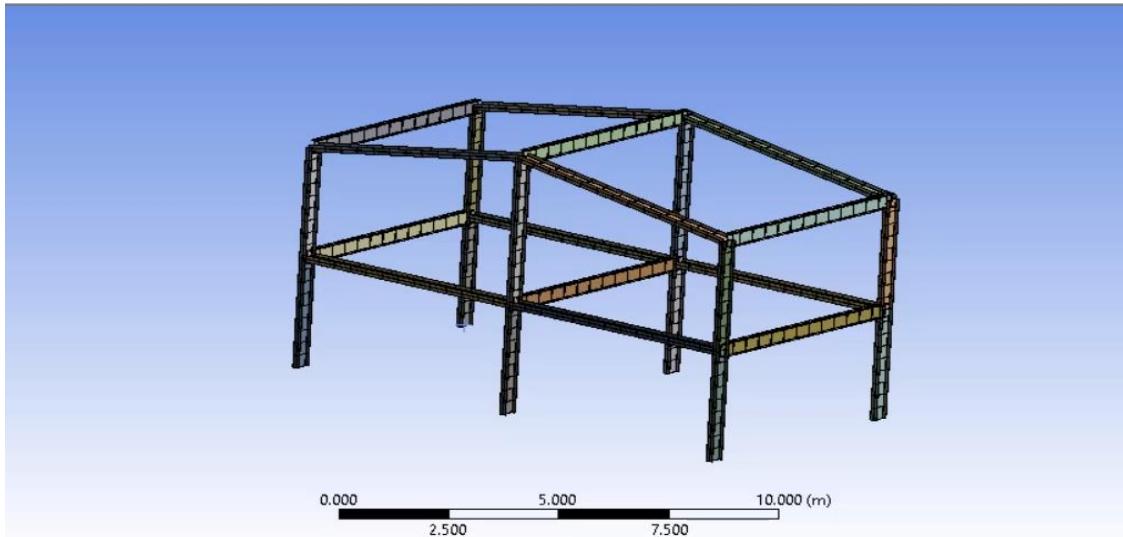


Total Deformation of pneumatic cylinder cover

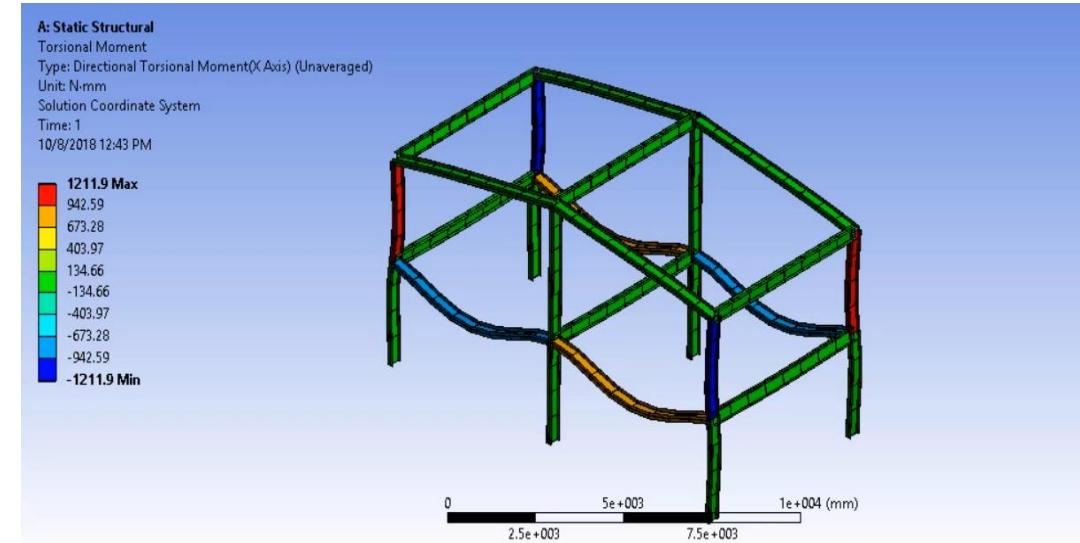


Directional Stress of pneumatic cylinder cover

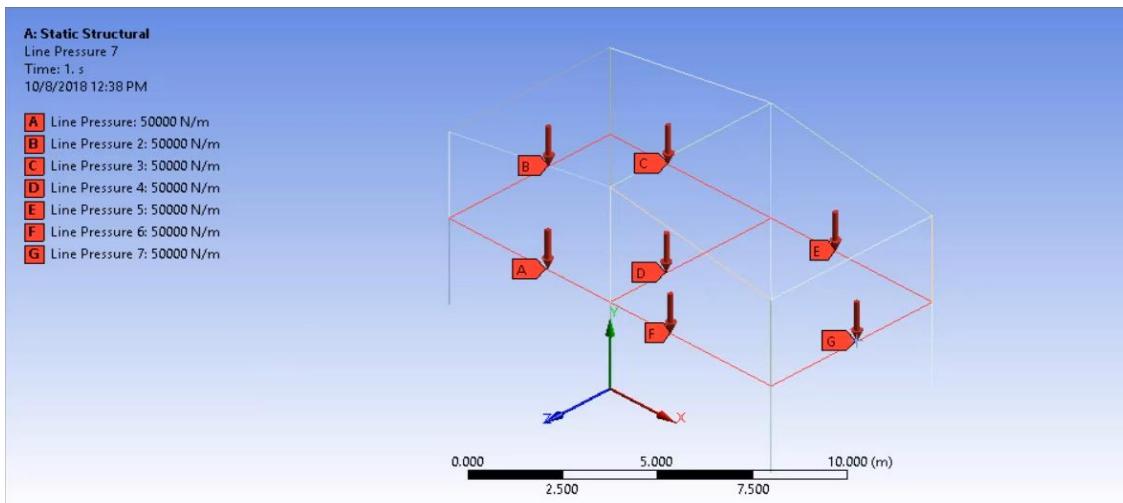
Structural Analysis



Meshing of SS I (356 x 171) Section Structure



Torsional Moment on Structure



Applying the Uniform load on each member

❖ Aim:

- ✓ Calculate Directional Torsional Moment by applying line pressure of 50kN/m on single story building.
- ✓ Define factor of safety of overall structure.

Thank you For Your Time

- Akash Suhagiya