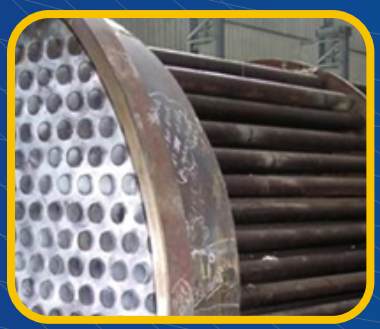
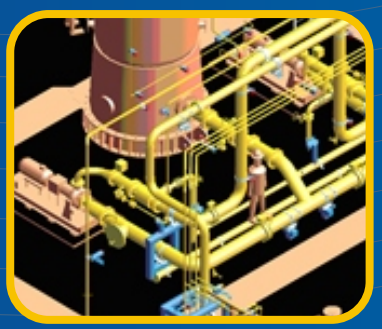
ISO 9001:2008 CERTIFIED
CAD/CAM/CAE/CFD

www.caetechnology.net

CAE TECHNOLOGY
TECHNICALLY PROFICIENT





INDIA USA GERMANY UK MALAYSIA

ABOUT CAE TECHNOLOGY

We are a new –age engineering services provider with a growing presence across diverse industries. We are one of the fastest growing organizations in the global engineering service industry.

Driven by the spirit of innovation and commitment to the values of quality, service and reliability, we offer services at competitive price using the latest technology.

We bring with our expertise, the best infrastructure, state-of-art facilities, and a talent pool that comprises of an interdisciplinary team of highly qualified and experienced engineers, scientists providing collaborative engineering, and R&D services.

CAE TECHNOLOGY INDIA PVT LTD performs finite element, a simulation technique which evaluates the behavior of components, equipment and structures for various loading conditions including applied forces, pressure and temperatures by using state of the art software's. CAE TECH has the expertise to perform finite element analysis for equipment and components used in refineries, chemical plants, power plants, nuclear plants and many others to list.CAE TECH can develop accurate finite element models of products from engineering drawings or from electronic design data-files.

FEA SERVICES TO COMPLY WITH THE FOLLOWING INTERNATIONAL STANDARDS:

- ASME Code Section VIII Division 1 : US Standard, widely used.
- ASME Code Section VIII 2 Alternative Rule
- ASME Code Section VIII Division 3 Alternative Rule for Construction of High Pressure Vessel
- ASME PVHO (Safety Standard for Pressure Vessels for Human Occupancy)
- BS 5500: Former British Standard replaced in the UK by EN 13445 but retained under the name
- PD 5500 for the design and construction of export equipment.
- BS 4994
- TEMA
- EN 13445: The current European standard, harmonized with the Pressure Equipment Directive.
- Stoomwezen
- AD Merkblatter: Germany Standard, harmonized with the Pressure Equipment Directive.
- CODAP
- AS 1210
- API 510(6)
- API-618 & API-661
- ISO 11439(7)
- IS 2825-1969(RE 1977)_code_unfired Pressure_Vessel
- FRP Tanks and Vessel
- WRCB-107 & WRCB-297
- EN 286 (Parts 1 to 4): European standard for simple pressure vessels,harmonized with Council Directive 87/44/EEC
- AIAA S-080-1998: AIAA Standard for Space Systems-Metallic Pressure Vessel, Pressurized
- Structures, and Pressure components
- AIAA S-08 IA-2006:AIAA Standard for Space Systems-Composite Overwrapped Pressure Vessels(COPVs)
- ASME/ANSI , B16.5 Pipe flanges & Flanged Fittings
- ASME B31.3 –Process Piping

CLIENT INDUSTRIES:

The client industries best served by CAE Technology are either those that order process equipments i.e. "End Users" or who does "Engineering consultancy" or "Manufacturers" of new pressure vessels and heat exchangers (including repairing of old vessels for restoration into service) that require approval and compliance to ASME Code, PD-5500, EN-13445, API, TEMA, IS, WRCB-107 & WRCB-297 and some other Codes and standards as desired by purchaser.

OUR CLIENT INDUSTRIES INCLUDE FOLLOWING AREAS :

- Vessels Fabrication Shops
- Process Plants, Power Generation Facilities
- Chemical, Petrochemical and Refinery Industries
- Oil and Gas Sectors, Offshore, Water Treatment Plant
- Pulp, Paper, Food and Textile Industries
- Engineering Consultants etc



PRESSURE VESSELS
DESIGN & ANALYSIS

The CAE Technology offers comprehensive professional engineering and consulting services for various types of pressure vessels. Design and analysis of pressure vessels are carried out using software like PV Elite, CAESAR and Nozzle PRO (FE Pipe Module) that are popular around the world. Pressure vessels are designed in accordance with international Codes and standards such as ASME Boiler and Pressure Vessel Code Section VIII Division 1 & 2, PD-5500, EN-13445, API-618, IS-2825, WRCB-107, WRCB-297, WRCB-368 etc. and some other Codes and standards as desired by purchaser. Rules from API-579 (Fitness for Service) are also used for evaluating the current state and remaining life of existing vessels

We are also reviewing pressure vessel designs for compliance with above Code requirements as well as Purchaser's requirements.

OUR ENGINEERING SERVICES INCLUDE DESIGN & ANALYSIS AND DESIGN REVIEW OF FOLLOWINGS

- Pressure Vessels (All Process Equpments)
- Reactors, Columns & Tall Towers
- Pulsation Dampeners & Volume Bottles
- Rectangular & Non Circular Vessel Analysis
- Jacketed Pressure Vessels
- Half Pipe Jacketed Vessels
- Limpet Coil Reactors
- Storage Pressure Vessels
- Receivers
- Pig Launchers
- Distillaton Equpments
- Knock Out Drums
- Vertical Vessels - Skirt / Legs Lugs / Pipe Supported
- Skirt BAse Ring
- Horizontal Vessels
- Saddle Supported Horizontal Vessel
- Horizontal Shipping of Vertical Vessels Etc.

VARIOUS DESIGN ANALYSIS CARRIED OUT APART FROM DESIGN COVERED IN CODE OF CONSTRUCTIONS:

- Finite Element Analysis
- Wind Analysis
- Seismic Analysis
- Local Load Analysis
- Zick Analysis
- Rigging Analysis
- Clip Analysis
- Lifting lug analysis

Desalination plant

Reactor Manufacture

LPG BULLETS FOR BPCL





HEAT EXCHANGERS
DESIGN & ANALYSIS

The CAE Technology offers comprehensive professional engineering and consulting services for shell and tube heat exchangers as well as air cooled heat exchangers. Heat exchangers design and analysis are performed using software like PV Elite, CAESAR and Nozzle PRO (FE Pipe Module) that are popular around the world. Heat exchangers are designed in accordance with international Codes and standards such as ASME Boiler and Pressure Vessel Code Section VIII Division 1 & 2, PD-5500, EN-13445, API-618, IS-2825, WRCB-107, WRCB-297, WRCB-368 etc. and some other Codes and standards as desired by purchaser.

Reviewing oh heat exchangers mechanical designs for compliance with above code as well as Purchaser's requirements is also carried out.

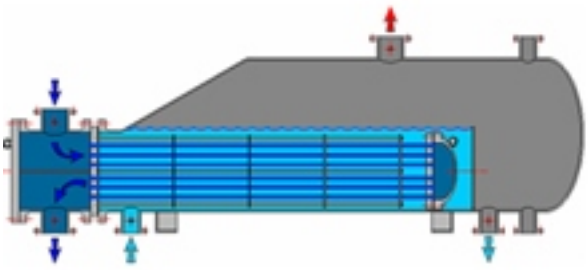
OUR ENGINEERING SERVICES INCLUDE DESIGN & ANALYSIS AND DESIGN REVIEW OF FOLLOWINGS

- Shell & Tube Type Heat Exchangers (All TEMA Types)
- Air Cooled Heat Exchangers
- Pre Cooler, Inter Cooler, After Cooler
- Gas, Water and Oil Coolers

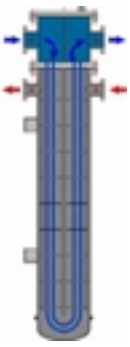
VARIOUS DESIGN ANALYSIS CARRIED OUT APART FROM DESIGN COVERED IN CODE OF CONSTRUCTIONS:

- Finite Element Analysis
- Wind Analysis
- Seismic Analysis
- Local Load Analysis
- Clip Analysis
- Lifting lug analysis

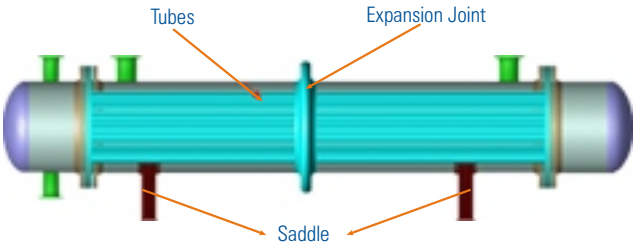
AKT TYPE HEAT EXCHANGER



Vertical Heat Exchanger

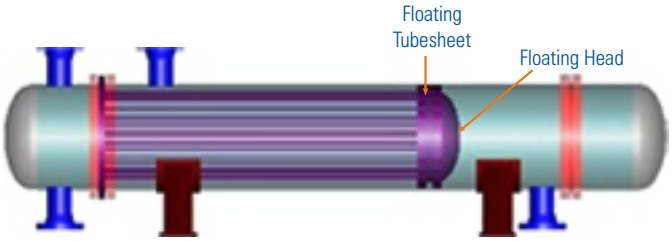


FIXED TUBESHEET HEAT EXCHANGER



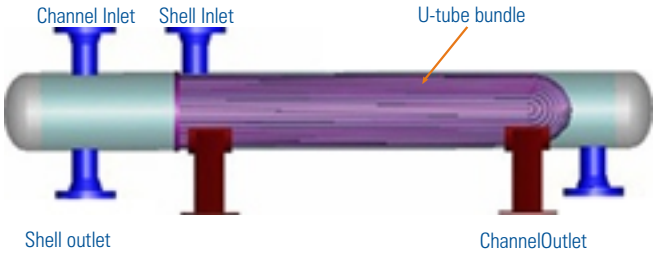
- Fixed Tubesheet design per ASME, PD5500 and TEMA codes.
- Plain Shell and Shell with Expansion joints or Bellows.
- Stress due to differential thermal expansion of tubes and shell is computed.
- Flanged and Flued (thick) Expansion Joint design per TEMA and ASME.

STATIONARY HEAT EXCHANGER WITH STATIONARY & FLOATING TUBESHEET

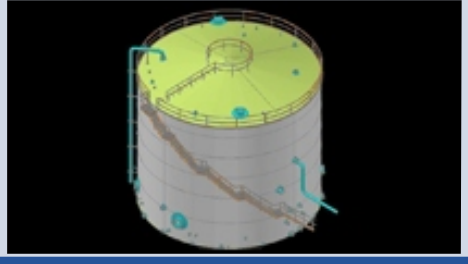


- Floating Exchangers design per ASME, PD5500 and TEMA codes. e.g.packed, sealed etc.
- Floating head covers design per ASME Pd5500.
- Stress due to differentialthermal expamsion of tubes and shell.

U TUBE HEAT EXCHANGER



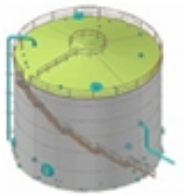
- "U" Tube Exchangers design ASME, PD5500 and TEMA code.


TANKS & CRYOGENICS

TANKS DESIGN

CAE Technology performs mechanical design of storage tanks. The design is carried out using API-650 Code. We have our own programs prepared for tank design calculations.


CRYOGENICS DESIGN

CAE Technology offers mechanical design and analysis of cryogenics equipments. The design is carried out in accordance with pressure vessel design codes such as ASME Boiler and Pressure Vessel Code Section VIII Division 1 & 2, PD-5500, EN-13445 etc. using software like PV Elite and Nozzle PRO (FE Pipe Module).

VARIOUS DESIGN ANALYSIS CARRIED OUT APART FROM DESIGN COVERED IN CODE OF CONSTRUCTIONS:

- Finite Element Analysis
- Wind Analysis
- Seismic Analysis
- Local Load Analysis
- Zick's Analysis
- Rigging Analysis
- Clip Analysis
- Lifting lug analysis


Cryogenic Pressure Vessel-1


Cryogenic Storage Tank


Cryogenic Pressure Vessel-2

STRUCTURAL

CAE Technology also carries out design and analysis of various structural items such as skids, supports of vessels / exchangers i.e. skirt with base chair, legs, lugs, pipe supports, saddles and their bolting etc. and lifting elements such as lifting lugs, trunnions, tailing lugs etc.

Finite Element Analysis of various types of clips attached to vessel shell or head is also performed.


Skirt Support with Base Chair

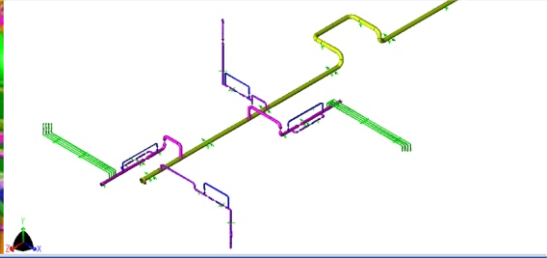

Pipe Support


Leg Support


Lug Support

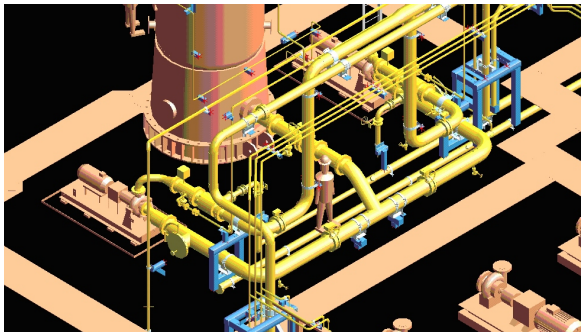

Saddle Support


Stacked Heat Exchanger



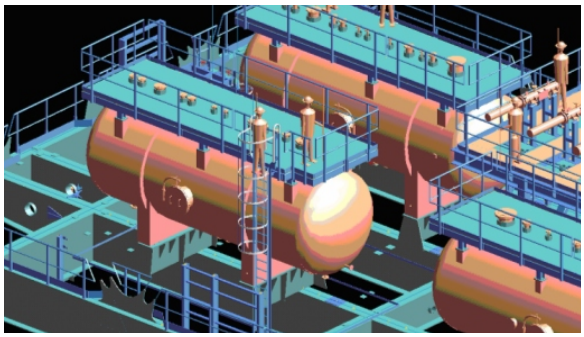
PIPING & PIPELINE DESIGN

GENERAL ACTIVITIES :



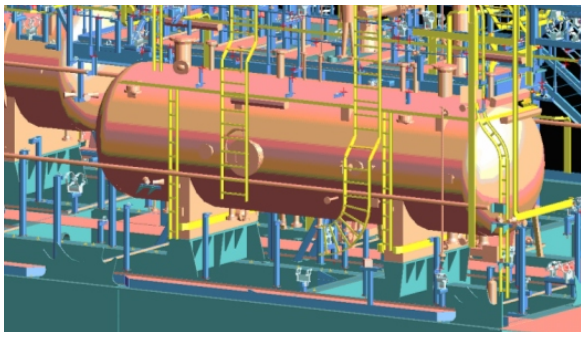
- Support Engineering Design
- Conceptual Pipe Routing.
- Piping Design Criteria Development.
- Piping Material Selection and Specification Preparation.
  - Pipes, Fittings, Flanges, Gaskets, Fasteners, Valves, Accessories, etc.
  - Material Selection.
  - Pipe Wall Thickness Calculation.
  - Pipe Branch Reinforcement Pad requirement & Thickness Calculation.
  - Branch Table.

LAYOUT ENGINEERING:



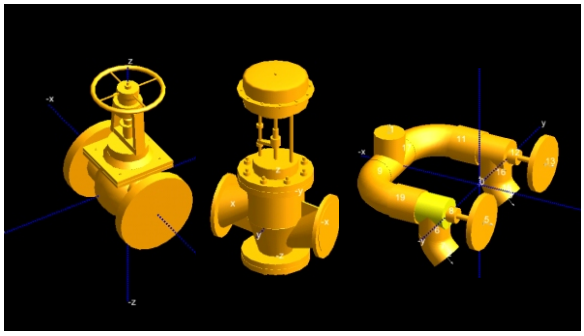
- Plot plan Development.
- Equipment Layout Plan & Sectional Elevation.
- Alignment Sheets for Cross Country Pipeline Projects.
- Piping General Arrangement (Plan & Sections).
- Layout Sheets for Cross Country Pipelines.
- Piping Fabrication Isometrics.
- Pipe Shop Fabrication Spools.
- Equipment Nozzle Orientation Plan.
- Review of P & Ids
- Review of Vendor Drawings/ Documents.

MATERIALS ENGINEERING: :

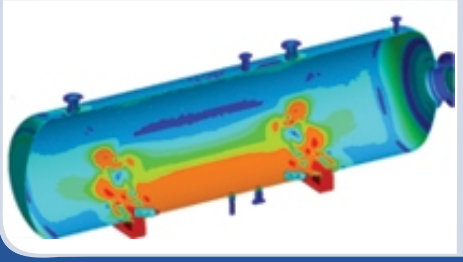
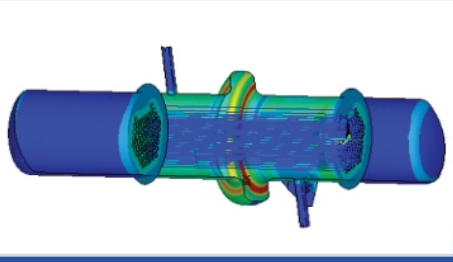


- Piping Items Procurement Specification.
- Insulation items Procurement Specification.
- Painting Specification.
- Piping Bill of Materials.
  - Preliminary Issue (Based on P & ID & Plot Plan).
  - Intermediate (Based on Piping Layout).
  - Final (Based on Piping Isometrics).
- Pipe Support Bill of Materials.
- Specialties B.O.M.
- Technical Bid Evaluation.

STRESS ANALYSIS (STATIC & DYNAMIC METHODS):



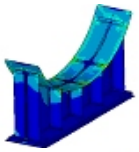
- Software being used: CAESAR II (Latest version)
- Above Ground Piping:
  - Bare
  - Insulated.
  - Internally Lined Piping (Example: Ceramic Lined Pulverized Coal Piping).
  - Jacketed.
- Buried: Bare / Insulated.

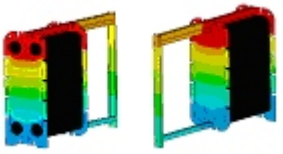

PRESSURE VESSEL DESIGN

CAE TECH performs finite element analysis, for various loading conditions including applied forces, pressures and temperatures by using state of the art software. CAE TECH has the expertise to perform finite element analysis for equipment and components used in refineries, chemical plants, power plants, nuclear plants and many others to list. CAE TECH can develop accurate finite element models of products from engineering drawings or from electronic design data-files.

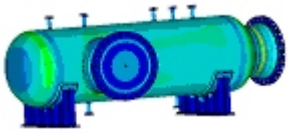
FEA problems are addressed for structural, thermal, and thermal stress evaluations and also can be used for a number of scenarios e.g. Design optimization, material weight minimization, shape optimization, code compliance etc. The design for various components is validated for compliance against the ASME, PED or other appropriate code. CAE TECH has the capability to solve both linear and non-linear problems and some of the expertises of CAE TECH in the area of finite element analysis are listed as follows:



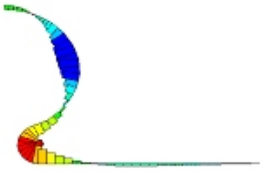
Structural analysis using Finite Element modeling for thin shells and shell structures (using shell elements where D/t ratios are relatively large) e.g. pressure vessels, tanks, saddles and associated nozzles etc and for solid structures (using brick and tetrahedral elements where D/t ratios are relatively small) such as tube sheets, flanges, turbine and compressor components etc. The loadings could include combinations of pressure, wind, seismic, externally applied concentrated and distributed loads.



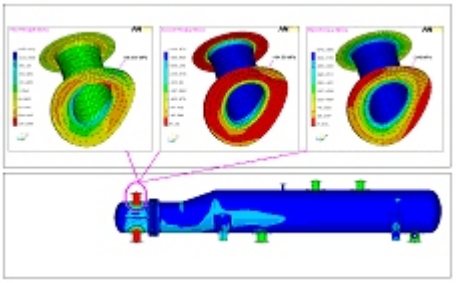
Thermal analysis such as steady state thermal analysis, transient thermal analysis and thermal stress analysis, using Finite Element modeling for thin shells and shell structures e.g. pressure vessels, tanks and associated nozzles etc and solid structures such as tube sheets, flanges, solid shafts, turbine and compressor components etc.



Coupled Field Analysis (Structural + Thermal) of pressure vessels, test separators, heat exchangers, condensers which are subjected to loads that includes combinations of pressure, temperature distribution, occasional loads (wind/seismic) externally applied concentrated and distributed loads. Finite element analysis of individual structural components of pressure vessels/heat exchangers such as shell cover, tubesheets, saddles, header box, obround flanges etc subjected to operating and occasional loading conditions.

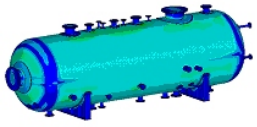


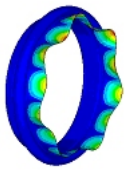
Axi-symmetric structural and thermal analysis of structural components of pressure vessels tubesheets, solid shafts and other symmetric components in which the geometry, loadings, boundary conditions and materials are symmetric with respect to an axis is analysed as an axisymmetric problem instead of as a three dimensional problem.



Fatigue analysis of the pressure vessels/heat exchangers. A fatigue evaluation shall be performed on the component which is subjected to pressure cycles, temperature cycles and startup / shutdown cycles. The evaluation for fatigue is made on the basis of the number of applied cycles of a stress or strain range at a point in the component to calculate the fatigue life of pressure vessels.

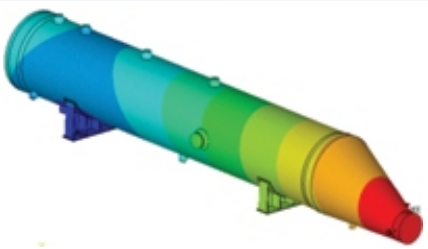
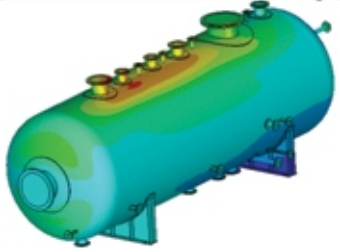
Non-linear structural analysis of the structural components incorporated with pressure vessels is performed for geometric nonlinearities and material nonlinearities. This includes Contact analysis incorporating gaps in the structures. The proceeding results from the elastic plastic stress analysis can be utilized to evaluate plastic collapse load that cause structural instability





Buckling analysis (non-linear buckling analysis and eigenvalue buckling analysis) for the structural components of the pressure vessels using design-by-analysis rules and the applied loads result in a compressive stress field and thus calculate the buckling factor and to make sure that structure / mechanical component will not buckle for the given design loading.

CAE TECH has strongly supported design and manufacturing industries, in the development of structures and manufactured products through analysis of very complex designs ranging from very small products to very large products, subjected to all forms of operating conditions ranging from normal to severe operating conditions. We can collaborate with Engineering Departments on a long-term or periodic basis as required to evaluate products, structural designs, and manufacturing equipments.

CASE STUDIES

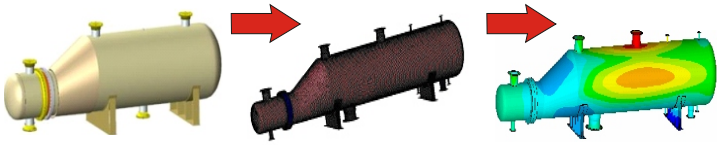
COUPLE FIELD ANALYSIS:

Modeling and Finite element analysis of heat exchanger according to ASME.

MAWP Pressure, Temperature, operating load seismic load, insulation, nozzle loads all corrode condition were applied. The Operation loads were calculated from the fluid capacity, density with the vessel weight. Finite element method (FEM) was used to compute the temperature and the stress fields according to ASME Code.

Result: The Vessel was declared safe under given conditions and suggestions were given to reduce the manufacturing cost by providing optimum thickness of saddle and other parts without affecting the performance and safety criteria.

CAD MODEL MESH STRESS INTENSITY



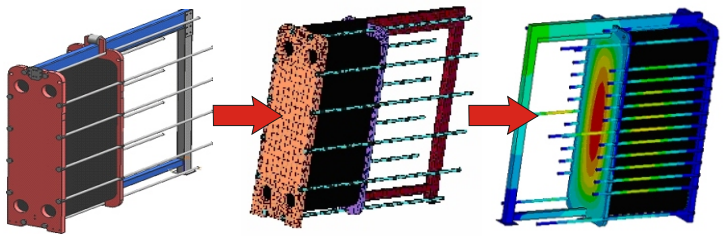
ANALYSIS OF PLATE HEAT EXCHANGER:

The work involved Modeling and analysis of Plate heat exchanger according to ASME Code.

Stress analysis, Fatigue calculation and optimization of Plate heat exchanger according to ASM code.

Result: Optimum thickness for header and follower was obtained reducing the manufacturing cost of the heat exchanger.

CAD MODEL MESH STRESS INTENSITY



ANALYSIS OF HEAT EXCHANGER:

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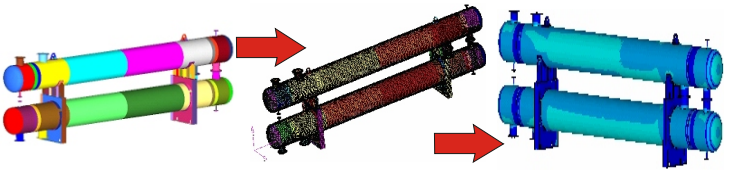
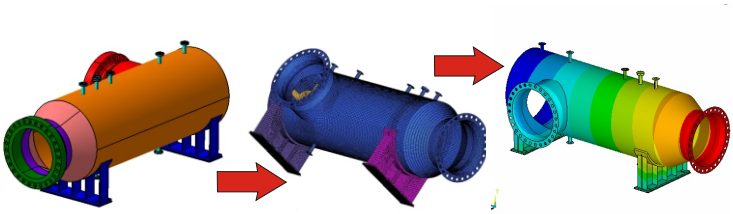


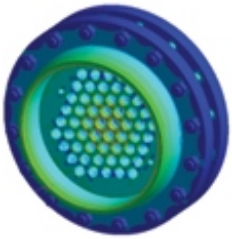
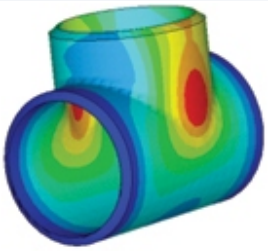
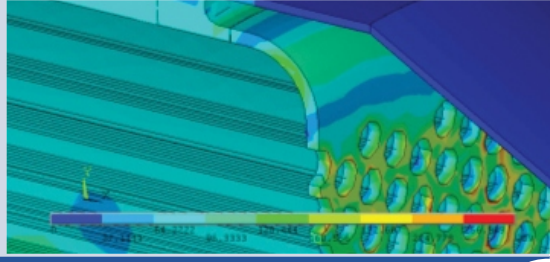
FE ANALYSIS OF HORIZONTAL DRY GAS FILTER:

The scope of the project is to convert the drawings from 2D to 3D model and conduct a stress analysis (FEA) on Horizontal Dry Gas Filter in according with part-5 of ASME BPV Sec Div-2, Ed 2007+Add2008a with wind and seismic loads specified.

Result: The stresses developed due to the loads on the saddles and nozzles are within the allowable stress limit. The maximum stresses are observed in the weld junction rib ad wear plates and were within the allowable stress values.

CAD MODEL MESH STRESS INTENSITY



CASE STUDIES

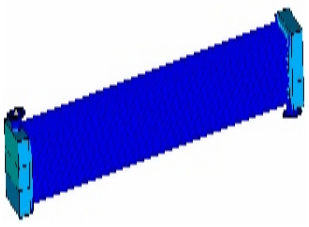
ANALYSIS OF AIR COOLED HEAT EXCHANGER:

Modeling and finite analysis of Air cooled heat exchanger according to ASME code.

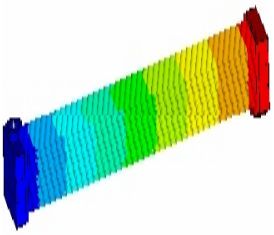
Temperature distribution, heat flux, thermal gradient and heat flow according to ASME code of Air cooled heat exchanger.

Result: The Mechanical-Thermal analysis was well executed and the heat exchanger was declared safe under the given loading conditions.

VON-MISES STRESS



DISPLACEMENT



FE ANALYSIS OF NOZZLE:

Modeling and analysis of over Nozzle assembly was performed for the estimation stress displacement according to ASME Code

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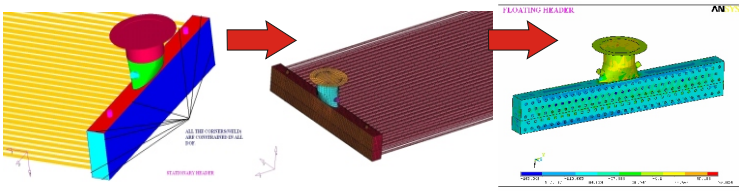
Result: The provided thickness of the material was not satisfying the reinforcement requirement, we had suggested the optimum thickness.

CAD MODEL MESH STRESS INTENSITY

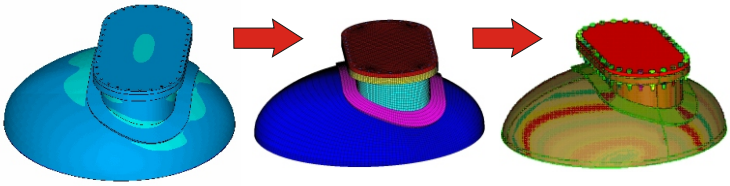


FE ANALYSIS OF OBROUND FLANGE:

Couple field analysis was performed on the Obround flange to find out the stresses developed in the critical region.

Result: Obround was declared safe under the given loading conditions and further optimization analysis was carried out to reduce the thickness

CAD MODEL MESH STRESS INTENSITY

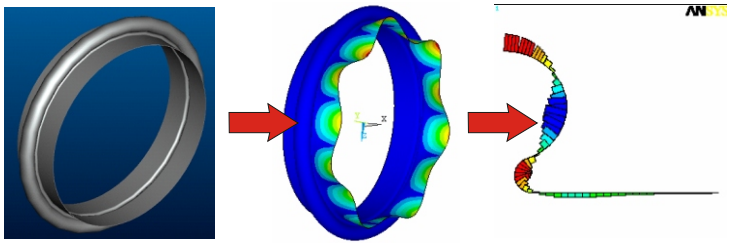


AXISYMMETRIC ANALYSIS OF TOROIDAL BELLOW:

Structural Analysis, Buckling Analysis, spring rate Analysis was performed on the bellow resulting in Critical Load Factor and Spring Rate.

Result: Bellow was declared safe under the given loading conditions and maximum displacement of bellow along with Critical load was found.

CAD MODEL MESH STRESS INTENSITY



FE ANALYSIS OF BOLTED FLANGE:

The scope of the project is finite element analysis on bolted flange of Horizontal Dry Gs Filter to predict levels of stress and deflection of flanged joint when the stud bolts are tightened and flange pressurized in accordance with ASME BPV Sec VIII Div-2,Ed 2007+Add2008a

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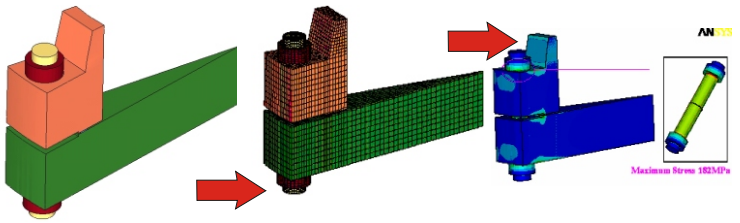
Result: The FE analysis shows that the joint is hard joint (a low stiffness bolt with a high stiffness joint and the flange was safe under the gasket seating and operating conditions.

CAD MODEL MESH STRESS INTENSITY



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