PRE-QUALIFICATION DOCUMENT

AAPL CONSULTING ENGINEERS LLC

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Year - March 18

Contents

1. General Introduction

1.1 About AAPL Consulting Engineers LLC(AAPL)

AAPL is a limited liability company incepted under the Free Zone Category and Provisions of UAE government registered with Sharjah Media City. The governing principle of AAPL is to assist and accentuate the growth and development of Industries and companies thereby facilitating further boost in economy of the region.

AAPL is formed for liberalizing knowledge sharing and helping industries to avoid or overcome bottlenecks so that they deliver quality engineering products and services. AAPL plan to provide customized software solutions to industries which will foster their services and products towards excellence. Our plan for cost effective software solutions extends from plant management, plant maintenance, product life cycle management etc. to tools like product failure assessment which are so designed to stabilize engineering system for better results.

AAPL realizes the fact that grass root problems, when un-attended tends an entire industry to issues of non-quality compliance, non-timely performance. Hence, we foresee our role as advisors and facilitators committed to engineer problems with effectiveness and perfection. We are committed to provide crystal clear, easy to understand and adaptable solutions which results in short as well as long term benefits to our clients.

AAPL is designed to be a socio-economic entity in the sphere of education which envisages budding engineers to realize their potential and walk that extra mile to achieve what is best for organization and country. AAPL want to usher the notion of revolutionizing education sector and gain self-independence through knowledge emancipation especially in EPC. AAPL is formed with a promise to help and streamline engineering systems for all round growth and prosperity of the region, thus year marking an era of self-reliance and collaborative progress.
AAPL has been involved since its inception from 2008 till date in detailed Engineering and contracting support in the field of Nuclear, Infrastructure, Oil and Gas, Aerospace and General Engineering. AAPL has its presence in UAE, KSA and India.

1.2 Industry Areas/Sectors

AAPL's engineering services due to its dedicated effort and innovative approach has achieved to serve in the wide spectrum of industries such as,

- Oil & Gas (Onshore and Offshore)
- Nuclear
- Rotating equipment manufacturing
- General engineering and Manufacturing
- Desalination & Industrial
- Infrastructure and MEP
- Aerospace & Automotive

Further information can be found at our corporate website: www.aaplconsultants.com

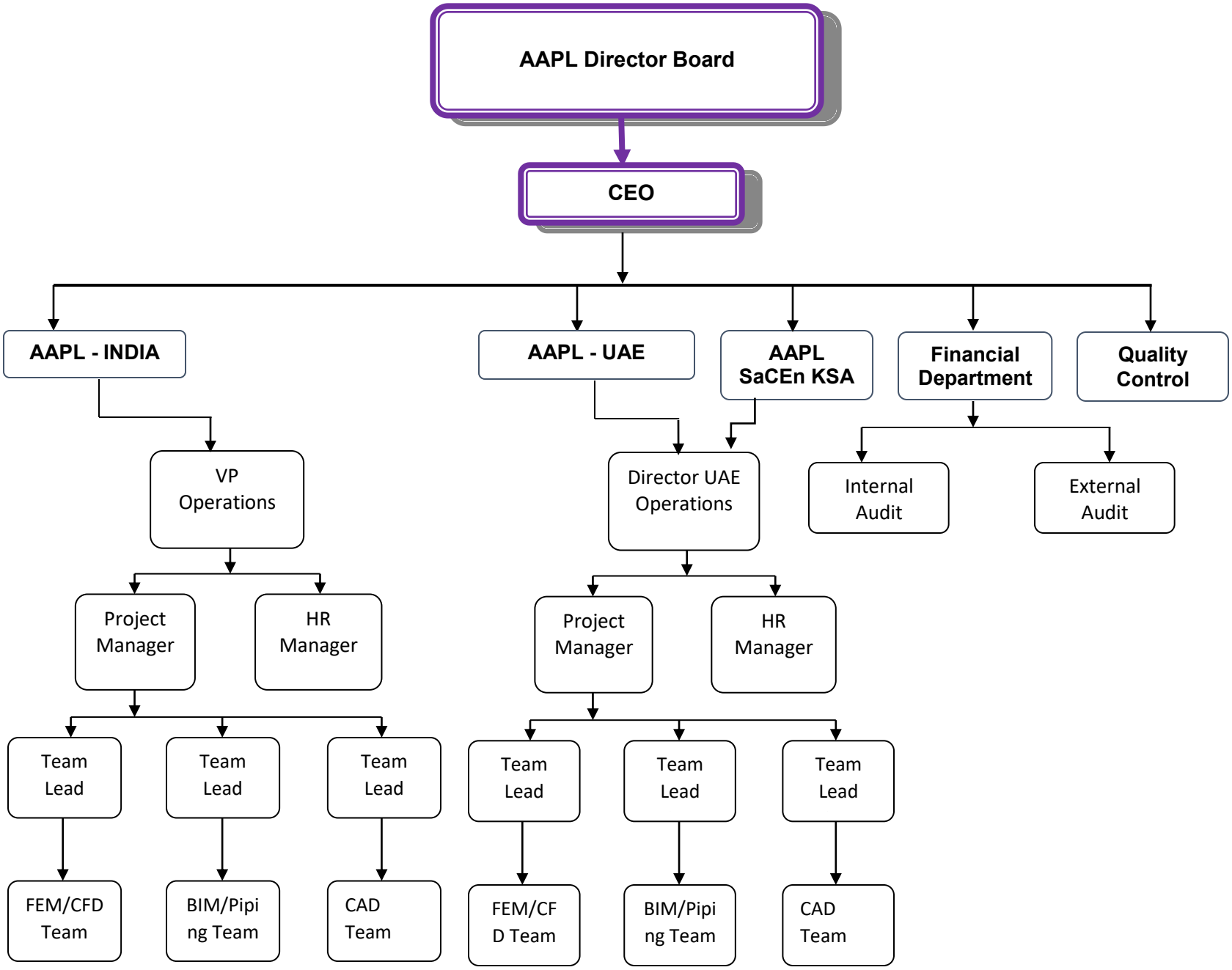
1.3 Quality Assurance

AAPL being a Consulting Engineering Company in several engineering disciplines particularly in process equipment engineering with a commitment to delivering the highest standards of quality, safety and responsiveness in process equipment engineering and services provided to customers.

AAPL Policy is communicated to customers, employees, vendors and partners striving to meet all expectations. AAPL team actively promotes this policy across all levels of Company employees and encourages them to embrace quality as their personal commitment.

AAPL team shall consistently strive to improve Company quality through learning, sharing, benchmarking, innovation and participation in continuous improvement programs. AAPL Quality Policy shall provide the framework for driving quality programs to inspire a quality culture of excellence, innovation and continuous improvement. We shall establish and maintain appropriate controls and conduct periodic reviews to meet our quality targets.

1.4 Organizational Chart



1.5 TEAM AAPL

Team AAPL is specialized in the domain of Analytical design coupled with high end engineering validation tools to generate optimized and error free designs for manufacturing. Our team comprises of engineers and researchers with master's and PHD with an average experience of 20+ years. The team structure is a blend of technical experts and tool proficient engineers who are experienced to deliver the best, cost effective solutions. The project Leads, and Managers are consultants in respective domain holding membership of renowned Society and Institutions such as ASME, ISHRAE, ASHRAE, AeSI etc.

The Project Manager is responsible for scoping, planning, and delivering a project, supported by team of engineers. The structure and composition of the team tends to change through the duration of the project; some team members might have a very brief involvement, bringing specialist knowledge or supplying specialist components during a phase, whilst others, such as the core members, project manager or lead consultants may be involved for many years.

The Project Team is responsible for translating the client's / owner's vision into an executed design, maximizing the outcome and minimizing risk. The Team Lead directs this process of organizing the design staff and sub-consultants, defining roles and responsibilities for each team member using Project Management Plans, Commissioning Plans, and Scopes of Work. The Team Lead promotes effective communications between all team members, holding coordination meetings throughout the design process and is responsible for ensuring that all information in the project as designed is complete and correct towards meeting the owner's goals.

AAPL Team with a strong passion to work and engage is organized and results-focused, comfortable working at both the strategic and operational levels, holds high standards of work quality. With our combination of industry-leading tools and engineers, we can provide you with the right engineering approach to determine the best solutions, given your real-world engineering requirements and constraints. Our simulation services help clients identify problems before market introduction through uncovering insight and highlighting opportunities for design optimization, thereby reducing risks and avoiding costly warranty problems.

1.6 Membership, Registrations and Licensing details

- Registered as Pvt. Ltd. Company- Company Act Government of India
- Registered as Limited Liability Company SHAMS Sharjah UAE
- Registered Member Indian Chamber of Commerce and Industry
- Registered Member SME through confederation of Indian Industry
- Registered Member Indian Saudi Business Network Association
- Registered Vendor for Saudi Petrochemical Industry
- Registered Vendor for Saudi Basic Industries Corporation (SABIC)
- Registered Vendor for Saudi Aramco
- License partner with Dassault for CATIA v5 R22
- License partner with PTC for CREO-2
- License partner with ANSYS India for ANSYS FEA & CFD tool
- License Partner Intergraph PV Elite and CAESAR 11
- License Partner Autodesk Building Design Suite_MEP Revit

1.7 Codes and Standards

Due to our international exposure, we are converse with local, regional and international codes& standards as well as corporate fire safety philosophies and requirements.

- ASME Section 8 Div 1 & 2 - BPVC
- ASME B31.1 & 31.3 - Process & Power Piping
- ASME B31.8 - Buried Piping
- ASME Section 3 Subsection NCA Div 1 & 2
- ASME B36.10 and B16.5/16.47/16.9
- API 650, 653,674 & 618
- ASCE 7-05, AISC
- AWS Standards
- ISHRAE / ASHRAE
- SAES – Saudi Aramco
- SAMSS – Saudi Aramco

2. AAPL Service Spectrum

AAPL offers through a multidisciplinary approach a full spectrum of design capabilities and enables efficient collaboration through the design community to encourage innovation across the extended enterprise. We focus on the collaborative definition of a product across its different views from requirements, to conception, to production up to operation. The service spectrum is as detailed subsequently,

2.1 AAPL-CAD- Computer Aided Design Services

AAPL- CAD uses RFLP approach (Requirements, Functional, Logical and Physical Design) upholds a full traceability during product development and product introduction. This helps shortening the gap between requirements analysis and the choice of the right solution.

CAD stimulates creative and inventive solutions to problems through imaginative engineering coupled with feasibility study of each element necessary for successful design. We have a Customer Centre Process, where the need of the customer is engineered towards developing an innovative solution. The exact objective of design is identified, followed with Conceptual Design & Design Modelling carried out with the Right Design Intend.

The technicalities of design are validated & optimised through FEA & CFD, there-by an effective & accurate solution is derived towards the physical problem.

Cross domain services:

- **Preliminary Design (Aero-Mechanical)** - Conceptual planning, Concept design & Feasibility study
- **Product Design (Aero-Mechanical)** - Concept modelling & Detailed Design for problem solving
- **Civil Structure Design & Detailing** – RCC, Footing design, pipe supports & other civil supports
- **Embodiment Engineering** - Product Teardown, Virtual, Validation & Design Simulation GD & T
- **Design to Reality** - Methods Engineering, GA drawings, Schedule of quantities (BOM), Model Migration
- **Reverse engineering**- Experimentation of actual performance followed with Re-Design, Design Validation & Optimization with CAE & CFD
- **Re-Design** - Design corrections & rectifications/recommendations for repairs, alterations or Re-rating of existing vessels/equipment for a new set of design parameters with improvised performance.

- **Design Life Cycle** - Evaluate Fitness-for-service for process equipment to ensure the structural integrity **for** the intended design parameters and product Life Cycle.

AAPL CAD combines product design with DFM, DFA, VA & DOE towards developing a robust design. The concepts of concurrent engineering and embodiment engineering are applied not only while refining the product vision into technical specification but throughout the journey from Designers Desk to Physical Existence of design.

2.1.1. Verticals: CAD

- **Industrial, Civil & Process Equipment Design**
  - Design of Pressure vessels, Storage tanks & Mixing chambers
  - Boiler Design - Heating boilers, Power Boilers, Splitter re boilers HRSG etc.
  - Design of Heat exchangers, Flow tubes, Channels, Baffles, channel fixed & floating heads, valves, orifices etc.
  - Design of Piping Skids, 3d Modelling, Analysis, Support design & Steel Detailing
  - Burn Pit engineering
  - RCC Foundation design
- **Aero-Mechanical System Design**
  - Rotary mechanics Design of Industrial Gas Turbine, Axial and centrifugal flow compressors and fans, Inlet & exit Ducts, Nozzles & Diffusers,
  - Wind turbine blades and mechanism. Design & Trouble shooting of centrifugal, axial and mixed flow pumps and drive systems including electric motors, gear-drives, clutches, drive shafts, and bearings, seal chambers & bearing housings.
  - Design of Heavy lifting equipment, spreader bars, crane hooks & sling mechanisms. Calculation of hydraulic thrust loads, Shaft stress, deflection and bearing life.
  - Tool Design - Component Design & Detailing, Generation of As-Build drawing & Reverse Engineering
  - Design of bolted, riveted and welded joints
  - Design of structural systems - roof trusses, gantry girders etc.

2.2. AAPL-FEA- Finite Element Analysis

AAPL FEA solutions provide the ability to simulate every structural aspect of a product, including linear/nonlinear, static/dynamic, steady/transient Structural & Thermal analyses to evaluate the stresses or deformations, modal analysis that determines vibration characteristics.

The fidelity of the results is achieved through the wide variety of material models available, the quality of the elements library, the robustness of the solution algorithms and the ability to model every product from single parts to very complex assemblies with hundreds of components interacting through contacts or relative motions which is all incorporated in the superior CAE Tools used by us.

FEA Service incorporate extensive dynamic solution capabilities, including modal analysis for calculating natural frequencies and mode shapes, harmonic analysis for determining harmonically time-varying load response, linear and nonlinear transient dynamic analysis, and spectrum analysis for random vibrations model of any geometry, from slender and thin structures to massive parts, using the latest generations finite elements formulations. Nonlinear geometric effects assist in performing large deformations or nonlinear stability analyses.

Analysis Capabilities: Structural, Thermal, Vibration & Coupled Analysis

- FEM - Stress Analysis, Vibration Analysis & Failure (Fatigue) Analysis.
- Thermal stress evaluation of Boilers, Heat exchangers, Fired heaters & equipment
- Thermal Validation of Burn Pits
- Explicit dynamics & Seismic/wind load analysis
- Fracture Mechanics - crack propagation study
- Rotating Equipment Engineering – Turbo machinery
- Static & Dynamic, Steady & Transient: Structural-Thermal-Vibration Coupled Analysis
- Fatigue & Creep, Buckling & large deformation
- Modal, Spectrum, Harmonic & Random vibration
- Conduction, Convection & Radiation Analysis
- Pulsation Study & Analysis

2.3. AAPL-CFD- Computational Fluid Dynamic Solutions

AAPL Fluid dynamics solutions are a comprehensive Engineering Simulation suite for modelling fluid flow and related physical phenomena. The solution offers unparalleled fluid flow analysis, providing all the Knowledge needed to design and optimize new equipment and to troubleshoot already existing installations.

AAPL CFD fluid dynamics suite contains both general purpose computational fluid dynamics analysis and additional specialized analysis to address specific industry applications. The V Flow Solutions from AAPL have a high degree of interoperability, and are assessed to be fitted efficiently in a company's Simulation Driven Product Development processes

CFD - Domains:

- CFD Applications to Process Equipment-Boilers, Fired Heaters & Heat Exchangers
- CFD Applications to Process Piping
- CHT for Thermal Mapping – Process & Vacuum Equipment
- CHT – Radiation Heating
- CFD Applications to Chimneys and Silos & ducts Refractory's Layered Equipment.
- CFD Applications for HVAC & Clean Air Room
- CFD Applications to Wind Engineering
- CFD Applications to Aerospace & Automobile – Aerodynamic Design
- CFD Applications to Turbo machinery – Axial and Centrifugal flow devices

2.4. AAPL PEngg- Plant Engineering Solutions

AAPL PEngg which is essentially Plant Engineering Provides Design and engineering of efficient plants and systems involve effective planning, visualization and collaboration. AAPL offers cross-industry expertise, state-of-the-art 3D plant design and lifecycle management solutions. This service segment offers services from plant layouts to equipment design and piping.

AAPL PEngg gives the power to tackle the most challenging and complex projects with greater ease and with superior results that were never achievable. Our plant design and analysis solutions are at par with ASME Codes, extremely scalable, and reliable to go with. The comprehensive series of design tools adopted by team AAPL includes structural steel, equipment, process and instrument diagrams and design review plus automatic isometrics and bills of material.

AAPL PEngg provides engineers, designers, estimators, fabricators and inspectors around the world with solutions that match their equipment design needs. The service is a complete solution for the quick and intuitive design of new pressure vessels Boilers, Heaters, Heat Exchangers we also evaluate and re-rates existing vessels, including Fitness for Service analysis.

PEngg Service features:

- Plant Engineering, Plant Layout Design & Pipe Routing
- Pipe Isometric Drawing & Pipe support Stress analysis
- Design of Piping Skids, 3d Modelling, Analysis, Support design & Steel Detailing
- Pressure Vessel design based on ASME Code using PV Elite
- Vacuum Vessel design based on ASME Code using PV Elite
- Heat Exchanger Design using PV Elite
- Efficient Plant Design.
- Structural Steel and Equipment
- Ducting and Cable Trays, Change Size and Spec
- Automatic Isometrics, Collision Checking
- Model and P&ID Synchronization
- Walkthrough Capabilities
- Error Checking and Reports

2.5. AAPL MEP- Mechanical Electrical & Plumbing

AAPL MEP offers energy conservation-oriented solutions for MEP that duly comply with ASHRAE, NBC, ECBC, NFPA, IPC and similar international standards. Our MEP design is further optimized with 2d & 3d flow simulations & equipment matching using advanced CFD tools.

AAPL MEP intends to provide an error free, energy optimized, cost optimized and efficient design consulting service where the customer can visualize the simulation and be aware of the actual situation. We also intend to provide Life Cycle Cost Calculation (LCC) of the system, Zone wise Indoor Air Quality (IAQ) and Comfort monitoring

AAPL Functional Methodology for MEP Design is built on three stages, Pre-Design Stage, Design Stage & Display/Exhibition Stage.

- **Pre-Design Stage -** This includes the preliminary project study and evaluation by conducting site survey, input document study & basic data fixation.
- **Design Stage** - This begins with Load calculations, followed by preparation of DBR suggesting feasible schemes along with load summary, unit configuration, estimated cost and relative merits. Multiple client review/discussion is carried out onto equipment finalization along with application of energy management systems and design optimization for cost/energy through CFD of critical areas.
- **Display /Exhibition Stage** - This includes detailed technical report generation, GFC-CAD drawings/As built drawing preparation, quality inspection report and testing the system to verify achievement of core design objectives like Comfort, Power saving, Capacity optimization etc.

Application Areas

- Architectural, Schools & Hospitals
- Chemical, Pharmaceuticals – Clean Air Room
- Equipment Engineering
- Food Industry
- Offshore & Petrochemical
- Piping, Power, Process and Plant Design
- Steelwork
- Water Treatment

AAPL MEP initiates its service with effective design for clean air concepts, Renewable energy techniques, power saving and eco-friendly techniques using VRF/VRV systems, solar power utilization in HVAC operation.

HVAC Design Outputs:

- Detailed Material Specification Report(MSR)
- Heat/Cooling Load Calculation Report (HLR)
- Conceptual single line drafting (CAD-1)
- Design Optimization Report (DOR) for critical area ducting-CFD based
- CFD Flow Simulation Report(FSR) for critical rooms
- Energy management conceptual study and Feasibility Report (EFR)
- MEP Shop drawing layout(CAD-2)

- Detailed bill of Quantities(BOQ)
- Periodic Quality Inspection, Testing & Commissioning Report (QTR)

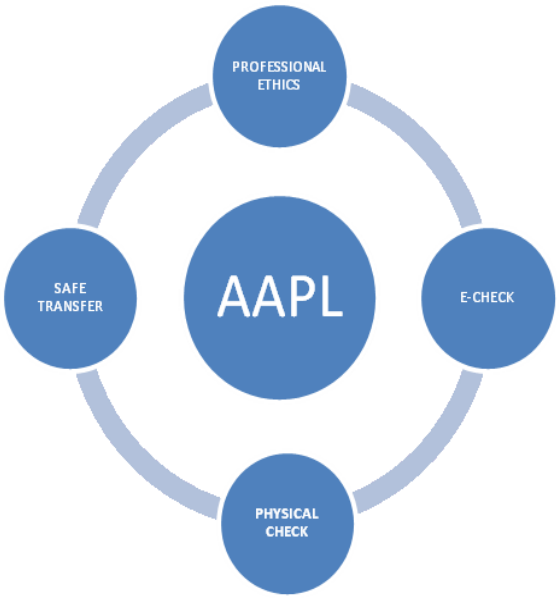
3. AAPL Infrastructure

3.1 Software Licenses and workstations

- CAD Platform:
  - ✓ AutoCAD (2013)
  - ✓ Creo parametric-(Pro E) -(ENG3607-F)
  - ✓ CATIA V5 Mechanical Design
  - ✓ CATIA V5 Advanced Surface Design HD2
- Equipment Design & Simulation
  - ✓ FRNC 5 PC - For fired heater simulation
  - ✓ HTRI - For heat exchanger simulation
  - ✓ PV Elite – Pressure vessel & Heat exchanger design
- FEM Platform:
  - ✓ ANSYS 16 - Mechanical/Civil/Offshore Platforms
  - ✓ ANSYS 12- Mechanical/Civil/Offshore Platforms
- CFD Platform:
  - ✓ ANSYS 16 ICEM/WB
  - ✓ ANSYS 16 CFX/FLUENT
- HVAC/MEP:
  - ✓ AutoCAD
  - ✓ Autodesk Revit MEP
- Piping Engineering:
  - ✓ CAESAR 2
- Office and Management Platform
  - ✓ MS Project, MS Office
  - ✓ Online In-house Management System

3.2 Data Management & Security System

- Design Lab is identified as a high security zone with limited personal access.
- All output ports remain deactivated. Downloading & Uploading of data is restricted only for admin login.
- Admin login is accessed through server which is protected by highly confidential passwords. Unauthorized attempt to login deactivates the system.
- PCs are anti-virus & firewall enabled to restrict proxy usage and internet usage is restricted to employees
- Mails are checked at frequent intervals by specific team.
- No movement of mass storage device or data prints is permitted in & out of the company.
- System level weekly backup and customized data backup is carried out periodically with copies maintained at remote location.



Sl No	Hardware's	BLR	Description
1	Desktop	40	i3 with 8GB RAM
2	Workstations	6	i7 with 64 GB RAM
3	Network Server	3	
4	Software Firewall	3	
5	Multi-Function Laser Printer	3	
6	Projector with Presenter	3	
7	24 Port Switch	3	
8	16 port Switch	3	
9	UPS(Online)	15kva	With 10hrs Backup
10	External Hard Disc	5	
11	EPBAX	2	

4. AAPL Major Project References

Selected & Relevant Projects that are completed by AAPL have been listed below:

4.1 Oil and Gas

4.1.1 Flow Simulation CFD & Structure - thermal - Vibration Coupled FEM Analysis of Waste Heat Boiler Duct - for Tasnee Petro Chem Kingdom of Saudi Arabia

- Scope-CFD - Analysis of RA & GT Duct, Mixing Chamber Assembly
  - Remodeling the existing geometry and to run the solver to see the actual. Advice better plates as guide vanes
  - Remodeling with plates both longitudinal and transverse and to run the solver. To alter the plate design
  - Better design of guide vanes/plates and to run the solver
- Scope FEA-1 – Analysis of Guide Plate Assembly
  - Validate the Guide Plate Assembly (GPA) structure under operating pressure – Static Structure Analysis
  - Vibration study of Guide Plate Assembly (GPA) structure under operating pressures – Modal Analysis
  - Validate the Guide Plate Assembly (GPA) structure under operating temperature – Coupled Analysis
- Scope- FEA-2 - Analysis of RA Duct Assembly under Pressure Difference
  - Validate RA Duct under Pressure Difference (Atmospheric - Operating) loads
  - Redesign complete support system with stiffeners and thermal elongation leverage for structural rigidity

4.1.2 API Code validation and Finite Element Substantiation of Storage Tank for shell course replacement _ MIS Arabia -Saudi Arabia

- Analytical Calculations for Shell Cut-out for replacement Purpose as per API 650
- Area Reinforcement Calculations for the cut outs made temporarily
- 3D Modelling and Pre-processing for FEM Validation for the model with cutouts defined as per Code calculation
- Static Structural FEA of the model with cut-outs for self-weight at atmospheric conditions

4.1.3 Burn pit Civil & Structural Design, Pipe design & detailing Uthmaniyah & Hawiyah Plant _ Saudi Aramco

- Design and validation of Aboveground Flare and fuel pipe line
- Piping flexibility analysis as per SAES and ASME B 31.3 /31.8
- Pipe support redesign and validation with FEA
- Pipe support civil design and structural calculations with Pipe spool drawings as per ASCE 7-05
- Detailed RCC drawing with BBS for Burn Pit & Pipe supports
- Burn pit civil structural design as per ASCE 7-05
- FEA Thermal validation for RCC Structure of Burn Pit
- Electrical and instrumentation design and detailing

4.1.4 FEA Validation of Thermal Shroud Container Assembly _ ISRO Bangalore

- CAD model generation for FEA.
- FEA Static structural analysis under self-weight & dead loads during lifting condition from a virtual point on crane.
- FEA Static structural analysis under self-weight & dead loads during hanging condition in Chamber.
- Validation of weld size around the lugs
- Evaluate stress and deformation and check whether under limits and evaluate FOS / Utility factors as required
- Project Report documentation with all details of analysis

4.1.5 Seismic - Structural Analysis of Steel Structure _ FEA Validation – Magnatech LLC Dubai

- CAD Modeling (3D) for FEA of Platform 4 as per input drawing
- Structural Analysis (FEA) of Platform 4 to validate for structural integrity against Dead load, Live load & Seismic load
- Design Modifications & Validation with FEA
- Detailed drawings & Project Documentations for manufacturing

4.1.6 Generator Cooling System Design Validation – Flexgen / TAAL

- CAD Modeling (3D) as per input drawing
- Thermal Design review & Validation with Code

- HVAC Design – Sizing & Duct routing

4.1.7 Floating Tube Heat Exchanger Design & Detailing – Therco / TAAL

- Generation of GA Drawing
- Thermo-mechanical Design & Validation with Code PD 5500 & TEMA
- Mechanical Design with PV Elite
- Generation of Detail drawing for Fabrication with BOQ

4.1.8 U- Tube Heat Exchanger Design & Detailing – NJ / TAAL

- Generation of GA Drawing
- Mechanical Design & Validation with Code ASME Sec Viii Div. 1 & TEMA
- Mechanical Design with PV Elite

4.1.9 Pressure Vessel Design & Detailing – NJ / TAAL

- Generation of GA Drawing
- Mechanical Design & Validation with Code ASME Sec Viii Div. 1 & PED
- Mechanical Design with PV Elite

4.2 Infrastructure and MEP

4.2.1 Pipe Stress Analysis as per ASME 31.4 for Buried lines and 31.9 for above ground lines for MARSA ALSEEF (W S Atkins & Partners Overseas)

- Pipe flexibility Analysis of Buried and non-buried cold-water lines
- Pipe flexibility Analysis of buried and non-buried fire piping
- Pipe flexibility Analysis of buried and non-buried chilled water supply and return lines
- Detailed project report with modelling details, input parameters, description of worst case scenarios, Stress Isometric drawing, Restraint summary, displacement reports etc.

4.2.2 Pipe stress analysis of chilled water supply & return pipes of Dubai World Trade Centre District Phase 1A5

- Lead Consultant: Hopkins Architect Dubai
- Contractor : Al-Futtaim / Carillion/Voltas

- The scope includes the flexibility analysis of complete chilled water (Supply & Return) pipes lines of C1, C2 and C4 building, including the ETS room.
- Detailed project report with modelling details, input parameters, description of worst case scenarios, Stress Isometric drawing, Restraint summary, displacement reports etc.

4.2.3 Pipe Stress Analysis for Chilled Water Service Pipe Lines for Jumeirah Village Circle (JVC) Phase 1, Phase 2, Phase 3 and Jumeriah Village Triangle (JVT) Phase 1, Phase 2, Phase 3

- Client: EMPOWER ENERGY SOLUTIONS
- Main Contractor: ISLAND TOWER ELECTRO MECHANICAL WORKS LLC
  - The scope of work is to do the flexibility analysis of the buried CHWS/CHWR for the GRP pipes as per ISO-14692 & ASME-B 31.1.
  - Detailed project report with modelling details, input parameters, description of worst case scenarios, Stress Isometric drawing, Restraint summary, displacement reports etc.

4.2.4 Pipe Stress Analysis for Chilled Water Service Pipe Lines for District Cooling Connections to Holiday Inn Hotel, Lexus Building & ETS Room at Zone 14A at DFC Dubai

- Client: AL-FUTTAIM GROUP REAL ESTATE
- Main Contractor: AL-FUTTAIM ENGINEERING
  - Flexibility evaluation of HDPE pipes & CS (A53 Grade B) pipes as per ASME B-31.1
  - Flexibility evaluation to be carried out for allowable Stress and displacement limits to achieve the required code compliance for the complete piping network.

4.2.5 Pipe stress analysis for chilled water service pipe lines of private resort at Jumeriah island- 2

- Client : H.H. SHEIKH HAMDAN BIN RASHID BIN SAEED AL MAKTOUM
- Consultant : ARC INTERNATIONAL ENGINEERING CONSULTANTS
- Contractor : BINLADIN CONTRACTING GROUP
  - Flexibility evaluation of buried and non-buried, A53 Grade B pipes as per ASME B-31.1
  - Flexibility evaluation to be carried out for allowable Stress and displacement limits to achieve the required code compliance for the complete piping network.
  - Anchor blocks sizing calculation of for the required bends

4.2.6 Pipe stress analysis for Jebel Ali Power Station M-Extension

- Site/Location details : P03761500012-JABEL ALI POWER STATION M-EXTENSION
- Client : DUBAI ELECTRICITY & WATER AUTHORITY
- Consultant : MOTT MACDONALD
    - Flexibility evaluation of GRP pipes as per ISO-14692/ASME B 31.1
    - Evaluation for allowable Stress and displacement limits to achieve the required code compliance.
    - Evaluation for stress and displacement limits in Static Wind and Seismic cases with 3 pumps operating and 1 pump standby.
    - To compile results of stress analysis and present the conclusions and recommendations.
    - Design of Spring Hangers to avoid excess loads over the sensible equipment.

4.2.7 Pipe Stress Analysis for Roof Floor& Riser Chilled Water Pipe Lines for Job KB 701- City Centre Ajman Expansion Project

- Site/Location details : CITY CENTRE AJMAN EXPANSION
- Client : MAJID AL FUTTAIM PROPERTIES LLC
- Contractor : KHANSAHEB CIVIL ENGINEERING LLC
    - Flexibility evaluation of chilled water pipes as per ASME B 31.1
    - Support design and calculations, Pump Validation as per API 610

4.2.8 Pipe Stress Analysis for Chilled Water Pipe Lines for Specialized Rehabilitation Hospital-Abu Dhabi Project

- Site/Location details : SPECIALIZED REHABILITATION HOSPITAL-ABU DHABI
- Client : Abu Dhabi Capital Group
- Consultants : STH SOCIETY TECHNOLOGY HOUSE LLC
    - The scope of work entitles the pipe support definitions and calculation for the CHW Supply and return lines. The calculation ensures that the individual members has been adequately sized with reference to loads on pipe supports as detailed in the pipe stress analysis report.
    - Flexibility evaluation of chilled water ERW pipes as per ASME B 31.1
    - Pump Evaluation as per API standards
    - Support design and calculations

4.2.9 Pipe Stress Analysis for Chilled Water Piping Network For –VVIP Villa at Al-Mina Palace Project

- Site/Location details : VVIP VILLA AT AL-MINA PALACE
- Client : CROWN PRINCE COURT
- Consultant : WS Atkins & Partners Overseas
- Main Contractor : Arabtec Construction LLC
    - Flexibility evaluation of chilled water(CHWS/CHWR) pipes as per ASME B 31.1

4.2.10 Pipe Stress Analysis for Chilled Water Piping Network for MAI Dubai Factory Expansion Project

- Site/Location details : MAI DUBAI FACTORY EXPANSION
- Client : MAI DUBAI
- Consultant : ARCHCORP ARCHITECTURAL ENGINEERING
- Main Contractor : AMANA
    - Flexibility evaluation of chilled water(CHWS/CHWR) pipes as per ASME B 31.1

4.2.11 Pipe Flexibility Analysis for Chilled Water Pipe Lines of CEN Expansion & Engineering Sciences Building Project

- Site/Location details : CEN Expansion & Engineering Sciences Building
- Client : American University of Sharjah
- Lead Consultant : archcorp
- MEP Consultants : HIDI
- Main Contractor : SAUDI BINLADIN GROUP
    - Flexibility evaluation of chilled water pipes (Buried & Non-Buried) as per ASME B 31.1
    - API Pump Calculations

4.2.12 Pipe Flexibility Analysis for Chilled Water Pipe Lines of Dubai Arena Project

- Site/Location details : DUBAI ARENA

- Client : Meras
- Consultant : Populous
- Main Contractor : ASGC
    - Flexibility evaluation of chilled water pipes as per ASME B 31.1
    - API Pump Calculations
    - Support design and calculations

4.2.13 MEP design Consultation & Validation for the DAWA Centre for SaCEn – GIESC Saudi Arabia

The project envisages a high-quality design with Design Optimization via CFD for optimum comfort

- Generate Material Specification – Based on ASHRAE & SMACNA
- Detailed load calculation - To keep a check on selected units such that they are not under or over capacity.
- Conceptual design & drafting - For clear and concise reading of drawings by end user/site engineer.
- Design optimization of duct on critical areas through CFD - For conducive and effective flow pattern
- Simulating the air flow in room - To visualize exactly how the stream flow is distributed
- Consultation on applicability of renewal energy concept and Energy management concepts
- Generate AutoCAD MEP drawing for equipment, ducts, pipes, grills, diffusers, exhaust ventilation etc.
- Detailed BOQ generation - To keep a check on the project cost to be within budgeted figure.
- Assisting the client on raising Tender, discussion & negotiation with the contractor

4.2.14 MEP Design for MARAFIQ's SWRO IN SADARA COMPLEX IN JUBAIL 2 through SACAAP

- Load calculation report for each selected zone
- Air conditioning and Ventilation Single Line drawing
- Ventilation and Air Conditioning Shop drawing in AutoCAD format
- MEP Consultation for the entire Project
- Supply and Installation of HVAC
- Commissioning and handing over

4.2.15 Clean Room Design & CFD Optimization for Saj Pharmaceuticals Pvt. Ltd. India

- Clean Room Design, Evaluations, Upgrades and Expansions

- Filter Integrity Testing (HEPA Leak test)
- Close-Tolerance Temperature & Humidity Control
- Biohazard Level P-3 Clean rooms, Negative Air Pressure Clean Laboratories
- CFD design and Optimization for rooms and duct
- Documentation and Consultation for Contracting
- CAD Modelling (3d) generations in CATIA
- BOM generation & drafting of fabrication and assembly drawings

4.2.16 MEP - Healthcare management & consultant facility based at Oman

- This project is about designing a Hospital in Oman. A 3D Revit model of the building is to be developed including MEP and structural modelling and shop drawing creation.
- AAPL performed 3D coordination for the entire building in terms of architecture, structure, interiors, Fire resistance and MEP design. This is a LOD 400 project.
- Project Status: Under Construction
- Solution Highlights
- 98% clash-free model
- 20% material savings based on QTO reports

4.2.17 MEP - Medical Center is home to state-of-the-art care in West Oahu

- This is a Hospital building with a scope of further expansion of the building. LOD 300 project.
- AAPL was responsible for producing coordinated drawings; plant area drawings and builders work drawings for the build and installation phase. We used Revit MEP and Revit Architecture to create a 3D BIM model for the project. We also relied on Autodesk Navisworks to constantly review and check our model clashes and interferences.
- Project Status: Construction Completed

4.2.18 MEP - The 34-story apartment tower with 496 units and 348 parking spaces

- The site is a new 496 units building with a floor area of 30,000 sq. m. It is a public funded 'Designed for Life' project consisting of five linked buildings/zones and external energy centre.
- Scope: -Working with the lead MEP contractor, AAPL provided spatial 3D coordination for all areas, including a modularized layout for all corridors and the energy centre. We were responsible for all coordinated drawings, prefabricated module drawings and record drawings for this site.

4.2.19 MEP -The Club House- The Realty

- This project is about designing a club house. A 3D Revit model of the building is to be developed including Structural, Architectural and MEP Services along with interiors for the building.
- Scope: - Virtual Design construction mock-up form DD (Design drawings). AAPL performed 3D coordination for the entire building in terms of architecture, structure, interiors, Fire resistance and MEP design. This is a LOD 400 project.

4.3 Nuclear Industry

4.3.1 Design of INTF Vacuum Vessel and FEA validation (ASME) -Institute of Plasma Research Govt of India

- Detailed design, modelling, Design Substantiation as per ASME Section Viii Div. 1 & 2
- Thickness summary & nozzle summary evaluation
- Flange design & Validation
- Large Flange design & support design validation
- Stiffener optimization & weld ability check
- FEM Validation – Thermal - Static Coupled Analysis, Seismic Analysis, Non-linear Buckling analysis

4.3.2 ASME Code Validation Design for Cold Walled Controlled Atmosphere Brazing Furnace and FEA substantiation: ASME Sec Viii Div. 1 for Baba Atomic Research Centre, Govt. of India

- Design Substantiation as per ASME Section 8 Div. 1 UG & UW
- Thickness summary & nozzle summary evaluation
- Flange design & Validation
- Double walled Vessel buckling substantiation
- Stiffener optimization & weld ability check
- FEM Validation - Static Analysis, Non-linear Buckling & Response Spectrum Analysis as per ASCE 7

4.3.3 Piping and Pipe stress Analysis- Validation and modification of an existing design: ASME 31.1 for Baba Atomic Research Centre

- Check the piping flexibility - Determine the displacements, and stresses developed in the piping system. To design the required supports for the NPS 4 LBE Piping Loop.
- The load cases as detailed below,
    - Water filled weight(WW) + Hydro-test pressure(HP)
    - Weight(W) + Operating Temperature(T1) + Operating Pressure(P1)

- Weight(W) + Design Temperature(T2) + Design Pressure(P2)
- Sustained Weight W(SUS) + Operating Pressure (P1)
- Sustained Weight (SUS) W+ Design Pressure(P2)
- Thermal Expansions (EXP) L6=L2-L4
- Thermal Expansions (EXP) L7=L3-L4

4.3.4 LBE Piping Support Design & FEA Validation with Seismic & RS analysis for Baba Atomic Research Centre

- Generate FE model from the CAD model of the support
- FEA thermal analysis for temperature loads
- FEA structural coupled analysis with pressure and gravity loads acting on the support as per design load conditions
- Seismic and response spectrum analysis for piping & support system
- Static Seismic Analysis of piping system for seismic loading as per B31E / ASCE 7
- Validation of Static Analysis with Response Spectrum Analysis as per ASCE 7

4.3.5 Vacuum Chamber Design Modification and FEA Validation for Institute of Plasma Research Govt of India

- Thermal structural coupled analysis for to identify hot spot generation
- Design modification for hot spot removal
- Re-validation with FEA - Thermal structural coupled analysis of Vacuum Chamber with modified ribs within the outer and inner drum for better thermal properties around the ports

4.3.6 Thermal Analysis of Heating Chamber (Radiation model) of Electro transport system for Institute of Plasma Research Govt of India

- Transient Thermal analysis (Radiation model) to get the temperature plots.
- Heat flux distribution at the area of interest
- Identify Temperature plot at vessel surface and hot zone
- The requirement is to do radiation based thermal analysis of heating chamber and components using FEA. The specimen is at 2000^{o}C and is surrounded by 7 shields, all placed within a vacuum chamber.

4.3.7 Flow Analysis CHT/CFD & Thermal Analysis of Vacuum Chamber (Radiation model) for Baba Atomic Research Centre

- Transient Thermal analysis (Radiation model) to get the temperature plots.

- Heat flux distribution at the area of interest
- Identify Temperature value at vessel inner surface
- CFD / CHT analysis to identify the coolant flow rate based on temperature generated from FEA radiation.

4.3.8 Pipe Stress Analysis to determine stress are within the range allowed by the Piping Code for Institute of Plasma Research Govt of India

- Piping stress analysis to evaluate the loads on one or more pipe supports.
- Piping stress analysis to evaluate the movements of portions of the piping system due to thermal growth or contraction.
- Piping Isometric Creations and definition of Guide supports & Pipe Flexural Analysis under various load conditions as per ASME Standard.

4.3.9 Design & FEA Validation of SSB Carriage Assembly for Fusion Reactor- IPR Gujrat

- Analytical validation of major superstructure sizing meant to support the vessel along with its accessories
    - Column & Beam Sizing
    - Design of Alignment clamps
    - Gate valve structural integrity check
    - Design of bolts & Check for tipping of carriage
    - Design of roller wheel and axle for various stress
    - Sizing of drive mechanism
- Generating 3D-CAD model for FEA
- FEA Validation of the 3d structure under dead load of 56 tons
    - Determining Reaction force and Reaction moments
    - Case1: Structural Analysis without Anchor Bolts
    - Case2: Structural Analysis with Anchor Bolts
    - Case3: Structural Analysis of Top Carriage with PINI Dead Weight
    - Case 4: Structural Analysis of Top Carriage with Vacuum Load
- Project Report documentation with all details of analysis, result plots, sketches, observations, modifications & recommendations

4.3.10 Design and Validation of Automated Cathode Processing(ACP) ,CTM Mechanism and Vacuum Distillation Vessel (VDV) – IGCAR Kalpakkam

- Analytical Design and FEM Validation of ACP as per the Technical Specification.
- Detailed engineering and preparation of fabrication drawings of the following
    - Vacuum Chamber Design as per ASME section Viii Div. 1 using PV Elite V16
    - Design of Susceptor assembly
    - Design of Crucible assembly
    - Design of Radiation shield assembly
    - Design of Condenser assembly
- Kinematic Validation and Detailed Engineering and Rigidity Analysis of mechanism:
    - Crucible Transfer Mechanism
    - Gripper and drive mechanism
    - Trolley Mechanism
    - Lifting Mechanism
    - Tilting Mechanism
- Automation of all mechanism with +/-1mm tolerance for accurate positioning and handling in Argon Environment (no human access)
- Testing and assembly of all mechanism with DMU validation
- Erection and commissioning of the complete system

4.4 Aerospace/Wind Tunnel Testing and General Engineering

4.4.1 Acoustic Silencer - Muffler (82db@ 1mtr) Design, Detailing & FEA for Skyes Yakka - FABCO LLC Dubai

- Design study for Vibration free, Reduced Noise level and Corrosion Resistant silencer for a 4`` inlet & sound level of 83dba@1mtr as per ASHRE TC 2.6.
- Analytical design calculation and identification of specification for the muffler, tail pipe and related exhaust tubes/ducts
- CAD Modelling (3d) generations in CATIA and pre-processing for FEA.
- Validate the design with CFD (Flow simulation) & FEA – Structural and Vibration/noise Analysis.
- BOM generation & drafting of fabrication and assembly drawings.

4.4.2 STRUCTURAL SUBSTANTIATION OF SPREADER BAR Fabco LLC - Skyes Yakka

- Acoustic Enclosures with Max. Capacity of 60T are to be lifted by mechanical cranes from their bottom side with lug attachment which tends to the need for the design of spreader bar structures to avoid falling of sling over the container which may be resulted the failure in lifting of the container as well as structural damage to the container.
- Design and analysis of Spreader Bar used to satisfy the above-mentioned purpose. The overall dimensions of the Enclosure and the Capacity have been provided by the client.
- Forces and moments on critical section with appropriate safety factor included
- Selection and Classification of section
- Check for shear strength & Check for bending capacity
- Check for vertical and horizontal deflection
- Check for web bearing and buckling at supports

4.4.3 Static Stress Analysis of Acoustic Enclosure Cummins /KOC / Shell – ZPS for Skyes Yakka - FABCO LLC Dubai

- The design is validated for static structural loading for its self-weight and external loading. Analytical calculation is carried out and the results of the same are verified with Finite Element Analysis with CATIA – GSA & ANSYS – WB.
- The design may be further optimized for vibration generated due to the operation of the generator set with FE Non-Linear Analysis.
- ASTM E1704 - 95(2010) Standard Guide for Specifying Acoustical Performance of Sound-Isolating Enclosures.
- Acoustical Society of America (ASA)

4.4.4 Enclosure Redesign & Validation for Skyes Yakka through Fabco LLC Dubai

- Redesign the existing enclosure as per the problem statement and suggest suitable Strengthening mechanism– (Analytical Design)
- Re-modelling in CATIA as per the existing and new design and pre-processing for FEA
- Validate the design with ANSYS WB (FEA) – Structural & Vibration Analysis
- Generate drawing for fabrication of strengthening member

4.4.5 Enclosure Stacking & Lifting Load Calculation, Lifting lug design & FEA validation For Skyes Yakka - Fabco LLC Dubai

- Design modelling of the enclosure as per the dwg file and check the sustainability of stacking.
- Identify the lifting strength and substantiate for single point lifting
- Analytically evaluate the loads and stress developed at resting and lifting position.
- Validate the design with FEA structural and modal analysis - Sub cases:
- As per client model (dwg file) with 3 lifting tubes
- Modified model with 3 lifting tubes provided with Strengthening pads and C-section stiffener plates
- Modified model with 2 lifting tubes and pads / stiffener plates
- Design a single point lifting by using a lug
- Validate the design with FEA structural and modal analysis

4.4.6 Static structural Analysis & Fatigue analysis of Goose neck support & mud gas separator for AMS Marine group-Singapore

- Modeling of structure and weld design is done in CATIA
- Static structural analysis with dynamic loading and to find the stress distribution on the structure,
- Bolt - pre-tension required, hoop stress, fatigue analysis, weld analysis.
- Fatigue analysis of mud gas separator to find out the life assessment, maximum and minimum principal stress acting on the structure.

4.4.7 Soil - structure interaction of offshore wind farm structure with conventional and reinforced soil foundation for CUSAT

- To study the response of the conventional offshore foundation using Finite Element Analysis
- To predict the enhancement in the strength of the foundation with reinforced soils.
- To analyses the dynamic response of the structure by consecutive waves hitting the structure.

4.4.8 Static structural Analysis of a water storage tank for AQUA TECH, Cochin

- Static Structural Analysis of the modeled tank
- Design Optimization(Parameters) for minimal stress development
- 3D model generation of the domain, Preprocessing and FEA solver for stress/displacement
- Appropriate parameter definition parameter optimization using FEM.

4.4.9 FEA of an ID Fan Impeller for a high tuned design for TLT Babcock India

The FEA is done on the following platforms to determine the various performance parameters.

- Stress analysis at 705 rpm at 110°F. The maximum Von-Mises stress must be less than 75% of the yield stress of ASTM 514 grade E at 110°F.
- Modal analysis at slung as well as operating condition at 70°F. Modal exclusion zones: - the rotor shall not have natural frequencies within **90**% to 110% & 95% to 105% of operating speeds.
- No excitable frequencies in the range of 97% to 103% of the blade passing frequency.
- 2nd nodal diameter mode should avoid the range of 5.0 to 7.0 times the operating speed, if possible.

4.4.10 Steel Pipe rack Design for Saudi Aramco

- The purpose of this project is to provide guidelines for steel pipe rack design for use by engineers working on Saudi Aramco projects and Saudi Aramco engineers.
- This design guide defines the minimum requirements for the design of pipe racks in process industry facilities at Saudi Aramco sites.
- It covers general design philosophy and requirements to be used in the analysis and design of pipe racks.
- Criteria presented herein pertain to loads, load combinations, allowable stresses, and superstructure and foundation design. Section 2 of this instruction includes reference codes, and Saudi Aramco Standards.
- The entire project is done using Saudi Aramco Standards

4.4.11 Civil & Structural Design for Stack Support Foundation _ Karrena Arabia Ltd – Saudi Arabia

- Design Calculations of RCC Foundation for Stack Structure as per ASCE 7-05
- Design drawings of RCC Foundation
- BOQ/MTO for RCC & Anchor Bolts

4.4.12 CAD Modelling (3D) & Detailing of Lact & Gas Metering Skids for YSC-ES Trivandrum

- Engineering & Modeling of Lact & Gas metering skid for Shell stones FPSO.
- Engineering & Design Analysis of Prover & Metering Skid for Yanbu Steel
- Final Piping & Structural MTO
- Final, updated 3D model & review file
- Piping Isometrics drawings for all lines in the skids in PDF & Native format
- Structural stress analysis including lifting calculations in line with project specifications and international codes with a view to optimize the member sizes & weight.

- Pipe stress analysis in line with project specifications and international codes to accommodate the nozzle loads provided & Implementing the required changes from the structural stressing-above
- Detailed fabrication drawings for both skids including all structural members involved (skid base, structural supports, pipe supports, ladders, walkways, junction box supports, grating, handrail etc.) in PDF & Native format
- Lifting drawing, details of slings, chains, shackles, tensioners & drawing and part list for lifting beam.

4.4.13 Design & FEA of Horton Sphere for Hypersonic Wind Tunnel _ DRDL_ Hyderabad

- Vacuum Vessel (Horton Sphere) design as per Section VIII Div.2 Part 4- Design by Rules
- Petal Sizing & Configuration
- Design by Analysis (Failure Analysis calculations): Section VIII Div.2 Part 5
- Weld Sizing: UW of Section VIII Div.1 and/or Div. 2
- Selection of Relief Valves and Safety Valves Section VIII Div.2
- Design of supports, bracing sizing with final vessel configuration
- 3d CAD model generation for manufacturing & FEA.
- FEA as per Load Combinations in ASME Section VIII Div.2 Table 5.1
    - Static structural analysis under self-weight & dead loads
    - Thermal Structural Coupled Analysis under design & operating conditions
    - Wind Load Analysis
    - Modal Analysis of the pre-stressed model
    - Seismic Analysis – Response spectrum Analysis
    - Failure Analysis – Buckling
    - Fatigue Failure Analysis for temperature cycles – life cycle evaluation

4.4.14 Steel Structure Design & RCC Foundation design for Sphere & Piping _ DRDL_ Hyderabad

- Design & Analysis of Steel Super Structure
    - Wind load analysis as per IS 875-3 / ASCE-7-10
    - Seismic analysis as per IS 1893 / ASCE-7-10
    - Evaluation of fundamental frequency & check for Resonance
- Design Calculations of RCC Foundation under self-weight, wind load & seismic loads as per IS/ ASCE
    - Base Plate, Bolt & Pedestal Design calculations

  - Footing Design calculations & Check for stability
  - Design of Reinforcements
  - Detail drawings of Base Plate & RCC Foundation with BBS
- FEA validation of Support under following loading conditions
- Design Calculations of scaffolding with appropriate member sizing
- Design Calculations with prescribed loading conditions- Live and Dead Loads
- Design calculations for the scaffolding foundations
- Design calculations for walkaways/working platforms/Ladders

4.4.15 Design, Flexibility Analysis & CFD of Wind tunnel piping _ DRDL_ Hyderabad

- Interconnecting Duct Sizing & Flexibility Analysis
  - Thickness calculation of the interconnecting piping system
  - Piping Flexibility check of the interconnecting piping as per ASME
  - Stress Analysis – Code checks
  - Piping Configuration for effective flow profile –CFD
- Perforated Duct Design & CFD Validation
  - Design of perforated duct - sizing & layout of perforations
  - 2d & 3d Modeling (Surface model-CAD) for Flow analysis
  - CFD Optimization of perforated duct for uniform flow distribution
  - CFD validation of perforated duct against flow induced vibration or surge
- Bellow Design, Sizing & FEA Validation
  - Bellow Design as per EJMA
  - Axial & lateral movement check
  - Bellow Stress Analysis under pressure & deflection loads
  - Circumferential Membrane stress evaluation, Membrane & Bending Stress Evaluation
  - In plane Stability check & Fatigue Life evaluation
- FEA Validation under Horton Sphere Operating / Wind conditions

4.4.16 Re-Design of Support Structure Foundation _ Karrena Arabia Ltd – Saudi Arabia

- Civil Foundation (RCC) design validation for Baffle Wall Support & Burner Supports.
- Design Calculations of RCC Foundation for Stack Structure as per ASCE 7-10

- 3d CAD Modeling of Civil RCC Structure
- FEA of RCC Structure for validation
- Design drawings of RCC Foundation
- BOQ/MTO for RCC & Anchor Bolts

4.4.17 Heat Exchanger Design & Analysis _ DRDL_ Hyderabad

- Thermo-mechanical Design of Heat exchanger as per TEMA
    - Thermal calculations for the Tube Side & shell side
    - Hydraulic Analysis of the Tube Side & Shell Side
    - Mechanical Design & Validation as per TEMA
    - Stress Evaluation and validation as per ASME Sec Viii Div. 1
    - 3d Modeling in CATIA
    - Detailing with AutoCAD

4.4.18 Thermo-Mechanical Analysis of Hot Plate- Ingen Robotics Pvt Ltd Trivandrum

- Thermal Mapping- Conduction, Convection & Radiation study
- Thermal design and selection of insulators
- Thermal Structural Coupled Analysis
- Fatigue Evaluation of the Hot Plate
- Design modeling & detailing

4.4.19 Design & RPT of Inertia Reel Cord Mechanism- Cycloids Inc. Canada

- Design of Inertia Reel Cord mechanism
- Elastic Limit Calculations for cord
- Calculations for the drum- reliability, Tightening force calculations
- Spring Design & sizing
- Mechanism definition and DMU Rotary drum and cord under tensile force
- Product Development with Rapid prototyping technology

4.4.20 Design Review of Transit generator HVAC & Liquid cooling system- Flexgen USA / TAALTech

- Thermal sizing of heat exchanger / radiator
- Cooling system design review

- Design modeling review & recommendations
- HVAC System conceptual & detail design
- Heat load evaluations, Duct lay outing & modeling
- Selection of equipment & controls & monitor

4.4.21 Design, CFD Simulation, FEA validation & Detailing of Hydrokinetic Turbine– Innovative Hydro

- Design of Hydrodynamic rotor blade profile to extract maximum kinetic energy.
- Design of Blade profile and complete configuration for 100Kw turbine
- Hydrodynamic CFD simulation for design optimization.
- Scale down model validation to support the experimental work.
- Mechanical design and optimization of rotary system using FEA
- Rotor shaft & Drive shaft design, Identify RPM and Torque table for different water velocity

4.4.22 ASME based Design & FEA Validation of Verano 25 Ltr. Heater Tank-V Guard Industries

- Complete design of tank with optimum profile and optimum thickness as per functional requirements. Thickness calculation of shell as per ASME code
- Design of Nozzles with Reinforcement of Openings as per ASME code
- Nozzle & Flange selection as per ASME code. Weld Sizing as per ASME / AWS code
- Re-validate steel support sizing with final vessel configuration
- CAD model generation (3d) for FEA
- FEA as per Load Combinations given below
    - Static structural analysis under self-weight & dead loads
    - Thermal Structural Coupled Analysis under Operating Conditions
    - Non-linear analysis under Hydrotest condition
- Project Report documentation with all details of analysis, result plots, sketches, observations, modifications & recommendations
- CAD modeling for fabrication & detailed drawings with BOM

4.4.23 FEA Validation of three Pole & Single Pole FRP Mast-Ercon Composites

- FEA validation of the single pole mast and for the triangular lattice mast with antenna`s when wind load is acted on it

- The primary objective is to identify the deformation and stresses when wind is acted and optimized using FEA for design, operating conditions.
- Optimization study of structure and joints for different iterations

4.4.24 Dynamic Analysis of Mounting bracket for KVG(VG-4) of LRU`s for Sea King Helicopter for Indian Navy

- Static structural Analysis for mounting bracket for KVG(VG-4) & Mounting of LRU`s under self-weight and dead load, followed with modal analysis and dynamic analysis.
- The load factors considered is with respect to FAR part 29 Section 561.
- The following ultimate inertia load factors is applied relative to the surrounding structure: -
    - Upward - 4g
    - Forward – 16 g
    - Sideward – 8 g
    - Downward – 20 g
    - Rearward- 1.5 g

4.4.25 FEA on Weather Radar Installation On-`Sea King 'Helicopter for Indian Navy

- To estimate the load & strength analysis of weather radar installation on-``SEA KING`` HELICOPTER under crash case conditions as per FAR part 29 sections 561, which includes
    - Static Structural FE Analysis
    - Modal Analysis
    - Response Spectrum Analysis.

4.4.26 Aerodynamic Pressure Distribution on 'SEA KING' Helicopter with and without Radar Mount - Indian Navy

- Flow parameters identification
- Flow Profiles, Streamlines, Velocity Contours
- Recirculation detection if any
- Stagnation Point zones
- Drag force, Aerodynamic Pressure on Helicopter front portion in hovering condition

5. OUR CLIENTS

FABCO LLC Dubai

Deutsche Babcock Middle East

Team Sustain

MAEEN SAUDI ARABIA

Tasnee

SWCC SAUDI

Vacuum Techniques [P] Ltd

Orell Software Solutions Pvt. Ltd

Karrena Gulf

MagnaTech-India

TAAL Tech – Engineering Global Sourcing

YSC ENGINEERING SERVICES PVT. LTD

Tooltech Global Engineering

Gulf Industrial and Engineering Services Company KSA(GIESC)

Orell -Techno Systems Pvt. Ltd

Sharon Insul India Pvt Ltd, Kochi, India

Silicon Valley Corporation, Chennai, India

TLT-BABCOCK INDIA Pvt. Ltd.

Mechanical Design Department, KEL, Kerala

SYKES YAKKA

INDIAN NAVY
AN OCEAN OF OPPORTUNITIES

Leminar
Commitment Beyond Comparison

6. CONTACT DETAILS

• AAPL INDIA

1. **Design Centre: Bangalore, India**

   #401, 4th floor, B Block, Connection Point, HAL Airport Exit road, Old Airport Road, Bangalore-17.
   T: +91-80-4125 6010
   E: info@airframeaerodesigns.com

2. **Design Centre: Kerala, India**

   #33/148, D-2, Chooraparambil Building, Alinchuvadu, Edapally PO, Cochin-24
   T: +91-484-4030 999
   E: info@airframeaerodesigns.com

   #1st floor, Dream World Building, Mini Bye Pass road, Arayedath palam, Kozhikode, 673004
   T: 0495 404 0988

3. **Design Centre: Hyderabad, India**

   #303, 3rd floor, Krishna plaza, above Hyundai Showroom, Khairtabad. Hyderabad 500004.
   T: +91-40-6646 3999
   E: info@airframeaerodesigns.com

• AAPL KSA

AAPL-SaCEn JV Saudi Arabia
#904, Al Jarbou Administrative Tower, Dhahran Street, Al Khobar, Saudi Arabia
T: +966 50 587 7465

• AAPL UAE

AAPL Delivery Centre: UAE
SNM International FZE
PO Box 2833, Abu Dhabi, UAE
T: +971-508583867

AAPL Consulting Engineers LLC
Shams Free Zone
Sharjah Media City
UAE