Promec
PROGETTAZIONI MECCANICHE

Studio Associato Promec

Via Tecla Baldoni, 15 - 47122 Forlì – Italy

Tel: +39/0543-68940 Fax: +39/0543-414053

www.promecstudio.it info@promecstudio.it

Professional Mechanical Engineering Design and Analysis

Expertise in

- ASME Pressure Vessels
- PD5500 Pressure Vessels
- VSR Pressure Vessels
- EN13445 Pressure Vessels
- Directive 97/23/EC compliance
- new Directive 2014/68/UE compliance
- API Storage Tanks
- B31 Piping Systems
- Heat Exchangers
- Flanges Fittings Closures
- Structural and Mechanical Drawings
- Materials and Welding Engineering
- Fabrications & Installations Reviews
- Quality Control Consulting

Highlighted Capabilities

Nonlinear, Elastic/Plastic, Large Deformation, and Contact Element FEA.

Steady State and Transient Thermal FEA.

Dynamic Analysis for Impact, Seismic and Transport Loadings.

ASME Design, including Division 2 Design by Analysis and Fatigue Life Analysis.

B31 Piping System Mechanical Integrity, Life Improvement, Layout and Remediation.

Design Software Compatibility

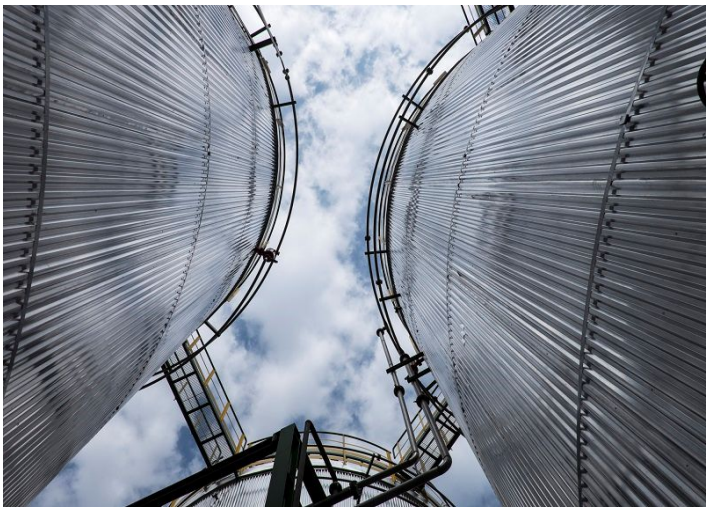
Promec performs mechanical design and analysis with a variety of software.

We use VSR2 from SANT'AMBROGIO Software for pressure vessel design according to Italian Code.

COMPRESS is used for pressure vessel design, rerates and suitability for service assessment according to ASME Sec. VIII Div.1 and Div.2

VVD is used for pressure vessel design according to PD5500 and EN13445 codes.

TANK is used for storage tank design according to API 650 and API 653 codes.



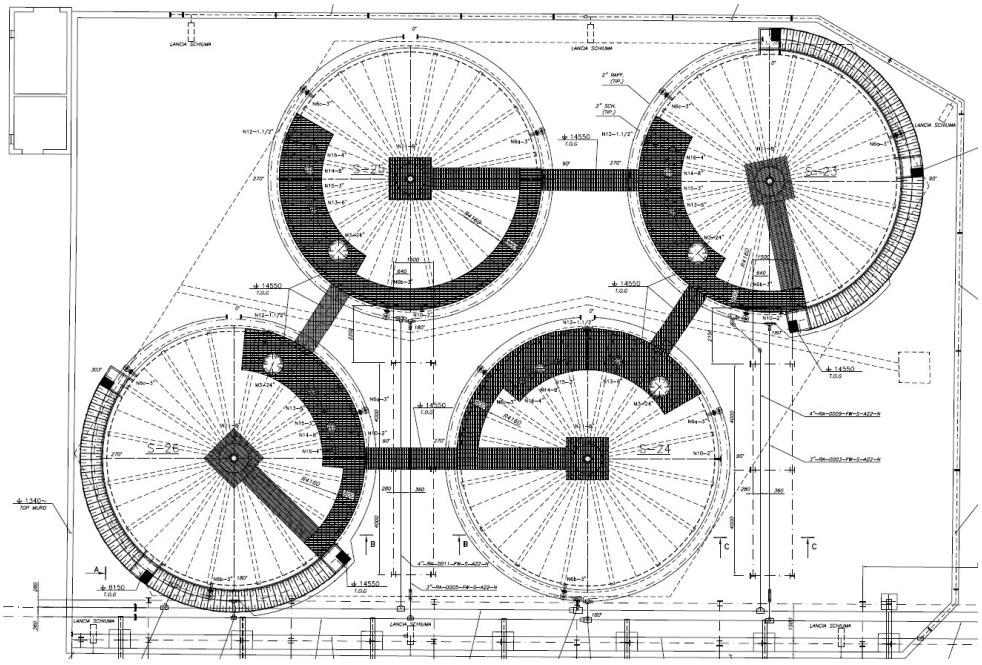
PIPEPLUS is the primary tool used for B31 piping analysis and hanger load/setting determinations.

Teaming with graduate engineers, we offer designer capabilities on ABAQUS for Finite Element Analysis of components and systems.

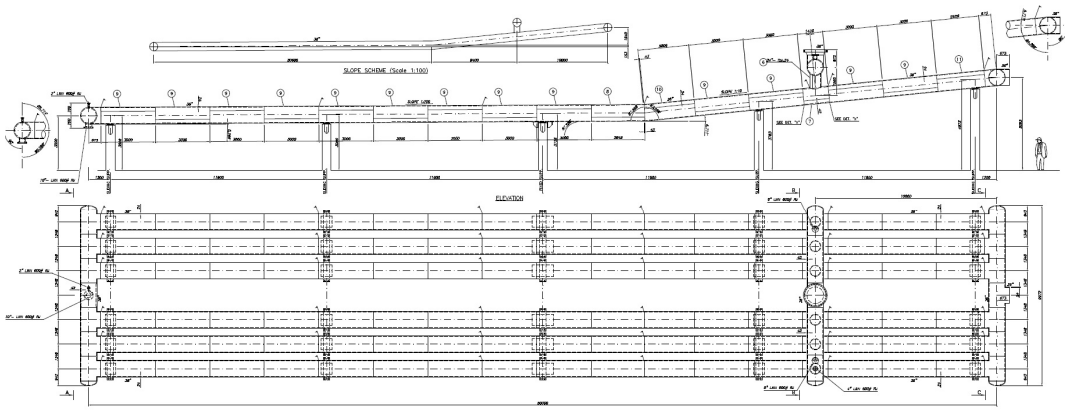
We also never lose sight of the value of classical, hand calculation solutions to many problems.

Targets

Promec is an engineering management consulting firm that assists its clients in the understanding and using the international Codes for pressure vessels, atmospheric storage tanks and piping construction, repairs, and maintenance and offers innovative mechanical engineering problem solving capability. Our focus is on the design and operational safety of pressure retaining components, and we provide engineering services for Pressure Vessels, Storage Tanks & Silos; Process, Utility, and High Energy Piping; Heat Exchangers, Columns, and other Process Equipment and components. We solve problems with advanced FEA techniques when necessary, but are equally adept with manual calculations. Our understanding of the ASME B&PV Codes, the new Pressure Equipment Directive 2014/68/UE, the B31 Piping Codes, and the API Codes is the underpinning of our success. We provide high value, professional engineering support to our clients. Because of our expertise in design and construction of pressure retaining components, we can help reduce costs associated with design, construction and repairs. Our target is to help our clients maintain quality and safety, without sacrificing time and money.



Storage Plant Layout



Finger Type Slug Catcher

Experience

Whether your Codes and Standards problems concern pressure vessels, atmospheric storage tanks, piping, welding, structural design reviews, component fabrication, in service inspection, quality assurance, quality control, or material procurement, **Promec** has hands-on experience to help you resolve your issues.

- Boilers and Pressure Vessels
- Piping
- Atmospheric Storage Tanks
- Valves
- Structures and Supports
- Welding (ASME, EN and AWS)
- In service Inspections
- Quality Assurance & Quality Control
- ASME Joint Review Assistance and Consuelling

Design & Analysis

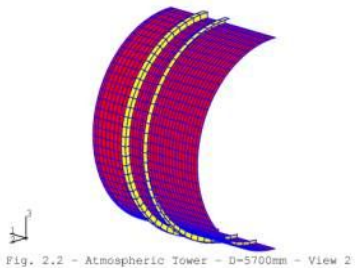
The **Promec** staff is composed of experienced engineers having diverse backgrounds in systems design and plant construction and operation. This enables **Promec** to evaluate the impact of proposed plant modifications or changes to operational and maintenance procedures on overall plant performance. Our focus is on assuring changes in procedures or plant modifications are practical and effectively and inexpensively incorporated without compromising plant safety or availability.

Teaming with **Promec** can help optimise the effectiveness of your engineering and design efforts:

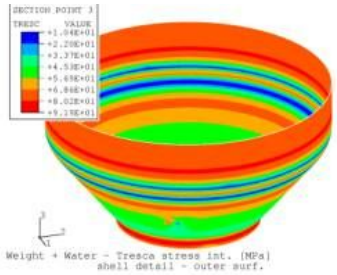
- Structural Engineering Reviews
- Design Specifications
- Design Reviews
- Design Control Practices

Detailed engineering i.e. mechanical design and fabrication drawings, fully utilizing the modern tools of computer aided designing is where the real strength of **Promec** lies.

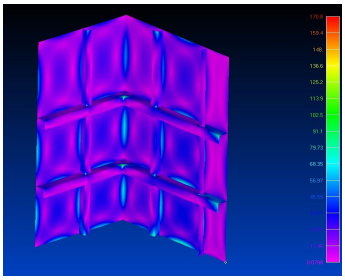
We have a fully equipped Design Department capable of doing mechanical designs of all offered equipment in house and thereafter generating fabrication drawings of the same. We are fully capable to undertake designing under various nationals / international design codes viz. VSR, ASME, TEMA, API, BS, European Standard EN 13445 etc. using various software developed in house as well as imported.



This picture shows the result of out of roundness analysis for a φ=5700 mm thin walled shell column supported in the horizontal position during hydrostatic test. The support saddle has been modelled by restraining all the shell nodes located along the saddle by means of unilateral gap elements acting in the radial direction. The external stiffening rings have been considered in the model to minimize out of roundness effects during water filling.



This is an ABAQUS model of a φmax=6370 mm conical reduction, for which **Promec** provided the design basis ASME stress analysis for a large manufacturer. The column support skirt is welded to the conical reduction. Because of the column height, pressure stresses were excessively high in the hydro test condition, and traditional vessel design software was not well suited to the task. Several analysis iterations and physical modifications were evaluated before converging on this arrangement, which meets all VSR ed. 99 material stress limits, although a Division 2 design by analysis approach was utilized.



This picture shows the result of evaluation of stresses on so called “hard points”, for an atmospheric storage tank. The objective of the analyses is to assess the compliance of the stiffeners and plates with ASME VIII DIV.2 code prescribed stress limits.

New Pressure Equipment Directive 2014/68/UE

The Directive applies to the design, manufacture and conformity assessment of pressure equipment and assemblies with a maximum allowable pressure greater than 0.5 bar gauge (i.e. 1.5 bar absolute).

Vessels, piping, safety accessories and pressure accessories are all included.

The **Promec** consultancy organisation is fully expert in this directive. Only Engineers with a pressure equipment background conduct consultancies.

We supply the entire consultancy needed to reach the CE mark. We are able to make the design and the procedure for the fabrication and welding in order to steer the manufacturers towards the CE mark in the minimum time with less efforts and costs, fitting with their existing fabrication systems.

Our service includes the following:

Identification of appropriate modules leading to joint agreement on application;

Design calculations, BDA, DBF, FEM according EN 13445, VSR and others international codes;

Risk analysis to satisfy PED ESRs;

Routes to Material Appraisal;

Operating manual;

Construction's procedure;

Welding book;

Technical file to be constructed and presented for examination to a notified body.

Services & Consulting

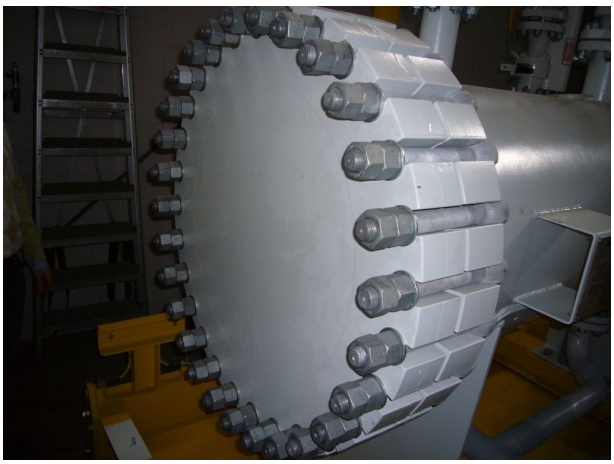
COMPUTER-AIDED ENGINEERING

Promec has extensive experience in performing computer-aided engineering analysis. We use a variety of engineering software and hardware platforms which undergo nearly continuous upgrading in today's rapidly evolving computing environment. We have also written customized software for special applications, such as for evaluation of lifting and transport devices, but will normally utilize "industry-standard" computer codes for our projects.

The principal engineering codes currently used are:

- COMPRESS: A pressure vessel analysis and design program developed and marketed by CODEWARE Inc. that evaluates pressure vessel components according to the current requirements of ASME Boiler and Pressure Vessel Sec. VIII, Div.1 and Div.2.
- VSR: The pressure vessel analysis and design program developed and marketed by SANT'AMBROGIO Software of Milan evaluates pressure vessel components according to the current requirements of the VSR Pressure Vessel Italian Code.
- VVD: A pressure vessel analysis and design program developed and marketed by Intergraph. VVD evaluates pressure vessel components according to the current requirements of PD 5500 "Specification for unfired, fusion welded pressure vessels" and EN 13445 "Unfired Pressure Vessels"
- TANK: A design program developed and marketed by Intergraph. TANK evaluates storage tanks components according to the current requirements of API 650 and API 653.
- ABAQUS for FEA modelling and solutions to linear and non-linear, large deformation, dynamic, and thermal stress problems

Additional software is utilized as required for specific projects, including the piping programs. Furthermore, Promec has developed proprietary engineering software to evaluate aboveground storage tanks, conventional pressure vessels, noncircular pressure vessels, and nozzles; and to perform other specialized calculations.



FINITE ELEMENT ANALYSES

Promec provides analytical FEA support to clients who experience in-house resource limitations, or who have unique design or qualification problems on complex components.

FABRICATION AND INSTALLATION REVIEWS

Promec can solve fabrication and installation problems in a wide range of industries and applications. Our problem solving abilities have been sharpened through long involvement in the design and construction of power, petrochemical, and other process plants.

Our experience includes:

- Welding
- Non Destructive Examination
- Procedure Reviews
- Qualifications
- Modifications

MATERIALS AND WELDING ENGINEERING

Promec has the expertise to help clients correctly select and maintain materials in power plant environments. Our materials engineering experience has proven invaluable to clients in the design and construction of valves, boilers, heat exchangers, pressure vessels, storage tanks and structural members. **Promec** personnel have active roles in working with ASME Codes and Standards regarding design, materials, NDE and construction for more than a decade.

Our skills cover a wide variety of materials and applications, including mechanical equipment (piping, valves, pressure vessels, storage tanks) and exotic alloys. Whether your needs concern failure investigations or material design considerations, **Promec** stands prepared to assist your staff in their materials and welding engineering needs

- Specifications
- Applications
- Investigations
- Expert Testimony

QUALITY ASSURANCE AND QUALITY CONTROL CONSULTING

Promec provides clients with a complete spectrum of quality assurance and quality control services. Our staff has extensive QA/QC experience in design, procurement, manufacturing, fabrication, construction, installation, operations, maintenance, and modifications. **Promec** 's practical experience in QA, coupled with a comprehensive knowledge of industry requirements, allows us to serve client needs promptly and effectively. Call upon **Promec** for QA/QC assistance in program evaluation, development, manual and procedure review and preparation, vendor surveillance, receipt inspection and testing programs, audits, and training.

- Audits
- ASME Code Application
- ASME Joint Review Assistance and Consuelling
- Pressure Equipment Directive (PED) Application
- Program Review and Development
- Inspection Techniques
- Vendor Surveillance
- Expert Testimony

Quality Assurance programs should ***reduce costs***. If this is ***not true***, the program is ***faulty*** and should be evaluated for ***practical*** revisions to be made.

STRUCTURAL AND CIVIL ENGINEERING SERVICES

Promec is a consulting firm offering a broad range of steel structural and civil engineering services. Our commitment to an automated and creative environment allows us to continually improve our structural design process.

Our team of in-house designers use the latest industry-specific software to provide a full design service for our Clients.

We offer full frame design, connection design or both, adding our knowledge of fabrication methods and procedures to arrive at efficient design for fabrication and added value.

Working alongside our design-and-build CAD draughtsmen, we can quickly produce schematic frame designs to illustrate our ideas and design philosophies, or alternative ideas to assist the Consulting Engineer in assessing project-specific time and financial saving proposals. Full frame designs, backed up with calculations produced in detail by our design team's software packages, are produced in accordance with our Client's requirements.

Our experience includes:

- Structural Design in Accordance with EN, CNR-UNI and AISC Specifications.
- Design of Ladders & Platforms.
- Design of Support Structures & Skids for Mounted Equipment.
- Special Guides and Supports for Large Piping.
- Supports for Vertical and Horizontal Vessels.

Promec is specialising in the design of skids mounted process plant for the oil and gas industry.

Promec was responsible for the detailed calculation design and for the relevant shop drawings and for fitting out supervision. The Process Unit consists in a fuel gas separator skid to filter gas for use as fuel in the power plant.

Main Completed Projects

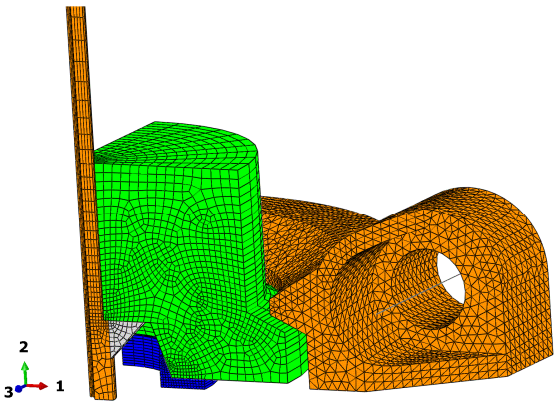
Project	Progettazione Pressure & Atmospheric Vessels Centrale Biomassa Agritre
Client	Group Service Energy spa / Comart
Location	Sant'Agata di Puglia (FG) - Italia
Year	2015
Project	Progettazione Pressure Vessels Val D'Agri
Client	Fores Engineering Srl / ENI spa
Location	Viggiano (PZ) - Italia
Year	2015
Project	Manutenzione N.2 Serbatoi – ALMA Petroli
Client	F.lli Amaducci / ALMA Petroli
Location	Ravenna - Italia
Year	2015
Project	Progettazione N.21 tank parallelepipedi per skid chemicals PETROBRAS P75 P77
Client	PETROBRAS / Fores Engineering Srl
Location	/
Year	2014
Project	Progettazione N.4 tank parallelepipedi per skid chemicals FPSO TEN – MODEC
Client	MODEC / Fores Engineering Srl
Location	/
Year	2014
Project	Progettazione N.21 tank parallelepipedi per skid chemicals PETROBRAS P74
Client	PETROBRAS / Fores Engineering Srl
Location	/
Year	2014
Project	Progettazione Pressure & Atmospheric Vessels – Piattaforme Fauzia & Elettra
Client	ENI SpA Dept. E & P
Location	Mare Adriatico - Italia
Year	2013
Project	Progettazione N.2 Skid Completi + N.3 pessure vessels – SNPC CONGO
Client	RENCO-SICIM / F.lli Amaducci
Location	Congo
Year	2013
Project	Progettazione N.8 Pig Trap Skid – DUNGA FIELD
Client	MAERSK / KCOI
Location	Kazakhstan
Year	2012
Project	Progettazione N.3 Racks e relative tubazioni - ALMA Petroli
Client	ALMA Petroli / F.lli Amaducci
Location	Ravenna - Italia
Year	2012
Project	Progettazione Nuovo Parco Serbatoi - ALMA Petroli
Client	ALMA Petroli / F.lli Amaducci
Location	Ravenna - Italia
Year	2012
Project	Progettazione N.21 tank parallelepipedi per skid chemicals PETROBRAS P62
Client	PETROBRAS / Fores Engineering Srl
Location	/
Year	2011

Project	Progettazione N.21 tank parallelepipedi per skid chemicals PETROBRAS P58
Client	PETROBRAS / Fores Engineering Srl
Location	/
Year	2011
Project	Progettazione N.3 Colonne Impianto EST - Sannazzaro
Client	ENI Spa DIV. R&M / Rosetti Marino S.p.A.
Location	Sannazzaro De' Burgondi – Italia
Year	2009
Project	Progettazione Desalter e Accessori – ENNPI - ASSIUT Refinery
Client	CAMERON / F.lli Amaducci
Location	Egitto
Year	2008
Project	Progettazione N. 6 API storage tanks - VISCOLUBE
Client	VISCOLUBE / F.lli Amaducci
Location	Pieve Fissiraga (LO) - Italia
Year	2008
Project	Progettazione Impianto Produzione Idrogeno SCT-CPO Zero Regio
Client	ENI
Location	Mantova - Italia
Year	2007
Project	Progettazione N.12 pressure vessels – UPGRADE PROJECT MOHAMMEDIA
Client	SAMIR / C.C.M.
Location	Marocco
Year	2007
Project	Progettazione N.4 Packages Completi – AKPO Field Development Project
Client	TOTAL / Fores Engineering Srl
Location	Nigeria
Year	2006
Project	Progettazione N.4 Packages Completi – Berrouaghia D'Une
Client	Saipem / Fores Engineering Srl
Location	Algeria
Year	2005
Project	Progettazione Slug Catcher – ONSHORE GAS DEVELOPMENT PHASE 3
Client	BECHTEL / Comart S.p.A.
Location	Emirati Arabi Uniti
Year	2005
Project	Progettazione Slug Catcher – UJUNG PANGKAH DEVELOPMENT
Client	AMERADA HESS / Comart S.p.A.
Location	Indonesia
Year	2005
Project	Progettazione HP e Test Separator - Kashagan Complex D
Client	AGIP KCO / Rosetti Marino S.p.A.
Location	Kazakhstan
Year	2004
Project	Progettazione N.3 Packages Completi - EL GAMIL PLANT UPGRADING
Client	PETROBEL / Fores Engineering Srl
Location	Egitto
Year	2003

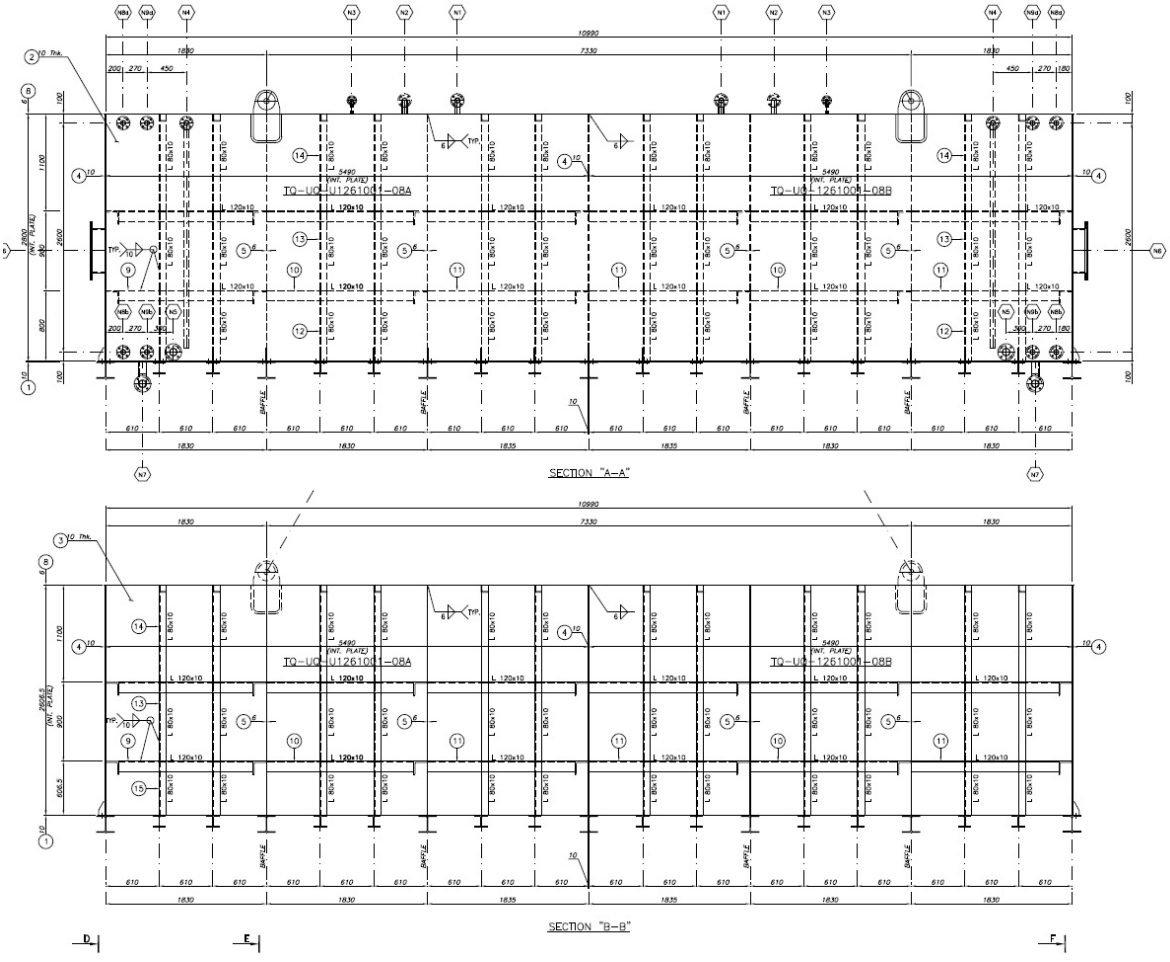
Project	Progettazione N.1 colonna + N.2 vessels – REVAMPING IMPIANTO PV1
Client	TECHNIP / F.lli Amaducci
Location	Marghera (VE) – Italia
Year	2003
Project	Progettazione N.5 pressure vessels – NPP PROJECT – PLOCK POLAND
Client	TECNIMONT / SICES
Location	Polonia
Year	2003
Project	Progettazione Package Completo - Impianto dispersione Acqua/TAR
Client	ENITECNOLOGIE / Fores Engineering Srl
Location	Marghera (VE) – Italia
Year	2003
Project	Progettazione N.4 pressure vessels – ROD INTEGRATED DEVELOPMENT –
Client	ENI SAIPEM BOUYGUES OFFSHORE /Rosetti Marino S.p.A.
Location	Algeria
Year	2002
Project	Progettazione Contactor N-LNG PHASE 3 GAS SUPPLY PROJECT –
Client	NAOC / Rosetti Marino S.p.A.
Location	Nigeria
Year	2002
Project	Progettazione N.2 reattori – PE PLANT 300 KT/Y
Client	TECNIMONT / Rosetti Marino S.p.A.
Location	IRAN
Year	2002

Challenges Met

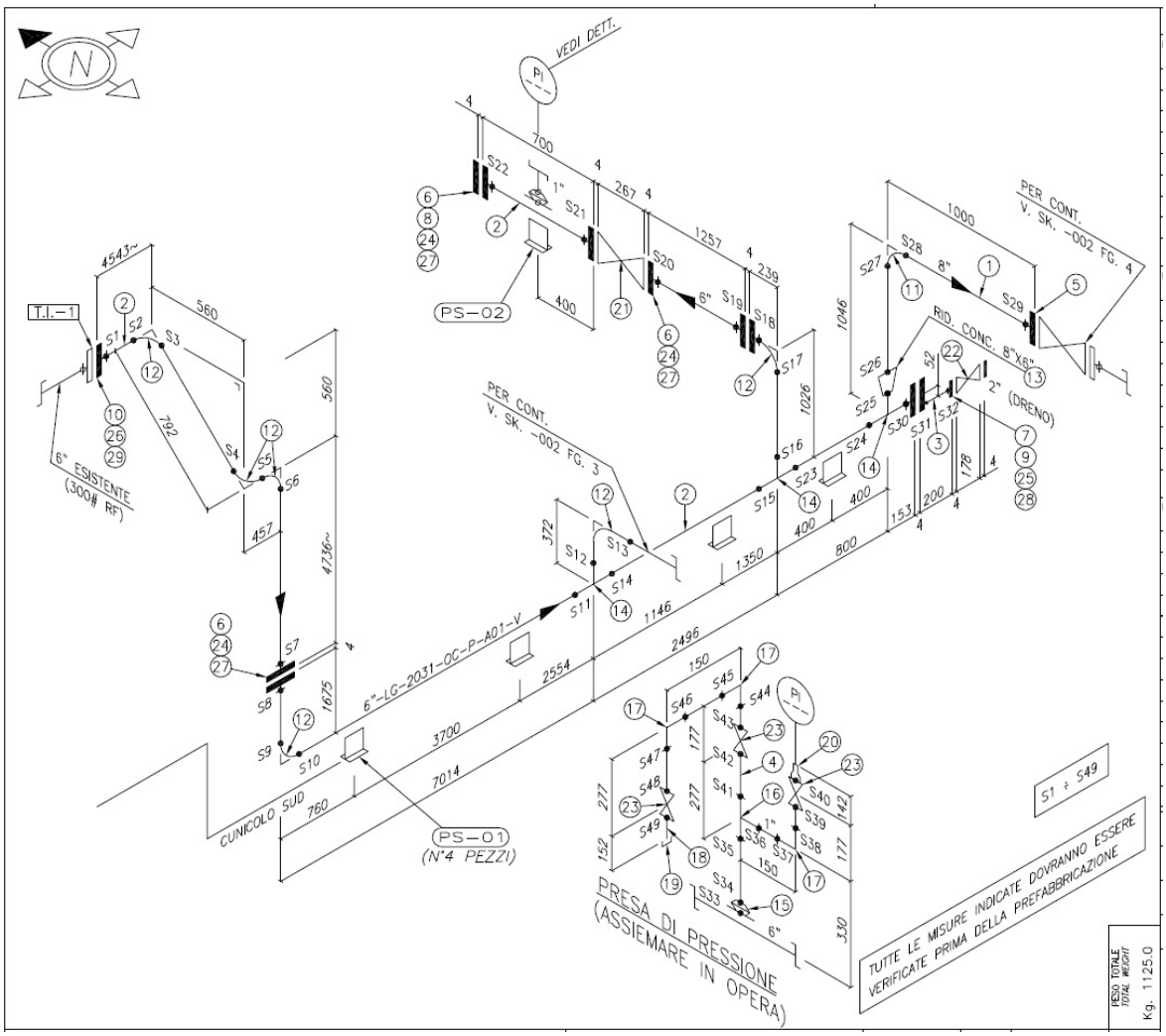
- Design Qualification of large distillation column using COMPRESS ®
- Hanger Failure Assessment - piping movement analysis, hanger redesign, equipment nozzle load minimization
- Design Review and Approval of API-650 External Floating Roofs for Manufacturer
- Bolted Flange joint and gasket design and qualification
- Clamped blind hub joint and gasket FEA design
- Modified Zick Analysis for horizontal tank on three saddle supports
- FPSO Rectangular chemical storage tank analysis



Clamped blind hub joint



FPSO Rectangular Chemical Storage Tank



Piping Sketch