ENGINEERING in Nuclear Energy

Quality Projects
In a span of over one decade, Fest Engineering Ltd. (FEST) has accumulated vast experience in supplying reliable engineering services in the sphere of Nuclear Energy. As the role of nuclear power generation grows more important in society, FEST endeavours to achieve the best engineering services in the field. Reliability, safety and economy are our key engineering benefits for customer satisfaction.

**In the field of engineering and construction, we offer:**

**Basic design / Detail design**

- Calculation of flow characteristics
- Piping system design
- Design of piping support systems
- Design of air ducts and HVAC
- Pipe stress analysis, verification
- Design of pressure vessels and equipment
- Analysis and design of steel structures
- Project Management
- Documentation
- Advice and reviews

We can help you to ensure the safety, reliability and integrity of the systems and the equipment. Guarantee of quality ensures professional approach of our engineers certificated according to PED 2014/68/EU and ISO/IEC17024: 2004.
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We provide the calculations of the piping systems and equipment to evaluate compliance with the following standards:


Calculations of anchoring and structures to evaluate compliance with standards:

EUROCODE 0-9, NTD A.S.I. Section III and ASME BPVC.

COMPLEX ANALYSIS

In the area of complex industrial applications, which require the interaction of various types of numerical analyses, we benefit from more than 20 years of experience. In this field we offer:

- Strength analyses of systems, structures and components of nuclear power plants
- Dynamic analyses of equipment for nuclear power plants
- Issuance of strength, lifetime and seismic resistance certificates for the systems, structures and components of nuclear power plants
- Analysis of high pressure systems and equipment operating in cryogenic or creep temperatures,
- Assessment of rotating machines according to API standards, torsional and lateral vibration analysis,
- Seismic resistance assessment of complex structures including fluid - solid interactions,
- CFD analyses,
- Assessments of the causes of the equipment failures and analysis of accident scenarios,
- Sensitivity analysis, optimisations and cooperation in the development of new equipment.

We provide the calculations of the piping systems and equipment to evaluate compliance with the following standards:


Strength analyses of systems

Calculations of anchoring and structures to evaluate compliance with standards:

EUROCODE 0-9, NTD A.S.I. Section III and ASME BPVC.

Analysis of steel structures
ANALYSIS OF PRESSURE EQUIPMENT

We offer elaboration of qualification documentation for WWER nuclear power plants equipment.

Temperature field, butterfly valve loaded in accident condition, Ansys

Assessment of torsional vibration, rotor of compressor assembly, Ansys

Assessment of vertical tank seismic resistance, fluid-solid interaction, Ansys

Flow rate, CFD analysis of gate valve closure to full flow, Open Foam

ASSESSMENT OF THE CAUSE OF FAILURE

Calculation analysis of buckling conditions

Stress at lens gasket, calculation analysis of leaking flange joint

Calculation model of leaking flange joint

Analysis of flange joint leakage

Comprehensive investigation of industrial accidents.
Analysis of the causes of cracks in an exhaust pipe

Large cracks were discovered after nearly a decade in operation in an exhaust pipe of turbo machinery, which was several meters in diameter. These cracks affected the stability of the structure.

VIBRATION RESISTANCE OF ROTATING MACHINES

Mitigation of undesirable vibrations during the operation of rotating machines is unthinkable without the detailed assessment of their vibrational characteristics.

The basis are torsional and lateral vibration analyses of rotating machines.

TORSIONAL VIBRATION ANALYSIS

The result of the operation of rotating machines near the torsional eigenfrequencies is usually the fatigue of shafts, coupling or gearboxes. A critical hazard of torsional vibration, in contrast to lateral vibrations, is that common sensors do not indicate operation in resonance frequencies.

By the torsional vibration analysis (TVA) are typically determined torsional eigenfrequencies in relation to the potential excitation frequencies (derived from the shaft rotational speed). Critical cross-sections are assessed usually for static strength and/or fatigue.
LATERAL VIBRATION ANALYSIS

The aim of lateral vibration analysis (LVA) is the complex assessment of vibration resistance of rotating machines. Based on the results it is possible to mitigate the risk of vibrations (suitable frame support design, changes in stiffness and damping of connected systems).

STRENGTH CALCULATIONS OF HIGH PRESSURE EQUIPMENT

PROCEDURE BY STANDARD
Standard assessments of high pressure equipment are based on calculation procedures in accordance with standards, for example ASME BPVC Sec. VIII Div.3, which allows and in some cases requires the use of elastic-plastic FEM analyses.

NONSTANDARD APPROACH

The nonstandard approach is chosen in cases when the assessment of atypical design / load condition is required. In such cases we offer research and development type services:

- problem analysis, solution methodology elaboration, specialist consultations for the fields of material science and welding technology,
- ensure the experimental part of the solution (e.g. low cycle fatigue or creep tests),
- evaluation of the experimental program and material model parameters set,
- computational analyses focused on different aspects of design (selection of autofretage pressure, optimisation tasks, lifetime maximisation, limit states of design).

TIGHTNESS ASSESSMENT OF HEAT EXCHANGER FLANGE JOINTS

The subjects of solution were four flange joints of heat exchanger, on which leakage problems were observed during periodic a pressure test. The task was to propos new gasket material and tightening moments of the bolts:

- strength: stress of each part has to fulfil limits in accordance with standards,
- tightness: gasket pressure shall be within manufacturer limits, at lower gasket pressure there is a risk of leakage and at higher pressure a risk of damage to gasket.

METHODOLOGY
In the design of flange joints and bolt tightening moment calculation, analytical methods are usually used. The assessment of flange joints detailed by finite element analysis. The special gasket element makes it possible to specify nonlinear gasket characteristics. The gasket pressure distribution is an advantage of this analysis. Flange joint categorisation in according with NTD-ASI-III.

Example of experimental gasket compression curve
Gasket pressure after flange stiffening
Stress intensity in welding neck after construction modification and increased bolt tightening force

- Analysis
TIGHTNESS ASSESSMENT OF HEAT EXCHANGER FLANGE JOINTS

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- Analysed flange joints of heat exchanger
- Detail of finite element model, flange joint of tube sheet and head of heat exchanger
- Tube sheet flange joint stress intensity during pressure test and indication of critical cross-sections
- Example of experimental gasket compression curve
- Stress intensity in welding neck after construction modification and increased bolt tightening force
- Gasket pressure after flange stiffening
Non-computing tasks

- Advice on selecting suitable components based on the results of computational analysis and the experience of our professionals
- Processing technology and installation instructions
- Development methodologies and practices in accordance with standards and legislation

We combine knowledge, experience and technology in one.

Currently, the investors or feasibility and engineering companies have an infinitive number of technological or structural components and materials. We go further in this direction - we cooperate with suppliers and assist you in selecting materials, pipe or structural components that we will check for you in terms of availability, integrity and security. During the construction of technological plants, we offer services related to author guidance or supervising the construction site.

Guidance

- Consideration of appropriate choice of materials
- Selection of the appropriate piping components
- Independent verification and calculation of seismic components
- Selection of suitable fastening and anchorage systems and their calculation
- Processing manuals and methodologies for the design and installation of piping systems in accordance with current legislation and relevant standards
- For commercial customers we offer a rendering of the project and creation of presentation images and animations of the project.

Supervision

- Site supervision services during construction
- Technical supervision services
- Supervising the construction
- Consultancy on site
- Inspection and interaction between construction and design department
- Consultancy during assembly
- 3D scan of structures and technology and its transfer to the 3D model formats in ACAD and PDMS
AVEVA PDMS

We provide:

- Creation of macros, pipe specifications, components catalogues
- Administration, management, complex project creation in PDMS system
- Outsourcing and staff training in PDMS
- Outsourcing of our team for your design

Outsourcing engineering team

Engineering solutions should be agile, innovative, robust and profitable at the same time. Which is why we offer our outsourcing services and complete solutions in all stages of the specific project.

Our key disciplines are listed below:

- Technicians
- Supervisors
- Engineers
- Project Managers
- Team Leaders
- Design
- Planning
- FEM Calculation Engineers
- CFD Calculation Engineers
- Pipe Calculation Engineers
- Welding - structures, pipes

We cover a large spectrum of tasks from office work to sitework in all stages of engineering, nuclear and non-nuclear, gas and oil projects.
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Contacts:

FEST Engineering Ltd.

37 Commercial Road, Poole, Dorset BH14 0HU
Great Britain

info@fest-engineering.com
www.fest-engineering.com