DOCAN©

A CAN DO COMPANY

OIL & GAS PACK

2021

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ABOUT US

WE ARE AN ADVANCED ENGINEERING CONSULTANCY AND CAE SOFTWARE DISTRIBUTION COMPANY.

WE PRIDE OURSELVES ON OUR CAN-DO APPROACH AND ABILITY TO OFFER CUTTING EDGE SOLUTIONS TO OUR CLIENTS.

We are run by experienced Professional Engineers, Designers and Consultants following an ISO9001:2015 BSI certified Quality Management System and have experience in many regulated industries.

bsi ISO 9001 Quality Management Systems CERTIFIED

ISO 9001:2015 | Certificate number: **FS 729034**

Our processes and QA system are aligned with providing design and assessment services for high integrity engineering products, and we have a growing track record of delivering on significant safety-critical projects.

OUR BUSINESS IS SPLIT INTO TWO DISCREET DIRECTORATES.

- **Engineering Consultancy**
- **CAE Software Distribution**

We have formed several strategic partnerships with world class CAE software houses, giving us access to a comprehensive range of design and analysis products. We have tools and skills covering a broad spectrum of client requirements for product design, drafting, analysis and assessment.

CONSULTING SERVICES

At DOCAN we have a wide range of skills, experience and people. At our core we are run by professional engineers with many years of experience in industries including Oil & Gas, Drilling (Onshore/Offshore), Renewables, Aerospace, Nuclear, Power Generation and Manufacturing.

Our culture, setup and experience are tailored to working on high integrity systems within highly regulated industries, while having to deliver to challenging timescales and budgets. Our verification processes follow the requirements of our ISO 9001 QMS and are compatible with those companies which operate in highly regulated industries.

We promote a 'can-do' attitude within our highly integrated consulting teams. Our engineers are encouraged to approach problems from different angles, and also to explore new methods and technologies where these could deliver benefits.

The core services that we provide include CAE involving systems, process, structural mechanics, thermo-fluids, engineering design, CAD, drafting, FEA & CFD, classical analysis, and both design code and fitness for service assessments.

Some of the many areas we have experience with include (but not limited to):

- Design, analysis and assessment of structures.
- Design and assessment of Rotating Control Device components and related drilling equipment.
- Design and drafting of mechanical handling equipment following British Standards requirements and employing FEA for assessment of items for lifting, from small items up to +450Te pressure vessels.
- Piping design, Pipe Stress Analysis to industry leading codes, design and assessment of vessel and tanks including reverse engineering of existing equipment.
- 1D Navier-Stokes based fluids analysis and 3D CFD analysis of various systems.
- Piping slug flow/water hammer and other Fluid-Structural Interaction problems.
- Fitness For Service Assessments (FFSA) of pipework, pressure vessels and associated equipment following the relevant industry codes.
- Design and validation of insert plate repairs strategy for +65m tall pressure vessel, including creation of AFC repair drawings.

Our team have experience working with a wide range of design codes including British Standards, Eurocode, ASME (American Society of Mechanical Engineers), API (American Petroleum Institute), DNV (Det Norske Veritas), and more.

In addition to our core services, we have access to manufacturing resources including fabrications, machining, and assembly, from small components through to large scale items such as furnaces and boilers.

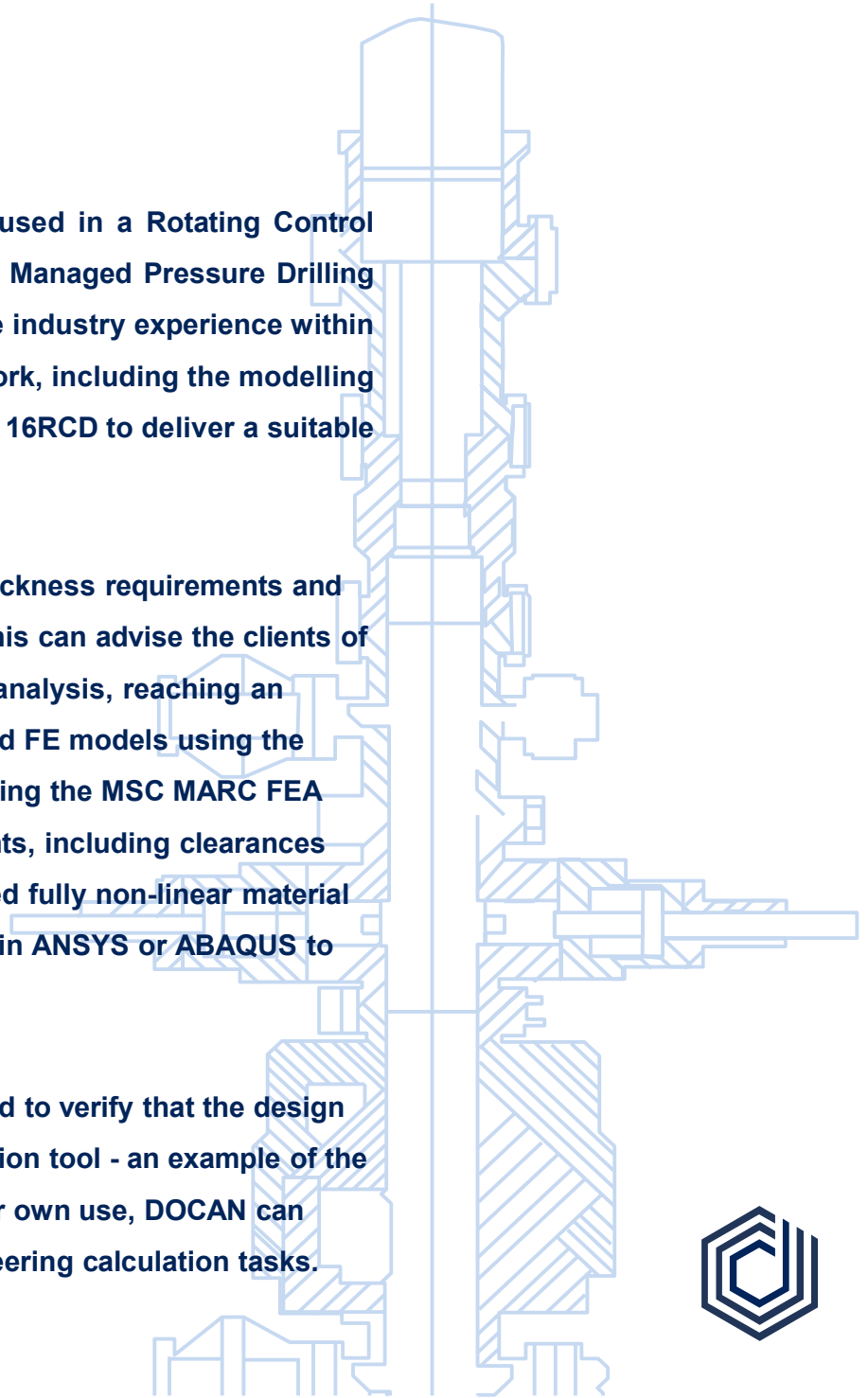
SAMPLE PROJECTS

RESEARCH & DEVELOPMENT

An OEM client in the drilling industry required assessment of a sub-assembly used in a Rotating Control Device (RCD) - which is used to divert and control flow under when operating in Managed Pressure Drilling (MPD) and can be subject to extremely high pressures. In addition to our extensive industry experience within this field, we also use state-of-the-art design and analysis tools to complete our work, including the modelling & simulation tools within MSC One. For this project we worked to design code API 16RCD to deliver a suitable design code compliant system to the client.

Firstly, we performed upfront calculations, including minimum design code wall thickness requirements and determining load transfer between parts to perform initial sizing of components. This can advise the clients of the likely areas of issue so we can suggest minor improvements without complex analysis, reaching an effective solution as efficiently as possible. We produced our 3D CAD geometry and FE models using the MSC Apex software for rapid preprocessing. Non-linear analysis was conducted using the MSC MARC FEA software allowing the analysis of complex interactions between multiple components, including clearances between parts and understanding the effects of bolting pre-loads. We also employed fully non-linear material models to account for material plasticity. These same procedures can be followed in ANSYS or ABAQUS to keep projects consistent with client's previous work.

The design was assessed following the relevant design codes and FEA results used to verify that the design was acceptable. Stress linearization was performed with a custom DOCAN calculation tool - an example of the DSET (DOCAN Stress Engineering Tools). In addition to creating these tools for our own use, DOCAN can develop custom tools for our clients to use to automate and streamline their engineering calculation tasks.



DESIGN

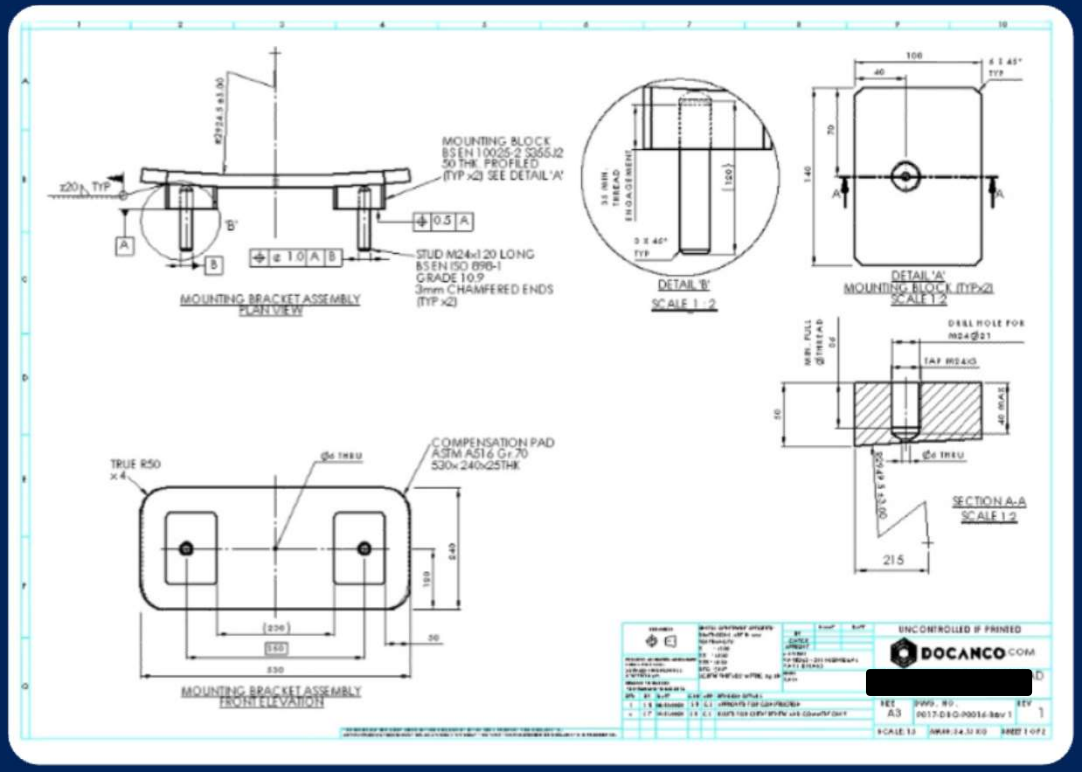
One of our larger consultancy projects included a smaller project to design a bracket which was to be used to attach a lifting hoist to a pressure vessel for use during repair of the vessel.

This component would be used to brace the lift and associated structure to the pressure vessel during repairs, so would need to withstand the wind loading and dynamic forces applied by the movement of the loaded hoist without damage to the thin vessel wall.

We designed the attachment bracket using a combination of manual calculations and analysis and provided detailed engineering drawings (including all relevant GD&T), for the client to manufacture and install the parts.

For our analysis work, we employed a combination of PV Elite to calculate stresses imposed on the vessel shell, as well as full FEA modelling to verify small detailed of the bracket.

Should our clients prefer that a particular FEA code is used for design work, we can work with ANSYS, ABAQUS, and MSC APEX, amongst others as required.



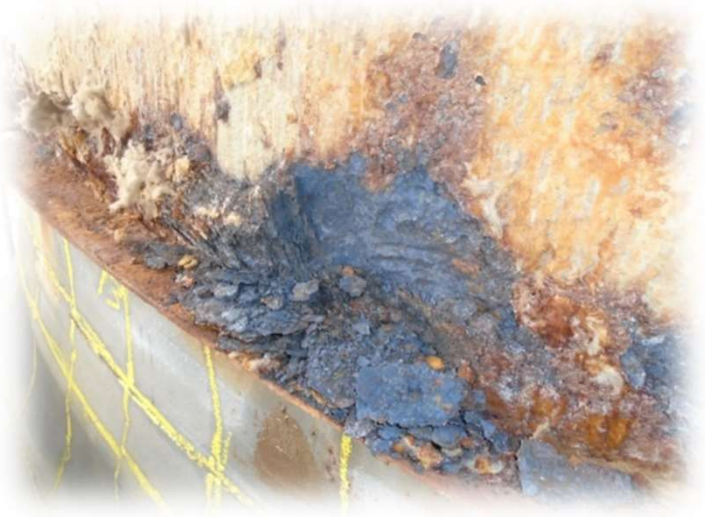
FITNESS FOR SERVICE

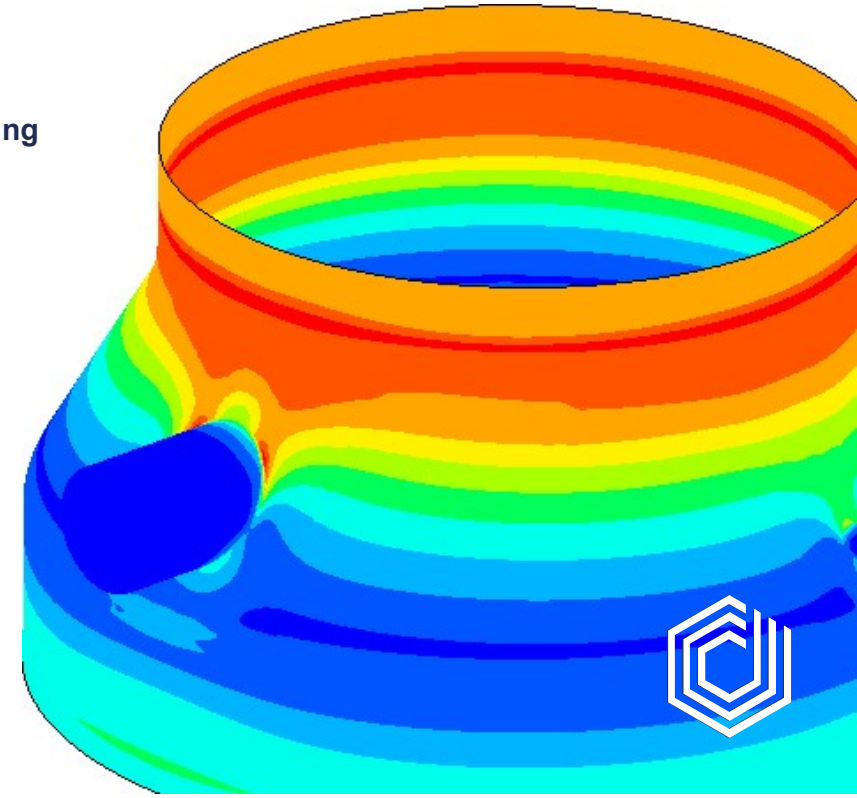
With significant corrosion present in the central cone section, this pressure vessel required a detailed API 579 Level 3 Fitness For Service Assessment (FFSA).

We began by reviewing photos and wall thickness measurements followed by using a combination of Solidworks with MSC APEX and MARC to develop the FEA model which would be used for the FFSA.

Shell elements were used to represent the vessel and corroded areas. Additional independent 3D solid element models of the defect features were used to verify the shell element modeling philosophy. As a result of this work, our team managed to achieve accurate results while minimising the computational expense of the assessment, providing quicker results for the client.

We produced a detailed report showing the methods required to capture the response of the model, and show the resulting utilisation as compared to the code allowable stresses and strains, showing the vessel fit for service.





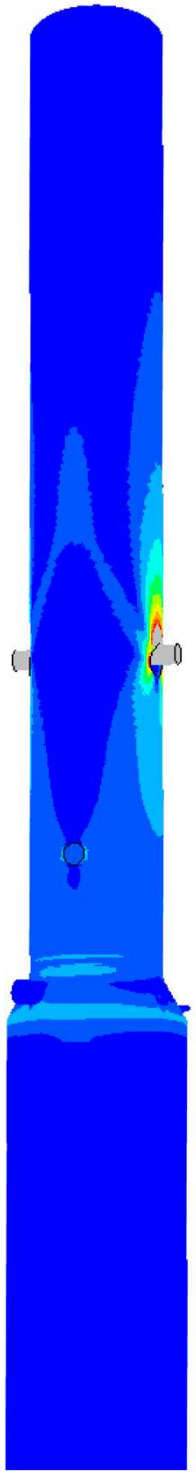
MECHANICAL HANDLING

As high integrity equipment, there is a limit to the life span of much of the equipment we work on. When the time comes to decommission a piece of equipment the client wants a smooth and organised operation to reduce the risks that they otherwise would be unable to properly assess.

In this example, the client was decommissioning a 40+ year old pressure vessel, weighing over 400Te and spanning over 50 meters. Due to the scale of the vessel, it was critical to be confident in the lifting operations as the thin vessel walls might not have been able to withstand the lifting stresses after years of corrosion. Our task was to verify that the vessel could be lifted safely out of its current position and laid down for transportation away form the refinery.

We handled this task utilising our knowledge of lifting standards such as BS EN 13001, and mechanical handling problems in general. We produced manual calculations and detailed FEA modelling to understand the magnitude of stress around the lifting details, and the factors that have significant implications on these stresses. Our calculations supported results produced by a highly non-linear FEA assessment including material plasticity, large displacement effects, and frictional contact.

Here we advised that a further safety margin would be required based on the known information about the system, and this could be achieved with a small change to the lifting detail, optimising the load distribution for the proposed set up.



CFD (GLOBE VALVE)

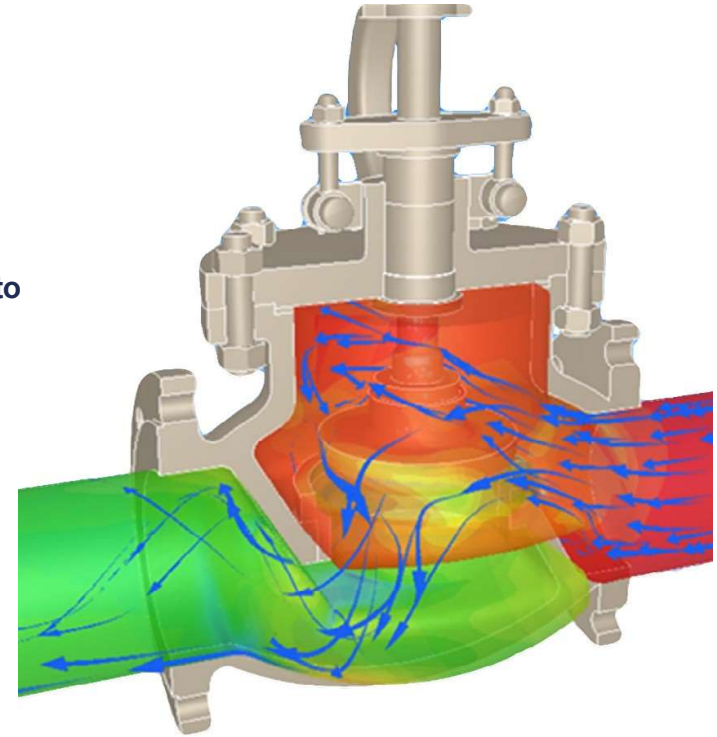
As part of a research task undertaken for a client, we developed a system model of a pipe network to understand the system response due to a valve's operating characteristics. This required a combination of detailed 3D CFD analysis to add fidelity of the valve Cv curve in the 1D system analysis.

The 5" Globe Valve was simulated with varying valve opening and flowrates in MSC Cradle CFD software in order to determine the associated Cv curve for the design. Then, Flownex was used to determine the effect of a custom valve on a flow network compared to a standard valve design.

This method of modelling the system offers significant time and resource saving benefits, compared to trying to idealise the valve and network in a single CFD model.

This is useful for special components where standard handbook flow coefficients are not available, so are not immediately representable in a 1D network modeler. CFD offers a simple solution which can be input into a network model within Flownex. This case showed use of a unique Cv curve, but the process could be used to consider erosion, cavitation, heat transfer properties, and more.

This Cv curve was input into a Flownex component with a network representing the client's system and run transiently to compare operations with different valve parameters. This method of analysis was used to demonstrate the benefits of combined 3D CFD and 1D network analysis for component selections and flow system optimization.



FLUID STRUCTURE INTERACTION (FSI)

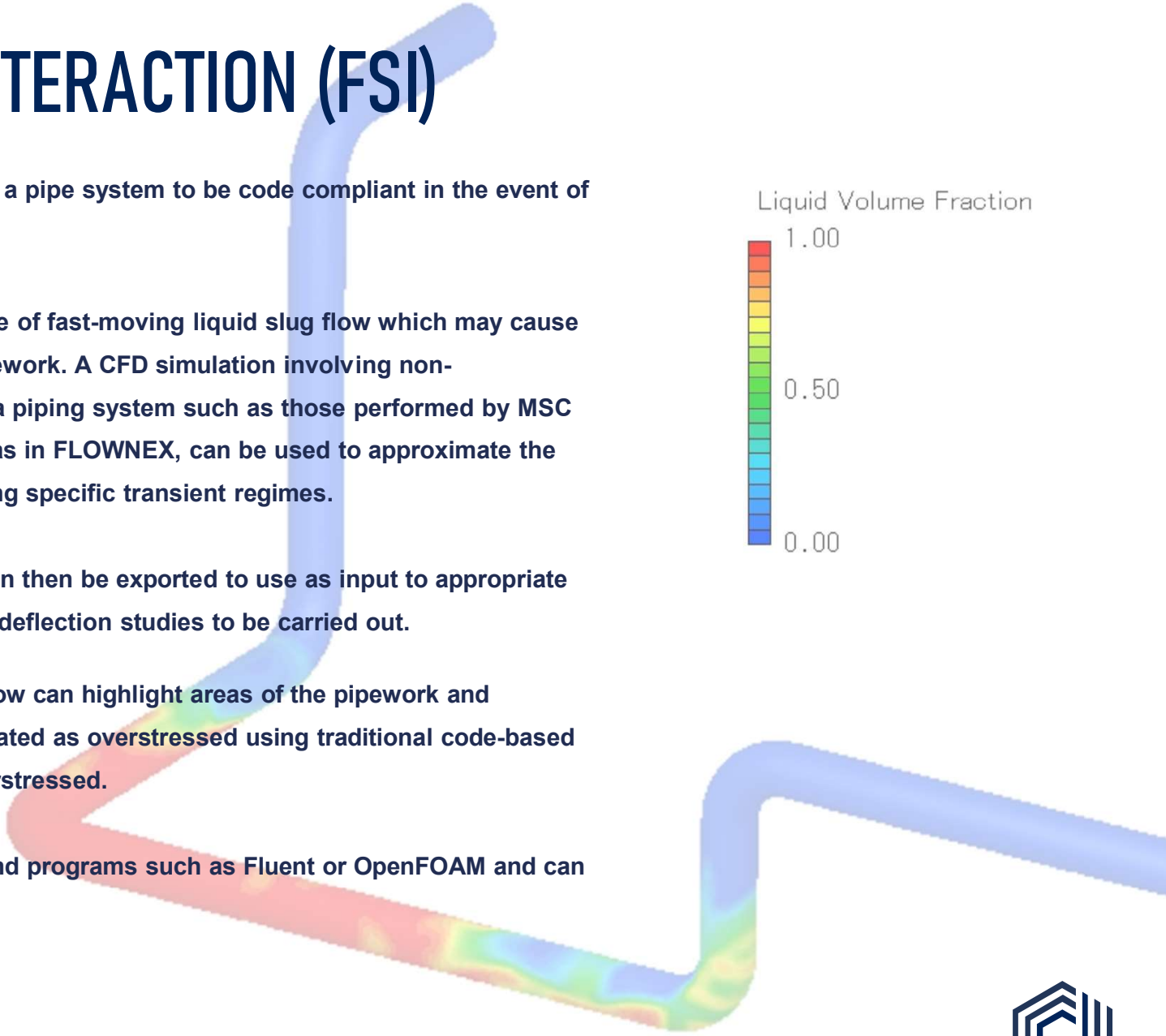
A potential client was having difficulty showing a pipe system to be code compliant in the event of slug flow occurring within the pipe.

This kind of phenomenon involves the presence of fast-moving liquid slug flow which may cause structural problems during impact with the pipework. A CFD simulation involving non-homogeneous multi-phase slug flows through a piping system such as those performed by MSC Cradle, or a simpler 1D fluid assessment such as in FLOWNEX, can be used to approximate the exact forces generated in a piping system during specific transient regimes.

A time-history of forces acting on each bend can then be exported to use as input to appropriate software, in order to allow transient stress and deflection studies to be carried out.

This method of calculating forces due to slug flow can highlight areas of the pipework and support structures which may have been calculated as overstressed using traditional code-based approaches, but which actually may not be overstressed.

DOCAN are familiar with a variety of software and programs such as Fluent or OpenFOAM and can be used at the client's request.



STRUCTURAL ASSESSMENT

Our client required a jet thrust testing system to be designed which would be retrofit into a standard size ISO container, which would form part of the load bearing structure.

The large forces produced by the jet thrust system required a strong frame design to protect the sensitive system components, whilst giving the client flexibility to change the configuration of the test equipment to accommodate different test parameters.

Our scope was also to provide marked up engineering drawings for manufacture and to verify the capacity of the containers lifting points for transportation purposes, with the much heavier test system installed. Our experience in the design, analysis and assessment of fabricated systems, and relevant design codes were an asset to the project.

Due to the detailed nature of connections involved, an FEA approach was used. For other cases we would use other tools such as STAAD, SAP2000 or GT Strudl which enable us to complete safe and efficient code designs. We began using a combination of manual calculations and beam element FEA modeling to size the main structural members, following EC3 design rules. This allows for several design iterations to be quickly explored. More detailed shell and solid element FEA modelling was then used to assess the detailed locations of the design. We developed an innovative bolting arrangement which could be used to quickly change the configuration of the equipment to suit the client's needs. Due to the different aspects of the testing system, we performed the assessment using Eurocode, DNV and ASME Piping design codes to show the components were suitable to carry the massive thrust loads which would be applied during use.

WHERE WE ADD VALUE

How We Can Help.

We have a track record of delivering on a wide range of large and small projects, including high integrity R&D, FEED, Detailed Engineering and Design projects, as we hope the examples on the preceding pages demonstrate.

End Client

At DOCAN your IP is yours, the same goes for your methods and clients. It is in our interest that you are successful which helps develop our relationship with you. We work seamlessly and badge any outputs as yours, or equally can fully use our own systems. For the End Client – it is business as usual.

Benefits To Project Director/Manager.

Due to our lean O&G experience, we will likely be very quick to market compared to some of our larger competition. We believe that we can compete by delivering safe, cost-effective solutions quicker than our competitors.

QA/QC/HSEQ Director/Manager

DOCAN was developed from experience within regulated industries and QA systems were put into place before any major pieces of work were completed. Our operating system is an ISO 9001 certified QMS and our processes are consistent with those of major companies in the O&G, Nuclear and Power Generation industry.

We are also industry members with FPAL and UVBD, and members of NAFEMS. You can have trust and confidence that we deliver on Quality, Health and Safety and Environmental measures.

“DOCAN’S TECHNICAL DIRECTOR USED TO WORK FOR ME AS THE ENGINEERING MANAGER WHEN I WAS CEO OF AN OFFSHORE DRILLING OEM – BASED IN NORTH AMERICA AND ASIA. WE GAVE RICK AND THE DOCAN TEAM TWO PIECES OF MAJOR API 16 RCD MPD EQUIPMENT WHICH NEEDED STRESS ANALYSIS BASED ON A CURRENT ADS DESIGNS.

NOT ONLY DID DOCAN COMPLETE THE FULL 3D STRESS ANALYSIS, THEY ALSO CAME UP WITH PRACTICAL AND THOUGHT-OUT DESIGN AND MACHINING CHANGES WHICH IMPROVED THE DESIGN AND STRUCTURAL INTEGRITY OF THE EQUIPMENT. OUR EQUIPMENT IS USED FOR LAND DRILLING PREDOMINANTLY IN NORTH AMERICA AND IS CUTTING EDGE. KNOWING WHAT DOCAN ARE CAPABLE OF, WE SHALL BE USING DOCAN AGAIN FOR MANY OTHER PROJECTS IN THE FUTURE. ”

- TESTIMONIAL BY CHARLES ORBELL – PRESIDENT, ADS

CONTACT US

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