DOCAN ©

A CAN DO COMPANY

ADVANCED ENGINEERING CONSULTING SERVICES 2021

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.

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**

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.

bsi ISO 9001 Quality Management Systems **CERTIFIED**

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

OUR VALUES

Our values at DOCAN are the forefront of our identity and vision. They play a major role in the success of every project we undertake.

We are driven as a company, as a team, to bring together our expertise, powerful technologies, industry experience and insights which helps our clients solve their problems.

- To have a can-do attitude
- To have accountability
- To have integrity
- To be honest and straightforward
- To deliver on value and quality
- To have a positive social impact
- To have a customer focus
- To have the most appropriate and innovative technology solutions available
- To be positive
- To have fun and learn on the way

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.

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.

In addition to our core services, we have access to a range of DOCAN Associate Engineers who are industry experts and specialise in key industries, for example Aerospace and Defense, and niche disciplines, such as Electromagnetics, RF, and Optoelectronics.

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.

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.

HOW WE CAN HELP

OUR KEY AREAS OF EXPERTISE ARE:

- Engineering Design & Assessment
- Engineering Simulation & Analysis Expertise
- Training Services for Design & Simulation
- Term Contracting Supplier
- Expert and 3rd Party Reviews

We provide a service to solve our clients' engineering problems.

We work in a way which suits our clients. This could be as an independent engineering resource which provides high-level engineering design, analysis and assessment services, through to providing turnkey project solutions. Or we could work alongside your in-house engineers, providing support, technology transfer services and training to meet your requirements.

We are flexible in our approach and work to provide our clients a solution which works.

TYPICAL INDUSTRIES AND EXPERIENCE

DOCAN's engineers are experienced across a wide range of industries, and we actively promote knowledge transfer within the company, meaning our skill sets are continually expanding.

Here are a few of the industries within which we have developed a track record with our clients:

Aerospace

The DOCAN team have access to the most trusted software and techniques used in the Aerospace sectors with MSC Nastran in addition to others. We have engineers with experience include working on the A400M and A380 and an Associate Engineer who has held a signatory level position for multiple blue-chip companies and has worked on highly complex aero applications.

Automotive

We have industry experience covering consultancy projects assessing the smallest components through to working in Original Equipment Manufacture (OEM) and parts supply into some of the biggest Japanese auto companies, as well as motorsport applications in world & national level categories.

Defence

Our engineers have industry experience working on a variety of defense applications. These include thermo mechanical design of electronics and sat comms equipment (SABIT, Manpack, Paradigm), Electronics applications for EADS, and the Faslane submarine ship lift.

Oil and Gas

Our engineers' have worked across the globe for multinational OEMs and have covered most aspects of the product life cycle, from R&D, through to manufacture and testing, all the way to fitness for service assessment and decommissioning.

Nuclear & Power Generation

We work on high integrity designs within highly regulated industries, while having to deliver to challenging timescales and budgets. Our verification processes are compatible with those of leading companies in the nuclear and power generation sector.

Electronics & High Tech

We work with major electronic OEMs on R&D projects and also provide theoretical and software training. We also have a specialist Associate Engineer with a background in Photonics and Optoelectronics.

Renewable & Green energy

We have direct experience of renewables as well from working with clients developing renewable wave energy, to wind energy directly developing thermal energy.

SOFTWARE

We employ a wide range of tools and software packages across our consultancy business.

We have formed partnerships with world leading software houses which enables us to offer you cutting edge software.

We also have acquired additional tools to support our consultancy work as needed.

Here are some of the tools available to us:

COMPLETE SIMULATION & ANALYSIS TOOLS

- MSC SOFTWARE* (INC. MSC NASTRAN, PATRAN, ADAMS, CAE FATIGUE, CRADLE CFD, AND MANY MORE)
- ALSO INCLUDES ABAQUS, ANSYS, AND OTHER PACKAGES AS DESIRED BY THE CLIENT.

For FEA & CFD, acoustics, fluid-structure interaction, multi-physics, fatigue and durability, multi-body dynamics, and more.

1D SYSTEMS ANALYSIS

- FLOWNEX*

1 dimensional thermo fluid system modeler and solver with capabilities to handle flows of pure liquids or gases, mixed flows, compressible and incompressible fluids, incondensable, two-phase, and slurry flows.

2D DRAFTING & 3D CAD

- BRICSCAD*
- SOLIDWORKS
- AND OTHER HIGH-LEVEL PACKAGES

Covering basic 2D drafting through to complex 3D modelling and engineering drawings for all industries.

PRESSURE SYSTEMS

- ROHR2*
- CAESARII
- PV ELITE & CODE CALC
- TANK

Static and dynamic analysis of pressure systems for piping, vessels and pipeline systems.

ENGINEERING MATHEMATICS & AUTOMATION

- MAPLE*
- MATHCAD
- MATLAB
- FORTRAN, C++, PYTHON

Analyzing, exploring, and solving mathematical problems.

HPC & CLOUD COMPUTING

- RESCALE*
- IN HOUSE HPC'S

Providing HPC resource solutions.

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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.
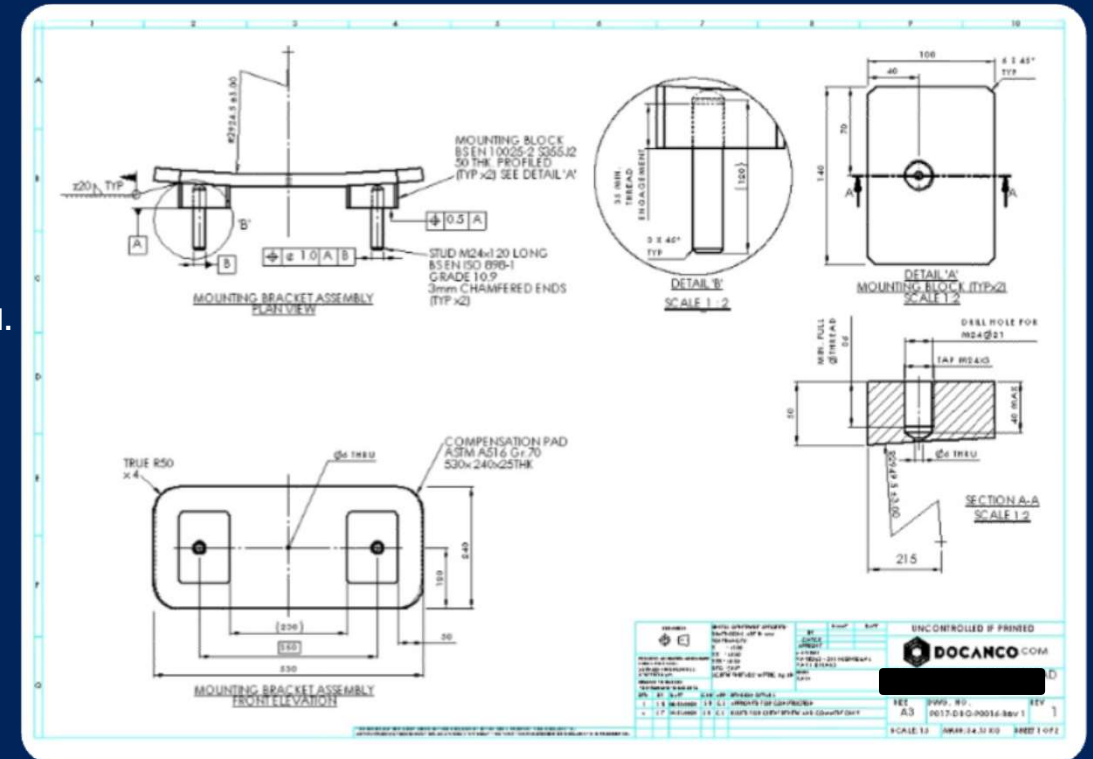
FLUID STRUCTURE INTERACTION (FSI)

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.

Liquid Volume Fraction

1.00

0.50

0.00
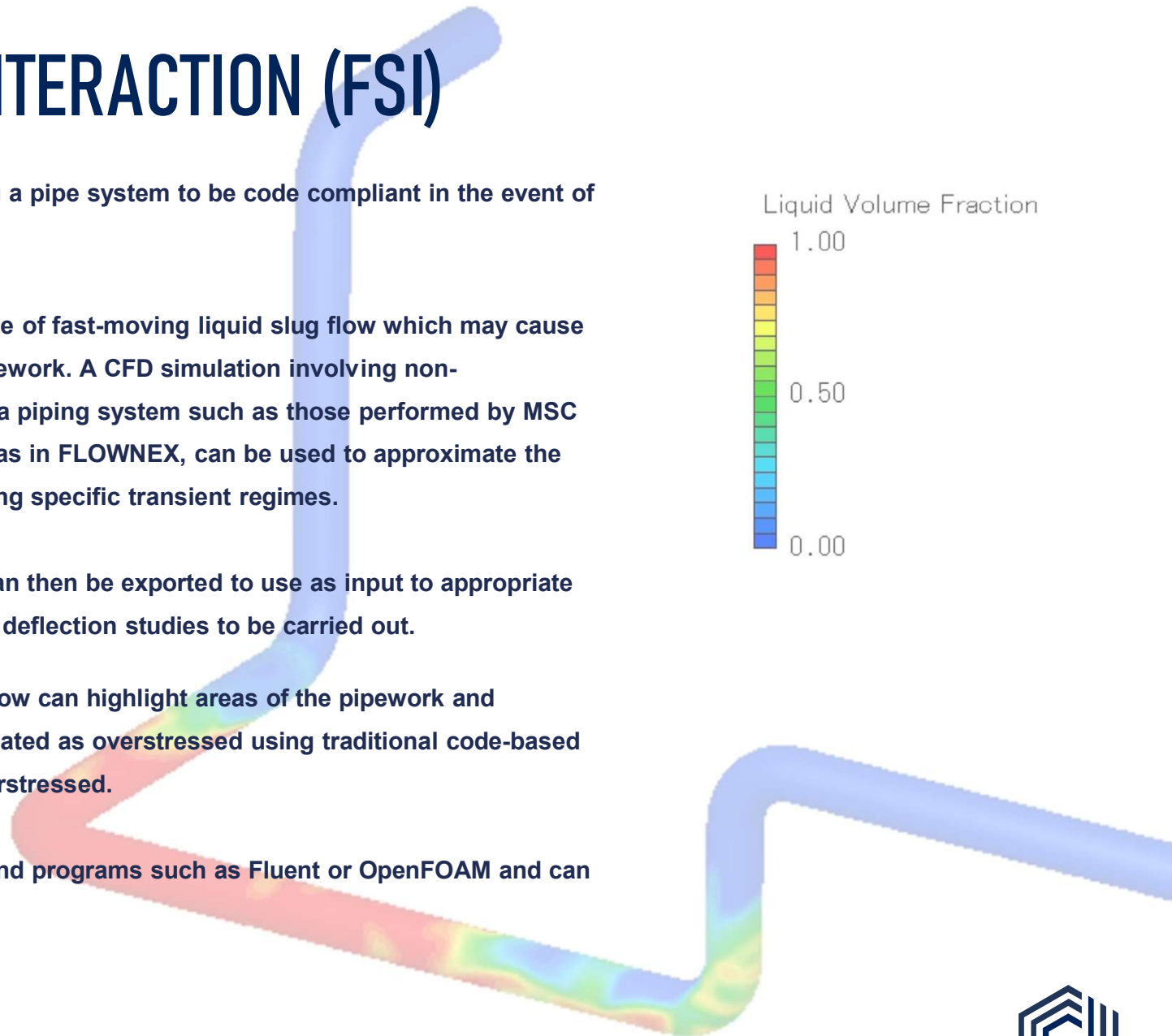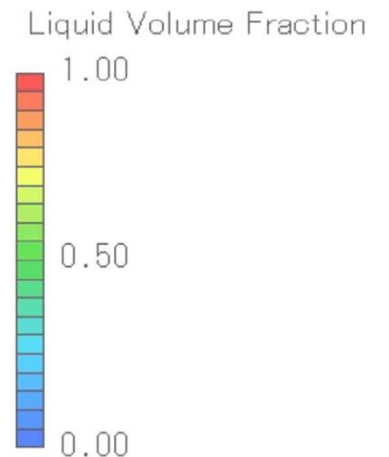
CFD (GLOBE VALVE)

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.
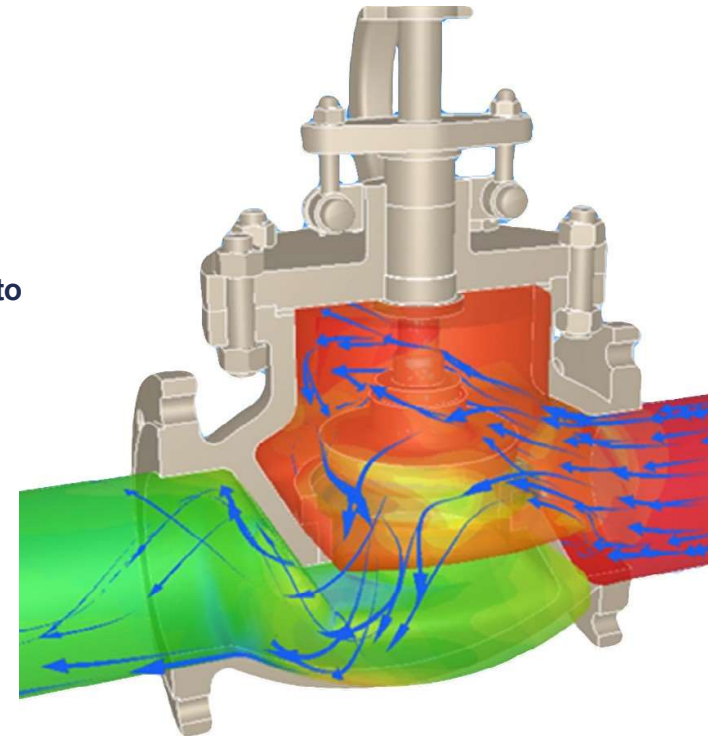
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