DOCAN©
A CAN DO COMPANY

# COMAH SITES CONSULTING PROJECTS 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.**

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**

**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.**

# 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 Safety Engineering, Programming, 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

*INDICATES WHERE DOCAN IS AN AUTHORISED RESELLER OR CHANNEL PARTNER

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.

## HPC & CLOUD COMPUTING

- RESCALE*
- IN HOUSE HPC'S

Providing HPC resource solutions.

## 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.

## 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.

## ENGINEERING MATHEMATICS & AUTOMATION

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

Analyzing, exploring, and solving mathematical problems.

## CAN'T SEE WHAT YOU'RE LOOKING FOR...?

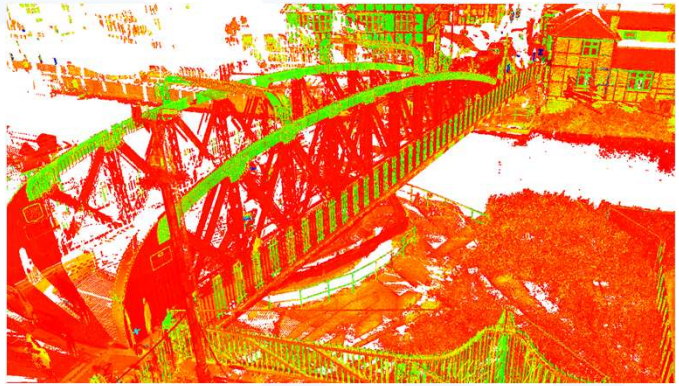
CONTACT US TO ENQUIRE ABOUT YOUR SPECIFIC CONSULTANCY REQUIREMENTS **WWW.DOCANCO.COM**

# SURVEYING SERVICES

**In addition to our strong engineering background, we have expertise in surveying techniques and are developing this part of the business through our partnerships with state-of-the-art surveying technology companies.**

**Advanced equipment, such as the Leica RTC360, P40 long range scanner, and Total Station allow for accurate scans of large areas in a short time while capturing all details.**

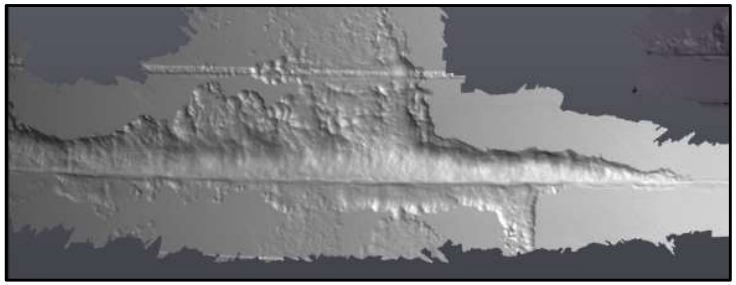
**In combination with the CloudWorx, BricsCAD and Cyclone software, we have all the tools necessary to provide a full turnkey surveying solution, including reverse engineering of existing equipment for Fitness For Service Assessment and re-design of damaged components.**



Full 3D surveying of Northwich historic swing bridge

**Some of DOCAN's previous projects involving surveying include:**

- **Power Recovery Train (PRT) Inlet Piping FEED, FFSA and repair.**
- **Deisobutanizer Column FFSA and repair.**
- **Pressure vessel decommissioning and super lift.**



Localised scanning of CUI area on pressure vessel for detailed FFSA.

## LIKE TO HEAR MORE...?

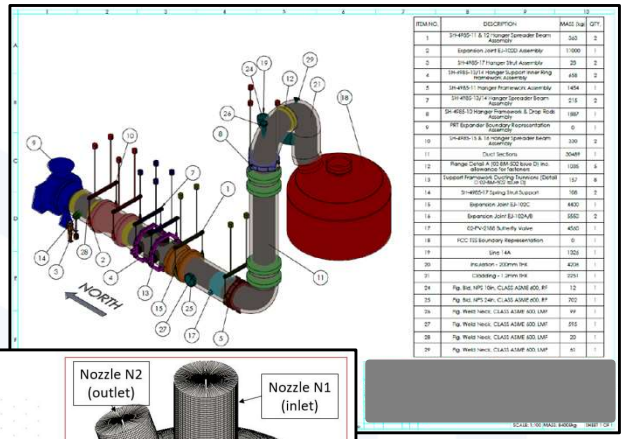
CONTACT US TO AT **WWW.DOCANCO.COM**

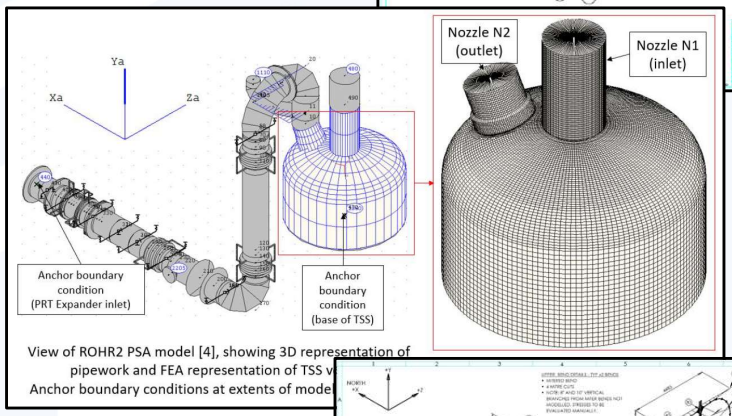
# COMAH SITE PROJECT EXAMPLES

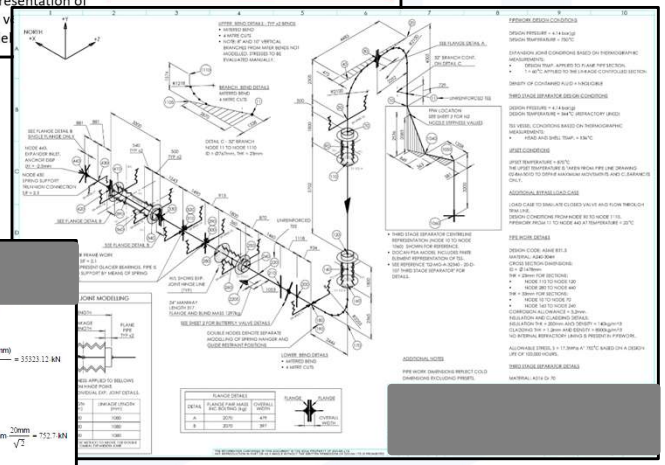
SAMPLE 1

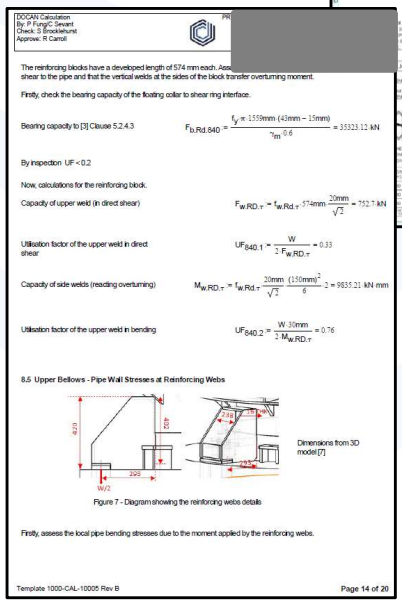
# POWER RECOVERY TRAIN INLET PIPING FEED, DESIGN, FFSA, & REPAIRS

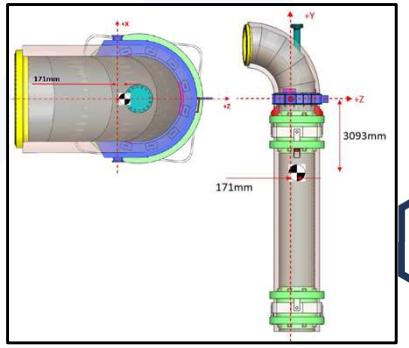
- **Assessment of Power Recovery Train (PRT) inlet pipework.**
- **High temperature (+700C) and large diameter (60”) line.**
- **Line had sagged and spring hangers bottomed out under hot operating conditions.**
- **DOCAN task was to identify cause of sagging, design remedial action, and determine the effects of creep.**
- **Tasks undertaken by DOCAN:**
    - 3D CAD model creation for mass & CoG assessment of line.
    - Review of construction information and site surveys.
    - Pipe stress analysis of line including detailed FEA modeling of attached vessel/nozzle arrangement.
    - Re-specification of spring hanger supports.
    - Produce stress isometrics.
    - Fitness For Service Assessment of potential creep damage in pipe and nozzle.
- **The results of the work indicated that a section of the pipe should be replaced. This involved:**
    - Update of PSA work.
    - Mass and CoG assessment for lifting out of old pipe section.
    - Lifting assessment with manual calculations & FEA, and design of lifting reinforcement components.



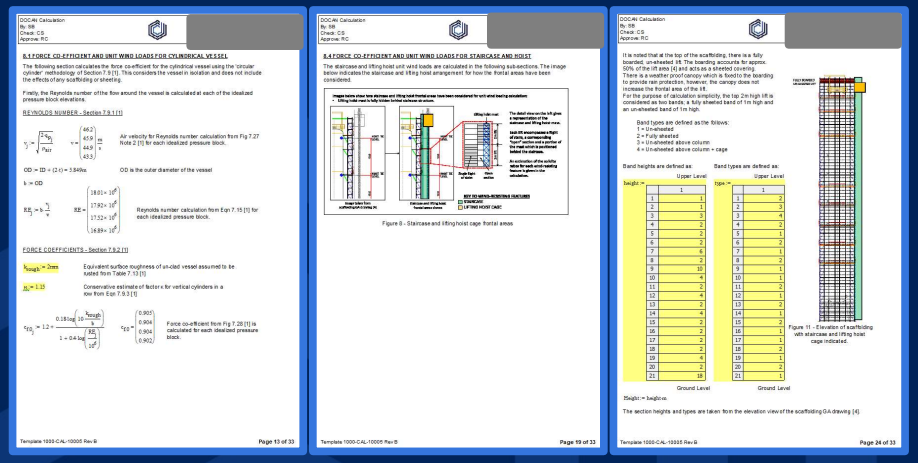


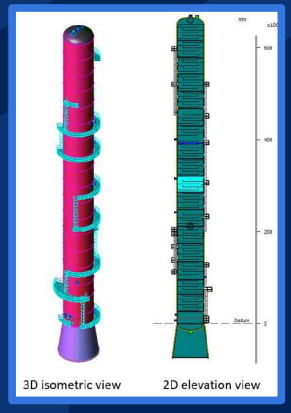



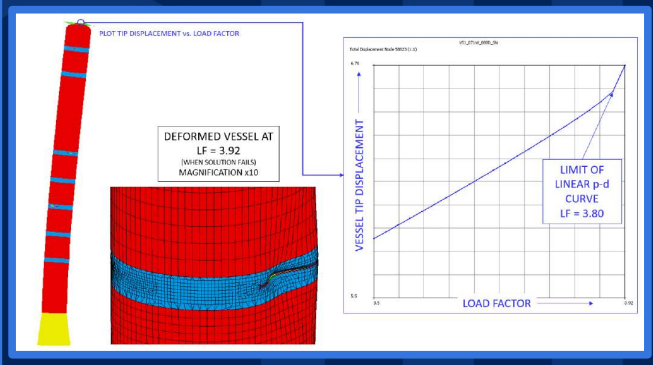
SAMPLE 2

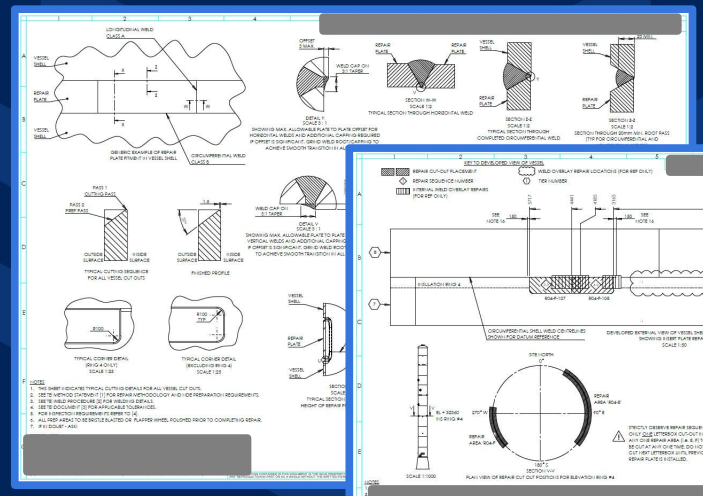
# FRACTIONATOR COLUMN

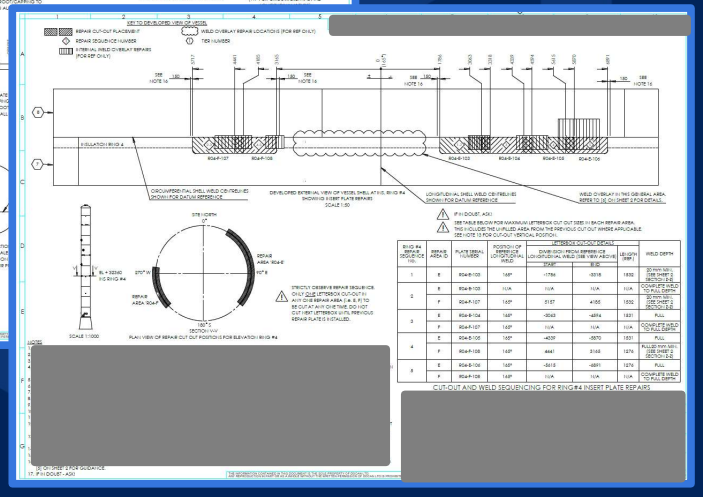
- **Phases of work:**
  - **Part 1 - Initial FFSA**
    - Vessel only, no scaffolding.
    - Supply 3D CAD model of column to client.
  - **Part 2 – FFSA inc. wind loading**
    - Calculation of wind loading on scaffolding and hoist from first principles.
    - PV Elite modelling and FEA based FFSA for operation and shutdown conditions including wind loading and sheeted scaffolding.
    - Determining optimum repair strategy to maintain structural integrity.
  - **Part 3 – Repairs drawings for TAR2021**
    - Produce repairs Technical Specification.
    - Create disinvestment drawings.
    - Create all drawings for vessel repairs and manufactured repair plates.
    - Design parts and produce drawings for lifting hoist attachment points.
  - **Part 4 – Post TAR2021 FFSA**
    - Review completed repairs and update FFSA.
    - Determine any additional repairs to be completed.
- **Approximately 2 years of assessment, calculation and design work, working with client and various sub-contractors**





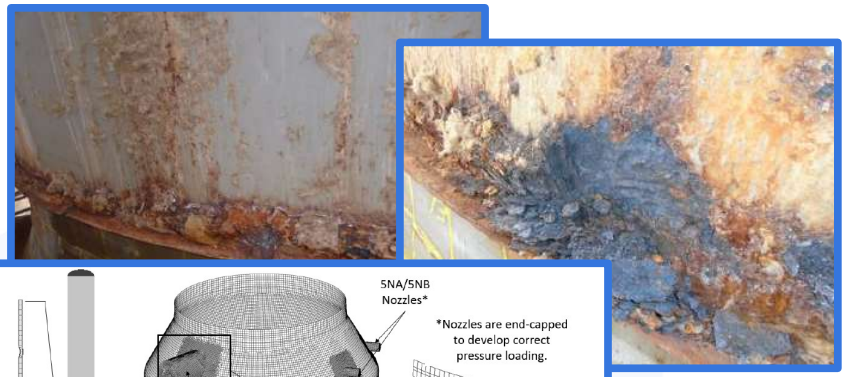



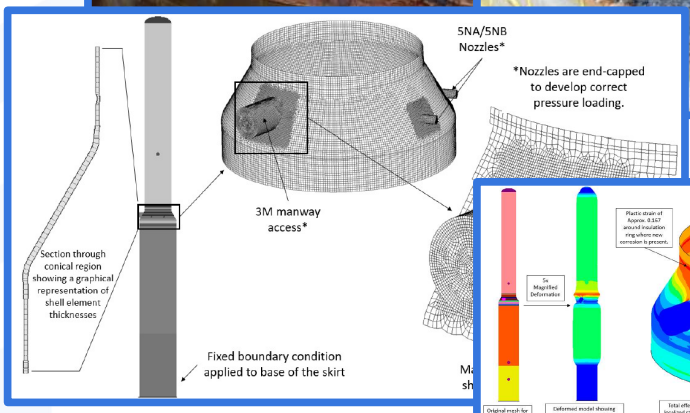


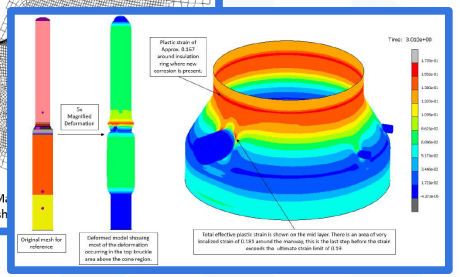
SAMPLE 3

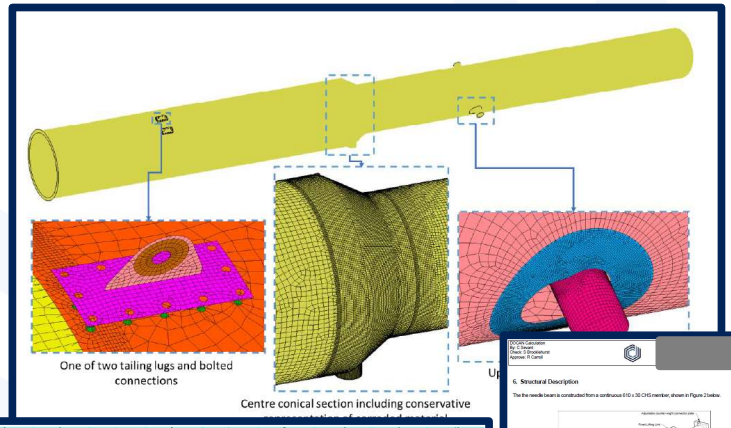
# PRESSURE VESSEL FFSA & DECOMISSIONING SUPER LIFT (+400Te)

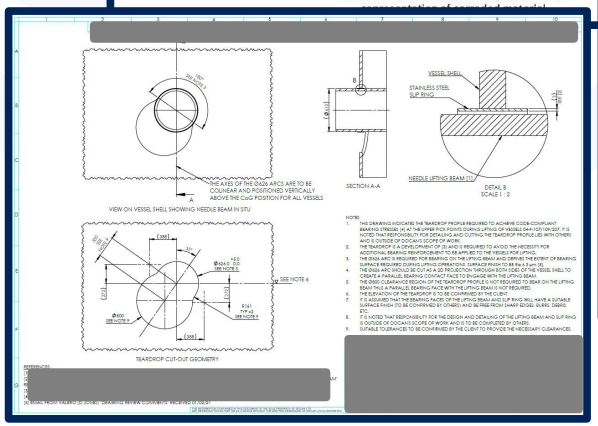
- **Level 3 FFSA performed for pressure vessel to verify the effect of high levels of corrosion around the middle conical section.**
- **Detailed FEA models used to represent the vessel and model the corroded areas.**
- **Tasks undertaken by DOCAN:**
  - 3D CAD modelling of corroded area
  - Manual calculations
  - Detailed FEA modelling
  - Level 3 FFSA
- **Vessel was shown to be FFS up to TAR2021.**
- **Decommissioning lifting of vessel required verification of corroded middle section and around the lifting points.**
- **Tasks undertaken by DOCAN:**
  - Manual calculations and 3D CAD modelling to determine mass and CoG of complete vessel.
  - FEA modelling of complete vessel including attachment points.
  - Re-design of upper lifting point to reduce local stresses.
  - Produce drawings for vessel modification at upper lifting point.

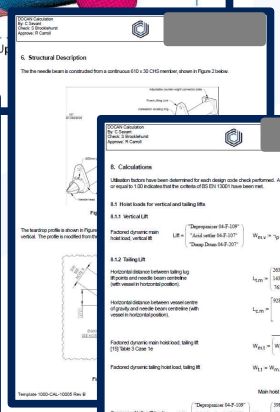


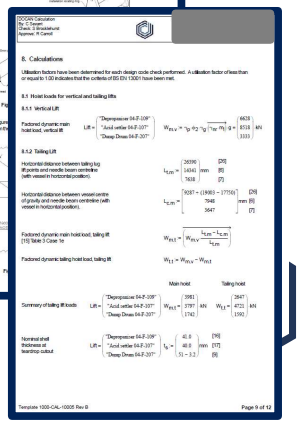






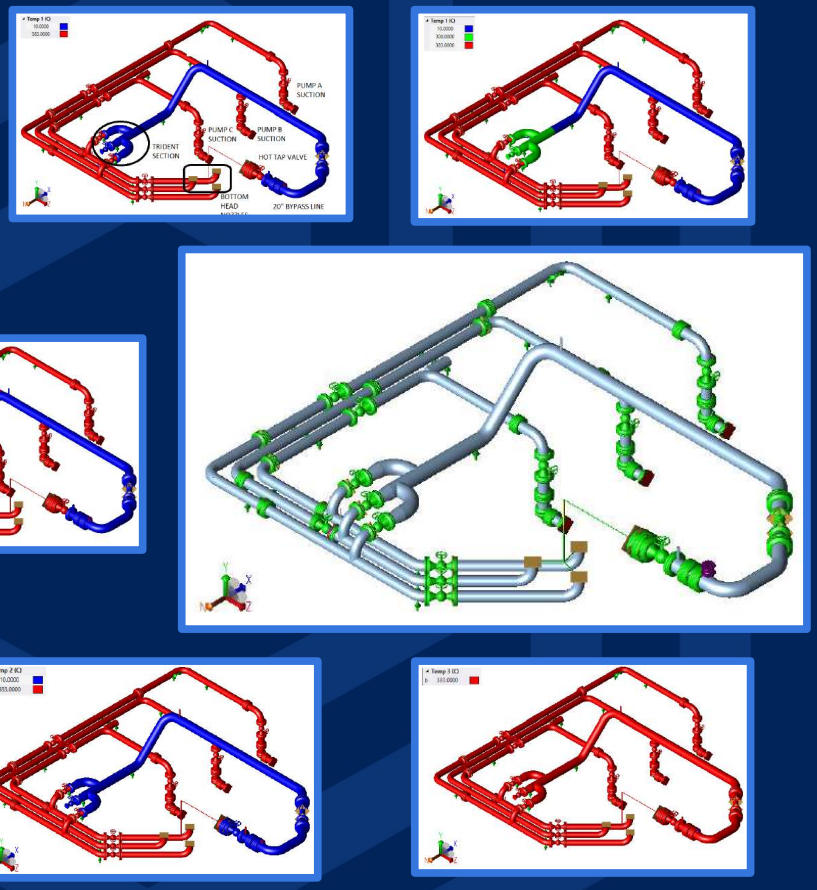


SAMPLE 4

# FRACTIONATOR BYPASS LINE & HOT TAP ASSESSMENT

- **A Fluid Catalytic Cracking Unit (FCCU) was shut down as a result of the UK National Grid power outage of August 2019. Following restart, flow to the fractionator column bottoms pumps was found to have been impeded. This was presumed to be due to an amount of coke being displaced into the bottoms nozzle strainers, which are internal to the fractionator.**

- **Tasks completed by DOCAN:**
  - Assess the pipework in each of the main stages of construction. At each stage determine required heating and/or cold pull to achieve fit-up of flanges.
  - Check Sustained stresses in the pipework.
  - Check flange leakage and review operating stresses in the pipework for each construction stage.
  - Review thermal displacements at each stage.
  - Determine the required points in the construction sequence at which laser surveys need to be carried out to ascertain the correct cold dimensions of the remaining fabricated spools.
  - Place restrictions of locations and magnitude of Field Fit Welds (FFWs).

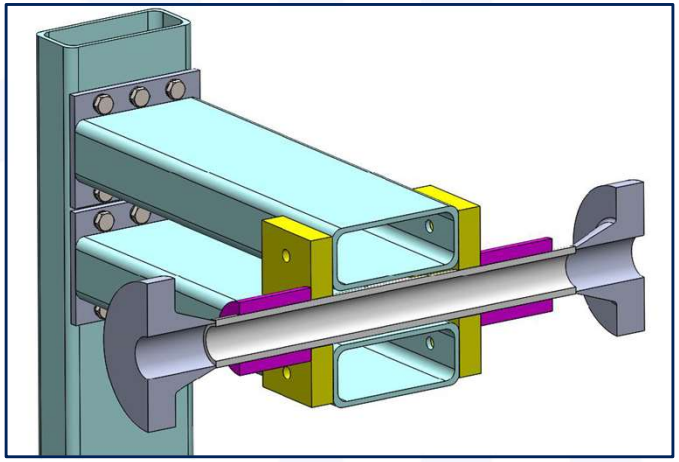


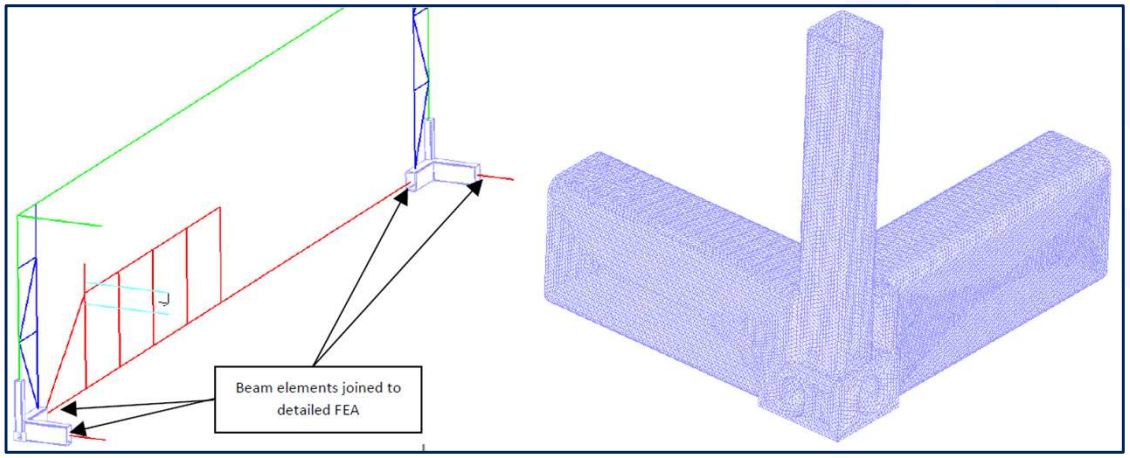
# GENERAL CONSULTANCY EXAMPLES

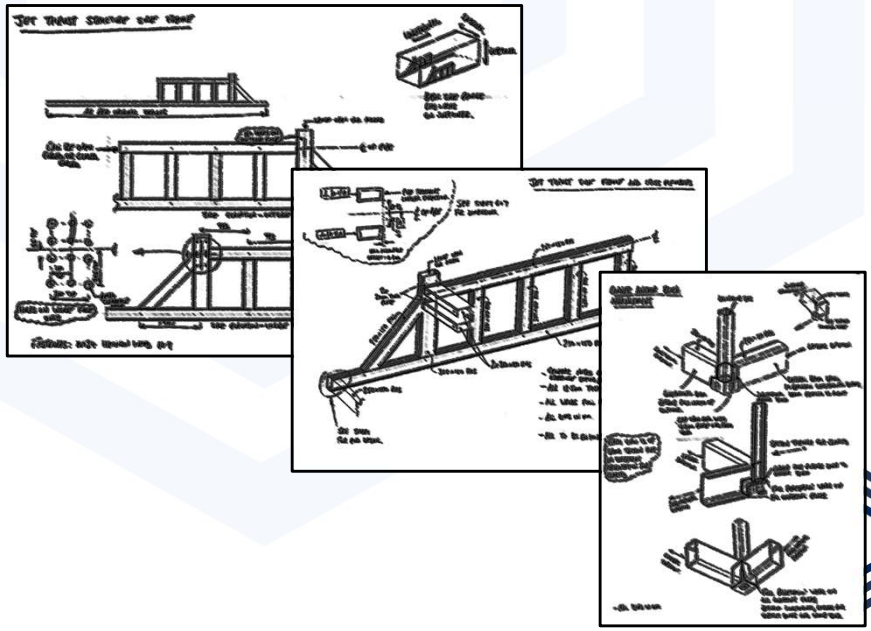
CONSULTANCY EXAMPLE

# RESEARCH & DEVELOPMENT

- We undertook a project to retrofit a DNV ISO container with an integral piping support structure to be used for testing very high jet thrust force applications.
- The design was developed using a combination of 3D CAD modelling, manual calculations, beam FEA modelling and detailed 3D solid FEA modelling.
- The design compromised on a welded fabrication with bolted joint connections for testing various jet thrust scenarios.
- Sketches and drawings were provided to the client to facilitate detailed manufacturing drawings to be produced by their in-house drafting resource.



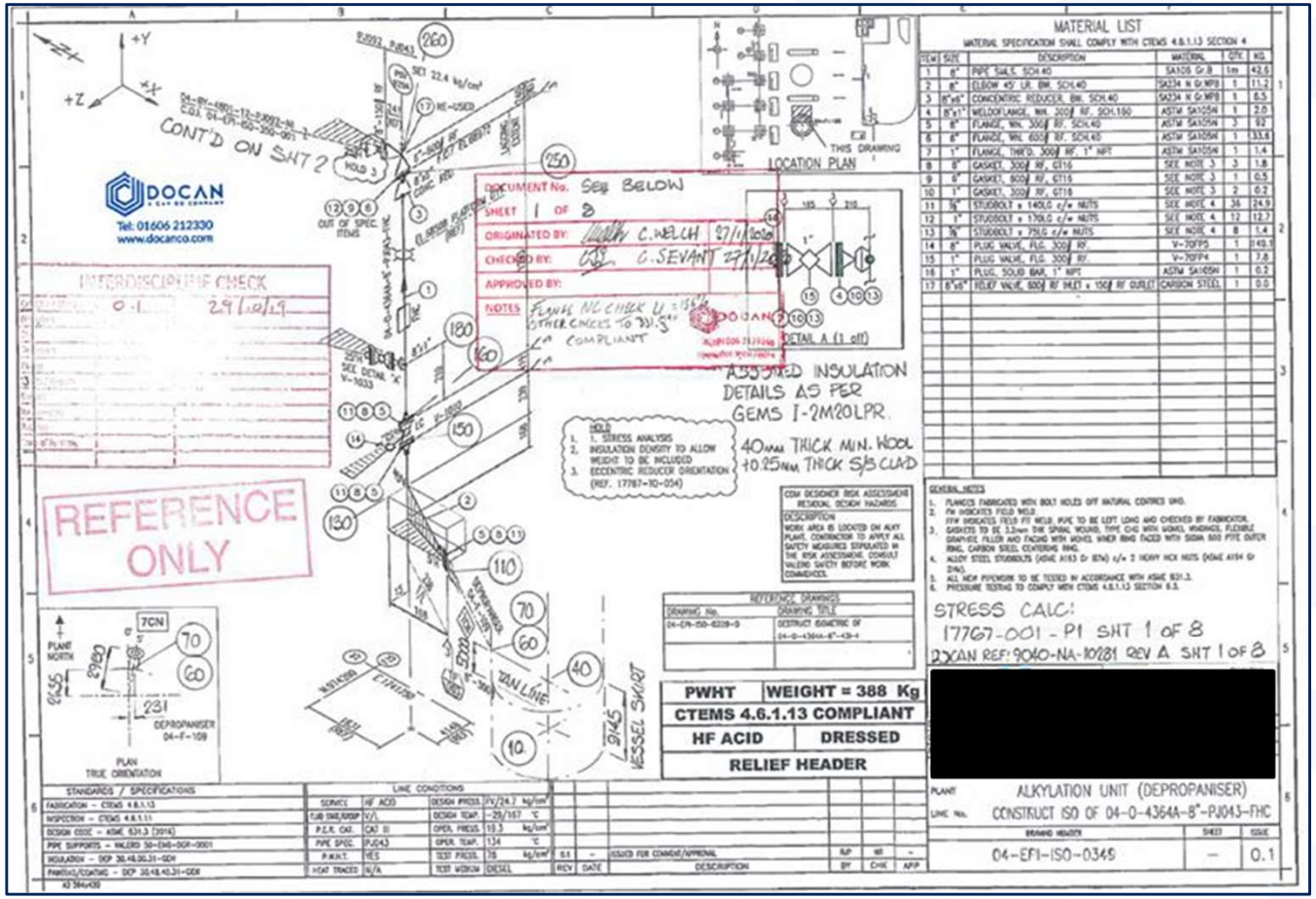


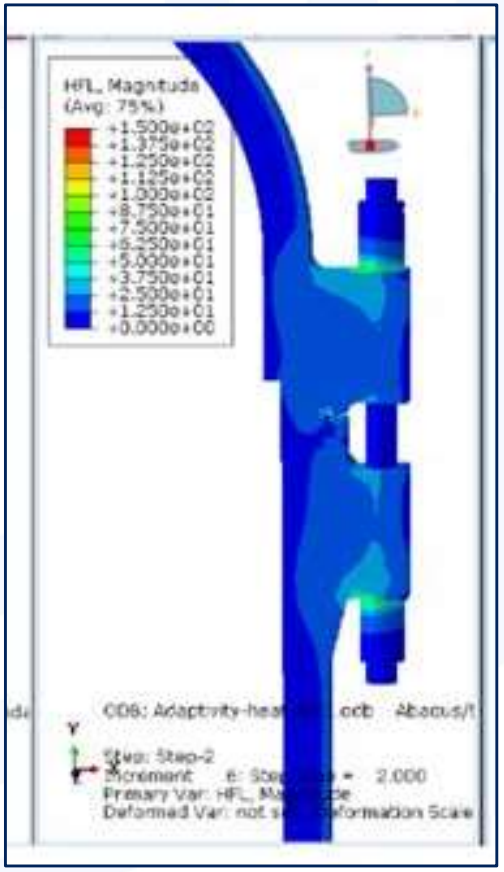
CONSULTANCY EXAMPLE

# FEED / DETAILED DESIGN

- We've completed FEED and detailed design projects large and small for companies in various industries on pressure, structural, and process systems.
- A couple of examples include ASME B31.3 Piping design and FE assessment of detailed flange leakage to ASME codes.




Stress isometric based on detailed CAESARII piping stress assessment

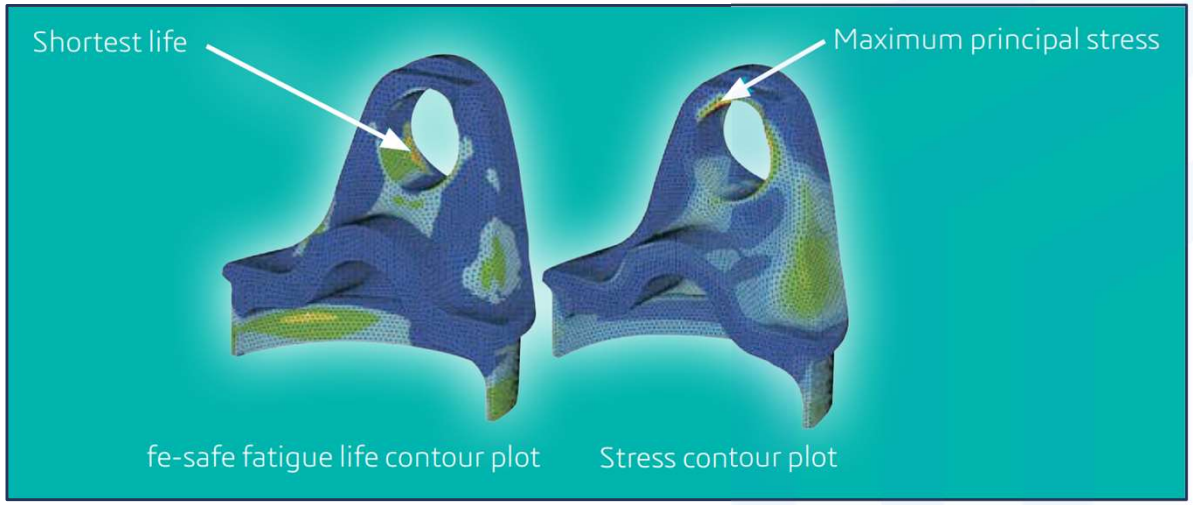



ABAQUS Standard detailed flange leakage assessment

CONSULTANCY EXAMPLE

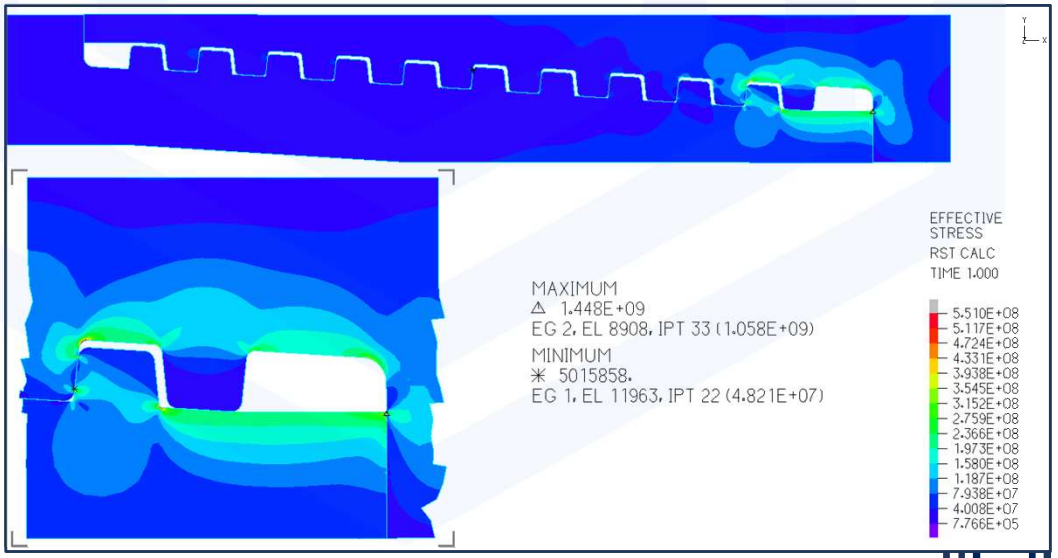
# LIFE EXTENSION / FATIGUE ASSESSMENT

- **Life extension based on detailed fatigue and creep assessment (using FE Safe).**




**We have access to some of the best tools and software packages for performing fatigue analysis and assessment.**

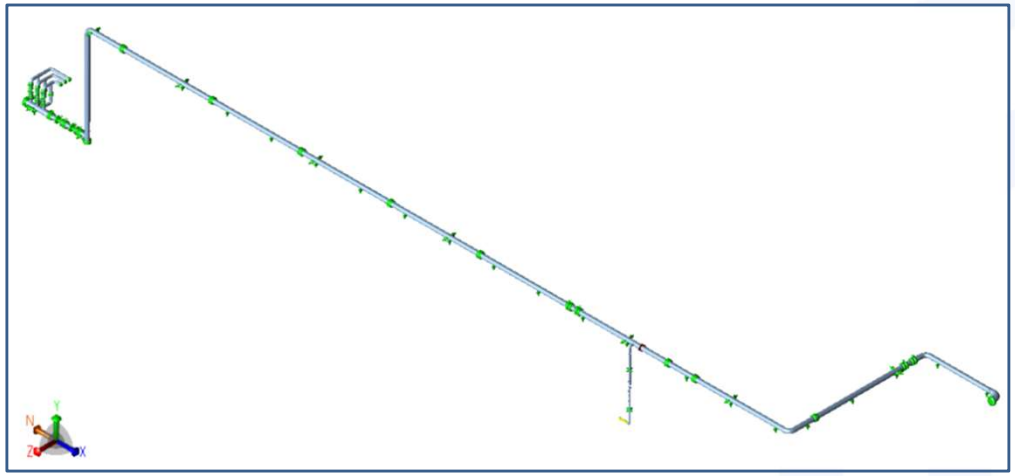
**This example is from a project where we performed a fatigue assessment of a threaded connection on the production tubing used on a UK well site, for a national energy provider.**
**The project included a combination of manual calculations and FEA modelling to determine if fatigue of the connection was likely to be an issue.**



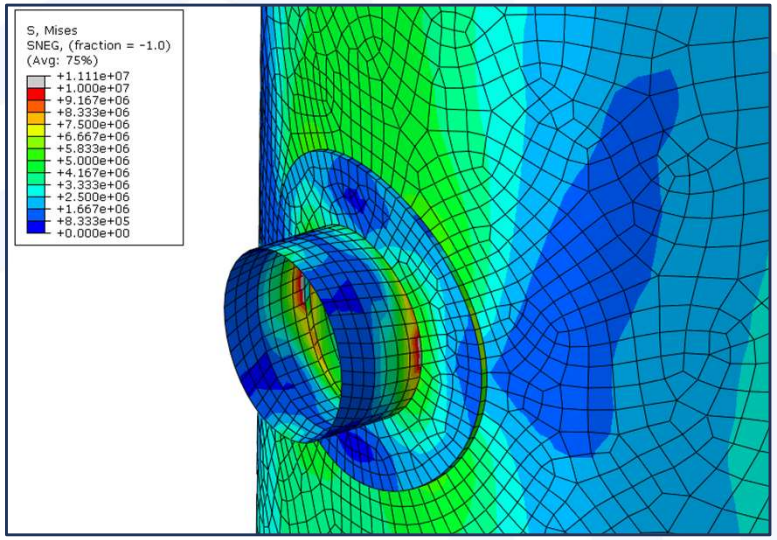
CONSULTANCY EXAMPLE

# LIFE EXTENSION / RERATE

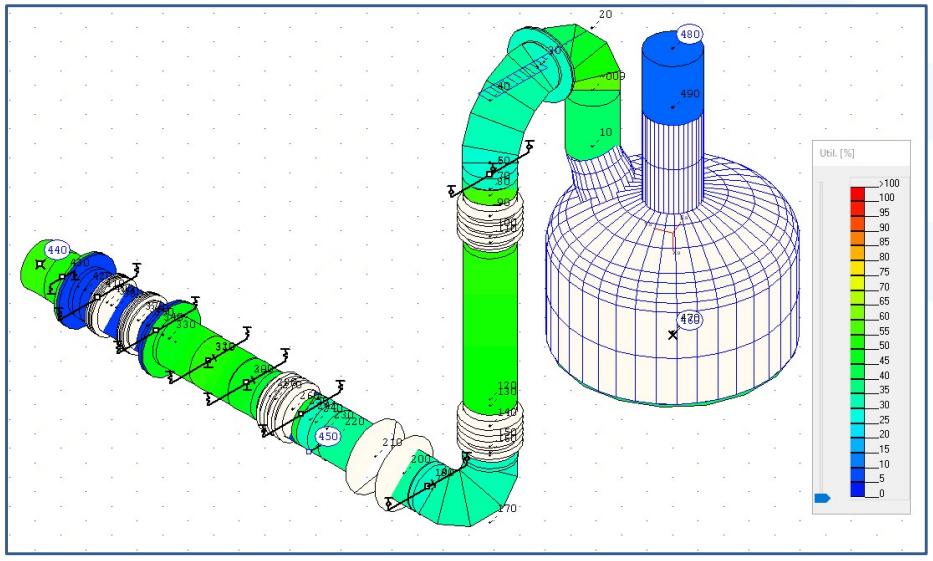
- **We have many examples of projects where we have conducted thermal / pressure rerating studies of piping and pressure vessel systems, including:**



**Thermal rerate using CAESARII**



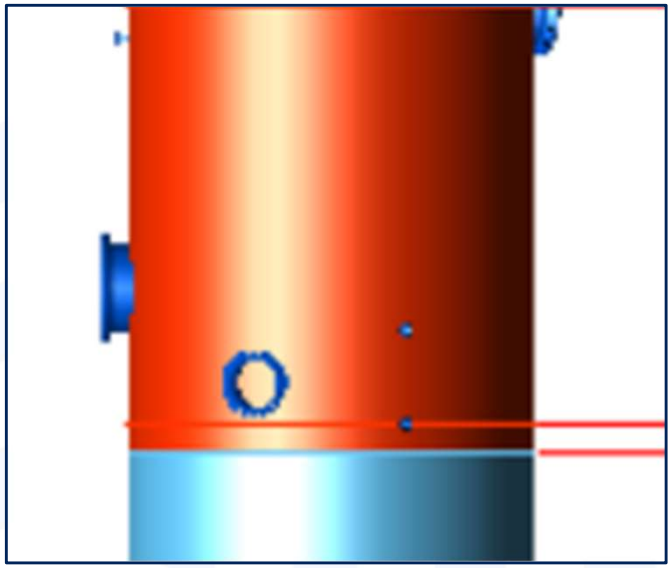

**Detailed rerating of pressure vessel nozzle using ABAQUS**



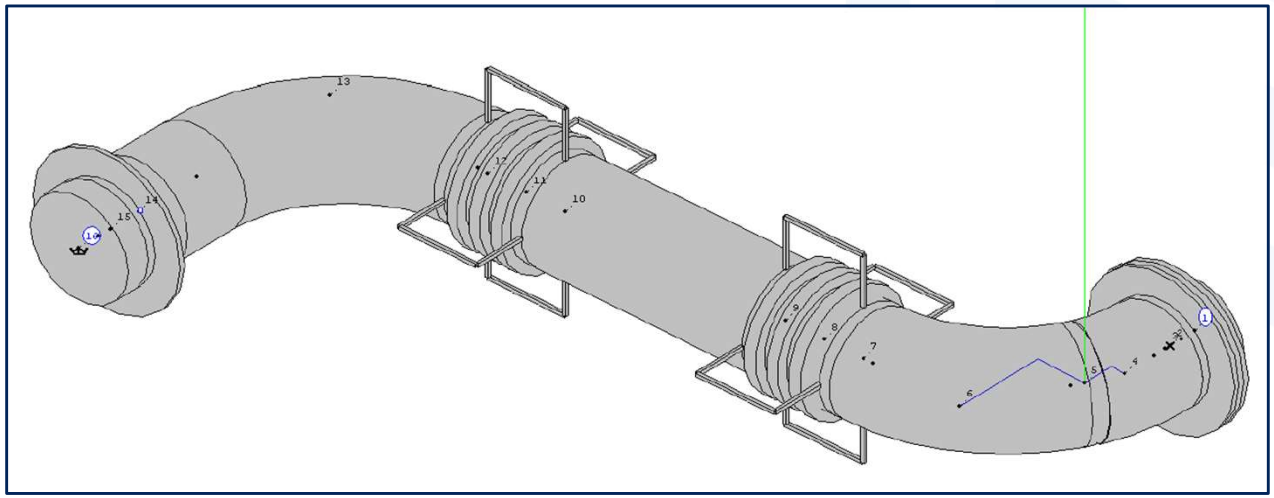
**FCC thermal rerate and creep assessment using ROHR2**

CONSULTANCY EXAMPLE

# FITNESS FOR SERVICE ASSESSMENT



- One of our recent FFSA projects involved assessment of internal corrosion within a vessel adjacent to a piping attachment on a UK site.
- We tackled this problem area by taking a multifaceted approach considering loading from design conditions, wind, and the attached piping including gimbaled joints.
- We utilized multiple packages from our suite of software including ROHR2, PV Elite, and MSCOne.
- We were able to demonstrate that the defect was FFS and guide the client on when remedial action should be implemented.

# CONTACT US

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