VIRTUAL INTEGRATED
ANALYTICS SOLUTIONS

IN PARTNERSHIP WITH
DASSAULT SYSTEMES

API 579 Based Level 3 FFS Assessment Using Abaqus/CAE

Rev. 2016-01

About this Course

Course Objective

This course is intended to provide a practical introduction to Finite Element Analysis (FEA) based Level 3 Fitness-for-Service (FFS) assessment of pressurized components using Abaqus software.

The main objectives of the course are:

1. Introduce essential skills to use Abaqus/CAE to create FEA models of commonly encountered pressurized components/sub-components.
2. Introduce FFS assessment procedures per API 579-1/ASME FFS-1 with special reference to Level 3 stress analysis.
3. Introduce Level 3 FFS assessment techniques using Abaqus/CAE through practical examples such as vessel with local metal loss.

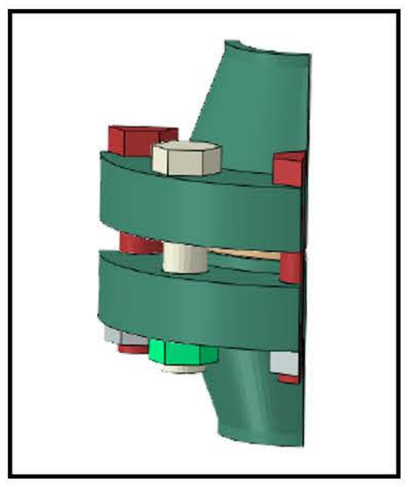
As part of the training, an Abaqus plugin will be available, at no cost, to map thickness data from inspection onto the FEA model.

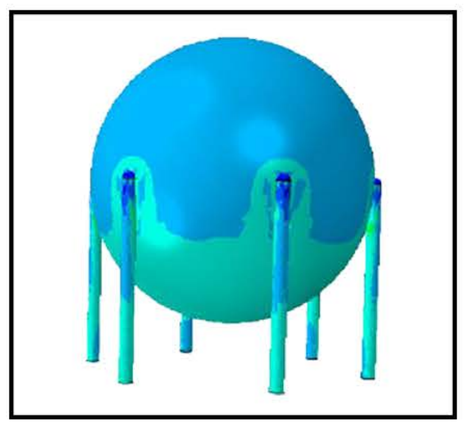
Description

The following SIMULIA products are covered by this course: Abaqus/CAE, Abaqus/Standard.

This course covers the following topics:

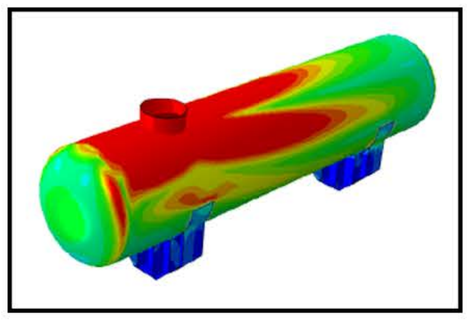
- Linear and nonlinear structural analysis
- Material models: linear elasticity and metal plasticity
- Loads and constraints
- Creating, submitting and monitoring analysis jobs
- Viewing simulation results
- FFS assessment procedures
- FEA base Level 3 assessment
- Practical examples showing Level 3 assessment
- Utilizing thickness mapping plugin to model local metal loss

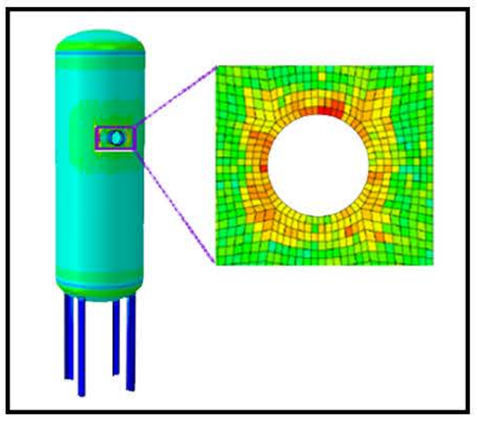




This course is divided into lectures, demonstrations, and workshops.

The course's workshops are integral to the training. They are designed to reinforce concepts presented during the lectures and demonstrations. They are intended to provide users with the experience of running and trouble-shooting actual Abaqus analyses.





Prerequisites

None

Target Audience

FFS Engineers, Equipment Reliability Engineers, Welding Engineers, Operations Personnel, Process Engineers, Project Managers, HSEQ Personnel

Duration

2 days

Day 1

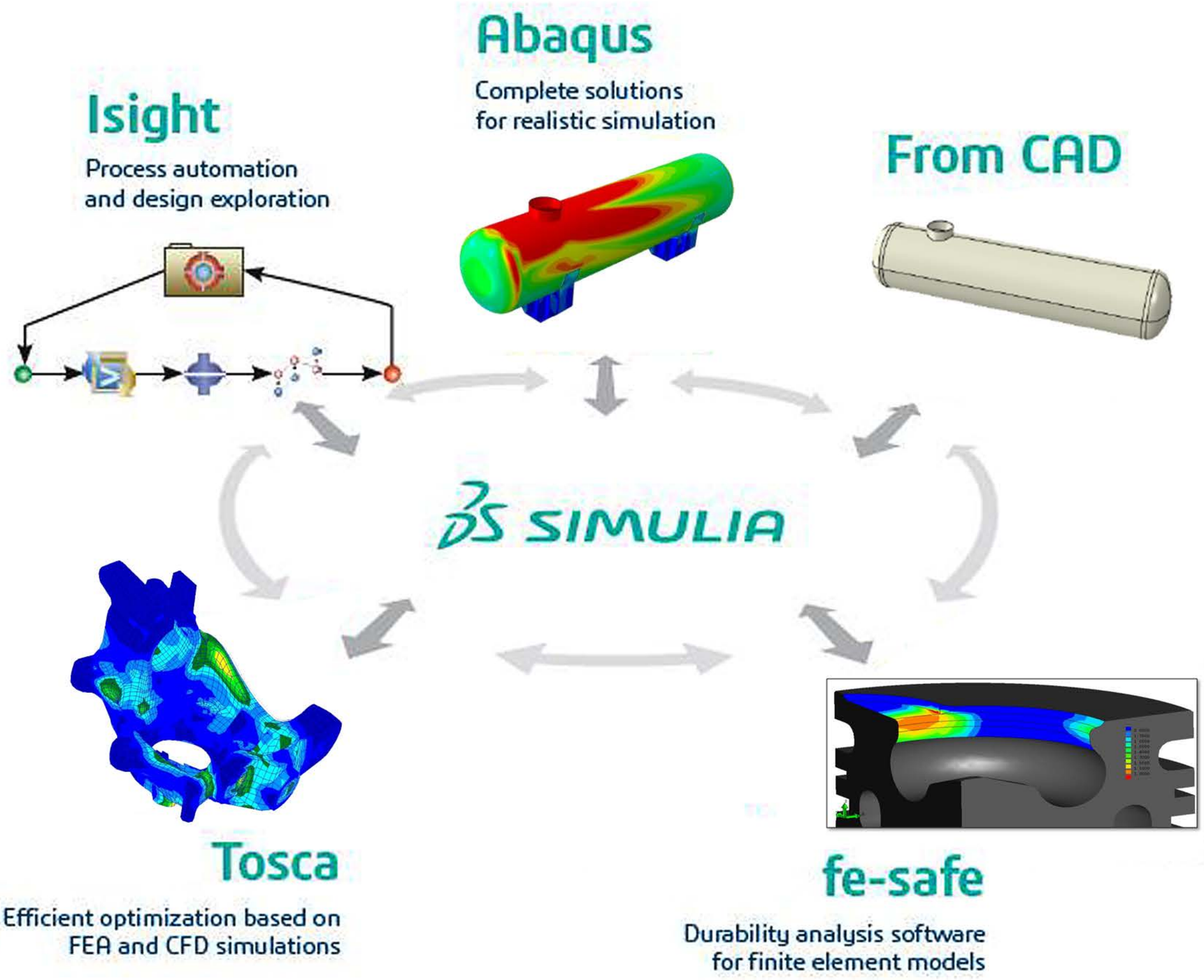
Lesson 1	Overview of Abaqus
Lesson 2	Introduction to Abaqus/CAE - Part I
Workshop 1	Modeling of a vertical tower
Lesson 3	Introduction to Abaqus/CAE - Part II
Workshop 2	Modeling of a flange joint
Lesson 4	Introduction to Abaqus/CAE - Part III
Workshop 3	Analysis of a vertical tower with vacuum rings
Lesson 5	Overview of Abaqus solvers
Workshop 4	Analysis of flange connection

Day 2

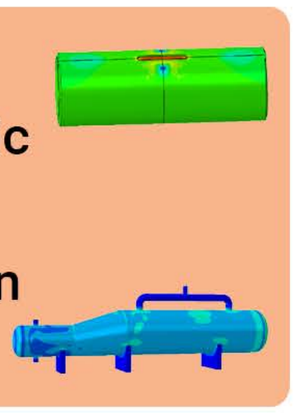
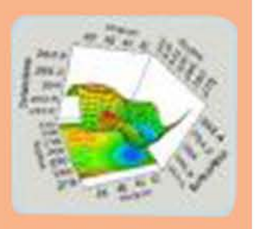
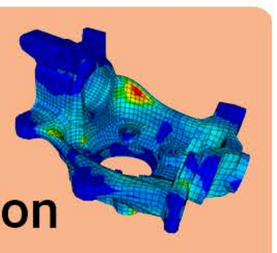
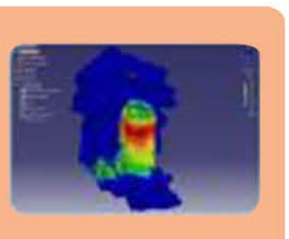
Lesson 6	Overview of Fitness-for-Service analyses
Lesson 7	Applying loads in a Simulation
Workshop 5	Modeling and analysis of spherical storage vessel
Lesson 8	Analysis of metal loss
Workshop 6	Modeling and analysis of horizontal vessel
Lesson 9	Analysis of a flange connection
Workshop 7	Limit load of a heat exchanger

SIMULIA

- SIMULIA is the Dassault Systèmes brand for Realistic Simulation solutions
- Portfolio of established, best-in-class products
  - Abaqus, Isight, Tosca, fe-safe
  - All using a common extended licensing pool



SIMULIA's Power of the Portfolio

Abaqus	• Routine and Advanced Simulation • Linear and Nonlinear, Static and Dynamic • Fluid, Thermal, Electrical, Acoustics • Extended Physics through Co-simulation • Model Preparation and Visualization 	FE Simulation for Assessment of In-service Equipment Plastic Collapse, Local Failure, Failure from Cyclic Loading, and Collapse from Buckling
Isight	• Process Integration • Design Optimization • Parametric Optimization • Six Sigma and Design of Experiments 	Material Calibration Workflow Automation Design Exploration
Tosca	• Non-Parametric Optimization • Structural & Fluid Flow Optimization • Topology, Sizing, Shape, Bead Optimization 	Conceptual/Detailed Design Weight, Stiffness, Stress Pressure Loss Reduction
fe-safe	• Durability Simulation • Low Cycle & High Cycle Fatigue • Weld, High Temperature, Non-metallics 	Safety Factors Creep-Fatigue Interaction Weld Fatigue

Join the SIMULIA Community!

How can you maximize the robust technology of Abaqus FEA and Isight?

Connect with peers to share knowledge and get technical insights

SIMULIA

Let the SIMULIA Learning Community be Your Portal to 21st Century Innovation

Discover new ways to explore how to leverage realistic simulation to drive product innovation. Join the thousands of Abaqus and Isight users who are already gaining valuable knowledge from the SIMULIA Learning Community.

For more information and registration, visit **3ds.com/simulia-learning.**
Connect. Share. Spark Innovation.

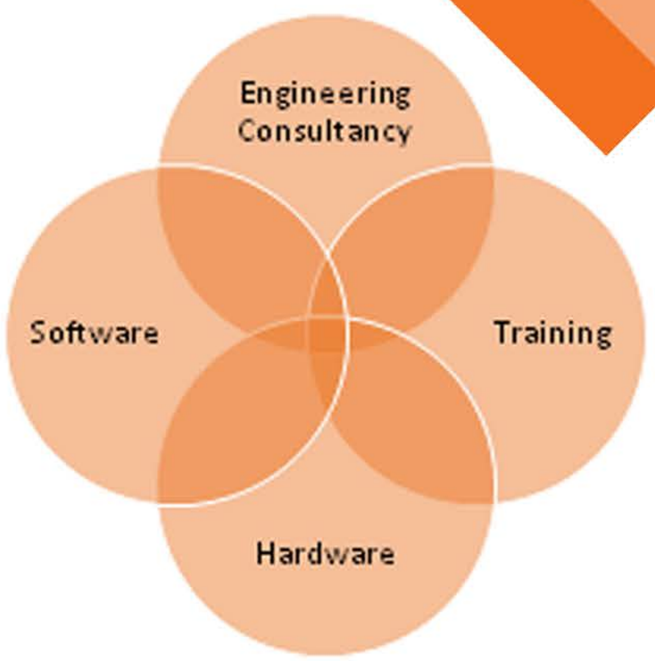
DASSAULT SYSTEMES | The 3DEXPERIENCE Company

Go to www.3ds.com/slc to log in or join!

VIAS - Company Overview

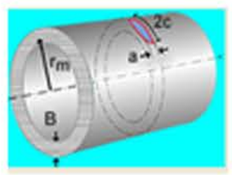
VIAS provides integrated, innovative and cost-effective engineering & software solutions.

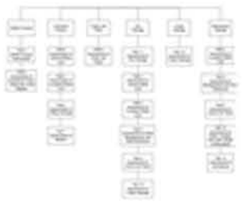
Our objective is to prevent repetitive design-related business interruptions and to provide cost-effective, quick and safer designs with an experienced engineering team.



FFS Capabilities

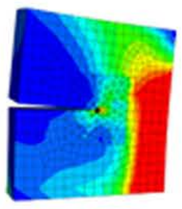
Combined Fatigue & Fracture Assessment (ECA)

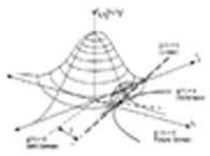




FEA Based Damage Assessment (API 579 Level 3)

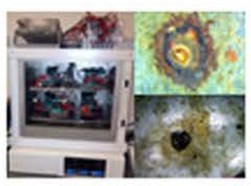
FEA Based Fracture Integrity Assessment

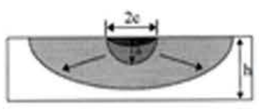




Probabilistic Fracture Mechanics

Material Testing, Corrosion Assessment (CTOD, J-R, K_{IC}, J_{IC})





Remaining Life Assessment (RLA)

VISION

WE PROVIDE INTEGRATED AND COST-EFFECTIVE ENGINEERING/SOFTWARE SOLUTIONS

TECHNOLOGY

Differentiated technology that sets a standard

We will support our clients with differentiated technology in key design challenges. We will introduce software and tools to the industry that have a competitive advantage over competitors.

PEOPLE

Differentiating ourselves through the quality of our people

Experienced people driven to succeed is our key differentiator in our company to leverage growth opportunities across service areas.

EFFICIENCY

Being efficient, effective, integrated and delivering quality that exceeds client expectations

We will standardize and automate our engineering and software solution processes to improve the quality of our offering globally through developing a framework for ensuring best practices across the company.

VIAS Training Solutions

We offer training services in our facility in Houston and also at client locations. Please visit www.viascorp.com to see our full course portfolio.

As an authorized education partner of Dassault Systèmes, we offer Abaqus SIMULIA training courses either in house or at our client's facility.

VIAS provides engineering and software solutions to Engineering Process and Utilities, Aerospace, Life Sciences, High Tech, Consumer Packaged Goods, and the Marine and Offshore industries.

Please note that the hours completed in this course can be counted towards Professional Development Hours. Upon completion of the course, certificates will be issued to all attendees. We welcome participants from all technical and industrial backgrounds. Depending on your level of expertise, we can offer both introductory or advanced level courses.

NOW OFFERING: 50% discount on the course price to students and professionals who are currently between jobs.

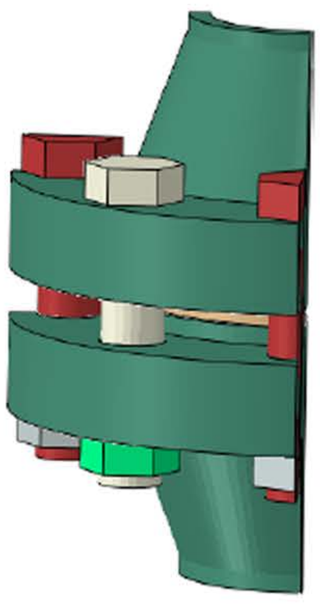
Below is the list of upcoming training courses scheduled from June to August. Please send us an e-mail at training@viascorp.com if you have any questions. We can also customize our schedule to fit your training needs and availability.

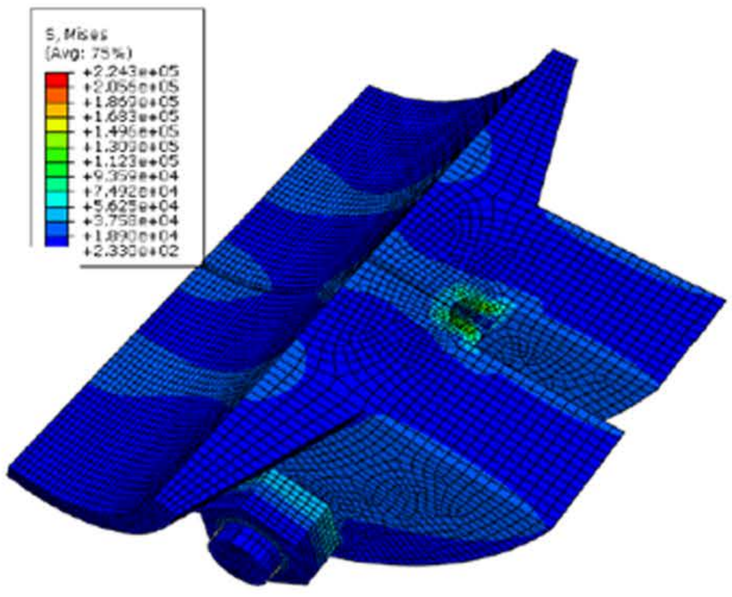
Date	Topic
June 6–10, 2016	Introduction To Abaqus
June 13–14, 2016	Introduction to Abaqus/CAE
June 27–28, 2016	Introduction to Abaqus Scripting
June 29–30, 2016	FSI Simulation Using Abaqus and Third-party CFD Codes
July 18–19, 2016	Introduction to Abaqus/CFD
July 20–22, 2016	Modeling Fracture and Failure with Abaqus
August 11–12, 2016	API 579 Based Level 3 FFS Assessment Using Abaqus/CAE
August 15–16, 2016	Introduction to Abaqus/CAE
August 22–23, 2016	Introduction to fe-safe
August 29–30, 2016	Introduction to Abaqus Scripting

COURSE HIGHLIGHTS (1/3)

Modeling and Analysis of a Flange Connection

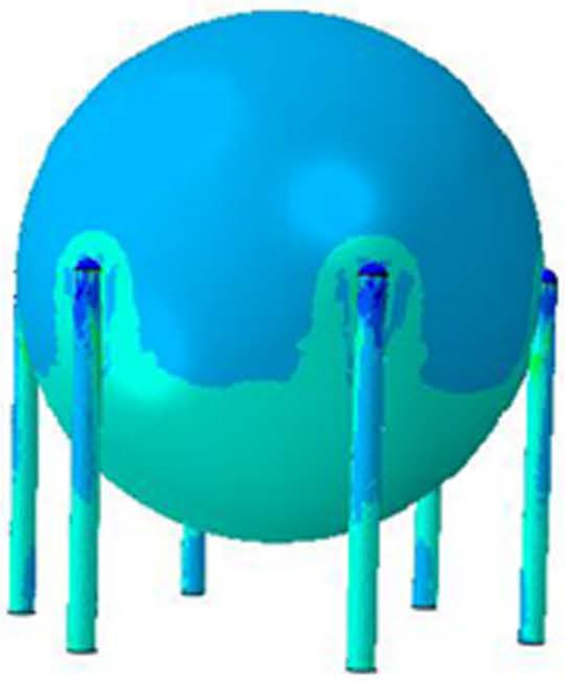
- Modeling of a bolted flange connection including top flange, bottom flange, bolts, nuts, and a gasket
- Performing of FEA to predict response after applying bolt loading and internal pressure





Modeling and Analysis of a Spherical Vessel

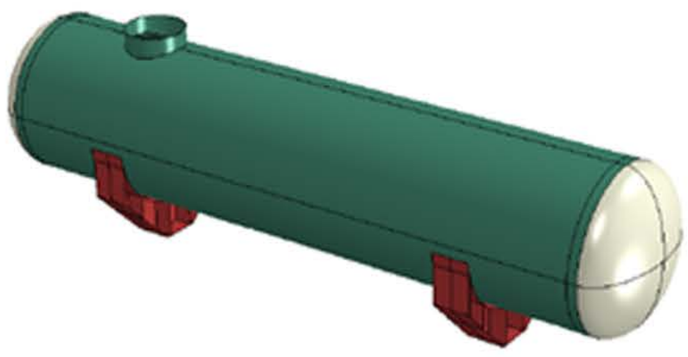
- Modeling of a storage spherical vessel
- Performing static stress analysis with weight of the contents and internal pressure

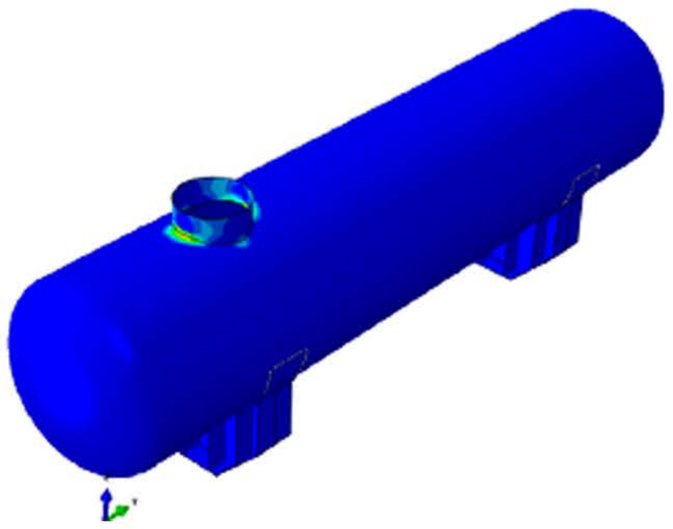


COURSE HIGHLIGHTS (2/3)

Modeling and Analysis of a Horizontal Vessel

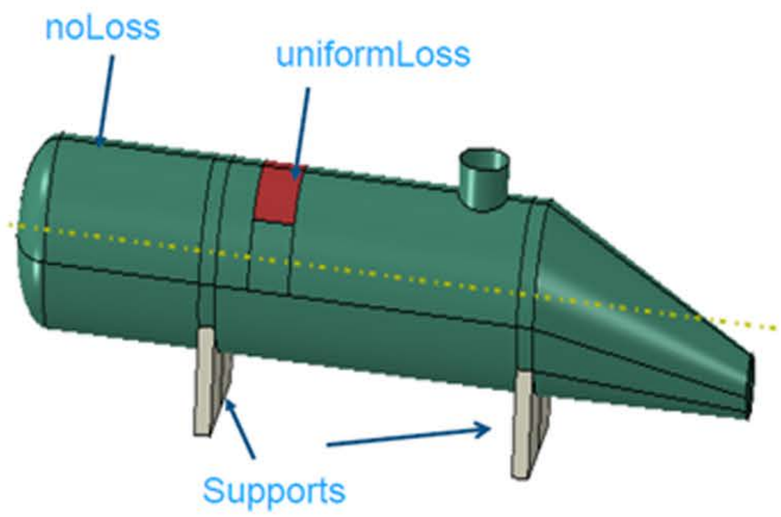
- Modeling of a horizontal vessel including the nozzle and saddle supports
- Performing static stress analysis with weight of the internal fluids
- Performing buckling analysis when the vessel is empty

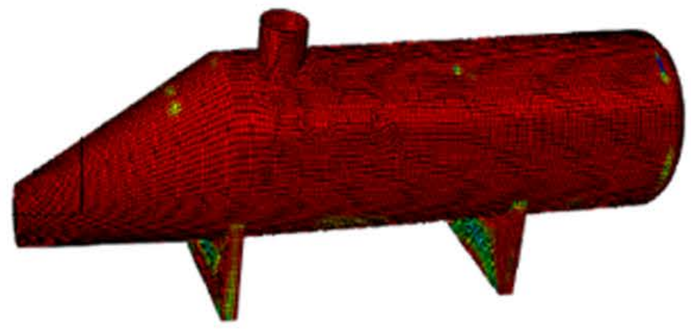




Modeling and Limit Load Analysis of a Heat Exchanger

- Modeling of a heat exchanger including the nozzle, the thickness loss region and supports
- Performing limit load prediction analysis with uniform corrosion
- Performing limit load prediction analysis with thickness data



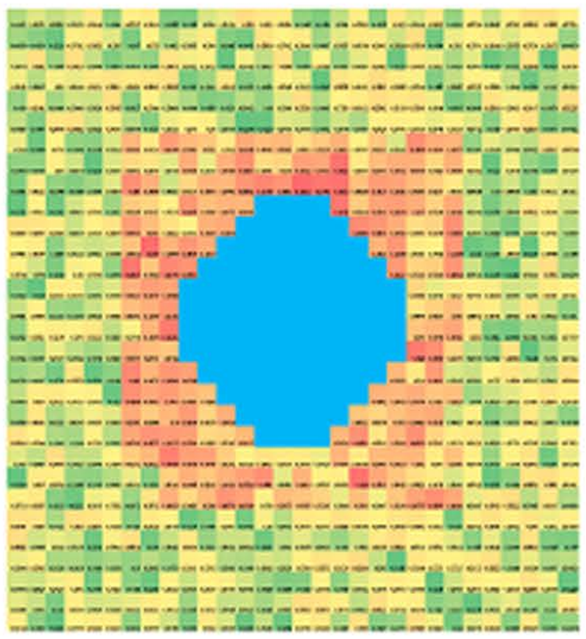


COURSE HIGHLIGHTS (3/3)

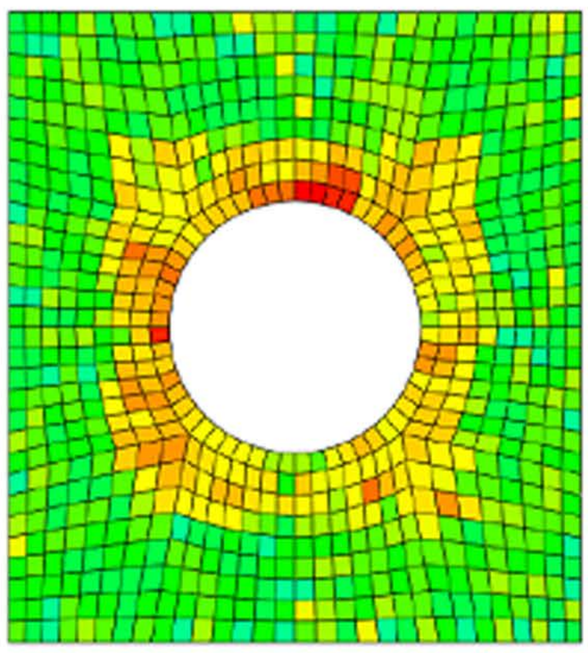
Thickness mapping plugin tool using Abaqus/CAE

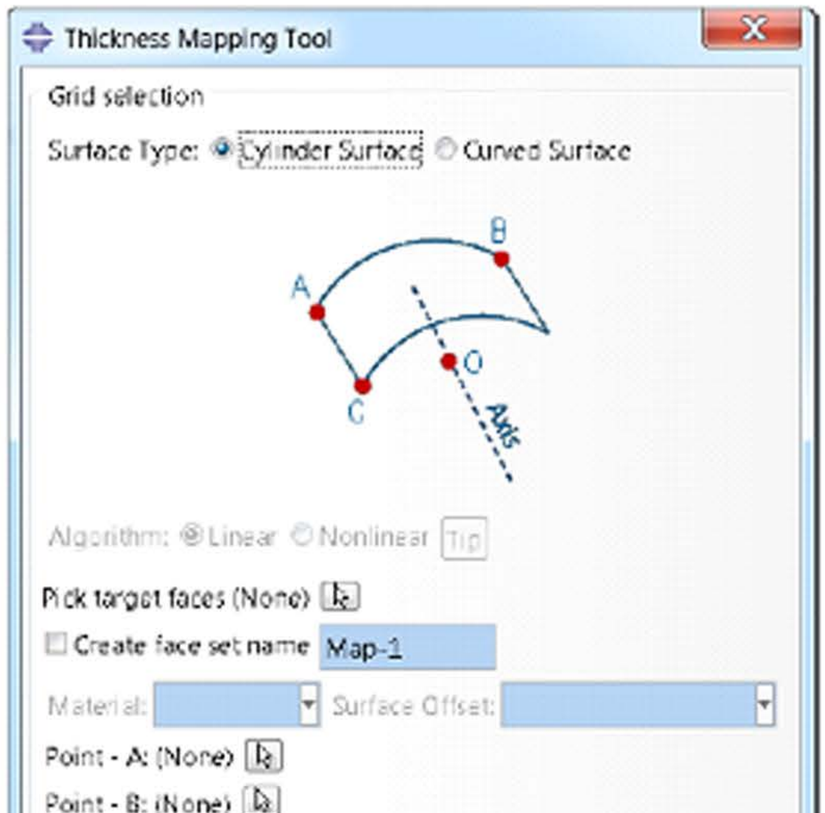
A plugin tool was developed to assess a structure with loss of thickness due to corrosion by mapping thickness data onto a shell element model.

Scan data (Excel file)

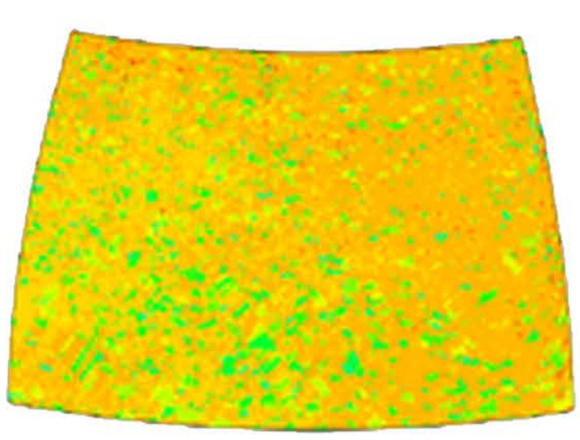


Mapped data - *FCA*

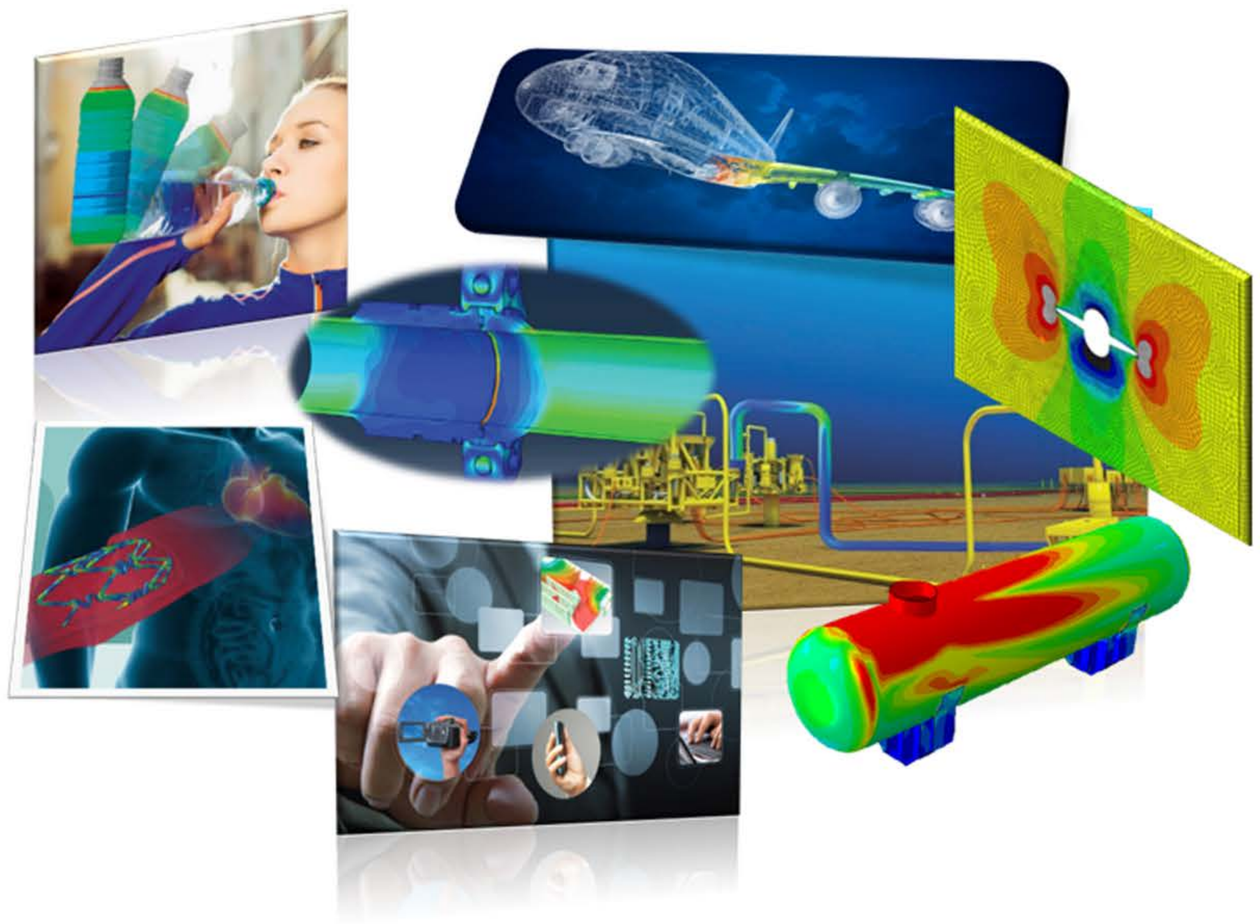




For post-processing, the plugin will plot the STH output on a curved surface to verify the thickness mapping.



FREE ABAQUS SUPPORT DAYS by VIAS



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Houston Office or Online

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This is an excellent way to learn about Abaqus, Isight, fe-safe, and Tosca capabilities from our in-house experts. Please share your general simulation related problems and we can help you to troubleshoot them. You can visit our office or schedule a video conference online. We can also suggest the best methodology to speed up your Abaqus analysis.
We recently launched our SIMULIA training courses. As an official education partner of Dassault Systèmes, we are offering SIMULIA Abaqus training courses either at your facility or in our training room. We welcome participants from all kinds of backgrounds and levels of expertise to attend our training courses. For details please check our Training Calendar at www.viascorp.com.
VIAS can also help you with your FEA software purchase(s) and FEA/CFD/Multiphysics consulting needs. Our engineers have an average of 15 years of experience using different simulation software in various industries.
Please send us an e-mail at support@viascorp.com to schedule a time and we will be ready to support you with our Abaqus expertise.

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