

## DOCAN Co.

MSC Apex enables a rapid retrofit of an FPSO vessel without CAD geometry



**Using MSC Apex’s “Geometry from Mesh” toolset, DOCAN engineers were able to use the existing FE model instead of starting over completely from scratch.**

In the world of Engineering Consulting, it is pretty often that you get tasked with difficult and almost-impossible jobs, with a short timeline, with very stressed-out customers who need answers quickly. And you, the Engineering Consultant, is looked to as the source of all the answers, and those answers must be provided as quick as possible.

Such is the life of the engineers at DOCAN, located in Northwich, UK, who specialize in the design and analysis of large structures in the Energy industry.

Recently, the engineers at DOCAN were tasked with validating a retrofit of an FPSO unit (Floating Production Storage and Offloading) since the operator wanted a new deck penetration in one of the modules of the FPSO, but they needed to confirm that this design change would have sufficient structural capability compared to the originally validated design.



A typical example of an FPSO.

## Challenge

The starting point of the FPSO analysis task was not CAD geometry, but an “orphaned” mesh, i.e., a Nastran .BDF file, that was previously analyzed and stored decades ago when the original design was validated and the FPSO was originally built.

“Having no baseline geometry behind an FE model can be a tough situation. In many cases, it's simpler to start from scratch due to the pain of making changes, which of course wastes lots of time, energy, and money,” said Richard Carroll, Technical Director at DOCAN. He continued, “In this circumstance, the changes that were needed required significant changes to the FE model to validate the new design – which historically with other FEA pre/post processors, can be quite difficult to do.

Unfortunately, we did not have the time to rebuild the FE model from scratch, so we needed an alternative option. MSC Apex filled that need. We simply could bring in the



Example of a typical FPSO process module, which is inserted on top of the FPSO.

FE model and make changes to it quickly. And since we were not re-building the whole model, the verification and checking cycle for QA was quick and straight forward. Much quicker than if we started with a brand-new FE model.”

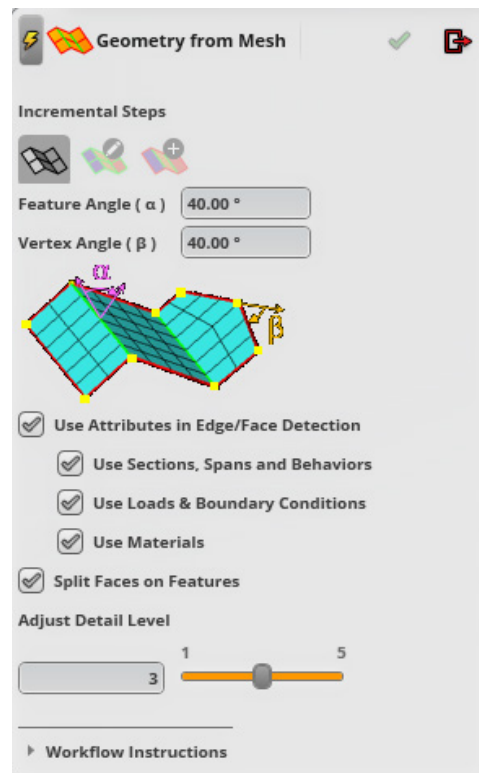
## Solution

Using MSC Apex’s “Geometry from Mesh” toolset, DOCAN engineers were able to use the existing FE model instead of starting over completely from scratch.

MSC Apex can bring in an orphaned mesh with no geometry, reverse-engineer the geometry from the existing mesh, and then allowing for all the same tools to be used to modify the model (like using the Surface Split tool to create the deck penetration that DOCAN’s customer wanted), just like if the CAD geometry existed in the first place.

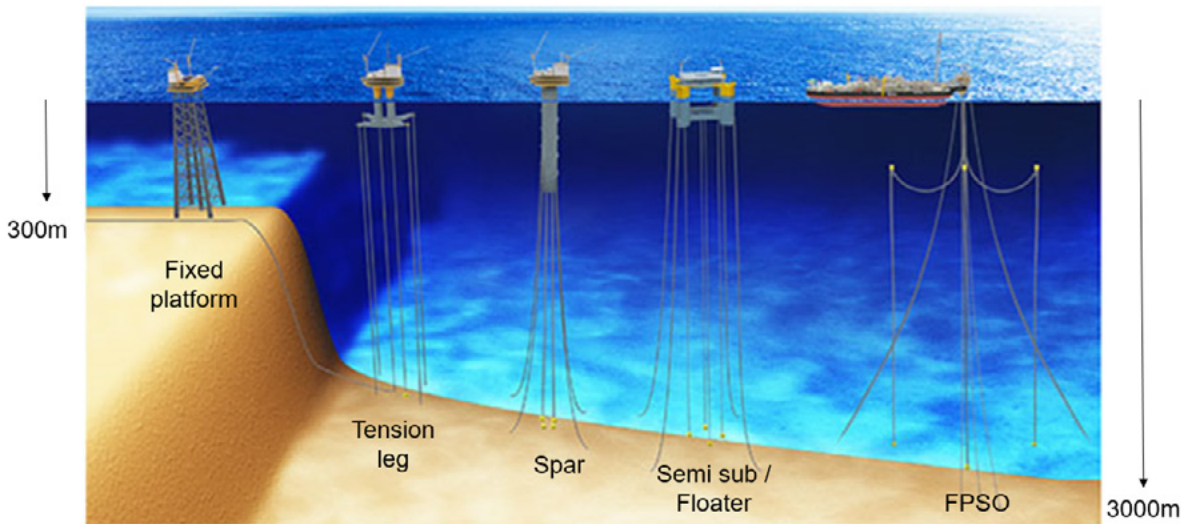
No new tools were needed to complete the work, allowing for DOCAN engineers to be familiar and quick with their work on the structure, thus saving time.

“For the end client - there is a cost benefit, and for the consultancy (i.e. DOCAN) there is repeat business. Everyone wins.”



Geometry from Mesh tool in MSC Apex. It imports an orphaned FE model, and re-creates the geometry from the existing nodes and elements.





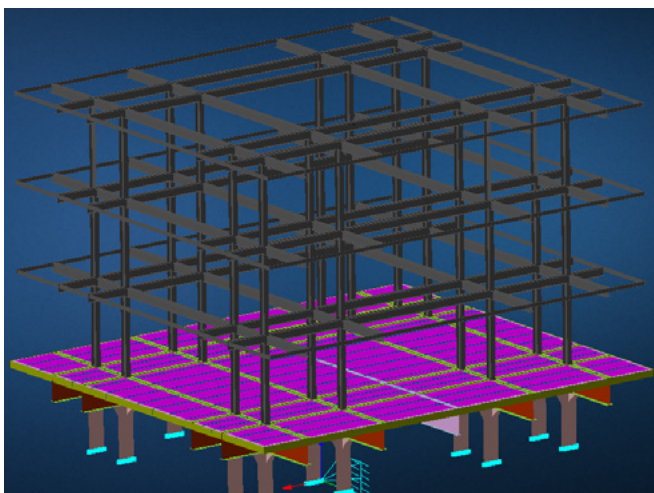
Example of a typical FPSO process module, which is inserted on top of the FPSO.

## Results

By re-creating the geometry for only the section that was needed, the rest of the FE model was left untouched, thereby saving lots of time in reviewing and certifying the new design. Since the only portion of the original analysis that changed was the area where the deck penetration was added, the analysis review and certification happened much faster than if it were a brand new FE model built from scratch.

This was not the end of the analysis for Richard and his team, though – in fact, it was just a very welcome beginning. Since DOCAN is a customer of the MSC One lease-based token system, they have access to the entire MSC One suite of analysis tools, including Marc, the world-class nonlinear analysis package.

Richard concluded by saying, “The seamless integration of MSC Apex into many other parts of the MSC suite means we can focus our attention on the task itself, rather than having to do a deep dive into all of the technology first, before actually solving the problem at hand.



Original Nastran deck read into MSC Apex, which was quickly modified and re-certified.

### Key highlights:

Product: MSC Apex

Industry: Energy

Benefits:

Engineers were able to reverse-engineer the geometry from the original orphaned mesh which led to reduced workflow time and quicker re-certification.

We are busy and have limited time - this is a major benefit especially since MSC One covers so much technology. Once I knew about MSC Apex and that it provided a front-door to Nastran & Marc, I was eager to have it in our arsenal.”

## About DOCAN

DOCAN is an Engineering Consultancy with a team of experienced, Professional Engineers, Designers and Consultants. Their primary experience is in the application of advanced engineering.

DOCAN has formed partnerships with several global firms offering the ability to consult, train, develop and distribute cutting edge solutions to our clients worldwide. The solutions offered cover everything required for the engineering lifecycle including mathematical modelling, plant design, pressure systems and piping design, stress analysis, multi-physics, thermal, fluid dynamics, systems modelling and more.

DOCAN engineers have worked in most regulated industries completing large and small projects. These range from bespoke R&D, large FEED studies, detailed engineering design to reverse engineering, fitness for service and decommissioning studies.



Hexagon is a global leader in sensor, software and autonomous solutions. We are putting data to work to boost efficiency, productivity, and quality across industrial, manufacturing, infrastructure, safety, and mobility applications.

Our technologies are shaping urban and production ecosystems to become increasingly connected and autonomous – ensuring a scalable, sustainable future.

MSC Software, part of Hexagon's Manufacturing Intelligence division, is one of the ten original software companies and a global leader in helping product manufacturers to advance their engineering methods with simulation software and services. Learn more at [mscsoftware.com](https://www.mscsoftware.com). Hexagon's Manufacturing Intelligence division provides solutions that utilise data from design and engineering, production and metrology to make manufacturing smarter.

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