

## FEA of Offloading Reel Design for FPSO Vessels

During new product development, ContiTech Beattie identified a need for detailed FEA (Finite Element Analysis) to demonstrate that their equipment would perform safely under the most arduous conditions. Product testing was not a practical or economic proposition. The analysis was required for approval by Lloyds Register, and Wilde was asked to carry out the FEA work.

### Company

ContiTech Beattie is a global leader in the design, manufacture and supply of flexible hoses and fluid transfer systems, and part of the multi-national giant, Continental Group. Based in Northumberland, it is a major service provider to the offshore oil and gas sector. The company provides services worldwide and clients include many blue-chip companies, such as:

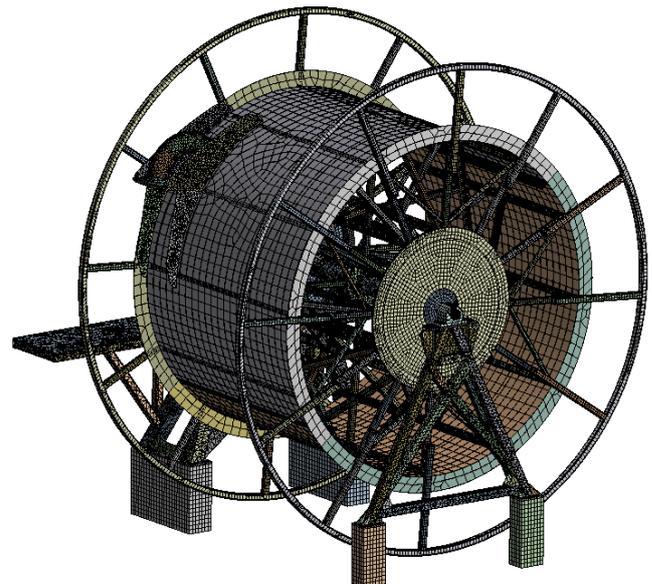
- BP
- Shell
- Chevron
- Exxon
- Jurong
- Hyundai
- Samsung
- Keppel

ContiTech Beattie delivers flexible engineering excellence, specialising in rubber and plastics technology, and is the world's largest manufacturer of non-tyre rubber-based products.

As a worldwide supplier, they develop, produce and deal with all aspects of fluid handling technology and are represented in more than 140 countries by subsidiaries, regional sales offices and joint venture partners.

### Background

As part of their product range, ContiTech Beattie produce mounted offloading reels for use on FPSO (Floating Production Storage and Offloading) vessels. An FPSO is a floating tank system designed to receive the retrieved oil or gas produced from nearby platforms and to process and store it until offloading can take place onto a tanker or transported through a pipeline.



*Fig 1: Structural Analysis of New Offloading Reel Design for FPSO Vessels (Courtesy: ContiTech Beattie)*

### Challenge

During new product development, ContiTech Beattie identified a need for detailed FEA (Finite Element Analysis) to demonstrate that their equipment would perform safely under the most challenging conditions. It was also identified that product testing was not a practical or an economic proposition. The analysis was required for approval by Lloyds Register.

“““ We approached **Wilde** because of their **experience** in working with the **offshore sector using FEA.**”””

As a mounted offloading reel is a large offshore structure critical to the efficient and safe transfer of oil or gas from one vessel to another at sea, the required analysis was to take into consideration all

anticipated operating and emergency loading conditions.

Global and localised stress distributions were required in addition to displacement predictions. Assessment of the acceptability of all significant structural components was also part of the scope of work and the analysis had to prove the structure for lift handling cases.

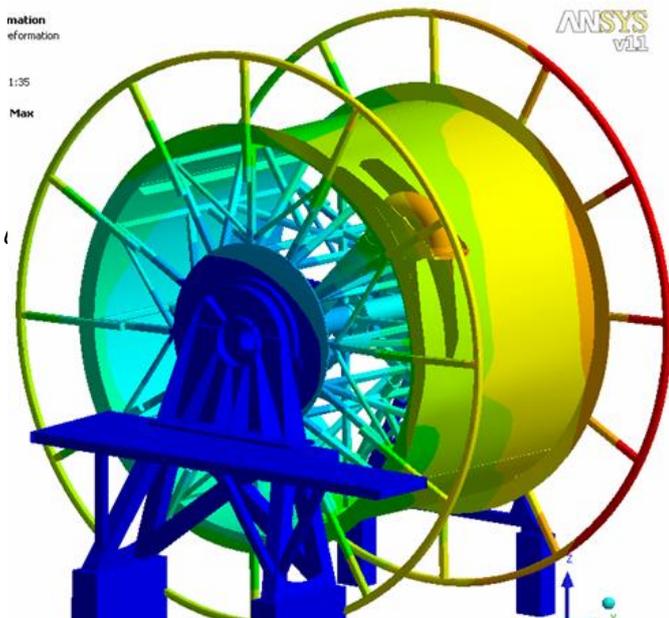


Fig 2: Structural Analysis of New Offloading Reel Design for FPSO Vessels (Courtesy: ContiTech Beattie)

## Solution

ContiTech Beattie supplied Wilde with 3D solid CAD geometry as the basis of the finite element model. This was imported into the leading **ANSYS** simulation software used extensively within the offshore industry.

Much of the offloading reel structure was thin-walled when compared to the main dimensions, and therefore benefited from the use of shell elements to accurately and efficiently capture any bending behaviour.

Consequently, thin sections of the solid geometry were mid-surfaced where appropriate with the aid of the **ANSYS DesignModeler** geometry editing module, with remaining parts meshed with solid elements.

Various analysis runs were performed to simulate the effect of ship born wave motions and

equipment deployment loads. Finally, a technical report was supplied to the client to support the findings of the design.

## Business Benefits

The use of simulation during the design of this new product reduced both development cost and lead time.

““ This project had to ensure the offloading reel was ‘fit for purpose’ in what would be very demanding conditions. We were **confident that Wilde** would provide us with the **detailed and accurate analysis** needed.

## About Wilde Analysis

Wilde Analysis is an independent full service provider of market leading FEA, CFD, safety & reliability engineering and optimisation solutions, comprising engineering software, multi-disciplined consultancy & training.

With a comprehensive software portfolio, including **ANSYS, LS-DYNA, ReliaSoft, PLAXIS, SpaceClaim, Optimus, Flownex, Autodesk Moldflow** and **DEFORM**, we uniquely offer a full suite of simulation technologies to optimise the design of both products and manufacturing processes for performance, safety & reliability.

Since 1980, we have helped over 1500 clients successfully integrate analysis tools and methodologies within their workflows for design and risk assessment, ranging from global aerospace, automotive and energy companies to specialised design consultancies.