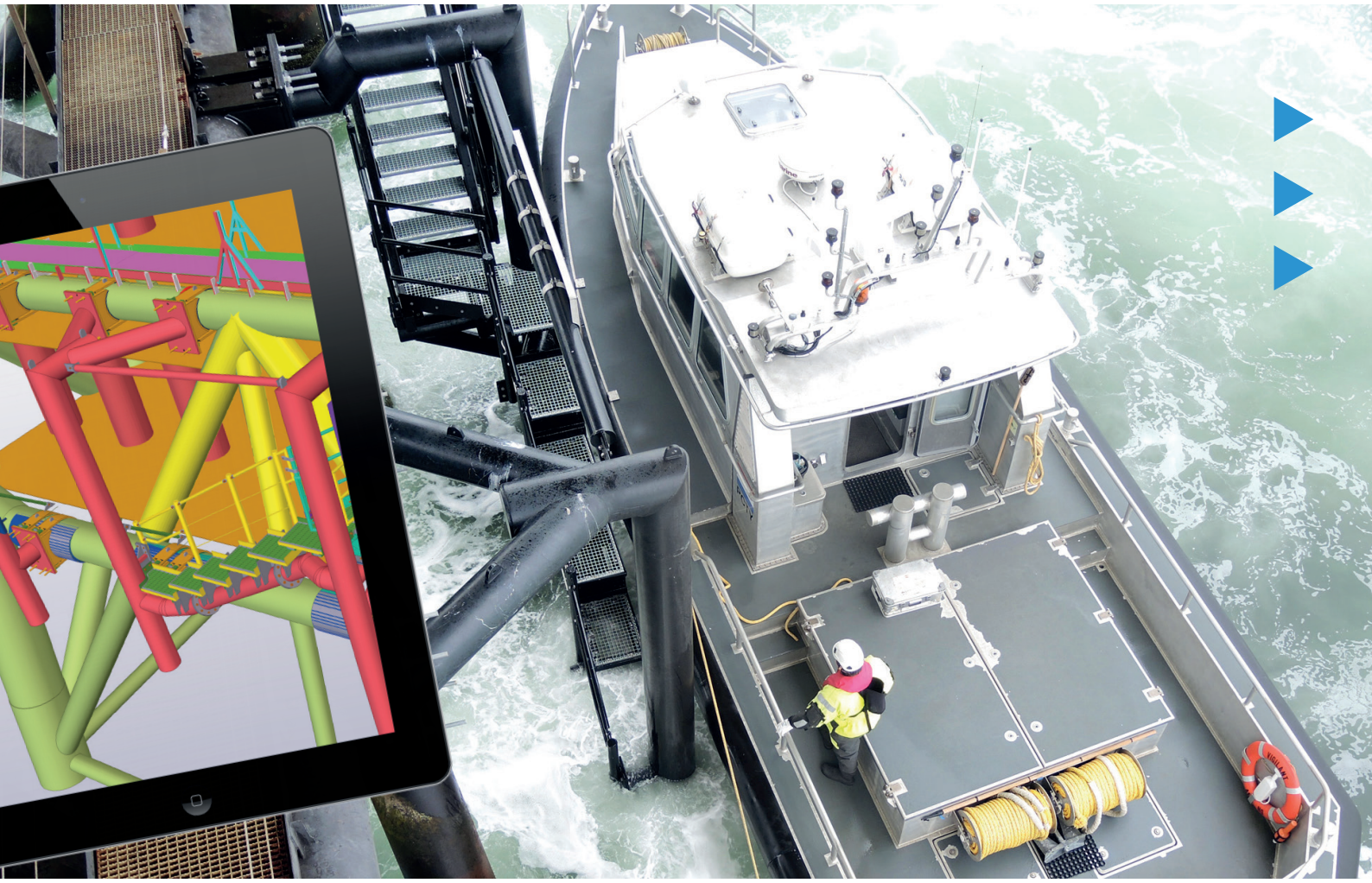
Tekla structures sails ahead on offshore projects



Offshore solutions made efficient with Tekla software

We have recently used Tekla structures on two offshore projects, Leman Alpha ICCP Project and Boat landings for AME-2 & AWG-1.

PINNACLE
CONSULTING ENGINEERS

Solutions

Tekla®

- Tekla Structures
- Tekla BIMsight

overview

Pinnacle Consulting Engineers has utilised Trimble Solutions (UK) Ltd's Tekla Structures on two impressive offshore projects, thanks to it being able to handle the most complex of structures, while creating accurate 3D models. In fact, one of the project's models was recognised in the Tekla UK Awards 2017 by winning the Small Projects category.

LOCATION
Norfolk, United Kingdom

Pinnacle is a regular user of Tekla software – especially when it comes to offshore projects, where high levels of steel detailing is required. Matt Byatt, Director at Pinnacle, said: *"As Tekla Structures was developed as a steel detailing package, it makes sense for us to use it on the majority of our offshore projects, as they are predominantly steel structures. At Pinnacle, our employees that model and create drawings on Tekla software have had at least ten years' experience of steel detailing before joining the company, which means that they have the knowledge and understanding of what fabricators require to help an offshore project run smoothly and on time."*

Models created with Tekla software contain accurate, reliable and detailed information needed for successful Building Information Modelling and construction execution. Tekla Structures was created to improve the way users work in their own offices and with their partners by creating more accurate ways of working and streamlining collaboration between all parties, at all stages of the construction project.

BOAT LANDINGS FOR AME-2 & AWG-1

Pinnacle was appointed as the structural engineering consultant to help develop and structurally engineer a safe and reliable boat landing station off the coast of Holland, from which personnel could access and return from the gas platforms. The principal engineering challenges were to create landing structures fixed to the existing jackets, between the sea level and the platform's 'spider deck'. The landing structure had to allow safe access from the chosen vessel within a 2m tidal range and, once on the landing, easy access to spider deck level via a safe and secure stair.

The structures also had to be designed and installed using the platform's crane, without the use of an expensive jack-up barge. As with any offshore project, safety was paramount and under no circumstances were the existing jacket structures to be drilled or welded. The new structure had to be installed safely and correctly the first time, without needing any site modifications. Once the design was finalised Pinnacle then had to produce a full set of fabrication drawings to be issued to a fabricator in Holland.

The design of the primary supporting clamps was a critical component in the overall solution, as they needed to be installed simply and accessed from the front, incorporating all of the required dimensional tolerances.

The lower clamps were installed within a very short period of time, when the sea level would be below the underside of the clamps. Accuracy was also critical and the ability to build in tolerances within the new structure was limited.

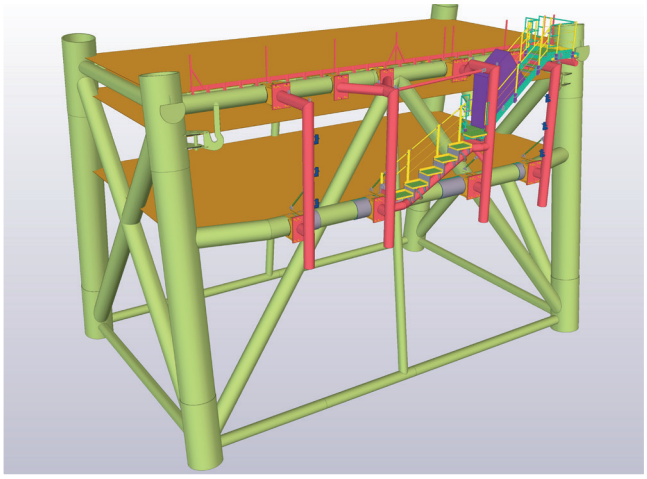
Once all of the design actions and combinations resulting from wind, wave, tidal and impact conditions were assessed, the boat landing structure was analysed, designed and then fully detailed using Tekla Structures. Pinnacle then had to ensure that the project could be phased to facilitate transport and installation on the project. The goal was to minimise the number of components whilst staying within the size and weight limitations of transporting and lifting onto the platform. Pinnacle's client was fully committed to engaging with the key stakeholders early within the design process, which enabled true collaborative design. The full and early involvement of the steel fabricator, vessel operator, installation and rope access companies all within the structural design and detailing phase, ensured that the primary clamps and frame were split, jointed and slung to facilitate the chosen installation contractor's preferred method of erection.

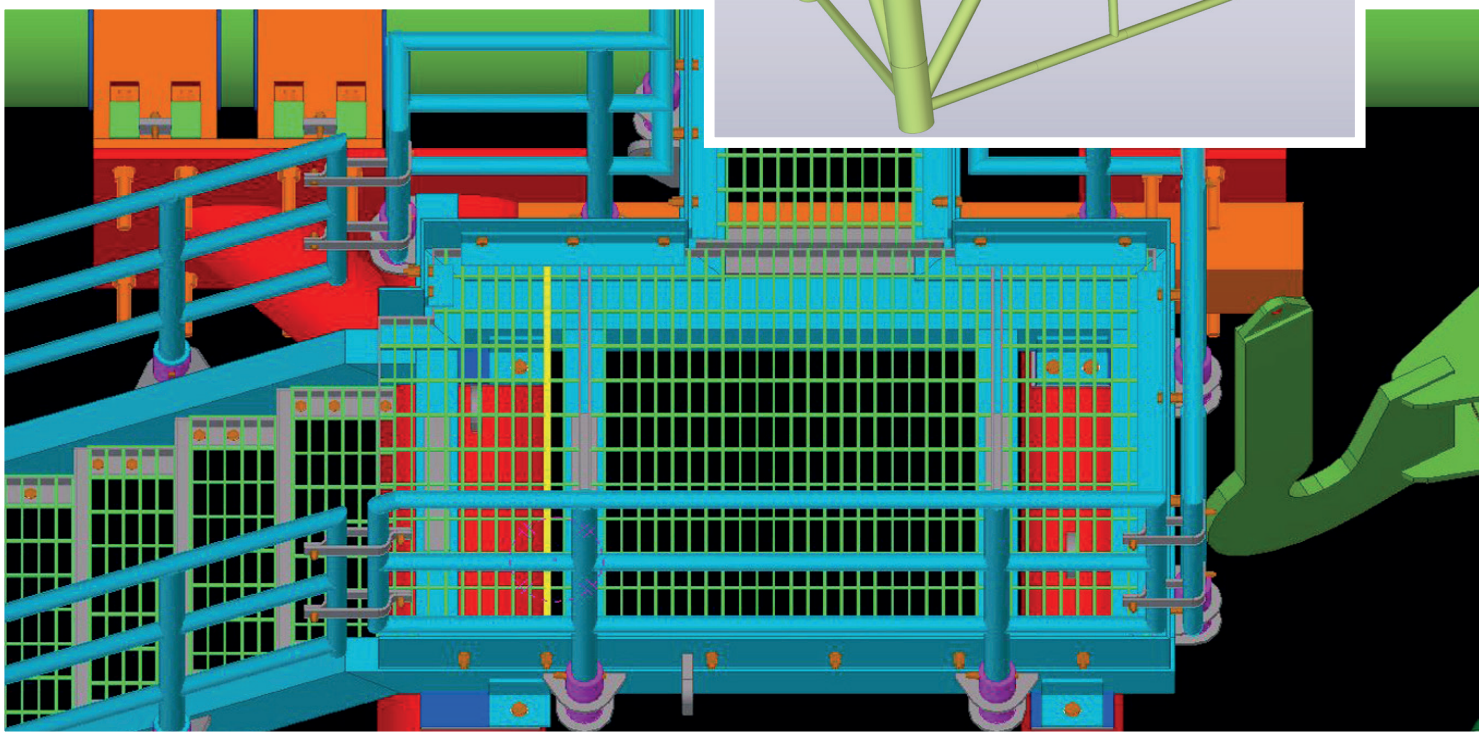
USING TEKLA STRUCTURES

Pinnacle was able to quickly build a 3D model using original as built drawings. This initial model then formed the basis for creating early scheme designs for the structure and clamps. From this, Pinnacle could produce a BIMsight model (including pre-set views created to show specific details) to use at meetings with the client and the installation company in Holland. The clarity and detail of the images presented meant that its client's team was engaged immediately with the proposed design. This helped to raise key issues early, so that adjustments could be easily worked into the design. It also helped to highlight the fine tolerances required and the need for an accurate site survey.

Matt continued: *"At all the key stages of the design process we would always create a 3D pdf for the client and team. We were able to import the laser survey, in dxf format, into our model and set this to line with the key setting out points in our model. This gave us the accurate positions to the inside edges of the tubular members."*

The outcome of this collaborative design process was a 'right first time' and 'delivered on time' pair of boat landing structures installed safely, extremely cost effectively, without incident, in challenging conditions, commissioned and handed over without the need for site modifications.

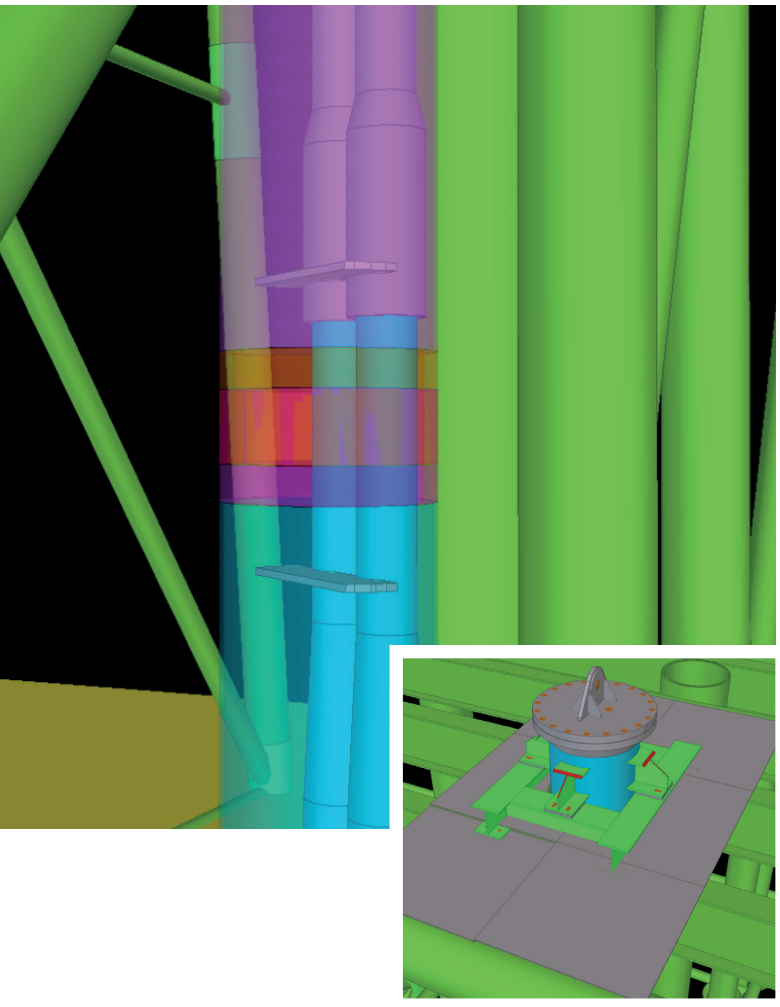


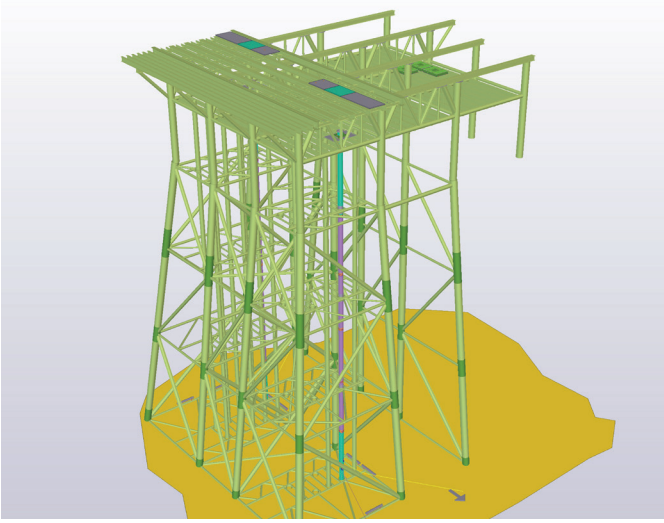


LEMAN ALPHA ICCP PROJECT

The Leman Alpha ICCP Project is located in the Southern North Sea, for Pinnacle's client Shell and formed part of a series of upgrade projects, which were designed to extend the life of the existing gas platforms. Pinnacle was engaged in early 2016 to structurally design and detail, in collaboration with Shell and their team of specialist contractors, two new I-tubes, which were to be installed within empty conductor guides from the platform's cellar deck to the sea bed. These new I-tubes were to house large diameter cables to the seabed forming part of an Impressed Current Cathodic Protection (ICCP) system to extend corrosion protection, and thereby the serviceable life of the Leman Alpha jacket structures.

The ICCP process consisted of installing three Retrobuoys (a 500 Amp ICCP Anode Sled) on the seabed and connecting them via a power cable to the jacket structure. In order to protect the primary cables as they travelled up to the platform deck level, two new 610mm diameter I-tubes were installed within two of the spare Conductor Guides – one each on the north and south side of the platform.





THE CHALLENGE

There were a lot of challenges that Pinnacle came across on this project, such as, for the pulling operation to be a success, it had to take into account the bend restrictions of the cables at the entry point on the seabed. In order to do this, two bellmouth openings had to be created vertically – 2m apart – to allow the pullhead mechanism to pass through these tubes and winch the cable to the top.

In fact the two internal 210mm diameter pipes had to be curved and twisted in order to fit within the 610mm diameter Caisson, whilst maintaining alignment to the location of the Retrobuoys located away from the platform on the seabed. Pinnacle also had to ensure that the pullhead could pass through the radius section at the base of the tubes. As the 610mm diameter Caissons were connected up to Cellar Deck level using specialist Merlin connectors, the internal tubes splices had to be formed above these to allow for a bespoke 210mm diameter female connector, which had to be carefully detailed to avoid the cable snagging as it progressed while being winched up.

This was then repeated at a further six locations until it reached the platform deck level where a trunnion frame provided a permanent fixing to the main structure. Each I-tube section ranged from 7.5m to 9.5m long, with the overall length of each tube assembly when joined being in excess of 60m.

Matt continued: *"Tekla Structures helped us to overcome these challenges as we were able to solve any problems early on in the project, check for any clashes and ultimately, distribute the IFC model."*

Committed to improving the way projects are designed and built, Trimble recently updated Tekla Structures to improve performance by adding new tools to the software. This includes expanding upon the group of default components already available to address more complex situations. The new tools, which can be used for a multitude of projects, whether it's residential, industrial or architectural, will allow detailers to create curved platforms, spiral staircases and mezzanine floor systems from industry leading suppliers.

Also, the bent plate functionality allows detailers to merge and form complex shapes. For example on a bent curve gusset plate, the three items can be joined together using the new command in order to create one item.

This one item can then be automatically unfolded as CNC data – perfect for folded steps, spiral staircases or cold-formed profiles.

With Tekla Structures being the backbone of these two complex projects, it's easy to see how the collaboration and detail created in the software was critical to Pinnacle's success in engineering these models.

For more information on Tekla Structures, visit: www.tekla.com/uk/products/tekla-structures

> "Once our models are created in Tekla Structures, they are then sent to the steel fabricators, so they can add all of their elements to the model, which means the whole process is streamlined and quick."
>
> Matt Byatt
> Director

Control throughout the structural workflow at your fingertips

TEKLA SOLUTIONS

Accurate, reliable information, as detailed as you need and always available, is necessary for a successful structural workflow. With Tekla software, your constructible design will promote error-free fabrication and successful construction. Welcome productive workflows and happy clients.

Tekla Structures is the most developed Building Information Modeling software on the market. It makes accurate, constructible modeling of any structure possible.

Tekla Structural Designer gives engineers the power to analyze and design buildings efficiently and profitably.

Tekla Tedds automates repetitive structural calculations.

Tekla Model Sharing allows Tekla Structures project teams to work efficiently together regardless of their location or time zone.

TRULY CONSTRUCTIBLE. Tekla®

TEKLA SOFTWARE BY TRIMBLE

Trimble is a technology company with a vision of transforming the way the world works. Trimble's construction offering ranges from total stations to advanced software, giving the industry tools to transform planning, design, construction and operation of buildings. The company also has products for trades like logistics and agriculture.

TRIMBLE BUILDINGS

In addition to Tekla, Trimble Buildings brands include names like SketchUp and Manhattan Software, targeting architects, engineers, fabricators, MEP contractors, general contractors and construction managers, and building owners. The software solutions promote constructible models and collaboration. Trimble Buildings offering blend groundbreaking innovations and practical features, helping the industry achieve transformative results.

CUSTOMER EXPERIENCE | AUGUST 2017

Please note that some products are not available in all areas.