FPSO Engineering

From Concept to Commissioning

escher

Nevesbu
NAVAL ARCHITECTS & MARINE ENGINEERS

Iv-Oil & Gas

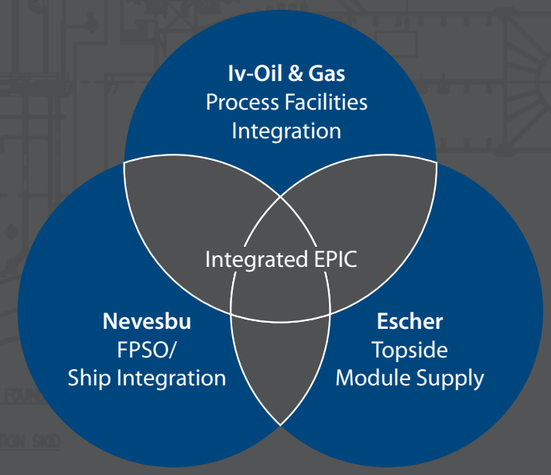
Introducing our company

Iv-Groep is a global engineering company, founded in 1949. With 1,000 professionals strong, we offer multidisciplinary services in the markets Oil & Gas, Maritime, Industry, Special structures & equipment, Buildings & Installations, Infrastructure & Ports and Water. This diversity of our knowledge represents significant added value for our clients.

With regard to FPSOs, Iv-Groep has extensive experience in all relevant disciplines by combining the strength of three of its companies:

- **Nevesbu**: Naval Architecture & Marine Engineering
- **Iv-Oil & Gas**: Process Facilities Engineering, Procurement and Commissioning
- **Escher Process Modules**: Engineering, Procurement and Commissioning of Topside Module Supply

With this expertise, Iv-Groep can take care of the complete engineering for modification, upgrade, new-build and tanker conversion projects as well as support its clients throughout all project phases.



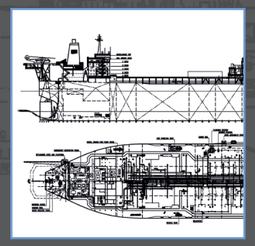
Integrated EPIC services

Years of experience in the oil & gas and maritime markets teaches us that decisions for offshore projects must be made strategically and delicately. The complexity of these projects in addition to frequent changes demands a well-balanced cooperation between all project partners. Operating under one roof and using short lines of communication give Nevesbu, Iv-Oil & Gas and Escher the flexibility to deliver fast-track solutions for its clients.

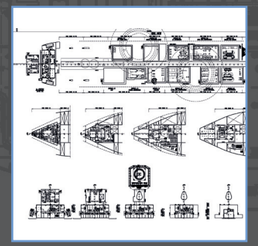
As part of our complete engineering package, we provide procurement and project management services, offer assistance with class submission, and supply, install and commission various fit-for-purpose oil and gas treatment modules.

Our systems are designed for ease of maintenance and safe, efficient and cost-effective offshore operations. The concept of 'safety in design' is a standard component of our work. This means that we place a great deal of attention towards mitigating risks by incorporating control measures into our design process.

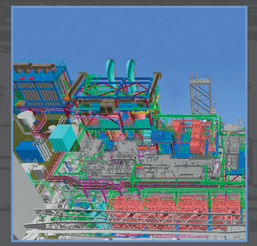
Concept Engineering/ Feasibility



FEED Study/Basic Design



Detail Engineering



Procurement

Construction

Installation

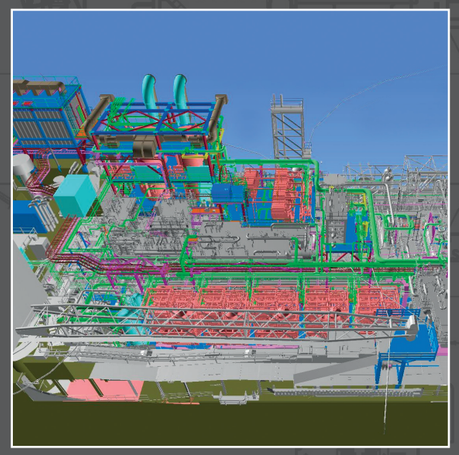
Hook up & commissioning

Working with Passion

Our strength is built on our people. It's their Passion for Technology, in-depth knowledge, positive attitude and commitment that make a difference. This passion motivates our employees, who are fully abreast of the developments in their respective fields. It stimulates them to come up with innovative solutions that exceed the expectations of our clients.

Our employees are driven to achieve excellence. Continuous training and years of experience enable them to exert the highest level of professionalism and commitment in their work.

DISCOVER OUR PROJECTS



Upgrade and modification of the Petrojarl I FPSO

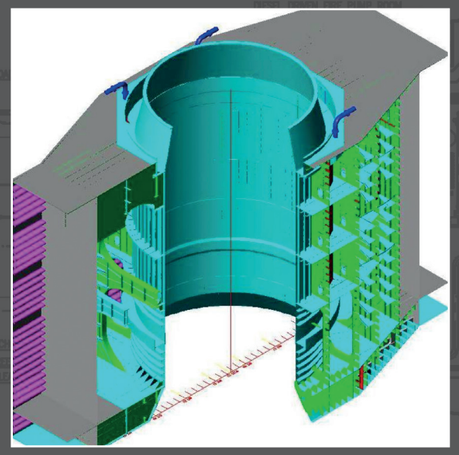
The Petrojarl I FPSO will sail to the Atlanta Field offshore Brasil in 2016 after modification of the vessel and process systems to meet the new filed conditions and crude oil specifications. Damen Shiprepair Rotterdam contracted Nevesbu to execute the engineering and design for all modifications for the upgrade and modification of the Petrojarl I FPSO. Iv-Oil & Gas joined in for engineering related to the process facilities.

Over 50 engineers and draughtsmen from Nevesbu and Iv-Oil & Gas are working together on the project. Nevesbu is handling the Marine Systems, Naval Structural Design & Engineering and Naval Architecture while Iv-Oil & Gas is taking care of the Process, Mechanical, Electrical, Instrumentation, Topside Structural, Piping Design and Piping Engineering.

Major conversion of the EnQuest Producer FPSO

Nevesbu executed the engineering for all modifications of the major conversion of the 249-metre-long EnQuest Producer FPSO. The on board production facilities underwent significant modifications to ensure that the FPSO can operate and produce for 10 years in the Alma and Galia fields. This is a complex project with some interesting findings. Nevesbu made a major contribution to the conversion of the FPSO and was part of the conversion team while work was in progress. This project shows that close involvement during implementation leads to an optimal end-result.

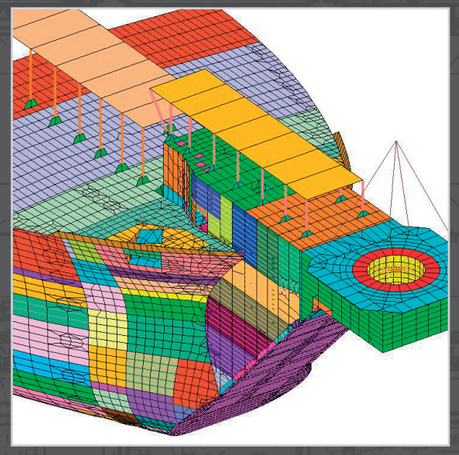
Our team made frequent visits to the Hadrian Yard to maintain intensive contact with the Client and remain closely involved during the implementation to be able to provide advice if necessary. As a result of our close cooperation with the site team, new issues could be addressed right away and work was not held up. Because this collaboration was effective and kept everything moving at pace, EnQuest brought us in to the overall conversion team. Nevesbu staff was on site once every two weeks during the entire period prior to delivery.



FPSO Internal Turret Integration

Nevesbu designed and engineered the structural integration for an internal turret mooring for Bluewater Energy Services. This ship was designed for the Norwegian Continental Shelf.

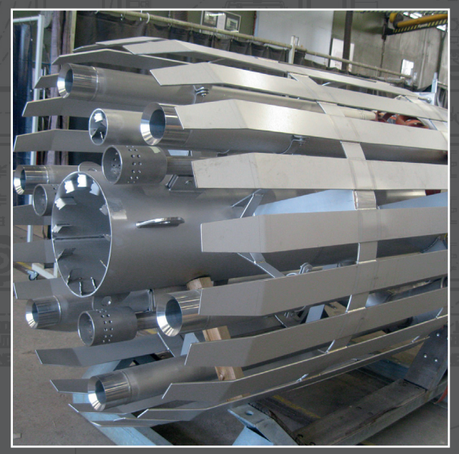
Due to a large number of risers, heavy seas and the ship's special design, this was to be an exceptionally large turret with a bearing diameter of about 20 metres. The bearings for an internal turret mooring are fitted in a cylindrical turret casing in the ship. The bearings enable the ship to move around the turret. This system is particularly suited to areas with extreme weather conditions. Also, because a large number of product streams can result in a complicated turntable, it is advisable to have this in-board for better accessibility. Nevesbu designed and engineered the cylindrical structure extending from the keel of the vessel to the deck and its integration into the ship structure.



Mondo, Saxi Batuque and Bunga Orchid External Turret Mooring

Nevesbu designed rigid arm support structures for external turret moorings for the FPSOs Mondo and Saxi Batuque under a contract from Single Buoy Moorings of Monaco as well as for the FPSO Bunga Orkid in a contract with Bluewater Energy Services in Hoofddorp. The SBM contracts also included engineering for a partial double hull section and increase sea cooling water capacity.

With an external turret, the bearing hangs in a kind of bowsprit, the 'rigid arm', which protrudes from the bow of the ship. Because of the angle at which the chains leave the turret, part of the bow must often be cut away at an angle to prevent it from colliding with the chains. Nevesbu designed and engineered the rigid arm support structures as well as the bow cut-off and closure plating, involving a total of some 1000 to 1500 tons of new steel. The work started with the conceptual design and analysis, and continued through to plans and reports for class submission.



Flare package Anasuria FPSO

Escher engineered, fabricated and delivered a Flare Package for the Shell Anasuria FPSO operating in the North Sea.

The package consisted of a High Pressure(HP) sonic multi-arm flare tip, combined with a Low Pressure (LP) open pipe tip and H_2S burner. For the ignition three pilot burners with double thermocouples were provided. The delivery period was within 20 weeks.

Glycol regeneration package Bluewater Haewene Brim FPSO

Escher engineered, fabricated and delivered a modification for the installed glycol regeneration package on the Bluewater Haewene Brim FPSO, operating in the North Sea.

A new reflux coil was required for the glycol reboiler in this package. After delivery, Escher supported Bluewater on the FPSO with installation supervision, start-up and commissioning.

Glas Dowr Upgrade

Iv-Oil & Gas has provided the Basic Engineering, Detailed Engineering and Design for the upgrade of the Glas Dowr FPSO, for utilisation on the Sable Field. The oil is produced from two different reservoirs with changing gas/oil ratios.

The modification comprised of:

- Four Reciprocating Three-Stage Gas Lift/Gas Injection Compressors (3 megawatt each)
- One Reciprocating Two-Stage Offgas Compressor (1 megawatt)
- Oil Stabiliser Columns, including Re-boiler
- First Stage Separator
- Modification to Existing Utilities (Water Treatment, Cooling Water and Vent System)

The project references presented here are provided to summarise the diversity of projects presently executed by Nevesbu, Iv-Oil & Gas and Escher Process Modules. For more information regarding additional projects, please feel free to contact us.

How can we help you?

Please feel free to contact one of the contact persons below and tell us about your challenges, or check out our website at www.iv-groep.nl for more information.

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