Concrete solutions
Kvaerner is a specialised engineering, procurement and construction (EPC) company. As a preferred partner for oil and gas operators, industrial partners and other engineering and fabrication contractors, Kvaerner is focused on delivering complete solutions to some of the world’s most demanding projects through reliable, effective and flexible execution models.

HSE is a core value
At Kvaerner, concern for health, safety and the environment is more than a core value; it is also an effective way to work. Our HSE mindset is founded on the belief that all incidents can be prevented. We work systematically to ensure continuous improvement of our HSE culture and performance.

- We strive continuously for zero harm to people, the environment, material and non-material assets
- We focus on employee health and on further improvement of the work environment
- We require every employee to take personal responsibility for HSE by focusing on their own behaviour
Engineering
An optimised design and engineering typically counts for 5-20 percent of the total project costs. This phase is the fundamental basis not only for the subsequent procurement of equipment and the construction of the facility, but it also imperative for building a facility which will operate effectively for decades to come. Our multi-disciplined organisation covers all phases of technical and administrative functions needed to execute demanding engineering tasks for our customers.

Procurement
In many projects, more than half of our own contract value represents equipment and services we procure from subcontractors on our customers’ behalf. Kvaerner provides best value procurement from subcontractors to customers by leveraging global sourcing networks and market knowledge. Our supply management and procurement organisation supports project execution through a pro-active process for optimising the lead-time, total costs and quality, mitigating risk and ensure HSE performance.

Construction
Kvaerner’s offering includes specialised in-house fabrication yards with decades of experience from demanding projects combined with the capacity at high quality partner yards. With Kvaerner’s flexible execution model we deliver reliable and cost-effective solutions while ensuring a high degree of local content when it benefits the project. All our projects are supervised by Kvaerner’s senior project and construction management.
Total concrete solutions

For concrete offshore installations, Kvaerner’s capability and track record cover the full value chain. Our deliveries span from conceptual and feasibility studies, front-end engineering and design (FEED), detailed engineering, global procurement and project management through construction and outfitting to commissioning and installation offshore. Kvaerner understands close integration between various phases is critical to long-term success of the overall project.

Concrete advantages

Based on documented performance of over 40 years, concrete platforms have proven to be a viable deepwater solution for offshore operators.

The material’s robustness allows facility installation in the harshest waters of the globe.

Concrete gravity base structures (GBS) are installed on the seabed and are typically designed with ballast cells in the bottom part of the structure. This feature not only enables the concrete structure to be de-ballasted, floated and towed to the installation site; it also permits float-over installation of the topsides after partly submerging the concrete substructure.

At remote locations, nearby pipeline connections are not always readily available. The cells in the bottom part of the concrete structure can hold temporary oil storages, and the oil can then be offloaded to shuttle tankers at regular intervals.

In many regions, there are strong expectations and clear directions in order to ensure local content in projects. Since concrete structures do not need established yard facilities, construction sites can be developed locally.

Kvaerner has consistently demonstrated the ability to develop the skills of the local workforce and subcontractors and contribute to the local economy, HSE standards and welfare of the people.

- Large topsides payload capacity also allows upgrades and hence a prolonged lifetime
- Concrete structures are eminently suited for harsh environments and ice infested waters
- Operational experience from 40 years of documentation shows virtually no demand for maintenance
- No piling necessary to hold the platform in place after installation. Suction between the platform’s base and the seabed ensures stability even at locations with difficult soil conditions
- Risers, conductors, drill string, etc. protected inside concrete shafts
- Allows construction with a high degree of local content
- Platform can be floated and towed to the field, enabling installation without the use of heavy-duty transportation vessels over long distances
- Cells with capacity to store crude oil if desired
- Robust solution: the structure is designed to withstand significant seismic disturbances on the seabed
Allows construction with high local content

Large topsides payload capacity, flexible wrt. centre of gravity allows upgrades and prolonged lifetime

Operational experience from 40 years documents virtually no demand for maintenance
For concrete substructure developments, Kvaerner can offer concepts for platforms with a concrete substructure sitting on the seabed, floating production platforms with a concrete hull, or terminals and facilities with process equipment installed on a concrete foundation.

**Condeep GBS**

Kvaerner’s Condeep design for gravity base structures is the world’s most widely used solution for offshore oil and gas platforms based on concrete substructures. For almost 40 years, the Condeep design has been tested and continuously developed based on real operations.

Many of the world’s leading operators have chosen Kvaerner and Condeep because the solution has proven to be reliable, cost effective and provide the versatility needed to meet the challenges of each specific project.

The Gullfaks C platform, one of the largest objects to ever be moved by man at the time of its installation, was based on Condeep. The world’s tallest fixed concrete platform, Troll A, is based on Condeep. The Hibernia platform offshore Canada, with its special features to withstand drifting icebergs, is based on the Condeep design, as are the three platforms offshore Sakhalin in Russia. The single-shaft, slender and simple Draugen platform is yet another illustration of the flexibility and versatility of Kvaerner’s Condeep design.

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**Arctic LNG facilities and ConGas LNG receiving and regasification terminals**

Concrete contains proven material characteristics which make it ideal for use at gas facilities. This makes concrete a cost effective alternative for terminals for reception of LNG from tankers and subsequent regasification for use in regional gas grids or for industrial purposes.

Not only is the concrete’s durability an important safety feature. The material also withstands cryogenic temperature exposures when natural gas is cooled down to extremely low temperatures to become LNG (liquefied natural gas) for transport or storage purposes.

With a large portion of the yet not produced oil and gas resources located in arctic regions, there are several plans for onshore or at-shore processing plants under consideration. In many cases, it is complicated and ineffective to construct onshore facilities at new sites which are remote from any infrastructure. Kvaerner has developed its own Arctic LNG concepts based on modularised process facilities located on concrete barges. The bulk part of a new facility can be constructed at an efficient fabrication site, and the barges with process equipment can then be towed to the site for the new process facility, embedded at shore where it is connected to form a complete plant.

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**Floating production platforms with concrete hulls**

As one of the world’s leading suppliers of floating oil and gas platforms, Kvaerner also has extensive experience and capabilities for delivering concrete hulls.

We have delivered the world’s first semisubmersible production platform with a concrete hull, Troll B. Similarly, Kvaerner has delivered the world’s first TLP (tension leg platform) with a concrete hull, Heidrun. Our documented experience shows the floating concrete platforms have excellent performance with respect to all key parameters, including motion characteristics, virtually no maintenance and minimal down-time.

Kvaerner also offers concrete monohull solutions, such as the Condeep Mono-Floater concept. This simple design allows for both cost-effective slip forming of the concrete hull, and deep draft of the hull, which provides buoyancy well below the wave zone. This ensures improved motion characteristics, especially in areas which are prone to extreme weather conditions.

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Solutions for different needs

We do not believe “one size fits all”, or that a single solution can meet all operator needs or demands. Kvaerner offers a wide range of fit-for-purpose solutions for offshore platforms and associated facilities.
1. SPAR concept with concrete hull for floating production.
2. The Draugen platform has a simple, single-shaft concrete substructure.
3. Kvaerner’s Arctic LNG concept allows for construction of a complete LNG facility to be built on a cost-effective site and then towed to the final location.
Tow out and installation of concrete platform for the Sakhalin II development.

World leading track record

Kvaerner is the world’s undisputed leader for delivering concrete substructures to offshore oil and gas projects. Our track record illustrates we are not only able to offer attractive concepts, but we also deliver reliable solutions, as agreed, on site on time.
With a concrete GBS substructure of 376 meters, the total height from the seabed to the tip of the flare is 481 meters, almost half a kilometre. This makes the Troll A gas production platform not only the world’s tallest concrete GBS platform, but also the current holder of the title “the largest object ever moved by man.” Kvaerner performed the full EPC scope for both the substructure and the topsides production facilities.

The Troll B is the world’s first floating production and accommodation platform with a concrete hull. Installed at a water depth of 350 meters on the Norwegian Continental Shelf, the substructure carries topsides with an operating weight of 25,600 tonnes.
The Heidrun TLP is the world’s first tension leg, floating production platform. Kvaerner delivered the engineering, procurement and construction of the hull and topsides, as well as the tethers and foundations for the mooring. We were also responsible for the tow-out to the field and installation.

Located at the northeastern part of the Grand Banks, the Hibernia production platform offshore St. John’s in Newfoundland demonstrates why concrete substructures are ideal in regions with drifting ice and harsh weather conditions. Kvaerner was involved in the engineering and fabrication of the topsides, including the establishment of a local fabrication and module assembly yard. Kvaerner, together with our local partner Peter Kiewit & Sons, was hired to manage the completion of the construction of the concrete GBS.
The completed Sakhalin II project and the ongoing Sakhalin I project represent a massive development off Russia’s Pacific Coast. The two platforms Kvaerner delivered to Sakhalin II and the additional delivery of a platform to Sakhalin I will produce from oil and gas fields in this region. For the delivery of these three concrete GBS platform substructures designed to withstand drifting ice and seismic disturbances on the seabed, Kvaerner established a local construction site on the Russian coast. We have also trained and utilised local contractors and thousands of local employees. This enabled a high degree of local content and exchange of technology, methods and best-practice HSE standards.

Kvaerner completed the Adriatic LNG facility, the world’s first GBS offshore terminal for LNG receiving and regasification. Located offshore Venice, Italy, the facility does not take up beach space in an already densely populated region; the low-profile facility is behind the horizon and can hardly be seen from shore. At the same time, the Adriatic LNG facility is close enough to the shore to effectively supply gas to grids onshore after regasification of the LNG received from tankers.
Kvaerner is a main contractor with practical experience gained from many of the world’s most demanding projects. Our comprehensive track record includes fixed and floating substructures for offshore platforms and terminals, topsides for offshore platforms and terminals. We have also delivered a wide range of onshore based facilities for oil and gas processing or industrial purposes.
Our front-end products and services range from feasibility studies and field development planning through concept screening and selection, concept definition and FEED (front-end engineering design) as well as project execution strategy.

The FEEDs are executed by our own multi-disciplined teams. The activities are planned and carried out to fit the clients’ needs, adjusted to suit the starting point and specific level of completion of defined deliverables.

Kvaerner understands that the FEED phase is critical to the long-term success of the overall project objectives. While the business plan identifies the financial opportunity, the FEED establishes a set of process operating conditions and specifies the equipment needed to achieve the necessary level of reliability, efficiency and safety. Hence, this phase sets the direction for the subsequent project phases.

Engineering
Kvaerner has experienced in-house engineering expertise for the execution of several large simultaneous projects. Our network of international locations may often be used to provide additional capacity or to contribute with local expertise and experience. Kvaerner also has the ability to leverage strategic partners worldwide, including low-cost engineering hubs, to assist in various parts of the project execution.

The detailed engineering phase also provides specific instructions which enable the operators at the fabrication site to construct the new installation with maximum efficiency.

Procurement
The documentation from detailed engineering is an important tool to enable the procurement organisation to gain the best terms and conditions from vendors, including the identification and ordering of long lead items at an early stage.

Kvaerner’s organisation includes extensive experience in procurement for concrete platform projects. Our expertise includes the overview of alternative suppliers and vendors, market prices and quality standards for specific items and systematic follow-up routines after the orders have been placed.

Construction
Concrete offers robust, virtually maintenance-free substructures for offshore platforms when they are constructed with the utmost quality. Kvaerner’s more than 40 years of experience with concrete platforms ensures the combination of effective, state-of-the-art slip forming with high quality.

Concrete structures can be built in green field areas with limited pre-existing infrastructure. Kvaerner has comprehensive experience from quick and cost-effective establishment of new construction sites for
Concrete platforms in various geographical regions.

Concrete platform structures enable a high degree of local content. The required materials for concrete and rebar are usually readily available locally around the world. In the construction phase of a concrete project, a local workforce with none or few industry-specific skills can be trained to effectively participate on the project. Kvaerner has long and documented experience of recruiting, training and effectively integrating local employees and subcontractors for projects for concrete substructures.

Local content is a key factor in many field developments. The flexibility to build the concrete structure locally, combined with the use of local sourcing and a local workforce, may significantly enhance the local content. In some projects, Kvaerner has contributed to bringing the local content of the total scope up to as much as 95 percent.

Outfitting

Outfitting is typically part of Kvaerner’s delivery of concrete offshore platforms. Among the outfitting equipment often required are topsides-related systems, including but not limited to firewater supply, seawater supply, disposal, risers, J-tubes, conductors and utility storage systems. The systems related to the concrete substructure often include ballast and vents, skirt evacuation, under-base grouting, electrical installations and instruments, safety and utility equipment, access and material handling systems, as well as steel structures, supports, marine brackets and embedded items.

Equipment is often installed in steel plates embedded within the utility shaft of the concrete structure. This is installed during the civil construction phase of the structure, with high precision and extensive coordination between various disciplines and systems in order to ensure success.

Kvaerner cover all the outfitting disciplines typically required, such as process and marine system design, piping, layout, material handling, pipe stress, secondary structural steel (steel decks, access and support systems), HVAC and safety systems, electrical, instrumentation, telecom, mechanical equipment, risers, J-tubes and pipeline interfaces.

Installation of topsides

In some projects, crane lift installation of the topsides modules is the most effective solution. In other projects, the installation of the topsides is based on quay side trailing and jacking.

In yet other projects, the topsides can be installed in a float-over operation. This includes the partial submerging of the concrete substructure by ballasting, and then floating the topsides on barges over the shafts of the substructure, and finally securing the topsides to the shafts. When the substructure is de-ballasted, it elevates in the water with the topsides on top, and can be towed to the field for installation. In any installation method, a high level of accuracy and control is necessary to ensure a successful outcome. Kvaerner has vast experience with all methods of installing the platform topsides on to the substructure.

Tow-out and installation

The towing and installation of a complete platform demands expertise within a wide array of disciplines. Kvaerner has been responsible for a long row of platform installation projects, including the control of subcontractors, command of tug boat fleets, underwater entrepreneurs, etc.

Hands-on project management

All our projects, including those executed with strategic partners or local contractors, are supervised by Kvaerner’s own project managers. The in depth expertise, the proven experience and the hands-on approach of our experts are some of the factors that make Kvaerner unique, and have made our brand recognised as the reliable, effective contractor for the most demanding projects.
Kvaerner’s mission is to successfully execute some of the world’s most demanding projects through living our values.

In any organisation, values are essential for building trust – in each other, in our partners, in our customers and with society. All the Kvaerner businesses share a common set of values – the compass that guides our policies, our operations and ultimately, our behaviour.

For further information, please visit our web site: www.kvaerner.com