



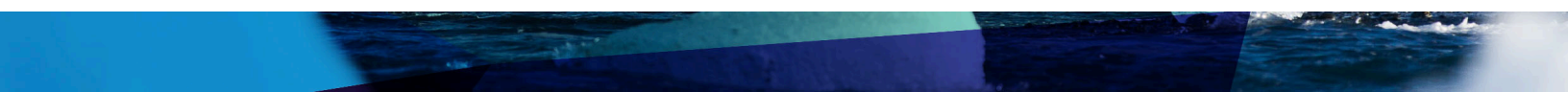
NORWEGIAN ENERGY PARTNERS

- Gateway to Norwegian world class technology and competence

REPORT TYPE

21.Oct 2020

TEXT	-
CATEGORY	-
SUBCATEGORY	-
CHALLENGE	Remote locations
TYPE	-





Calculation of arctic environmental loads

2018-01-26 - Moss Maritime

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: Ice load modelling

Type: Service

Moss Maritime has significant experience in design of units operating in cold, harsh and ice-infested areas. We contribute to projects involving arctic challenges such as ice load calculations, hull design and optimization for ice breakers, ice model testing and winterization. Calculations are performed either using relevant design rules or more advanced direct calculation methods such as continuum modelling of ice and icebergs.

With the Arctic as a close neighbor and area of business, the Moss team has gained the experience to design units with ice-breaking and survival capabilities to withstand the impact of the arctic extremes.

Technology readiness level (TRL)

According to API RP 17N

TRL: Not applicable.

Reference

Moss Maritime website

Contact

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Technology Qualification (TQ) for innovative solutions in complex, cold and harsh environments

2018-12-06 - Lloyd's Register Consulting

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: Ice load modelling

Type: Service

With new operators starting to explore the polar regions, and following several incidents in recent years, there has been a drive towards increasing the safety of design and operations. Regulatory frameworks are working to keep pace, however there will be a need to qualify new design and technology.

Lloyd's Register is your partner in complying with the regulations and you can access our wealth of arctic expertise to get exactly what you need, when you need it. Our interactive toolkit allows you to work through such as the Polar Code for marine vessels on your own terms and you can download our free guidance, templates and examples to help you understand and meet your needs. We also offer guidance through Technology Qualification (TQ) and issue certificate of Technology Qualification.

Technology readiness level (TRL)

According to API RP 17N

TRL: Not applicable.

Reference

Lloyd's Register website
Guidance notes for Technology Qualification

Contact

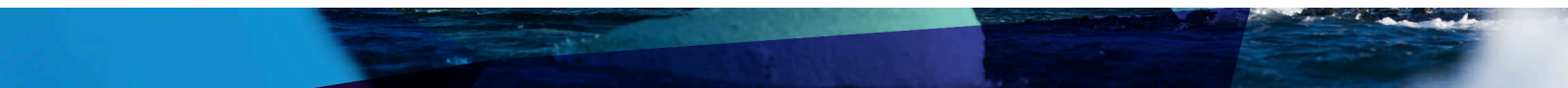
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Design and engineering - basic and detail

2017-05-22 - Inocean

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: FPO/FPSO and platform design and construction

Type: Service

Inocean has more than 20 years experience in providing solutions to lease operators, oil companies and others in the offshore oil and gas industry. We can contribute to each phase of a project, from conceptual studies, front-end design and engineering through project management and yard follow-up to final delivery.

The Inocean engineering team has experience from several cold and harsh environment offshore projects, including development of an arctic drillship for Statoil. Based on this we can offer our clients a wide range of services in cold climate / arctic engineering.

Technology readiness level (TRL)

According to API RP 17N

TRL: Not applicable.

Reference

Inocean website

Contact

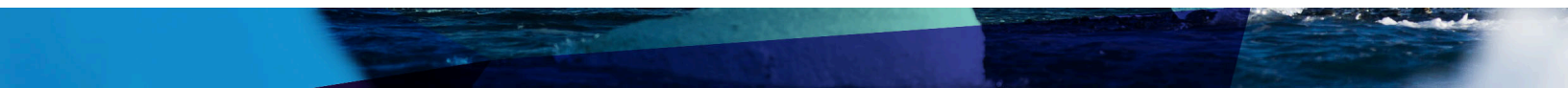
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Offshore facilities design

2017-08-16 - Wood

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: FPO/FPSO and platform design and construction

Type: Service

Wood perform design of floating production units, both topsides and hull on units such as production semis and FPSOs as well as design of MODUs, e.g. drilling semis and drill ships. Multi-discipline engineering services, also covering winterization of offshore facilities. Significant project experience from early concept studies through detail engineering.

Low temperatures, lack of daylight during winter, atmospheric icing, snow accumulation and sea ice are all potential challenges when operating in arctic areas. Mitigating measures need to be implemented at design stage in order to achieve a safe and reliable facility. Wood has competence and experience enabling implementation of required mitigating measures for a fit for purpose facility.

Technology readiness level (TRL)

According to API RP 17N

TRL: Not applicable.

Reference

Wood website

Contact

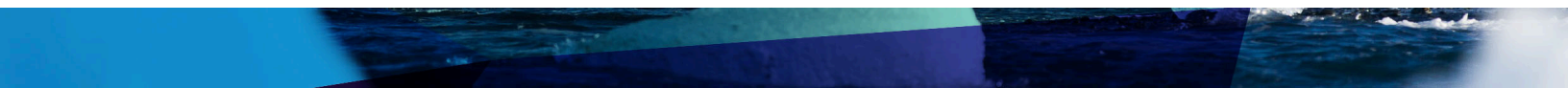
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Studies and front-end engineering and design

2017-10-30 - ABB

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: FPO/FPSO and platform design and construction

Type: Service

The development of a robust and cost-effective Front End Engineering and Design (FEED) package is vital to the successful delivery of a capital investment project. This is especially critical for harsh and remote environments such as the Arctic. ABB can provide experienced project and functional engineers to take your project from the initial concept through to a fully developed front-end engineering package complete with an installed cost estimate, which can be used to confidently sanction your project.

Our aim is firstly to arrive at the safest, simplest and most cost-effective plan, then put it into practice in the most effective way possible. The FEED package produced forms a firm foundation for later stages of the project, with no unpleasant surprises.

Technology readiness level (TRL)

According to API RP 17N

TRL 7: Proven technology integrated into intended operating system. The technology has successfully operated with acceptable performance and reliability within the predefined criteria

Reference

ABB website
Systems and solutions

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Sevan cylindrical FPSO

2018-03-16 - Sevan SSP

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: FPO/FPSO and platform design and construction

Type: Service

Sevan SSP has pioneered the cylindrically shaped FPSO as an alternative to the ship-shaped FPSO. The Sevan hull design represents substantial cost savings for harsh environment installations, both in the construction and the operational phases.

General benefits of the technology:

- Reduced CAPEX and OPEX; no complex turret and swivel systems, no thrusters for heading control
- Scalable design
- Accommodates a large number of risers/umbilicals
- Low cost for subsea interfaces and provisional tie-ins
- Improved motion characteristics

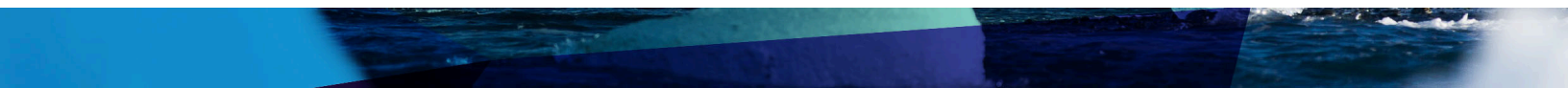
Special benefits for arctic environments:

- Insensitive for the rapid wind direction changes of polar lows
- Geostationary design for sea ice conditions
- Ice breaking hull developed and model tested
- Winterization efficiently integrated

Technology readiness level (TRL)

According to API RP 17N

TRL 7: Proven technology integrated into intended operating system. The technology has successfully operated with acceptable performance and reliability within the predefined criteria



Reference

Sevan SSP website
FPSO Hummingbird Spirit
FPSO Voyageur Spirit
FPSO Goliat
FPSO Western Isles
FPSO Piranema Spirit

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Design and construction solutions for harsh environments

2018-04-03 - OWEC Tower

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: FPO/FPSO and platform design and construction

Type: Service

OWEC Tower provides design and construction of specialized projects for harsh environments. With safety as our top priority we offer innovative and cost-effective construction, conversion, refurbishment, upgrading and life extension works, and back our commitment for reliability and value-added services with experience from the last decade on providing 11 ice-class specialized shipbuilding projects.

We deliver high value to our customers through strong, integrated project management and execution, and synergised engineering capabilities, procurement and resource utilisation.

Research related to arctic regions also include:

- Arctic offshore structure
- Conceptual design for field development
- Lifeboat for arctic evacuation
- Ice-resistant jackup
- Mobile ice-resistant drilling unit

Technology readiness level (TRL)

According to API RP 17N

TRL 7: Proven technology integrated into intended operating system. The technology has successfully operated with acceptable performance and reliability within the predefined criteria

Reference

OWEC Tower website

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Condeep GBS

2018-05-15 - Kvaerner

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: FPO/FPSO and platform design and construction

Type: Product

Kvaerner's Condeep design for Gravity Based Structures (GBS) is the world's most widely used solution for offshore oil and gas platforms based on concrete substructures. The GBS's are installed on the seabed and are typically designed with ballast cells in the bottom part of the structure, enabling it to be horizontally and vertically moved and towed to site. This also permits float-over installation of topsides.

At remote locations, nearby pipeline connections are not always available. The cells in the lower part of the concrete structure can function as temporary oil storage where the oil can then be offloaded to shuttle tankers at regular intervals. The solution has proven to be reliable, cost-effective and provide the versatility needed to meet the challenges of each specific project.

Technology readiness level (TRL)

According to API RP 17N

TRL 7: Proven technology integrated into intended operating system. The technology has successfully operated with acceptable performance and reliability within the predefined criteria

Reference

Kvaerner website

Hebron GBS

Kvaerner's track record within concrete substructures

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Floating production platforms with concrete hulls

2018-05-15 - Kvaerner

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: FPO/FPSO and platform design and construction

Type: Product

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

Kvaerner offers concrete monohull solutions, such as the Condeep MonoFloater 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 such as the Arctic, which are prone to extreme weather conditions.

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.

Technology readiness level (TRL)

According to API RP 17N

TRL 7: Proven technology integrated into intended operating system. The technology has successfully operated with acceptable performance and reliability within the predefined criteria

Reference

Kvaerner website

Kvaerner concrete solutions brochure

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Arctic LNG facilities

2018-05-15 - Kvaerner

Category: Design and construction of FPO/FPSO and offshore platforms

Subcategory: FPO/FPSO and platform design and construction

Type: Product

With a large portion of the yet not produced oil and gas resources located in arctic regions, there are several plans for onshore or near-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.

Technology readiness level (TRL)

According to API RP 17N

TRL 7: Proven technology integrated into intended operating system. The technology has successfully operated with acceptable performance and reliability within the predefined criteria

Reference

Kvaerner website
Concrete GBS LNG Solutions

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