DOEDIJNS | MEMBER OF DGI

Upending and **Flooding Systems**

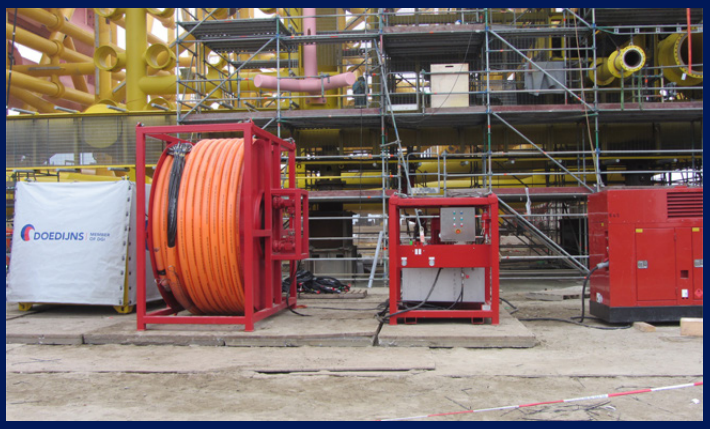
TAILOR-MADE TO MEET **PROJECT REQUIREMENTS**

Upending control systems typically consist of the flooding and venting of empty ballast chambers with sea-water by means of opening and closing valves. The valves are traditionally controlled by a central upending control centre located on top of a jacket, or by means of an umbilical where the controlling parts are located onto an assisting installation vessel.

With the advent of the very large platforms developed for offshore oil use today it is not an easy task to safely upend these huge structures. A reliable and safe system for controlled flooding and upending is therefore an essential need for oil & gas operators. We deliver upending and flooding control systems for the installation of these large offshore structures. By controlled flooding and venting of ballast chambers, large offshore structures can safely be installed.

These structures are traditionally too large to be installed using crane operation and require a remote way of installation by means of controlling and monitoring automated systems.

We have experienced people that can be brought onboard from concept phase as we can deliver full engineering support with integrated project management during the complete project and commissioning or services during installation. With the in-house technical expertise and over the years obtained practical experience our upending and flooding systems can be tailored to meet individual client, end-user or project requirements in the best possible way.



UPENDING AND **FLOODING SYSTEMS**

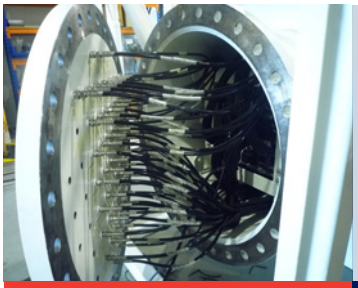
Different valves and valve automation systems can be applied to control the flooding and venting of the individual ballast chambers. Double or single actuating controlling parts, with mechanical spring release systems allow for different installation requirements. Using ball, butterfly or project specific valve configurations with tailor made actuator, valve types and sizes can be used. ROV or lever operated valves can be added as a secondary backup system. Deepwater pressure compensation can be added depending on the installation depth, all fully hyperbaric tested. More on valve automation can be found in our Valve Actuation & Controls leaflet.

UPENDING CONTROL **CENTER (UCC)**

Controlling the flooding and venting of empty ballast chambers is done by actuated valves controlled by a central hydraulic power unit (HPU). We can deliver custom made solutions to our clients when it comes to HPU's, with a special type of HPU for upending and flooding solutions. The valves are controlled by a central unit that can be placed onto the installation vessel or directly onto the offshore structure, nowadays the UCC is preferable placed onto the installation vessel. Redundant power units can be delivered providing reliable hydraulic power solutions, with hydraulic accumulators or with external tie-ins. HPU can be custom-made depending on operator requirements such as pressure, flow, temperature, valve position or other information to provide the operator full and instant control. All control and information can be brought together in tailored operator control panels providing efficient, reliable, robust and user-friendly solutions.

UMBILICALS, JACKET INTERFACING **AND TERMINATIONS**

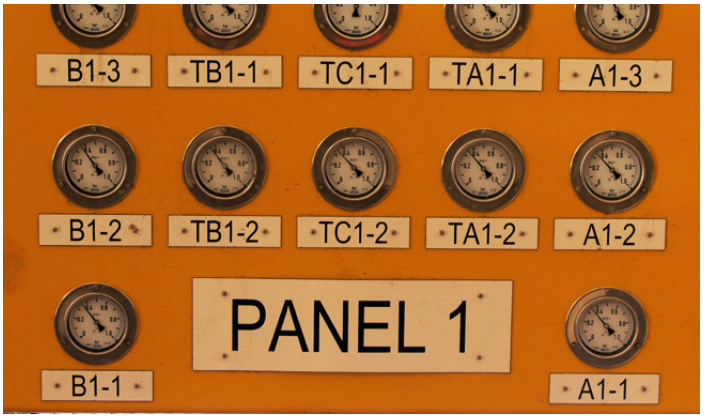
Custom made umbilicals to connect the jacket to a nearby installation vessel with all controlling and monitoring parts is the standard today for safety requirements and on-bottom stability. Electro-hydraulic-optical umbilicals with individual hydraulic lines for controlling the valves with power cabling for electrical requirements and fibre optic for the use of data communication. Tension relief and outer protection can be taken into account when supplying the umbilical. The umbilical can be supplied on an individual storage winch with individual HPU or powered by the UCC. Umbilical can be supplied on a pneumatic or hydraulic driven hose reel depending on the power requirements and availability.



Pressure capsule

Multi connectors

The interfacing onto the jacket with the umbilical can be provided with umbilical interfacing. The interfacing can be a pressure capsule up to IP68 integrated with junction boxes allowing connections of the jacket tubing and electrical cables, a traditional hot-stab or a custom made solution. With increasing hydraulic cores connecting to the jacket, human error on faulty connections increases. By means of multiconnectors, a maximum of 10 connections can be made at once. Several multiconnectors can be installed for a safe and reliable umbilical jacket interface, with a mobile male part onto the umbilical and a fixed female part on the jacket.



MONITORING **AND SENSING**

Besides controlling we can also deliver custom made monitoring solutions for controlled flooding and upending installations. A typical example is the monitoring of the air pressure inside the compartments that allows for structural integrity check.
By means of a central manometer panel, connecting to individual compartments with overpressure where a positive reading indicates that the compartments are structural intact before cutting of the seafastening to initiate jacket launch. Water level inside compartments can be measured during installation by means of mounting submersible pressure transmitters. Optional the transmitters can be extended with communication protocols. By measuring the water level inside the compartments this allows for controlled partial compartment filling, or knowing when a compartment is completely filled.

Besides knowing the water level inside the flooding compartments, the in- and outflow rates can also be determined. Information on the flow rate of the sea-water going through the valves controlling the flooding can be presented on the operator control panel. Using information graphics combining all sensor data the offshore operation can be tailor made to meet specific user requirements. Applying different sensors and techniques, the required information can be displayed on a graphically user interface (GUI). The GUI can be separately, integrated with the UCC or transmitted to the vessel directly.

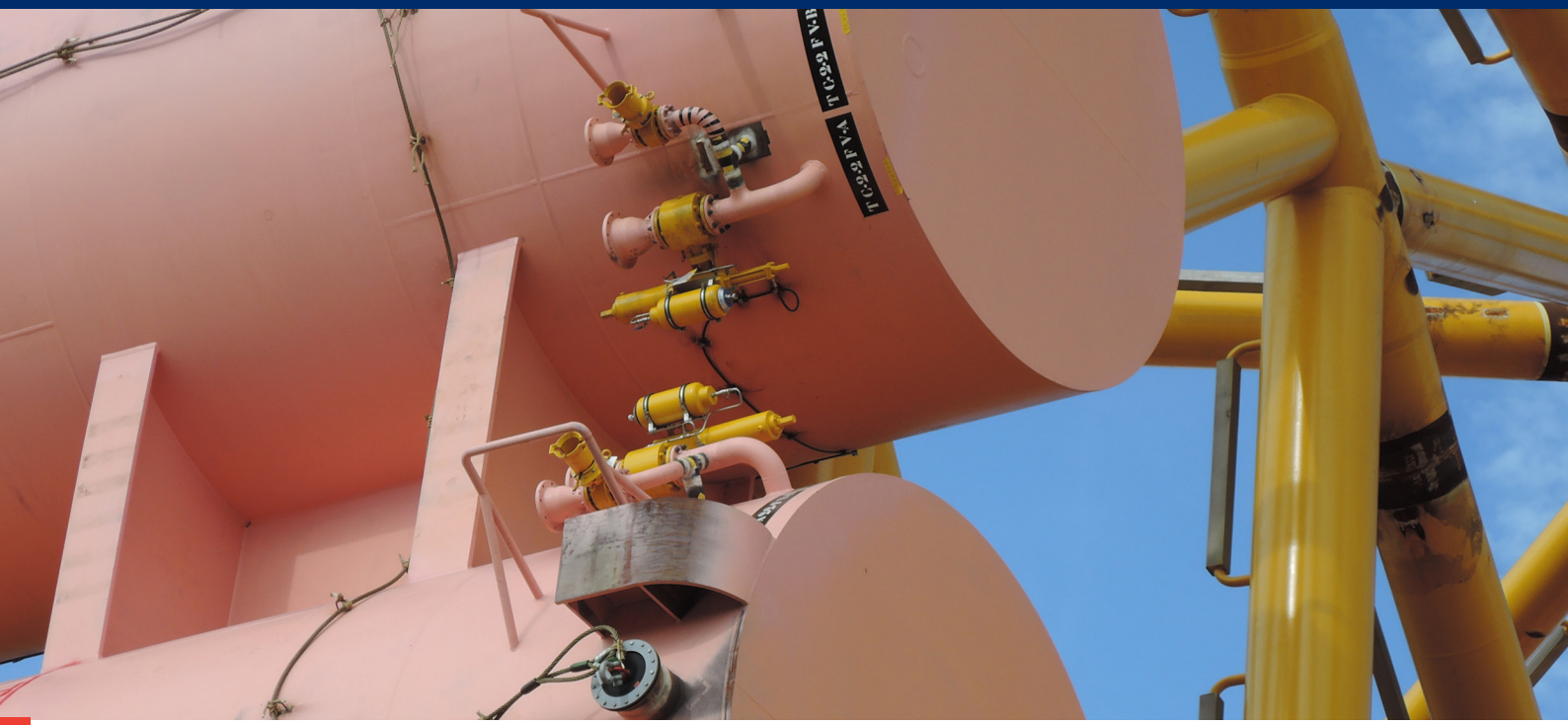
SYSTEM SPECIFICATIONS IN A NUTSHELL:

- Custom made hydraulic power units (HPU)
- Custom made multi-connectors for safe and easy use
- ATEX certified
- Pressure monitoring systems
- Hose reel and umbilical solutions
- Remote control, manual and automatic
- Use of specific hydraulic, electrical, optical umbilicals
- Electrical systems, up to IP68 for subsea applications
- Deepwater pressure compensation and hyperbaric testing of different parts
- Topside umbilical distribution and termination systems
- Monitoring, sensing and HMI solutions

"Innovation and leadership in upending and flooding solutions"

WHY DOEDIJNS?

- Integral partnership with our clients by means of a single-point-of-contact
- Tailor-made solutions to best fit the clients' applications
- Complete Project Management; interfacing with vendors
- An individual and experienced valve automation (VA) division
- In-depth knowledge and expertise of oil management and mineral oil and water-glycol based hydraulics filtration thanks to separate RMF filtration division
- Experienced offshore service and commissioning engineers



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