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Flowline & Pipeline Engineering Services



2H is an independent engineering contractor that specialises in solving complex subsea challenges to create subsea flowline and pipeline systems that perform optimally and are commercially feasible.

Our team of experts combines the latest technology and engineering methodologies with years of experience to deliver tailored solutions that meet the unique challenges of the offshore industry.



What Sets 2H Apart

Advanced Engineering

Our strength lies in understanding the intricacies of flowline and pipeline design and how those systems respond in harsh subsea environments. We leverage advanced engineering techniques to create systems that are uniquely designed to be both robust and efficient.

Bridging the Gap

We have years of expertise in flowlines and pipelines and understand the critical role they play in your subsea infrastructure. Taking all adjacent systems into account early ensures seamless connection and results in a fully cohesive and more reliable system.

Complementary Services

In addition to our core engineering design capabilities, we provide additional specialist engineering services to further optimise and enhance your system's performance throughout its lifecycle. From early concept geotechnical studies, to buckling analysis and fracture mechanics, to digital twin and IM.

Independence

Unlike some other contractors, we operate independently, allowing us to provide unbiased, client-centric solutions. Our commitment is solely to your project and its success.

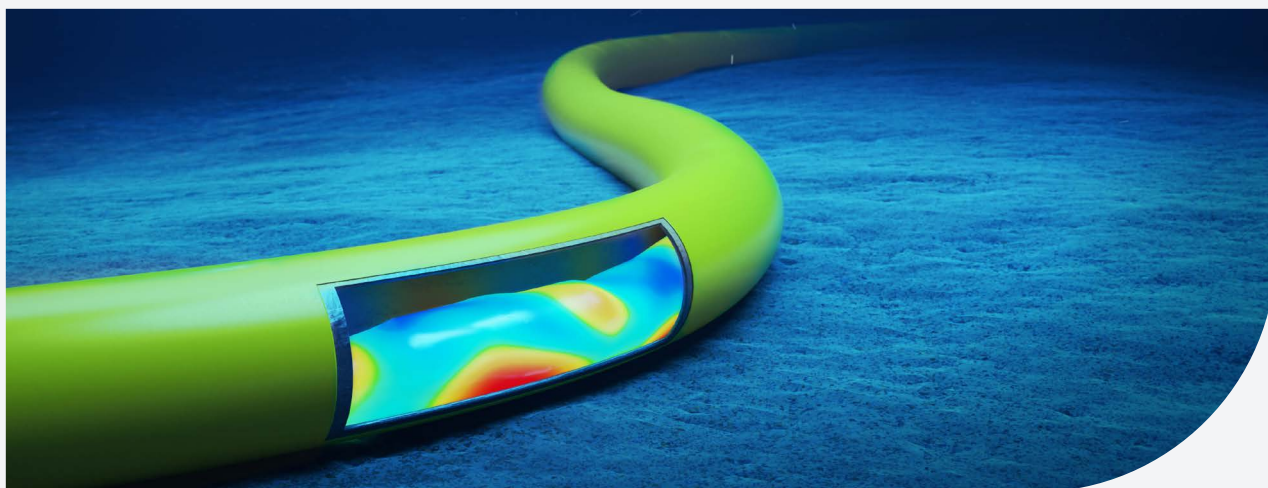
Geoengineering

The geoengineering aspect of pipeline design starts early within a project's lifecycle and begins with a desktop study. This review of existing data helps determine ground conditions at the site and identify any hazards associated with the route design including any geological hazards and anthropogenic constraints that could dictate the pipeline routing or protection philosophy.

Following the desktop study and concept engineering, detailed specification and management of geophysical and geotechnical data acquisition is key to mitigating any design and installation risks. This includes the detailed specification of onshore laboratory testing for input into the pipe-soil

Interface engineering analysis. In parallel, the geophysical and geotechnical data is used to develop a detailed ground model to identify all unknowns and hazards such as routing constraints and hazards to the in-place design or installation and to develop solutions to challenges posed by nature.

Project Phase	Typical Activities	Description
Early Screening	Desktop Study	Desktop study of the development area based on public domain, historical data and in-house regional experience.
	Concept Route Selection	Constraint mapping based on inputs from the desktop study, i.e. definition of preliminary route(s).
	Ground Risk Assessment	Risk assessment based on expected ground conditions identified in desktop study.
	Geophysical/Geotechnical Data Acquisition Roadmap	Guidance/recommendations for ground data acquisition to address potential ground risks.
Ground Data Acquisition	Data Acquisition Specifications	Specifications and objectives for geophysical and geotechnical data acquisition for contractor tender documents.
	Ground Data Acquisition Management	Day to day management, QA/QC and scope development during the offshore data acquisition. Includes management and detailed specification for onshore laboratory testing.
	Onshore Laboratory Testing Specification & Mgmt	
	Ground Model Development	Development of detailed ground model with detailed constraint mapping.
Detailed Design	<i>See Pipeline Design page</i>	
Installation Engineering	Recommended Depth of Burial/Protection	Recommendation for pipeline depth of burial and/or protection based on soil conditions and client requirements.
	Recommendation of Installation Equipment	Identification of suitable installation equipment/methodologies, including expected installation schedules.
	Installation Risk Assessment	Pipeline installation risk assessment associated with ground conditions along route, i.e. installation performance risk.
	Offshore Installation Engineering Oversight	Offshore engineering oversight throughout the installation campaign.



Flow Assurance

We design pipeline systems that transport hydrocarbons and pressurised fluids efficiently throughout the life of the asset, no matter the throughput condition or fluid composition. We develop start-up, changes in operational status, and shutdown procedures that are compatible with the operational capability of the upstream and downstream facilities and make recommendations on modifications needed for optimal design.

Based on the project type, objectives and phase, 2H's flow assurance team will establish the most suitable system design process, which typically includes the following steps.

1. Flow Assurance Design Basis

Initially and during the early phase of the project, we define the design basis and determine the basic design data, methodology and activities based on collected and received information. This will typically include fluid compositions and characteristics, field area location and bathymetry, production profile and rates, production chemistry, PVT behaviors and fluid laboratory test data, and interface data.

2. Fluid Characterisation Modelling

Evaluating the fluid phase behaviour is dependent on the selection of the thermo-dynamic model. We predict fluid phase behaviour and properties using either a 'black oil' model or a 'compositional' resulting in rigorous heat and mass balance simulations.

3. Steady Thermo-hydraulic Analysis

The main purpose of the steady state analysis is to assess and define the field architecture, select an optimum size, and evaluate the insulation performance. For multi-phase systems, the steady state analysis should also generate an initial indication of predominant flow regimes through a pipeline. We investigate all possible scenarios during the simulations to assess the potential critical cases in terms of max/min flowrate, max/min GLR/routing, max water cut, etc.

4. Transient Thermo-hydraulic Analysis

The field architecture and basic system configuration defined during the steady state analysis is carried forward as a basis for the transient analysis. This assesses the potential for unsteady conditions resulting from things such as changes in flow during start-up, ramp-up or pigging, pump start-up/shutdown, closing/opening of a valve, cooldown, etc. The transient analysis helps optimise the pipeline configuration, i.e. line sizes, insulation performance, liquid surge/slug handling, pressure surge, etc.

5. Operating Strategy Development

The findings of the steady and transient analyses will help us develop the operating strategies for pigging, start-up, depressurisation, slug handling, chemical injection and related remediation of deposited solids, including hydrates, wax and sand.

Pipeline Design

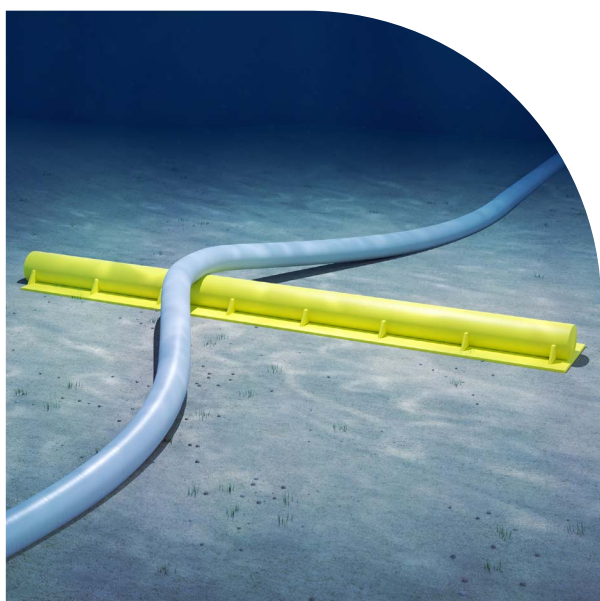
We excel in providing comprehensive offshore pipeline design solutions. Our approach extends beyond conventional engineering practices, incorporating the lifecycle engineering services from initial concept to decommissioning. By considering operational aspects throughout the pipeline's life, we optimise performance, minimise risks, and ensure long-term reliability.

Our designs benefit from real-world operational integrity experience. We actively feed insights from our integrity management practices back into the design process. This feedback loop ensures that our pipelines not only meet technical specifications but also withstand the challenges posed by harsh offshore environments.

Our engineers thrive on complexity. Whether it's high-temperature pipelines in deepwater fields or high-pressure systems, we have the expertise to address demanding scenarios.

As part of our commitment to sustainability, we engage in studies focused on cost-effective pipeline designs for carbon dioxide (CO₂) transportation and injection into depleted reservoirs. These efforts contribute to environmental stewardship and align with our energy transition initiative.

Our extensive track record has seen us execute projects in Brazil, Gulf of Mexico, North Sea, West Africa, Southeast Asia, and Western Australia and covers a wide range of fields, water depths, HPHT services and environments.



Pipeline Design Capabilities

- Pipeline route selection
- Pipe soil interaction
- Line pipe material selection
- Wall thickness sizing
- On-bottom stability
- Pipeline end expansion
- Riser/spool design
- Freespan design
- Global buckling design
- Risk assessment
- Landfall/shore approach design
- Installation analysis
- Cathodic protection design
- Engineering criticality assessment
- Specifications, procedures and philosophy preparations
- Material take off and cost estimation
- Installation/construction hazard identification
- Pipeline decommissioning, abandonment and recovery design

Pipeline Integrity

Offshore pipeline integrity management is a crucial activity during operations to ensure the safe transport of hydrocarbons, prevent environmental disasters caused by leaks or ruptures, and extend the lifespan of the infrastructure, all of which can help reduce operational costs. We have extensive experience developing comprehensive risk-based integrity management programs for offshore and onshore pipeline systems.

Risk Assessments

A risk assessment helps identify and optimise the monitoring and maintenance activities needed to mitigate perceived risks to a particular system or component. To develop the risk assessment, we go through a process of threat identification to determine the possible degradation mechanisms or threats that are applicable to the system/component. We also provide a review of associated barriers, definition of the risk ranking against each relevant threat mechanism and documentation of the applicable inspection, monitoring, and mitigation techniques that are the most effective in managing threats and preventing failures.

Integrity Management Planning

Following on from the risk assessment, we will develop a comprehensive integrity management plan based on the risk assessment output. We identify the most applicable inspection or monitoring activities and suitable intervals that will help mitigate and manage the risks identified in the risk assessment.

Inspection Assessment

We have extensive experience in supporting offshore inspections such as general visual inspection, cathodic protection surveys, non destructive testing, lidar, multibeam inspection, etc. Upon completion of inspections, we perform comprehensive engineering assessments to help identify any anomalies that require further assessment.

Anomaly Management

An anomaly is defined as any change or deviation from the intended design or planned operating parameters that may compromise the integrity of the system or lead to a decreased level of confidence in the integrity of the system. A crucial part of managing integrity is identifying, categorising, and remediating anomalies.



In-Line Inspection Feasibility Review and Execution Support

We specialise in performing feasibility assessments and pipeline in-line inspection (ILI). This includes a bore map of the pipeline based on a review of the following:

- Wall thickness changes along sections of the pipeline
- Bend location and radius along the pipeline flow path
- Identifying valves and other appurtenances and including the minimum IDs
- Feasibility of supplying fluid to the launcher with proper safety barrier in place.

We are experienced in ILI execution and can provide field support to ensure the ILI is conducted per client specification and ensure the data quality.

Structural Monitoring

We offer state-of-the-art structural monitoring solutions for long subsea pipeline spans. Our experienced team of engineers can specify the type of system best suited for the subsea pipeline application (real-time or standalone, motion and/or strain measurements) and our client's integrity concerns. We provide comprehensive engineering data insights, enabling you to make informed decisions and take proactive measures.

2H Offshore is a global engineering contractor specialising in the design, structural analysis and integrity management of systems used in the offshore energy sector. Our capabilities and experience cover a huge range of solutions and environments. By working together in partnership, we will help you get the best results for your project smoothly, efficiently and within budget.

We have teams in all of the major offshore energy hubs around the world. So no matter where your project is located, we have engineers nearby with the local and technical expertise to support.

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