Asset Integrity
CAPABILITIES
Other services of Oceaneering include:

REMOTELY OPERATED VEHICLES
ROVs are submersible vehicles teleoperated by technicians from a control van on-board a floating drilling rig or vessel. They are piloted by means of a microprocessor-based control system through an armored, electrical, fiber-optic umbilical. ROVs are the key technology enabling the performance of critical oilfield tasks in deepwater. These tasks include drill support, subsea hardware installation and construction, subsea infrastructure inspections and surveys, and subsea production facility operation and maintenance.

SUBSEA PRODUCTS
We manufacture a variety of specialty subsea ziland products. These encompass production control umbilicals, tooling and subsea work systems, installation workover control systems (IWOCS), and subsea hardware. While most of our subsea products are sold, we also rent tooling and provide IWOCS and subsea work systems as a service, including hydrate remediation, dredging, and decommissioning.

SUBSEA PROJECTS
We perform subsea ziland hardware installation and inspection, maintenance, and repair services, principally in the U.S. Gulf of Mexico (GOM) and offshore Angola. We service deepwater projects with dynamically positioned vessels that have our ROVs on-board, and shallow water projects with our manned diving operations, utilizing dive support vessels and saturation diving systems.

Our offering includes survey and satellite-based positioning services on a global basis, primarily offshore. These include ocean-bottom mapping in deepwater utilizing customized autonomous underwater vehicles.

ADVANCED TECHNOLOGIES
We provide engineering services and related manufacturing, principally to the U.S. Department of Defense, NASA and its prime contractors, and the commercial theme park industry. The U.S. Navy is our largest non-oilfield customer, for whom we perform work predominantly on surface ships and submarines.
OUR CORE VALUES

Our highly skilled and experienced employees working world wide are the key to our success. We are dedicated people who work together as a team that includes our clients and subcontractors. Our goal is to live up to our core values. They are not just words, they are important and valuable tools, and we strive to live by them every single day.

SAFETY & THE ENVIRONMENT
- The safety, health and well-being of our employees, contractors, customers and the public are our number one ethic and will not be compromised.
- We believe all incidents and injuries can be prevented.
- We protect the environment.
- We are committed to a culture where all employees adopt an HSE mind-set both at work and at home to keep themselves and each other safe.

TEAMWORK & PEOPLE
- We invest in people, demonstrate compassion and respect to all and promote leaders who challenge, motivate, and acknowledge their people.
- We achieve mutual trust by open, two-way communication, mutual respect and doing what we say.
- We care about our people.

CUSTOMER FOCUS
- Our internal and external customers are the reason for our existence, and we are committed to their success.
- We listen to our customers.
- We are responsive to our customers and we deliver predictably.
- We are committed to healthy, long-term, value-added customer relationships.

ETHICS
- We require the highest ethical and legal standards, in both internal and external relationships.
- We act honourably toward ourselves, our families, our teams, our shareholders, our communities and our customers.

ACCOUNTABILITY
- Accountability is the cornerstone of the Oceaneering culture.
- Accountability cannot be delegated.
- A strong commitment to accountability is essential.
- We do what we say.

EXCELLENCE
- We will be better tomorrow than today by focusing on continuous quality improvement, innovation and embracing change.
- We focus on results; we are committed to being the best at what we do.
- We are committed to seamless operational excellence across service lines.
- We believe both capable people and effective processes are critical for excellence.
For more than 50 years Oceaneering Asset Integrity has been an industry leader in the provision of risk and reliability centered services across many major industry sectors including: Oil and Gas, Chemical, Power and Construction. Operating worldwide Oceaneering are committed to meeting and exceeding client’s expectations offering a safe, innovative and cost effective service designed to assist clients to manage the overall integrity risk, reliability and performance of their assets.

The comprehensive range of services provided by Asset Integrity can be individually tailored and packaged to meet client’s specific requirement. Services are available from the inspection of a single item at an approved test laboratory to developing and implementing asset integrity management systems for assets that operate in the harshest of environments.

Oceaneering are unique in the fact that its Asset Integrity offering forms part of the total value proposition provided by Oceaneering International. Services and products are available either individually or combined as a managed integrated solution offering.
Integrity Management

Asset Integrity provides Integrity Management Programs and Condition Assessments for process, drilling equipment, pipeline and infrastructure, structures, lifting appliances, mooring system offshore platforms, FPSOs, and onshore plants.

Asset Integrity delivers a customized integrity solution. We establish inspection and maintenance programs, plan and execute inspections, evaluate, report and make recommendations to our clients. This provides the basis for informed decision making, which leads to asset integrity assurance and maximizes return of efforts made.

Oceaneering focus on adding value to clients’ operations. Our pragmatic yet innovative approach has resulted in many long term relationships of more than 25 years with the industry’s leading operators.

Through executions of a Managed Integrity Service, asset owners will improve operational performance and profitability, through optimized resources management and return an effort. Oceaneering provides an integrated service that includes:

- Inspection Management
- Maintenance Management
- Corrosion Management
- Vibration Management
- External Coating and Insulation Management
- Condition Monitoring Activities

Oceaneering aims with the Integrity Management Service to improve our clients’ operations and be a partner in achieving excellence. Business benefits from the service are:

- Improved risk perception, understanding and the associated cost
- Better ability to plan and optimize on-plant activities
- Increased production availability

Service Portfolio

- Strategic Asset Plan and Integrity Strategies
- Integrity Management Programs using RBI/RBU/RCM
- Planning and scheduling of inspection and maintenance programs
- Execution support of inspection and maintenance activities
- Assessment and validation of reports
- Anomaly management and integrity verifications
- Predictive modeling to optimize targeting of activities and use of resources
- Recommendation to mitigate, intervene or repair
- Improvement and updates to integrity programs

Oceaneering Asset Integrity brochure
INTEGRITY SOFTWARE TOOLS

Software systems supporting the management of all the principal Integrity Processes:

ACET
- Inspection Management
- Corrosion Management
- Vibration Management

KAMPER
- Maintenance Management
- Condition Monitoring Activities

SOLY
- External Coating and Insulation Maintenance

Oceaneering’s suite of software systems present managers and engineers responsible for implementing, maintaining and improving the corrosion management strategy with knowledge and information on equipment condition.

Suites of modules are used to store and assess the various data formats gathered through inspection and monitoring activities, and can be used to assist in the implementation of the following key steps:

DATA STORAGE
Equipment details, design information, inspection data.

PLANNING
Schedule work activities.

EXECUTION OF WORK
Implement inspection strategy, gather data.

ANALYSIS
Anomaly recording and tracking, results, data, information, risk assessment.

REVIEW
Performance, strategies.

IMPROVEMENT
Modify inspection strategy, recommendations, repairs.

LONG TERM CONTINUITY
The degradation and inspection management systems stores clients’ asset data (pipe work, pipelines, vessels, valves, rotating equipment, auxiliary systems, structures etc).
Inspection Management forms an important step in the Asset Integrity service whereby it provides inspection programs, first level integrity evaluation and manages the inspection data sets.

Inspection programs are developed from the integrity strategy and/or from the maintenance management inspection routines. These programs take the form of long term, medium term and short term forward plans, work packs for the activity sets to be undertaken and site support functions required to perform the work scopes.

Work is then executed in the field by selecting the correct resources, briefing technicians as to the inspection requirements prior to deployment, on-going communication during execution, evaluating reports and finally de-briefing the inspection teams on completion.

First level evaluation of the inspection results are carried out by our Inspection or Corrosion Engineers to provide an assessment of integrity and fitness for purpose and the development of any remedial actions required. If inspection results are out of the set tolerances then the results are escalated to the appropriate integrity support teams.

Effective Data Management is key to ensuring archiving and retrieval of data and other relevant records. The Oceaneering suite of integrity software provided under the ACET brand name provides this assurance together with the ability to trend data sets as required.

Reporting of inspection results is provided as either trend reports, anomaly notifications or formal reviews on asset performance.
NON-DESTRUCTIVE TESTING

Conventional and Specialist Non-Destructive Testing

Non-Destructive Testing (NDT) is the branch of engineering concerned with all methods of detecting and evaluating flaws in materials. Flaws can affect the serviceability of the material or structure, so NDT is important in ensuring safe operation as well as quality control and assessing plant life. The flaws may be cracks or inclusions in welds and castings, or variations in structural properties that can lead to loss of strength or failure in service. The essential feature of NDT is that the test process itself produces no deleterious effects on the material or structure under test.

Oceaneering supply multi skilled and experienced engineers certified to the appropriate requirements of all NDT disciplines relating to conventional and specialist techniques. Our NDT services are available for either new build or in-service applications and include:

- Conventional Ultrasonics, Radiography, Magnetic Particle Inspection and Dye Penetrant
- Alternating Current Field Measurement
- Digital Radiography
- Electromagnetic Acoustic Transducer (EMAT)
- Guided Wave Technology
- Magnetic Flux Leakage
- Pulsed Eddy Current
- Ultrasonic Corrosion Mapping
- Ultrasonic Phased Array
- Time of Flight Diffraction
- Tube Inspection
- Permanently Installed Monitoring Systems (PIMs)

Oceaneering operates a technology development process to meet clients specific challenges, which ensures inspection technology is developed and validated for the right applications appropriate to current and future degradation issues. The primary aim is to help clients achieve full statutory compliance, reduce process safety risk, provide cost benefits, and provide higher quality more reliable Non Intrusive Inspection (NII) data to help managers make better informed engineering decisions on managing plant and equipment integrity.

TRAINING

Strategically located independently accredited Oceaneering training centers provide internationally recognized training courses and certification for NDT technicians in support of worldwide operations. Training programs are provided in all conventional NDT methods and many advanced techniques.

VALIDATION AND COMPETENCY CENTRE

Oceaneering’s Validation and Competency Centre provides a purpose built environment to independently assess and validate advanced NDT inspection methods and new equipment. The program of qualification is enhanced by an eclectic collection of ex-service test items from lengthy pipes for Guided Wave corrosion screening to small socket weld crack specimens for Phased Array technique development.

It provides a dedicated center of excellence, for facilitating third party supervision of both blind and open testing programs, organized and managed on a professional, impartial and practical basis. Oceaneering have experienced hands-on site operators to provide Subject Matter Expertise to validate new and innovative NDT methods for difficult and complex integrity issues, such as Corrosion Under Insulation, Contact Point Corrosion and Stress Corrosion Cracking.

In addition to the management of validation programs, the new facility is used to ensure operator competency, provide accredited training and demonstrate compliance by providing practical solutions to UKAS standards. This unique training facility assists our clients to strategically manage their business risk whilst continuing to work in line with current and future regulatory requirements.
**NEW PIPELINE CONSTRUCTION**

**PIPE LAYING ACTIVITIES**

Oceaneering offers a comprehensive range of inspection services for both onshore and offshore pipe laying activities. Operating from strategically located operational and service centers around the world, the company is at the forefront of pipeline NDT technology with a proven track record of delivering inspection requirements within demanding construction cycles.

The department utilizes a pool of experienced personnel from the UK, USA, Australia, the Middle East and Asia with qualifications from ASNT, PCN, CSWP, BGAS-CSWIP and AWS.

**RADIODGRAPHIC INSPECTION**

Oceaneering provides a range of two and four wheel drive crawlers capable of operating in pipes from 3" to 72" OD utilizing X-ray or gamma radioisotopes. Gamma radiography is possible down to 3" OD pipes using 1mm spherical Selenium 75 radioisotopes operated from specially designed tungsten exposure heads.

The construction of the crawlers utilize integrated modular units that combine to provide three basic configurations covering pipe diameters ranging from 3–10" gamma, 6–16" X-ray and 12–72" X-ray. The latest microprocessor technology is employed to achieve enhanced performance, reliability and ease of use.

**AUTOMATED ULTRASONIC TESTING**

Oceaneering has one of the largest fleets of Phased Array automated ultrasonic testing (AUT) systems in the world. Since 2004 Oceaneering’s AUT capability has been deployed in many parts of the world, on a variety of projects and for numerous clients. Pipe sizes inspected have ranged from 5" to 48", wall thickness from 12mm to 33mm and to a variety of technical standards.

Oceaneering employs PipeWIZARD® Phased Array systems to ultrasonically inspect pipeline girth welds. Our AUT services provide efficient, reliable detection and characterization during new fabrication or in-service scenarios. The zonal inspection technique used for girth weld inspection is recognized as the most accurate method of detecting and sizing weld flaws in high-production environments and is suitable for inspection with welding processes such as FCAW, SAW, GMAW and Manual.

Oceaneering’s AUT inspection systems have been independently qualified by DNV-GL in accordance with DNV-OS-F101 (2012) & DNV-RP-F118 (2010). In addition the systems are verified by multiple client validation programs.

The semi-automated Phased Array Ultrasonic Testing (PAUT) (Volumetric Inspection) and full AUT (Zonal Inspection) on-line scanning techniques are used to present recordable client data commonly in accordance with international standards e.g. ASTM, API, and DNV. In addition Oceaneering offers the application of statistical analysis values to create alternative acceptance criteria based on Engineering Critical Assessment (ECA) to meet clients specific requirements.

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CRANE & LIFTING CERTIFICATION

Oceaneering offer extensive services for inspection, third party verification and certification of all types of cranes and lifting gear. Oceaneering also offer consultancy, design and manufacturing of special designed/purpose built cranes and lifting gear, as well as compliance evaluations, risk analysis and FMECA.

Oceaneering’s inspection services for lifting equipment uses an in-house developed software database to keep track of condition, inspection intervals and maintenance history.

ENGINEERING STUDIES, MODIFICATIONS AND UPGRADING DATA STORAGE
Oceaneering perform engineering studies for crane replacement, modification and upgrading. Through alliance partners we also install and modify cranes.

COVERING ALL DISCIPLINES
The department cover all necessary disciplines including: engineering, inspection, piping, mechanical, structural, document management, planning, cost/benefit, risk assessment etc.

Our personnel have extensive knowledge within Non-Destructive Testing (NDT) and Rope Access, and provide services ranging from the design stage to the certified product.

HYDRAULIC TEST-JIG
Oceaneering have an in-house designed 750 ton hydraulic Test-jig. The jig is built with remote monitoring systems, in order to have high focus on safety handling during the testing of equipment. The test done by the jig can be documented by a printout of time/weight graph. The jig is designed for testing of the ultimate strength of test objects and is designed to withstand shock-loads from test objects breaking. The jig is made for larger than average test objects, with an internal length of 15 meters and width of 1.5 meters.

HYDRAULIC TEST-JIG FOR POWER DRIVEN HOISTS
Oceaneering have an in-house designed 40 ton hydraulic Test-jig. The jig is built for remote monitoring systems, in order to have high focus on safety handling during the testing of hoist and other lifting equipment. The test done by the jig can be documented by a printout of time/weight graph.

SUPPLY AND APPROVAL OF ADDITIONAL LIFTING EQUIPMENT
Oceaneering supply lifting equipment such as loose lifting gear, hoists etc. We provide new replacement or repair of equipment, if damage is found on lifting gear during inspection, thus enabling certification.

Inspection services provided for lifting equipment:
- Inspection, testing and certification of lifting equipment
- Engineering and modifications
- Maintenance and repair of appliances and gear
- Supply and approval of additional lifting equipment
Vendor Inspection Services

Oceaneering provides a comprehensive worldwide Vendor Inspection, QA/QC and expediting service for all types of mechanical, rotating, electrical and electronic equipment as well as Oil Country Tubular Goods (OCTG).

Features:
- Vendor audits (prior to PO Award)
- Expediting
- New Build equipment inspection
- Mill inspection and surveillance
- Temporary and portable equipment inspection
- Shipping inspections

Vendor Inspection ensures full compliance during the manufacture stage of all high value plant and equipment including: pumps, pipes, vessels and valves. This ensures that each stage of the client's purchase order requirements are fully satisfied before the material or equipment leaves the suppliers premises, therefore resulting in minimum potential for production outages and the subsequent threat to safety, asset integrity and legislative compliance.

Vendor Audits
The purpose of these audits (prior to Purchase Order Award), is to verify that vendors and their sub-vendors appear to be capable of fulfilling the requirements of the purchase order.

Expediting
Expediting is required to ensure that the vendor delivers to the client on time and that the client can be assured the vendor conformed with all relevant standards and specifications set out in the scope of work. The Expeditor will:
- Monitor and report conformance to relevant standards, codes, specifications and specific Supply Chain Management requirements
- Identify/resolve bottlenecks at all levels
- Verify and confirm all information relevant to the project
- Evaluate progress to date and assist the vendor/sub-vendors to meet required delivery dates

New Build Equipment Inspection
Oceaneering Inspectors carry out impartial inspections of equipment to ensure conformance to clients’ standards, codes, specifications and specific scope of work requirements as stated within the Purchase Order:
- Includes vendors and sub-vendors
- Conducted during all stages of manufacture, FAT, shipping and receipt
- The inspection is based on a risk ranking process regarding type and content
- Ranking considers consequence and probability of failure

Mill Inspection and Surveillance
This service is carried out by specialist inspectors with in-depth knowledge of forming, welding, NDT, threading, coatings and loading. Either full or ad-hoc support services are used to complement the expediting process covering all stages of manufacture and testing.

Hired and Transportable Equipment
This service covers the inspection of hired and temporary equipment for use in hazardous areas both offshore and onshore. Our inspectors carry out detailed and impartial inspections of equipment; in most cases at the vendor’s base prior to shipping, to ensure compliance with all relevant legislation, codes, standards and procedures and in accordance with the manufacturers’ specifications.

Shipping Inspection
Oceaneering Inspectors carry out pre-shipping inspections as part of client contract requirements when operating on a expedited/final inspection assignment; however, there are many occasions when we may be requested by the client to carry out a shipping inspection at a particular vendor’s site anywhere in the world.
ROPE ACCESS

Oceaneering’s offering includes the supply of multi-disciplined Rope Access services as a method of access to perform an array of services including engineering and maintenance work and inspection services such as close visual inspection, conventional NDT including radiography through to the application of the latest advanced inspection techniques.

Rope Access is recognized as the safest method of working at height due to the combined effect of a high standard of training, quality equipment and reduced numbers of personnel involved in completing a task and therefore exposed to risk.

Oceaneering is a full member of IRATA (Industrial Rope Access Trade Association) and dependent on location and requirement can provide the service in accordance with this or other internationally recognized standards including SPRAT (American standard) and SOFT (Norwegian standard).

Applications for Rope Access are constantly evolving. Work is not limited by height, inclination or location and can be implemented far beyond the limitations of conventional fall arrest systems or alternative access methods.
Oceaneering are bringing their innovative topside inspection techniques into the subsea environment to provide operators with a greater understanding of the integrity challenges facing their assets. The application of these techniques provides solutions to challenging problems such as the inspection of non-piggable lines, flexible risers/flowlines and concrete weight coated pipelines.

SERVICES
- Inspection of rigid and flexible, risers and flowlines
- Inspection of pipelines with various external coatings
- Internal pipeline inspection
- Chainlink inspection

NEPTUNE
ROV deployed high resolution UT inspection tool providing data on rigid and flexible tubular structures. The system is deployable up to 3000m water depth with the ability to perform weld inspections as well as corrosion mapping of the parent pipe material. Phased Array UT probes provide a high speed, high accuracy corrosion mapping and weld inspection, all from the same probe without the need to recover the tool. Alternatively the system can be deployed with Pulsed Echo Time of Flight Diffraction (TOFD). The tool has also been used to inspect over 150 flexible risers to determine annulus condition and the corrosion rate of the tensile armor wires.

TRIDENT
Diver deployed advanced ultrasonic delivery system including two Phased Array UT probes. This system has all the benefits of Neptune with an easily maneuverable handling frame for ease of use subsea.

CHAINSCANNER
An ACFM/UT tool to provide inspection of the butt weld region of open chainlinks.
**IN-SERVICE PIPELINE INSPECTION**

Oceaneering operate a number of unique internal inspection systems launched from a platform or floating installation that provide data from subsea pipelines.

**TETHERED PIPELINE INSPECTION SYSTEMS**

Pipeline operators make extensive use of Pipeline Inspection Gauges (PIG) to clean and inspect pipelines. For a line to be piggable it must have launch/receive facilities, an adequate product to propel the pig and no obstructions. Significant numbers of the pipelines in use today do not meet these criteria and are therefore deemed unpiggable. Oceaneering’s innovative and patented technology is challenging this perception with the use of tethered bidirectional propulsion systems with single point launch and receive capability.

Corrosion, erosion, weld porosities/inclusions and cracking can all be detected utilizing the Pipescan/Weldscan data presented to an operator in real time. This data is then stored digitally for further analysis if required. Operators now have the information needed to make informed decisions on unpiggable pipe integrity and projected life that enables continued safe and environmentally conscious operation.

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**OCEANEERING’S TETHERED INSPECTION TECHNOLOGIES**

- **PipeScan** – UT Pulse Echo (PE) probes utilized for zero degree scanning providing surface corrosion mapping and the detection and determination of internal anomalies.
- **WeldScan** – Utilizes Time of Flight Diffraction (ToFD) and Phased Array (PAUT) to perform radial scanning around the pipe circumference in order to locate and size anomalies in girth welds or base material such as inclusions, porosity and cracking.

**OCEANEERING’S TETHERED INSPECTION PROPULSION SYSTEMS**

- **Pipe Intruder** – A differential pressure driven propulsion system which negotiates many of the geometrical challenges of unpiggable pipelines. The system does not require cleaning of the pipe wall to ensure propulsion is generated which provides a benefit over crawler type systems.
- **Pipe Rover** – An electro hydraulic tractor system which meets the demands for the propulsion of inspection technologies for larger pipelines.

**OTHER TECHNOLOGIES AND PRODUCTS**

- **Laser Video** – Provides an enhanced visual inspection system utilizing a laser and a fibre optic. The laser can be used to derive measurements regarding the pipelines internal condition such as corrosion, scale build-up, ovality etc.
- **Hybrid Inspection Tool (HIT)** – Ground breaking video inspection tool for long-range internal pipe inspection.
CONDUCTOR STABILIZATION SOLUTION

A conductor stabilization method for reducing wave-induced damage and increasing guide stability.

Oceaneering Asset Integrity developed a conductor stabilization method called CSS™ to improve traditional techniques for reducing wave-induced damage and to increase guide stability.

Offshore wave-induced damage to an asset can be costly and dangerous. Lateral wave movement can cause conductors or caissons to impact against the conductor guides resulting in fatigue or fracturing.

Wave damage intensifies from subsea to topside. Damage caused by the wave shock effect can be limited by installing the CSS™ at the optimum depth.

The CSS™ uses an elastic Polyurethane compound that can be cast for subsea conductor tube installations or injected directly for topside applications.

BENEFITS

- Reduces damage
- Increases guide stability and extends life of conductors and caissons.