

GE Oil & Gas  
Subsea Systems

# Flexible designs & modular components

DVXT deepwater vertical tree system



# Changing the game

## MODULARIZATION IS THE KEY

We take a modular approach to engineering and manufacturing that standardizes common components (such as valves, sensors, control modules and connectors) used in all our Shallow, Medium and Deepwater vertical series trees. It enables our application engineers to focus more on defining the unique project specifications and more quickly designing customization where it is really needed.

This approach is proven to increase efficiency and quality across the product range at every stage — from shorter delivery cycles to enhanced reliability and allowing more cost-effective maintenance and workover programs.

## DESIGN PHILOSOPHY: SIMPLIFICATION

All our trees have optimized master block forgings and a predefined base case that can be configured to suit specific project requirements regardless of schedule or complexity.

## END-TO-END ADVANTAGES

Installation and maintenance can be performed from vessels of convenience no matter what the water depth. We've eliminated the need for installation risers, and all tooling and procedures are greatly simplified through modularization. Tubing spools, trees and manifolds can be run on wire from field-support vessels rather than using the drilling rigs. Our plug tooling package allows tubing plugs to be installed and retrieved by ROV, and the designs enable quicker and more frequent well access with wireline tools allowing for more cost-effective maintenance than traditional methods.

## Life-of-field monitoring

Post installation and through the field life, we combine our in-house testing and qualification experience with in-field tree performance data gathered at client remote monitoring centers or at GE's SmartCenters around the world. This allows us to apply complete analysis and diagnostic regimes to optimize tree availability over the life-of-field.

Since all of our trees are designed to accommodate the GE ModPod Subsea Control Modules real-time data gathering is facilitated through the Production Control System — enabled with GE's fifth generation SemStar5™ providing data multiplexing and high speed, high integrity, long range communications data links

# Our portfolio is industry-deep



## S-Series

### 20 YEARS IN SHALLOW WATER

- Up to 100 m, 6,500 psi, -18 to 121°C
- SVXT™ vertical tree: 20% lighter and 30% shorter than our traditional TOMs



## M-Series

### 30 YEARS AT MEDIUM DEPTHS

- Up to 750 m, 10,000 & 15,000 psi, -29 to 121°C
- MVXT™ traditional guideline vertical tree: wide rig compatibility, installed directly on completed wellhead
- MHXT™ guideline horizontal tree: compatible with 18¾" drilling systems, no completion riser required



## D-Series

### NEXT-GENERATION DEEPWATER

- 3,000 m, 10,000 & 15,000 psi, -18°C to +151°C
- Short delivery cycles, available in large-bore for gas developments
- DVXT™ vertical tree: adaptable modular system, installed by simple support vessel, tree mandrel can accommodate drilling BOP or completion riser
- DHXT™ horizontal tree: can be configured for water, gas or injection; compact and lightweight; multiple pressure, temperature and sand detection sensors; variety of features to minimize ROV intervention

# The game changer

## DVXT deepwater vertical tree system

### MAJOR ADVANTAGES

- Enables BOP-on-tree operations or in open water using OWRT
- Optional tree cap installation through BOP (testable secondary barrier installed before removing the BOP, or open-water installation and retrieval)
- Retrievable flow control module
- Configurable FCM with gas lift, pumps, chemical metering, MPFM, etc.
- Deploy on wire or drill pipe
- Extended DW mandrel
- High bending capacity connector

### KEY SPECIFICATIONS

- 5" x 2" 10,000 psi deepwater monobore vertical tree with tubing head spool (THS)
- Temperature rating:
  - -18°C to +151°C (Class U/X)
  - PWV & downstream: -29°C to 151°C (Class P-U) with charpy impact testing of materials to -46°C
- Design life: 30 years
- Depth rating: 3,000 m
- Bending capacity 5.25 million ft.lb
- H4 mandrel up x DW-HT-H4 connector
- All production flow path is alloy 625 clad (no super duplex)
- GE structured product
- Maximum re-use of existing design
- MVB material: 2¼ Cr, 1 MO (UNS K21590) alloy steel
- Alloy 625 CRA overlay used for:
  - Production bores
  - Sealing surfaces
  - Valve pockets
- Alloy 718 gates and seats throughout (including annulus bore)
- Optimized to fit a 16' x 16' moonpool
- Tree estimated weight approx 52 tonnes (dependent on spec)
- THS estimated weight approx 32 tonnes (dependent on spec)



Launch the ClevAR app and point your device camera at:  
 1) "the game changer" title to launch the DVXT video  
 2) the front cover image for a 360° model rotation  
 See back cover for more info on the ClevAR app.



## Subsea communications

Our production control systems are built around flexible, two-way, subsea communications networks that focus on data integrity and system up-time.

### RELIABLE, REDUNDANT, RECOVERABLE

- Reliable routers and latest technology optics proven beyond industry requirements
- Redundant optical communications for up to 270 km offset without repeaters
- Recoverable router modules capable of multiple, varied media outputs

## Subsea Control Module

The on-tree SCM contains the Subsea Electronics Module (SEM), the heart of intelligent instrumentation interfaces and commanded control status, and controls the tree, downhole (including 'smart' completions), choke and manifold functions.

### OVER 1,000 NOW DEPLOYED

- Up to 3,000 m depth and capable of a world-record 220 km offset
- Structured, modular design allowing operator configuration for optimal time to market
- High availability through rigorous pre-FAT testing: ESS, temperature and hyperbaric

## Seabed utilities distribution network

Multi-well subsea production facilities require configurable and flexible distribution of the utility services (electrical power, electrical and optical communications, hydraulic fluid and chemical services). Ultra-high system availability requires the most reliable components.

### FLX 360

GE's FLX 360 is the next generation of multi-function, hydraulic quick-connect system. Its new stabplate design sets a new standard for connection reliability.

We have removed screw threads and reduced the number of moving parts left subsea — to just one. This allows the mechanism to be serviceable at topside in the tool.



# Breadth & depth



## TECHNOLOGY & GLOBAL EXPERTISE

GE Oil & Gas has over 100 sites worldwide and employs 45,000 people, nearly half of whom work on offshore technologies and over 7,200 are directly involved in subsea solutions. We proactively recruit and train local workforces in every region where we do business, and we maintain advanced engineering, manufacturing, testing and service facilities worldwide to provide the localized support our customers need.

Our Centers of Excellence focus on our customers' continually changing project requirements by ensuring that our equipment and systems are at the forefront of technological development. Our offshore solutions are supported by state-of-the-art centers in Italy, the UK, Norway, Australia and the United States. Technologies developed at these sites draw on the wider knowledge network of the GE organization, including the unique benefit of technology transfer from our other businesses and the independent research carried out at seven Global Research Centers.

Collectively and in great collaboration with our customers, we work on the things that matter most in the oil and gas industry. GE Oil & Gas is committed to pushing the boundaries of technology to bring energy to the world — from extraction to transportation to end use, we address today's toughest challenges in order to fuel the future.

## SUBSEA LEADERSHIP HERITAGE

GE Oil & Gas engineers have been designing leading-edge subsea systems for more than 40 years. Our installed base includes half of all subsea wells around the world (over 1,300 subsea trees, 1,000 subsea control systems, 140 subsea manifolds and nearly 4,000 nkm of Wellstream flexible pipe), and our commitment to innovation has delivered a number of important industry milestones, including:

- First 15,000 psi subsea tree installed in the Gulf of Mexico
- Longest offset subsea production control system — 144 km from seabed to beach in Norway
- Deepest light well intervention at 1,130 m

The proven GE subsea portfolio covers all applications from shallow-water, single-well satellites to major deepwater developments; from low-pressure reservoirs with artificial stimulation or lift to high-pressure applications.

With current capabilities including depths of over 3,000 m and reservoir shut-in conditions of 177°C and 15,000 psi, we continue evolving technologies to give our customers more cost-effective solutions — along with the reliability and safety they need in ever-deeper waters and more challenging environments.

## SUPPORT FOR COMPLETE LIFE OF FIELD

GE's design engineers, analysts and field service engineers play increasingly important roles in the subsea industry's most critical areas. We tailor solutions to get new life from old fields, deal with higher pressures and temperatures, more complex resources; and to increase maintenance ease and operating flexibility at increasingly remote installations in extreme environments.

Our global design and manufacturing capabilities are therefore supported by 11 service workshops, dedicated to providing advanced capabilities in every major producing region — ensuring that our customers have all the support they need to stay ahead of the game.

- Installation & commissioning
- Operations & maintenance
- Intervention & enhancement
- Life-of-field management
- SmartCenter remote monitoring, diagnostics & optimization support

## Working with purpose

From manufacturing and testing to installation and lifecycle support, our people have a sense of purpose that never falters. And wherever in the world they work — at our own advanced facilities, a customer's site or a remote location under the most extreme conditions — their commitment to the environment, health and safety, quality and integrity is unrelenting.

### INTEGRITY

Doing it right and striving to do it better is part of our culture. That means demanding more of our processes and our technologies and operating with honesty and integrity, whatever the challenge.

### ENVIRONMENTAL HEALTH & SAFETY

We work hard to mitigate risk and consider people, communities and the natural world in everything we do. That applies to everything from the layout of our workshops to GE's global ecomagination program, dedicated to delivering products that are better for business and the environment.

### QUALITY

Driven by practical industry challenges, our innovative solutions build on proven technologies and undergo rigorous testing and qualification. Our objective is to deliver improvements you can measure — in efficiency, reliability, availability and performance.





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