Subsea Manifold System

Presented by

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Outline

Lecture 1: Introduction
  - Objective

Lecture 2: Manifold Components
  - Subsea Valves
  - Chokes
  - Control System
  - Subsea Modules
  - Subsea Modules

Lecture 3: Manifold Design and Analysis

Lecture 4: Pile and Foundation Design
Outline

Lecture 5: Installation of Subsea Manifold
Lecture 1: Introduction to Subsea Manifold System

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Introduction

- **Subsea manifolds** have been used in the development of oil and gas fields to simplify the **subsea system**, minimize the use of **subsea pipelines** and **risers**, and optimize the **fluid flow of production** in the system.

- The manifold is an arrangement of **piping and/or valves** designed to **combine**, **distribute**, **control**, and often **monitor fluid flow**.

- **Subsea manifolds** are installed on the seabed within an **array of wells** to gather product or to inject water or gas into wells.
Introduction

Typical Subsea Structure System
Introduction

- There are numerous types of manifolds, ranging from a simple pipeline end manifold (PLEM / PLET) to large structures such as an entire subsea process system.

- A PLEM is one of the most common manifolds in this range and it is detailed in the next lesson separately because it is directly connected to pipelines and its installation considerations are key factors in the design.

- A subsea manifold system is structurally independent from the wells. The wells and pipelines are connected to the manifold by jumpers.
Introduction

- The **subsea manifold system** is mainly comprised of a **manifold** and a **foundation**.
- The **manifold support structure** is an interface between the **manifold and foundation**.
- It provides necessary facilities to **guide, level, and orient** the manifold relative to the foundation.
- The **connection between** the manifold and the manifold supporting structure allows the **manifold to retrieve and reinstall** with sufficient accuracy so as to allow for the **subsequent reuse** of the **production and well jumpers**.
Introduction

- A manifold is a structural frame with:
  - piping,
  - valves,
  - control module,
  - pigging loop,
  - flow meters, etc.

- The foundation provides structural support for the manifold.

- It may be either a mudmat with skirt or a pile foundation, depending on seabed soil conditions and manifold size.
Introduction

- The **functions and purposes** of **subsea manifolds** can be summarized as follows:

  - Provide an **interface** between the **production pipeline and well**.
  - **Collect** produced fluids from individual **subsea wells**.
  - **Distribute production fluids**, **inject gas**, and **inject chemicals and control fluid**.
  - Distribute **electrical** and **hydraulic systems**.
  - Support **manifold wing hubs**, **pipeline hubs**, and **umbilical hubs**.
  - Support and protect all **pipe work** and **valves**.
  - Provide **lifting points** for the manifold system during installation and retrieval.
Introduction

✓ Provide a **support platform** for **ROVs** during ROV operations.
✓ Provide **sea-fastening interfaces**.
Introduction

- **Subsea manifold systems** are often configured for the following specific functions:
  - **Production and/or test manifolds**, for controlling flow of individual wells into production and test headers, which is connected with pipelines;
  - **Gas injection manifolds**, for injecting gas into the riser base to decrease slugs in the production flow;
  - **Gas lift manifolds**, for injecting gas into the tubing to lighten the fluid column along the tubing in order to increase oil production;
Introduction

- **Water injection manifolds**, for supplying water to the last valve in the well before the shutdown valve to increase oil production;

- **Choke or kill manifolds**, for controlling well operations.
Introduction

- This module discusses the **issues and standards** related to the **design**, **manufacture**, and **testing of subsea manifolds**.

- Requirements for **individual components** such as **valves**, **actuators**, and **piping** will also be detailed.

The discussion includes the following contents:

- Manifold components;
- Manifold design and analysis;
- Foundation and suction pile;
- Installation and maintenance.
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