

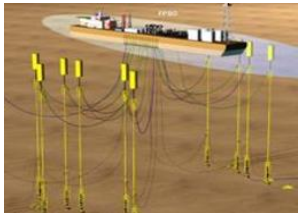
## Riser Tower

- + Reduced Layout
- + Local Content
- + Short duration Installation
- + Small loads on Hang-Off Balcony
- + Gas Lift integrated in Riser PIP Annulus
- Number of Components
- Change of slope
- Core Pipe not Inspectable
- Temperature Limitation (Flexible)
- Expensive solution



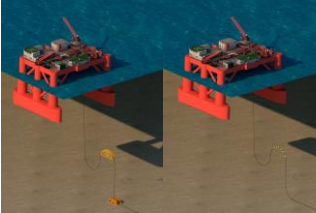
## Single Hybrid Riser (SHR)

- + Low Fatigue Damage
- + Performed during pipe laying campaign
- + Gas Lift integrated in Riser PIP Annulus
- Number of Components
- Change of slope
- Lead to congested Layout
- Temperature Limitation (Flexible)



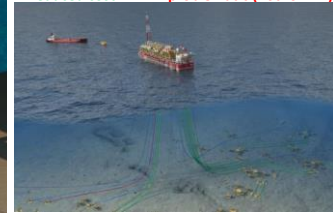
## Flexible Riser

- + Good Response to Dynamic Motions
- + No discontinuity with Flowlines
- Depth Limitation VS pipe OD and pressure
- Low Local Content
- Limited U-value:
  - 10" ID: 2.5 W/m<sup>2</sup>K
  - 6" ID: 3.5 W/m<sup>2</sup>K
- Temperature limitation (110-130°C)



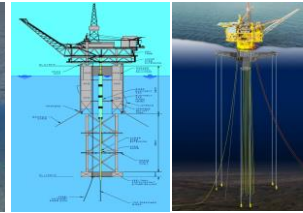
## Steel Catenary Riser (SCR)

- + Continuity of Flowlines
- + Reduced Number of Components
- + No Subsea Tie-ins
- + Easier pigging or coiled Tubing Inject\*
- + Reduced cost
- Fatigue Damage
- High Loads on top of Riser
- High stress at TdP
- High Quality Welds Required
- Gas Lifting is more problematic (not for PIP)



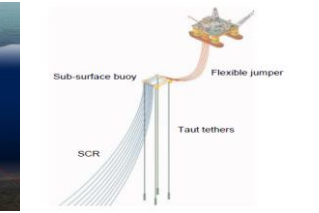
## Top Tensioned Riser (TTR)

- + Connected to Dry Tree
- + Accommodate Hurricane
- + Simple Technology (drilling)
- Narrow Field
- Adapted to TLP or Spar platform Only

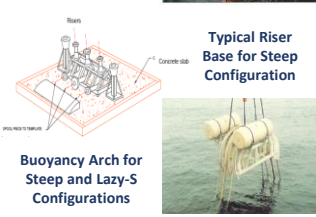


## Buoy Supported Riser (BSR)

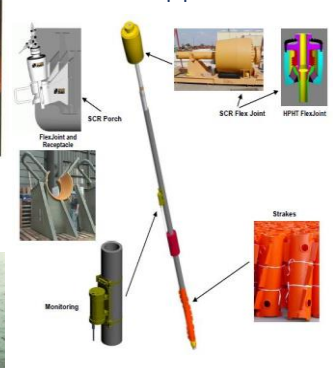
- + Low Fatigue Damage on the SCR section
- + Adapted to high water depth.
- + Reduced Load at TDP
- Complex system with Fatigue Damage
- High Loads on Sub-Surface Buoy
- Limited Temperature (Flexible)



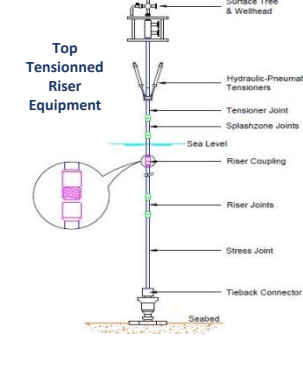
### Buoyancy Modules for Steep and Lazy Wave Configurations



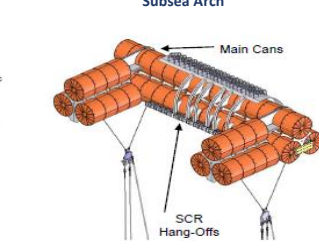
### SCR Equipment



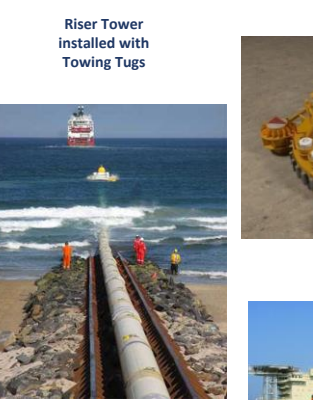
### Top Tensioned Riser Equipment



### Subsea Arch



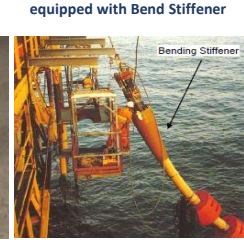
### Riser Tower installed with Towing Tugs



### Foundation: Suction Pile & Flexjoint



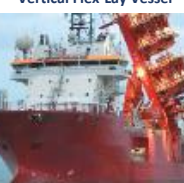
### Top of RT/HR/FR: Flexible Jumper equipped with Bend Stiffener



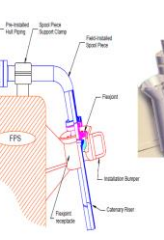
### Single Hybrid Risers installed by J-Lay Vessel



### Flexible Risers installed by Vertical Flex-Lay Vessel



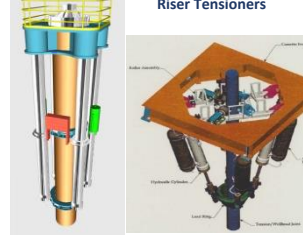
### Top Attachment SCR Arrangement



### Steel Catenary Risers installed by J-Lay or Reel-Lay Vessels



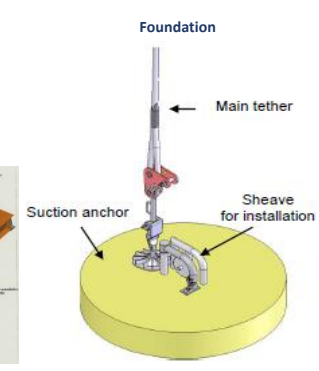
### Riser Tensioners



### Top Tensioned Risers Installed from TLP Platform



### Foundation



### BSR/HySR installed by J-Lay or Reel-Lay Vessels

