



***techflow* marine**

OFFSHORE AND MARINE SYSTEMS

TANDEM MOORING & OFFLOADING



www.techflowmarine.com



FPSO/FSO Tandem Mooring & Offloading Systems

Techflow Marine Tandem Mooring & Offloading Systems enable safe and efficient tandem mooring & offloading operations between FPSO/FSO and Shuttle Tankers.

Techflow Marine is a proven global supplier of fluid transfer systems to the oil, gas and petrochemical industries, delivering solutions to major blue chip companies worldwide.

We have extensive experience in the design, manufacture, supply & aftersales support of a range of specialist products for FPSO/FSU units, semi-submersibles, jack-up rigs & conventional fixed platforms.

Techflow Marine operates and maintains an effective quality management system in accordance with ISO 9001:2008, accredited by LRQA (Lloyds Register Quality Assurance). Our quality system is a key factor in providing products and services that consistently satisfy the needs and expectations of our customers.

Our highly qualified team of Design and Project Engineers have extensive experience and knowledge of the design and supply of fluid transfer systems and associated mechanical, electrical and hydraulic equipment to the Offshore Oil & Gas industry.

Our Engineering Support Team can assist the Offshore Installation designers and yards during all phases of engineering from initial Concept / FEED studies through to Commissioning / First Operation ensuring the our products meet the specified requirements.

We have developed long term relationships with strategically located manufacturing partners & suppliers globally. Their familiarity with the processes, equipment and quality required, delivers consistently high standards.

Typical Tandem Mooring & Offloading Sequence...



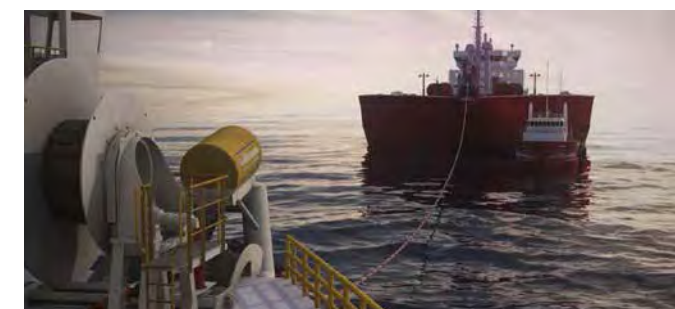
1. Shuttle Tanker approaches FPSO...



2. FPSO messenger /Hawser lines deployed...



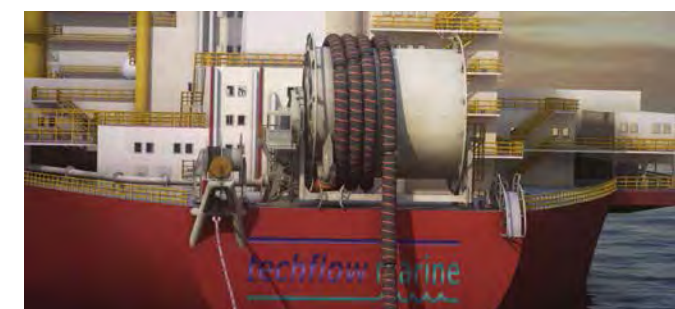
3. FPSO hawser Chafe Chain engaged...



4. Shuttle Tanker hawser chafe chain engaged...



5. FPSO Hose Reel ready...



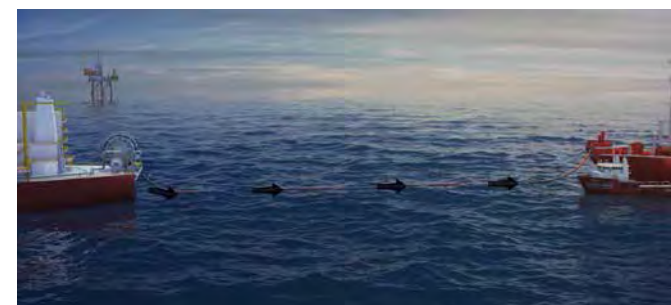
6. FPSO Hose Reel deploys Offloading Hose...



7. FPSO Offloading Hose fully deployed...



8. FPSO hawser and Offloading Hose connected...



9. FPSO Offloading operation commences...



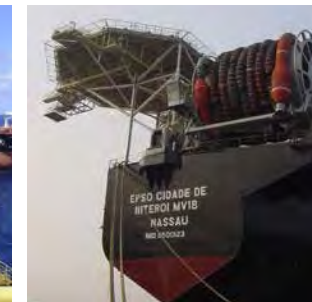
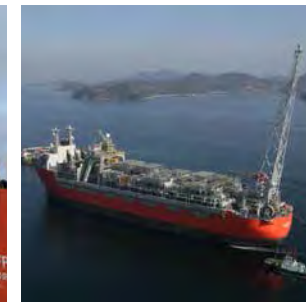
10. FPSO Offloading operation monitoring...

Techflow Marine Offloading Systems

Techflow Marine Fluid Transfer Systems provide safe and efficient loading and offloading operations in various offshore and onshore applications. Typically, these systems will utilise flexible pipe to transfer crude oil or other media in dynamic applications.

Various hose storage reels, chutes or outboard platform stations are available, specifically configured and designed to suit individual applications and installations worldwide. The systems will usually include means for storage, deployment and recovery of the flexible pipe, and will incorporate power, control and utility equipment.

Tandem Mooring, handling and storage systems complement our fluid transfer systems. Techflow Marine provides comprehensive and fully integrated transfer systems with reliable and simple operation. Systems are tailored to meet specific client requirements.



Hose Reel Systems

Bow & Stern Deck hose storage arrangements

- Hose Storage Reel c/w Support Structure
- Hydraulic / Electric Drive
- Export Manifold c/w Hose ERC
- Hose Reel Spooling
- Hose Flushing Connection
- Hose String Assembly (OCIMF Catenary & Floating)
- Local Control Station, PLC Control & Monitoring System



Cantilever A-Frame Systems

Outboard Hose Connection (Hanging Hose Arrangement)

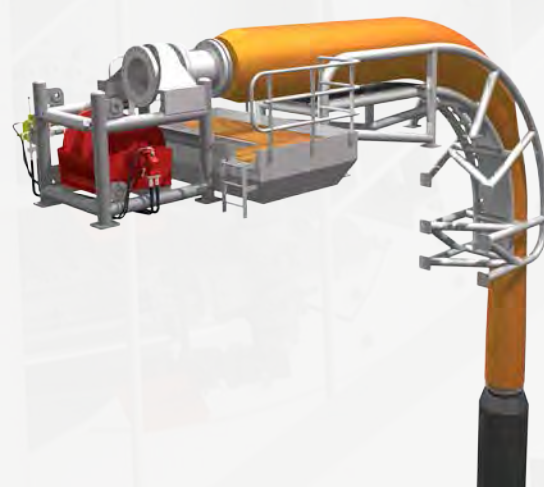
- Vertical Export Manifold c/w Hose Emergency Release Coupler
- Articulating A-Frame & Support Structure
- Hose Pull-In Winch
- Access Platforms
- Hose Hold-Back Wires & Emergency Release Hooks
- Local Control Station



Hose Chute Systems

Inboard Hose Connection (Supported Hose Arrangement)

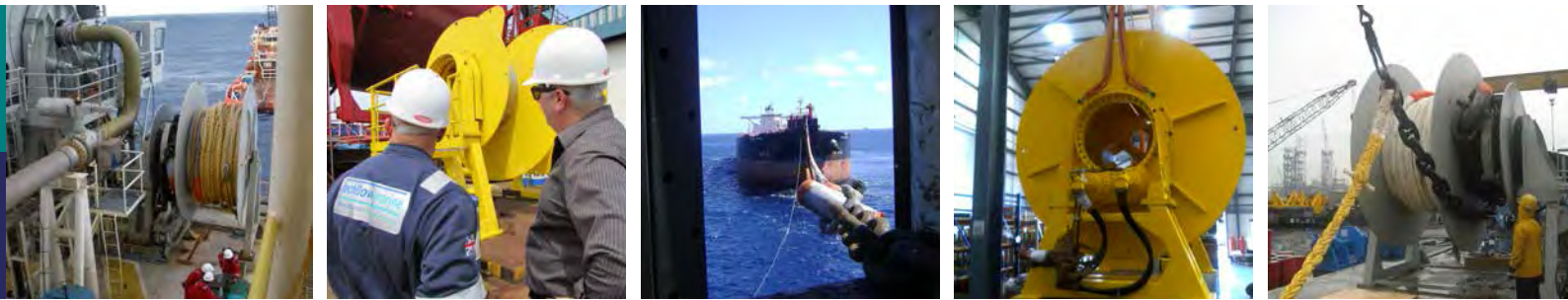
- Horizontal Export Manifold c/w Hose Emergency Release Coupler
- Hose Low Friction Slipway Chute c/w Integral Oil Spillage Tray
- Hose Pull-In Winch
- Access Platforms
- Hose Hold-Back Wires & Emergency Release Hooks
- Local Control Station



Techflow Marine Tandem Mooring Systems

Enabling safe and efficient tandem mooring operations between FPSO and Shuttle Tankers, our systems provide a means for storage, deployment and recovery of the Mooring Hawser/Chafe Chain/Messenger Line Assembly and Integrated Mooring Point, with full load quick release facility.

In addition, hydraulic power & control, load monitoring and data logging equipment can be incorporated. Various systems are available, specifically configured and designed to suit individual applications and installations worldwide. The Tandem Mooring Systems can complement our range of Fluid Transfer Systems utilising common power and control arrangements.



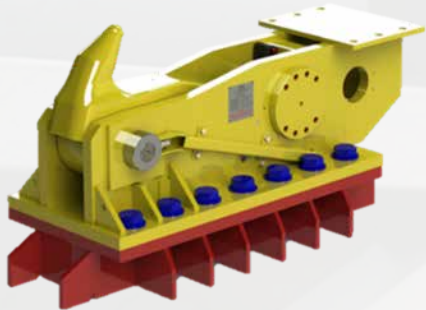
Mooring Hawser Reel Systems

- Bow & Stern Hawser Reel Deck Storage Arrangements**
- Mooring Hawser Storage Reel c/w Spooling Gear
 - Integrated Mooring Point c/w Emergency Release (Full-load)
 - Load Monitoring/Data Logging Systems
 - Mooring Hawser Assemblies (OCIMF 2000)
 - Inboard/Outboard Fairleads
 - Single/Double Mooring Hawser Configurations
 - ETS (IMO-MSC 35(63))



QR Mooring Hook Systems

- Mooring Hawser Hanging Deck Storage Arrangements**
- Integrated Mooring Point c/w Emergency Release (Full-load)
 - Load Monitoring/Data Logging Systems
 - Mooring Hawser Assemblies (OCIMF 2000)
 - Single/Double Mooring Hawser Configurations
 - Hawser Hang-off/Hoist Frame



Fuel, Oil & Potable Water Hose Reels

Techflow Marine Fuel, Oil & Potable Water Hose Reels provide safe and efficient operation and storage of bulk loading hoses used for fluid or powder transfer operations.



These systems are ideal for Fuel, Oil & Potable Water replenishment to FPSOs, FSOs & FSUs.

Single, double or multi-reel stations are available, specifically configured and designed to suit individual project requirements.

Hose assemblies, connectors and reel pipe work materials are selected for compatibility with project specifications.

The stations are supplied with self-contained hydraulic power and control units.



Power, Control & Monitoring Systems

Techflow Marine can provide various power options to fit project specifications including Electro/Hydraulic & Ring Main Systems. Our control & monitoring systems aid safe, reliable and simple operation during loading & offloading procedures.



Electro/Hydraulic Power

Dedicated Hydraulic Power Solutions

- Safe Area, Zone 1 & Zone 2
- Integrated Power, Control & Accumulator Units
- Modular Power, Control & Accumulator Units



Ring Main Systems

Integrated Hydraulic Power Solutions

- Pressure / Flow Control Units
- Filter Units
- Back-Up Accumulator Units
- Local Control Stations



PLC Control & Monitoring Systems

- Variable Speed Drive Reeling Solutions
- Wireless Remote Handheld Control
- PLC / HMI Units, ICSS Interface
- Power, Control & Safety Systems Design
- Hazardous Area Solutions (incl. ATEX, IECEx, AS/ NZS Ex and more)



Case Studies: Worldwide FPSO Experience

Techflow Marine has designed, manufactured & delivered Tandem Mooring & Offloading Systems for some of the most prestigious & technically demanding projects including the World's Deepest FPSO Development (Turitella FPSO). This section contains a small selection of these projects.



Enping FPSO

Tandem Mooring & Offloading System

TFM Scope of Supply:

- Aft Offloading Station consisting of:
- 1 x Tandem Mooring System
- 1 x Offloading Hose Reel System
- 1 x HPU, Control & Monitoring System

Client: CNOOC Owner: CNOOC
Built In: China Operating: Enping 24-2, Eastern
Class: BV Location: South China Sea



Western Isles FPSO

Tandem Mooring & Offloading System

TFM Scope of Supply:

- Aft Offloading Station consisting of:
- 1 x Tandem Mooring System
- 1 x Offloading Hose Reel System
- 1 x HPU, Control & Monitoring System
- 1 x 'North Sea' type HEV

Client: Dana Petroleum Owner: Dana Petroleum
Built In: China Operating: Block 210/24a,
Class: BV Location: Northern North Sea, UK



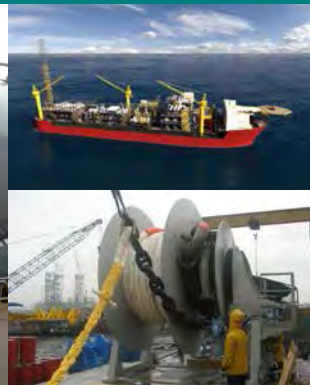
Ichthys LNG FPSO

Tandem Mooring & Condensate Offloading System

TFM Scope of Supply:

- Aft Offloading Station consisting of:
- 1 x Tandem Mooring System
- 1 x Offloading Hose Reel System
- 1 x HPU, Control & Monitoring System

Client: DSME Owner: Inpex
Built In: South Korea Operating: Ichthys Field, Browse
Class: DNV Location: Basin, Western Australia



Turritella FPSO

Tandem Mooring & Offloading System

TFM Scope of Supply:

- Aft Offloading Station consisting of:
- 1 x Tandem Mooring System
- 1 x Offloading Hose Reel System
- 1 x 'North Sea' type HEV
- 1 x HPU, Control & Monitoring System

Client: SBM Owner: Shell
Built In: Singapore Operating: Stones field, Gulf of
Class: ABS Location: Mexico, USA



FPSO Cidade de Caraguatatuba MV27

Tandem Mooring & Offloading System

TFM Scope of Supply:

- Fwd & Aft Offloading Stations consisting of:
- 2 x Tandem Mooring System
- 2 x Offloading Hose Reel System
- 2 x 'North Sea' type HEV
- 1 x Hyd. Ring Main, Control & Monitoring System

Client: Modec Owner: Petrobras
Built In: China Operating: BM-S-11 Block, Santos
Class: ABS Location: Basin, Brazil



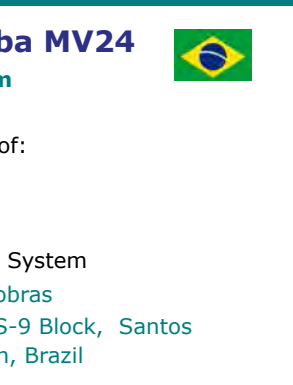
Pazflor FPSO

Tandem Mooring & Offloading System

TFM Scope of Supply:

- Aft Offloading Station consisting of:
- 1 x Tandem Mooring System
- 1 x Offloading Hose Reel System
- 1 x HPU, Control & Monitoring System

Client: DSME Owner: Total E & P Angola
Built In: South Korea Operating: Block 17, deep
Class: BV Location: offshore Angola



Skarv Indu FPSO

Tandem Mooring & Offloading System

TFM Scope of Supply:

- Aft Offloading Station consisting of:
- 1 x Offloading Hose Reel System
- 1 x 'North Sea' type HEV

Client: SHI Owner: BP Norge
Built In: South Korea Operating: Skarv Field, Northern
Class: DNV Location: North Sea, Norway



TANDEM MOORING
& OFFLOADING



***techflow* marine**

OFFSHORE AND MARINE SYSTEMS

T. +44(0)191 250 1865
sales@tfm-uk.com



www.techflowmarine.com