

MIBreak: A new generation hose breakaway coupling



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Agenda

- Offspring International / MIB Italiana SPA
- Risk of Tanker Breakaway
- Marine Breakaway Couplings
- MIBreak Marine Breakaway Coupling
- MIBreak – Operation



OIL Offspring International Ltd.

- Founded in 1991, over 20 years experience in the Offshore Industry
- Based in the UK with a branch office in the USA, and agents worldwide
- Worldwide sales & marketing agent for Lankhorst Ropes – Offshore Division
- Industry leading, single point mooring and deepwater mooring projects
- Agent for MIB Italiana – marine breakaway couplings, EMSTEC marine offloading hoses

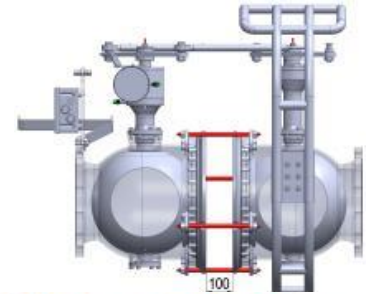
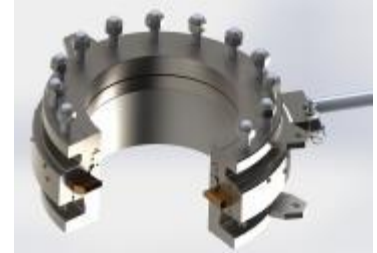


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MIB Italiana SPA

- Entered the Oil & Gas Emergency Connector and Safety System business in 1966 with equipment now in-service world-wide.
- Based in Padova, NE Italy with a branch office in Coventry UK.
- Renown leaders in the supply of quality customised as well as standard solutions for all types of marine terminals
- Pro-active and progressive approach to R&D keeps the company abreast of increasing client demands
- Provides a full After Sales Service for training, assistance and maintenance



Emergency Disconnect Systems for the Oil & Gas & Petrochemical Onshore & Offshore Industries



Risk of Tanker Breakaway and Surge

- A trend towards tanker operations in harsher offshore environments, as oil exploration moves to more hostile environments
- OCIMF survey (2006) – tanker breakout or surge event every 3,518 operating days
- A breakout is when the mooring hawser parts and the tanker is effectively moored by the hose string. Typical axial failure load of hose string around 70 Tonne
- A surge event is when the oil flow is suddenly restricted such as a valve closing, creating a hydrostatic shock load on the pipeline. An internal pressure of 28.5 Bar generates an axial load of 35 tonnes on a 20” diameter bore pipe



Risk of Tanker Breakaway and Surge

- Causes of tanker breakout and surge events:
 - Poor tanker equipment maintenance
 - Poor terminal equipment maintenance
 - Human error
 - Environmental conditions
- Possible solutions include:
 - Quick release systems on loading hose – too slow
 - Surge protection tanks – operationally impractical in many cases
 - Marine Breakaway Coupling provides additional safety case



Marine Breakaway Couplings

- Marine breakaway couplings:
 - Passive protection
 - Located in flexible hose string
 - Automatic operation when pre-set load exceeded (Typically 35 Tonne)
- Operational benefits:
 - Significantly reduces environmental impact of tanker breakaway / hose failure
 - Reduces risk of damage to tanker, SPM buoy and pipework
 - Reduces time the terminal is out-of-service following an incident



Marine Breakaway Couplings

In developing the new generation of MBC, the challenge was to reduce or eliminate reported problems and to build on the positives from the First Generation of MBC's which included:-

POSITIVES

- Ground Breaking design when invented
- No alternative available until now
- Broad range of applications – crude oil and LNG transfer through to riser and choke emergency disconnect
- Lightweight and compact
- Pressure compensated units available

NEGATIVES

- **Reported cases of premature weak bolt failure both during installation and in service**
- **On site maintenance discouraged**
- **Return to base policy for rebuild after activation requiring spare unit to be held in stock**
- **Little change in design over last 30 years**
- **Machined metal to metal seals result in variable leakage rates**



MIBreak - Next Generation Coupling

- Same length and weight as first generation so directly interchangeable
- Valve petals include nitrile O-ring seals and overlapping design for minimal leakage
- New Titanium alloy break bolts for prolonged service life and consistent breaking load.
- On-site reassembly after activation
- 5 year service intervals and on-site preventive maintenance and test



MIBreak : Overview

- Full bore – no interruptions in the flow path with zero pressure loss
- Central Sleeve assembly protects valve petals from product contamination
- Innovative damping system:
 - to better tune the petal valve closure rate
 - to prevent debris clogging
- Passive operation, no external energy source required
- Provided with flanges for direct bolting to hose flange



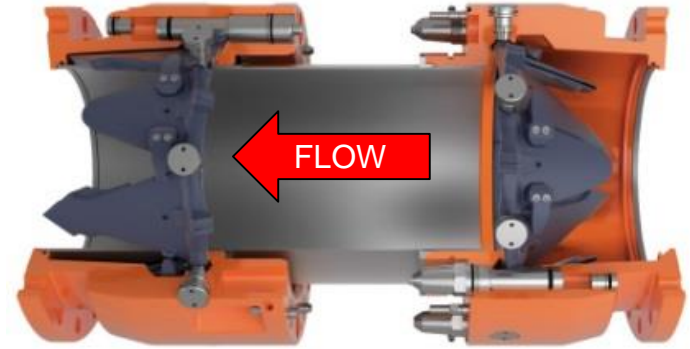
MIBreak – Operation

- The 8 titanium alloy weak bolts are machined to a pre-determined diameter to suit the specified “breakout “ load up to a maximum of 50 tonne
- The forces to generate this parting load are
 - a) An axial tension in the hose
 - b) Internal product pressure
 - c) Combination of both a & b
- A typical weak bolt load setting is 36.5 tonnes, equivalent to 28.5 bar internal pressure
- The coupling will separate when preset load or internal pressure exceeds break bolt capacity



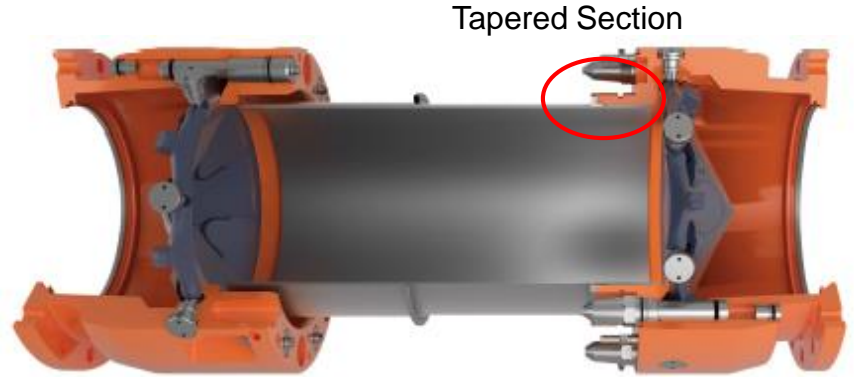
MIBreak – Operation

- Axial load or Internal pressure forces the two halves of coupling to move apart
- The central sleeve is pulled out allowing closure of upstream petal valves
- The 4 large petals close first at a speed pre-determined by the springs and dampers
- The 4 smaller petals follow in a time that can be set.
- These petals have nitrile O-ring seals to fully seal the flow of product (except for the very centre which is metal to metal seal)



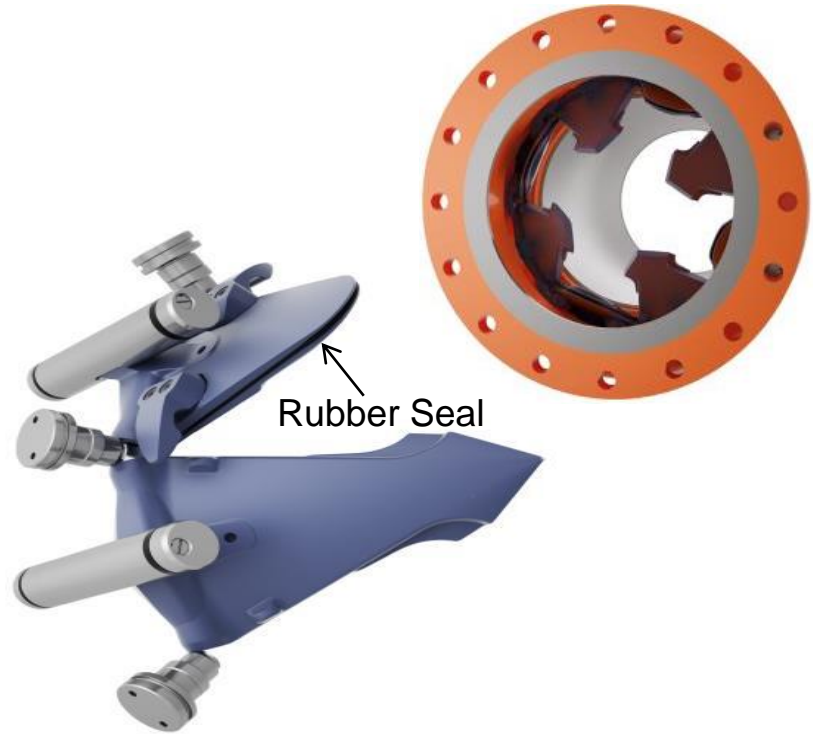
MIBreak – Operation

- The central sleeve has a machined taper at the upstream end, preventing it from pulling completely out of the unit
- Upstream flow of liquid is shut-off and contained by petal valves in upstream half of the valve
- Continued axial load will part a second set of weak bolts between the downstream valve body and the central sleeve, allowing sleeve to separate and pull out of the downstream valve
- When sleeve reaches end of downstream valve, the downstream valve is fully closed
- Petals are spring loaded so will close when no product flow and will remain closed with no pressure in system



MIBreak – Valve Petal Activation

- Two different petal valve shapes ensure:
 - rapid closure of a consistent bore portion
 - reduction of surge pressure effect
 - minimum spillage
- **Stage 1:** Four large petals close rapidly (typical 3 seconds from activation). Petals meet in the centre, significantly reducing bore area
- **Stage 2:** Remaining four petals close subsequently, in a time that can be adjusted to suit client flow requirements
- As an extra safety feature, mechanical stops prevent smaller petals from closing before large petals



MIBreak – a closer look



- Patented damping system based on a helical profile, to control petal valve closure rate and to prevent debris clogging
- Sealed piston chambers: no spillage of oil outside during activations
- Sealing of the Titanium weak-bolts seat to prevent Hydrogen Embrittlement and extend their service life
- Titanium weak-bolts design to prevent fatigue cracking / failure (round profile, no sharp edge)
- Special nut sealing washer to keep the bolt tight throughout the service



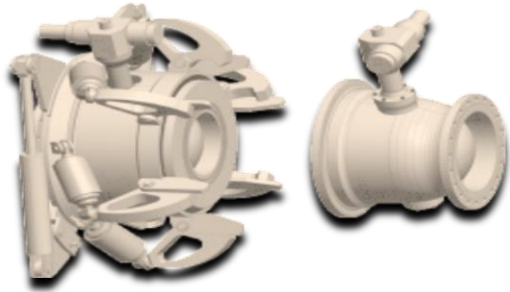
MIBreak - Reassembly

- MIBreak can be quickly and easily reassembled by trained fitters and placed back into service
- Detailed and simple step-by-step procedure using tools provided by MIB
- No need to return the coupling to MIB
- Test and Service every 5 years if not used in anger.
- Design life of 20 years



...a look forward

OIL experience in the SPM systems and MIB expertise in the Emergency Connector and Safety System to be basis for Bespoke breakaway solutions to be evaluated upon specific request by operators...



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