



Operating Experience With  
MBC's at Tetney Monobuoy

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- ❖ Tetney monobuoy is a crude oil import facility at the mouth of the Humber Estuary.
- ❖ It is the primary supply route for crude oil to the Phillips 66 Humber Refinery.
- ❖ Approximately 110 vessel / year use the facility
- ❖ Throughput is in the region of 9 million m<sup>3</sup> / year



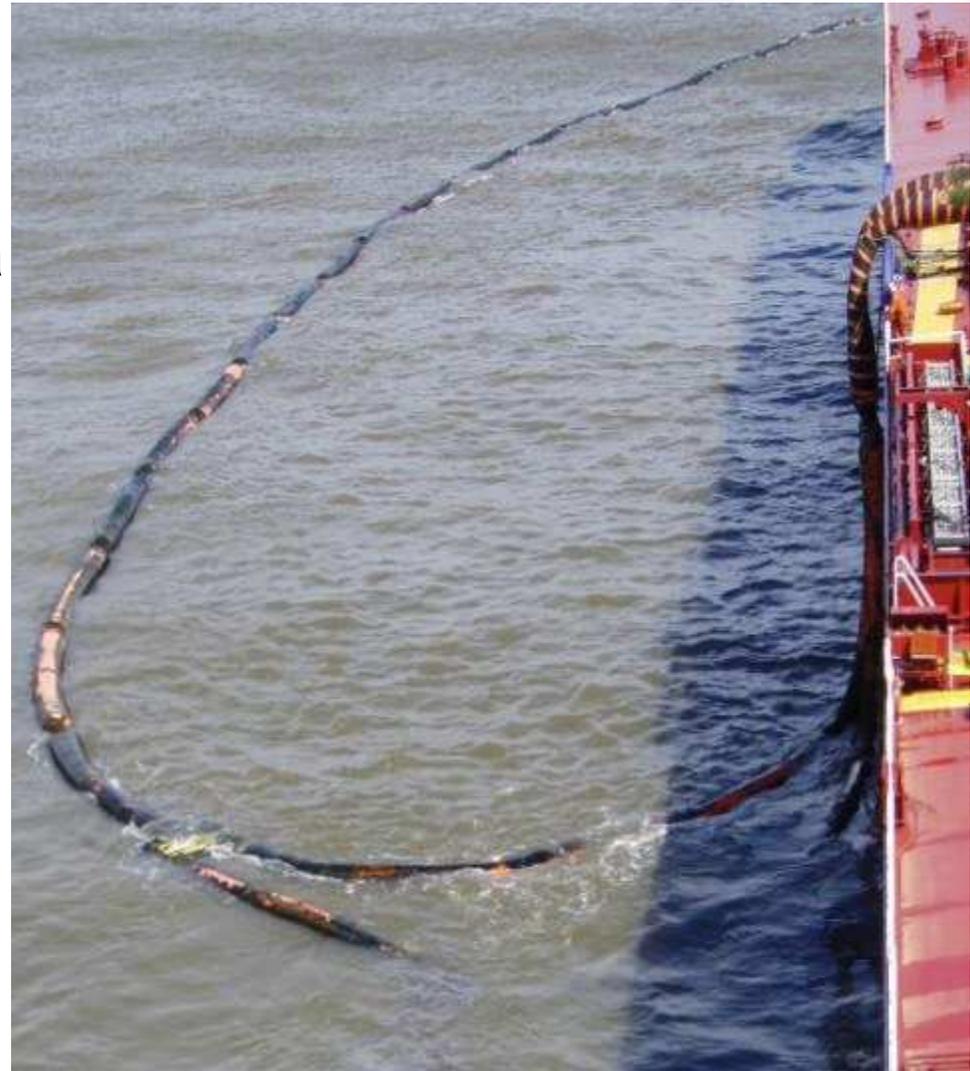
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- ❖ **Hose string consists of a single string of 20 x 24" hoses, split at 'Y' tank into 2 strings of 4 x 16" hose.**
- ❖ **MBC were incorporated into string in 2003.**
- ❖ **Manufacturers recommendation was to install between 1<sup>st</sup> and 2<sup>nd</sup> hose after 'Y' piece**
- ❖ **Maintenance intervals were set at 5 years.**



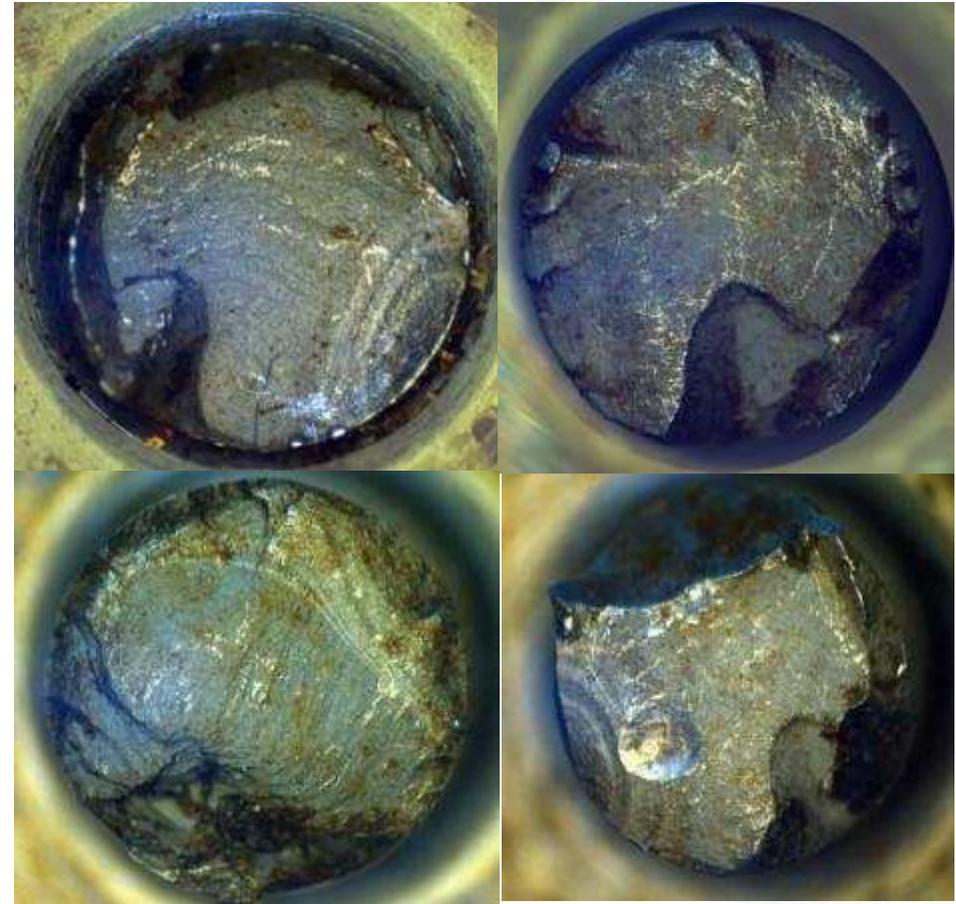
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- ❗ **Less than 4 years later, the MBC in the aft string suffered a spurious activation.**
- ❗ **Conditions at the time were calm, and there had been no evidence of pressure spikes.**
- ❗ **Pollution was estimated at 3 m<sup>3</sup>.**



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- ❖ Breakstuds were retrieved and analysed independently.
- ❖ At least four of the breakstuds failed due to fatigue
- ❖ Fatigue failures were all initiated on the studs outer radius.



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- ❗ Stud from activated MBC showing failure originating at radius.



- ❗ Breakstud from in tact coupling tested to destruction, showing normal 'cup and cone' failure mode.



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### Remedial actions

- ☐ Increased the neck radius to give better fatigue resistance properties to previously failed areas
- ☐ Increased stud thickness
- ☐ Pre tension studs to only 80% of yield value.
  - (studs had been previously tensioned to 95% of yield value)
- ☐ Enhance maintenance regime.
  - Studs to be changed out annually, and tested for signs of cyclical fatigue.

### MBC's were reinstated in early 2009

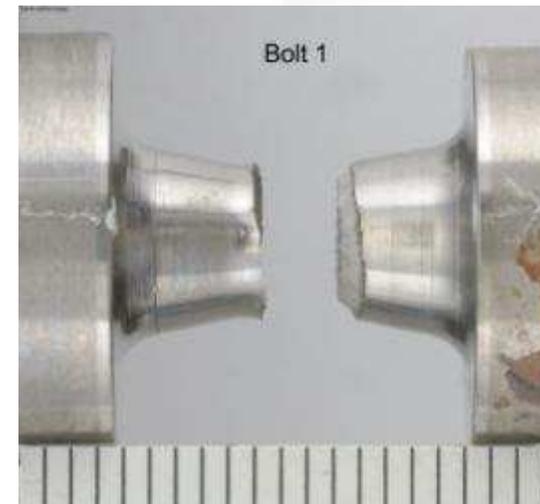


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- ❗ **Further spurious activation experienced in November 2011.**
- ❗ **Occurred during maintenance operations**
  - ❏ Hoses were being slid back into water from stern of work boat.
- ❗ **No pollution, as hoses had previously been flushed with water.**
- ❗ **MBC studs had been replaced only 3 months earlier.**

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- ❖ All studs exhibited signs of ductile failure.
- ❖ Technical analysis report concludes that failure of studs was as a result of overload.
- ❖ Review of incident and operation has not identified any conclusive evidence of overloading.



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## ❗ Possible causes of overloading were considered:

- ❏ Lifting MBC out of water during discharge
  - Freeboard limitation at terminal of 16.7m
  - MBC fitted between 3<sup>rd</sup> and 4<sup>th</sup> hose from manifold.
  - On this basis, 3<sup>rd</sup> hose can be partially lifted clear of water at opposite end of hose from MBC
  
- ❏ Y tank introducing additional forces into hose string:
  - During mid tide conditions, tidal flow of up to 5 kts can be experienced
  - This can have effect of rotating 'Y' tank through 90 degs.



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### Remedial Actions.

- ☐ Y tank to be replaced by single 24" to 16" reducer. Single connection to be presented at manifold.
  - This will remove possibility of any rotational forces being transmitted to the MBC.
- ☐ Additional 16" hose to be added to the string.
  - This will increase distance of MBC from ships manifold by 10 metres, and reduce possibility of MBC being lifted clear of water.

### MBC to be reinstated September 2012