

HSE Information Sheet

Reducing the risks associated with flooded machinery spaces on monohull FPSO and FSU installations

Offshore Information Sheet 8/2007

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Introduction

1. This information sheet highlights the need for safety barriers to protect against the flooding of machinery spaces below the water line on monohull FPSO and FSU installations. It replaces Safety Notice 4/03 (SN4/03) (issued Dec 2003).
2. The provision of suitable systems for flood detection and the remote closure of safety critical shipside valves from a safe location are considered to represent good practice in reducing these risks to as low as reasonably practicable.

Background

3. Flooding of a machinery space will result in risks to people responding to the incident, as well as reduced stability and seaworthiness of the installation and the loss of safety critical systems. Any safety critical systems remaining will usually be limited in their availability to the emergency power supplies (typically of 24 hours duration).
4. Suitable arrangements for flooding detection require the availability of bilge high and high/high alarms, giving clear and unambiguous audible and visual signals to the control room operator. Many FPSO and FSU owners and operators have not fully adopted these arrangements for flood detection and cannot remotely close the safety critical shipside valves from a safe location, as recommended in HSE research report OTO 2001/049. The guidance in this report was formerly included in the publication Offshore installations. Guidance on design, construction and certification (fourth edition 1990) which was withdrawn from print in June 1998. Operations Notice 27 gives further information on the status of the guidance which has since been made available through the research report series.
5. Monohull FPSO and FSU installations generally follow the rules of the classification societies, which do not currently include the above provisions. Reliance is placed upon manual intervention to limit flooding by the local closure of shipside valves low down in machinery spaces. It is also assumed that the installation's damage stability criteria is capable of withstanding the flooding.
6. The Duty Holder should be aware of the location and size of each and every suction and discharge ships side valve. All of these valves should be considered Safety Critical Elements as defined by the verification scheme and should be "suitable". For a safety critical element to be "suitable" it should be appropriate for the intended use, dependable and effective when required, and able to perform as intended. "Suitability" should apply throughout the life cycle of the installation.
7. It is considered unlikely that manual intervention would succeed in securing timely closure of a relevant shipside valve, due to there being insufficient time to respond to an alarm by way of accessing and closing the valve, particularly when faced with high flooding rates, eg from pressurised sea water systems with lines of up to 800 mm diameter.
8. Damaged stability capabilities can normally be expected to prevent catastrophic loss through capsize in the event of a major machinery space flooding incident. This is nevertheless a highly undesirable event which would involve vessel inclination, a reduction in stability and seaworthiness, as well as limited functionality of safety critical systems.
9. Additionally, for machinery spaces that are unmanned for any length of time, it is considered good practice to install CCTV that displays in the continuously manned control room. In machinery space flooding incidents to date, the availability of CCTV has enabled the relevant operator to rapidly confirm the

- source and extent of the flooding, and to take immediate action to isolate the affected space from the sea.
10. Some dutyholders have already upgraded their installations in line with these recommendations.
 11. HSE has drawn these concerns to the attention of classification societies and the International Association of Classification Societies, (IACS).

Actions

12. Owners and operators of monohull FPSO and FSU installations should review their risk assessments for the flooding of machinery spaces and ensure that effective means are provided for the detection and control of flooding. This could include providing each safety critical shipside inlet, or discharge valve, with an independent remotely controlled means of closure, from a safe location, ie from a readily accessible position above any final waterplane, after damage. Systems should be in place to demonstrate that all safety critical ships side valves are “suitable” and will remain so throughout the life cycle of the installation.

Relevant legal requirements

13. The main relevant legal requirements are:
 - the Health and Safety At Work, etc Act 1974;
 - the Management of Health and Safety at Work Regulations 1999;
 - the Offshore Installations and Wells (Design and Construction, etc) Regulations 1996;
 - the Offshore Installations (Prevention of Fire and Explosion, and Emergency Response) Regulations 1995;
 - the Provision and Use of Work Equipment Regulations 1998.

References

Stability Offshore Technology Report OTO 2001/049 HSE Books 2002 ISBN 0 7176 2508 7 available online at

<http://www.hse.gov.uk/research/otohtm/2001/oto01049.htm>

Status of technical guidance on design, construction and certification Operations Notice 27 HSE 2003 available online at

http://www.hse.gov.uk/offshore/notices/on_27.htm

Further information

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This information sheet contains notes on good practice which are not compulsory but which you may find helpful in considering what you need to do