Anti-ship immobilisation – anti-pollution for the sea

An available and affordable technology

Can we imagine a modern car nowadays without passive safety equipment onboard, such as air bags and structural integrity? Nevertheless, we accept vessels without Marine Passive Safety devices.

Keeping ships afloat and avoiding accidents are sometime not enough to avoid disaster when sea constraints are too high. The FOR systems are the best Marine Passive Safety devices ever developed for shipping and have now been adapted for the oil & gas industry. Such leading-edge onboard technology provides ships with efficient and permanent solutions to mitigate environmental & financial damages in the event of an incident.

FPSO and shuttles: matter of time, productivity and transport

Link between the offshore oil production and the shipping activity:

- The Floating Production Storage and Offloading (FPSO), the gigantic offshore production facility that house both processing equipment and storage,
- Shuttle tankers, which transport the oil from the FPSO to the coast, have seen their services grow with increased demand.

Financial loss and pollution risks

Deep analysis on tank weaknesses has shown that a small incident occurring on FPSO or shuttle tankers can turn into major catastrophe involving all users and stakeholders.

Productivity, profitability, and image will be directly affected and can be deeply impacted in the event of oil spill. Such harmful crises have not yet benefited from fast solutions to mitigate damages.

Make FPSO or shuttle tankers secure and "eco"

Ten years of study have led the French company JLMD to design new equipment belonging to the group called the Fast Oil Recovery Systems (FOR); the only equipment that limits the consequences generated by an incident.

JLMD was the first company to work out a FOR System: the result of a meticulous analysis of tanks (Cargo and Bunker) in order to provide the ship, in any event, with the adapted onboard circuit to deal with a minor or major incident.

In order to avoid expensive circuit and component redundancies, JLMD installs each tank with two simple additional and permanent circuits properly chosen and positioned.

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The FOR systems provide the ship and the technical staff with simple and reliable solution reducing by more than 50% the time of the immobilization of the damaged tank or the damaged ship.

For a small investment, the JLMD system® FOR systems can:

- Stop an incident from becoming an accident
- Protect the productivity and profitability of production assets, such as FPSO and Shuttle tanker.
- Ensure authorities and all crisis players (insurers, salvage companies) are free of potentially damaging situation.
- Enhance oil industrial players with a green image
- Protect the company image

Tank weaknesses

Ten years of test and analysis considering diverse situations led JLMD to highlight tank weaknesses. The technical gap should be fulfilled with devices and architectural modifications that become active after an incident to mitigate its consequences: the passive safety devices.

The Fast Oil Recovery System is one of these passive equipments. It allows the recovery of the pollutant, directly into the tanks whatever the situation.

When an accident arises the tank becomes the core of the environmental concern. The ship (FPSO, Shuttle tanker) and tanks are not designed to participate to the mitigation of the after-incident only focus on productivity.

The FOR system provides the ship with solutions to limit the consequences of an incident at sea.

The tank: an addition of requirements

In order to increase the shipping business profitability and to reduce incidents, the tank design follows economical, commercial, legal, safety and engineering constraints as: Content, function, ship type, ship route constraints, and legal requirements.

Each cargo and bunker tank is a specific element, dedicated to a definite function, with its own particular and precise modules, accesses and equipment.

The tank includes many different inputs called by diverse departments of the shipping industry.

To complete the functioning of the tanks, some important and recurrent devices equip the tank: pumps; valves; level sensors; temperature sensors…

The failure of one of these components could at least result in stopped production, tank blockage, or the immobilization of the ship (Crude Oil Tanker, Shuttle Tanker, FPSO, FSO, etc...).

The tank is always a major player in the incident: it is either a cause or the main centre of attention.

Incidents scenarios

Devices dysfunction: Pump/valves/pipes failures – Redundancy would be the only and obvious correction for this design gap. If all these components were doubled, the tank utilization would not be affected and the malfunctioning component could be replaced during sailing.
This costly redundancy matter can be solved by a multifunction, alternative piping circuit.

Major incident (wreck, grounding, collision, loss of main power …) – Since the attention is focused on the

oil pollution risks, the principal goal of the technical staff will be to empty the tanks and recover most of the pollutant poured into the sea as quickly as possible in order to minimize the oil spill, its cleaning costs, and the public reaction.

The common salvage procedures employed in these cases is to drill new accesses to reach the tanks.

New designs for the prevention of pollution, such as: double hull; tanks moved toward the centre of the ship; segregation of big tanks into a multitude of smaller tanks.

Ensure tank integrity but make tank access complex. The oil recovery operations are much more difficult, risky, time consuming thus costly. The solution will be to fit each tank with recovery facilities.

The FOR System: The Recovery facilities

The Fast Oil Recovery System is a clever alternative circuit replacing the failing/missing equipment. It is composed of at least two dedicated, pre-installed, emergency piping accesses per tank. Each of these accesses is a DN 200 pipe with a minimal radius of curvature of one meter, ending on main deck with a standardized connector.

With such system onboard, it is obvious that a failure of the loading/discharge line, inert gas system, venting circuit, gauging and sampling pipe could be solved by the use of the FOR System connectors and pipes, since they assure the back-up of some tank equipment functions.

In the case of collision or grounding the standard equipment onboard is either out of order or out of energy. Therefore additional means of pumping are necessary. In that respect, the FOR accesses are designed (DN200 and a bending radius of pipe not less than one meter) to allow the insertion of a submersible pump.

In the case of a sunken ship, since the head of the pumping distance is far too high, a submersible pump will be useless. The pumping engine used in that case would thus be the water cushion process. As the oil is lighter than the sea water, filling the tank with sea water would push up the oil toward the sea surface.

Additionally, during the dismantling, the cleaning of the tanks is a key problem in terms of worker safety, environmental protection and costs. The FOR system provides an access and means of pumping via pair of connectors located on each tank. As a side benefit, the FOR system becomes a useful tool when the vessel is being deconstructed.

Such equipment would permit to keep the control on the oil in any situation and limit the ship knowledge required for the treatment of a major incident.

Study cases have been carried out based on major accident as: Prestige, Exxon Valdez, Erika…More than 50% of time can be gained with a FOR system reducing the damages accordingly.

Easy to install

A deep analysis of the existing piping architecture can simplify a FOR installation by merging the FOR accesses to part of the existing piping circuit. This task requires know-how since a valve or an unseen circuit could block the process or divert the oil during recovery. However, the gain in terms of installation complexity and cost deserves it. It can be, thus, possible to retrofit the FOR System to an operating vessel within few hours and without hot works.

The FOR System is either implemented during the construction of the ship or retrofitted during a technical stop. The equipment is thus available in sleep mode and active as soon as the incident occurs. In that respect, as the air-bag in the automotive industry and the dry riser for the firemen, the FOR System is proactive equipment which will intervene to mitigate the consequences of the incident, by contributing to a more efficient oil recovery from tanks.

As the zero risk does not exist, this system introduces a new way of thinking, where solutions are developed in order to limit the transformation of an incident into an economic and environmental disaster.

The Emergency Response Plan

In event of incident a deep pre-study is carried out to define the tanks location, the way to reach them and the recovery process to deploy. Such time consuming steps are an important source of cost. During this period, the oil gets thicker and continues to be poured into the sea.

Regarding the time that could be saved, it seems evident to associate to the Fast Oil Recovery system, an Emergency Response Plan. This document encloses all the technical information required for a fast and safe oil recovery: location and access to each FOR connector, location of each tank, tanks capacities, the FOR system arrangement on each tank. The information given in this document allows to deploy the proper procedures so the crew can handle small events and the salvage teams can act very quickly on major ones.

Green Label: be a part of it!

The experts from Bureau Veritas have studied the FOR system's conformity and awarded a quality-label which acknowledges effectiveness of function of the Fast Oil Recovery System.

This recognition is here to insist on a critical stake that is the protection of the industrial productivity and the marine environment. ■