SAFETY BULLETIN

MAJOR ACCIDENT CAUSED BY PIPE HANDLING SYSTEM FAILURE EIGHT PERSONS INJURED, FOUR FATALLY

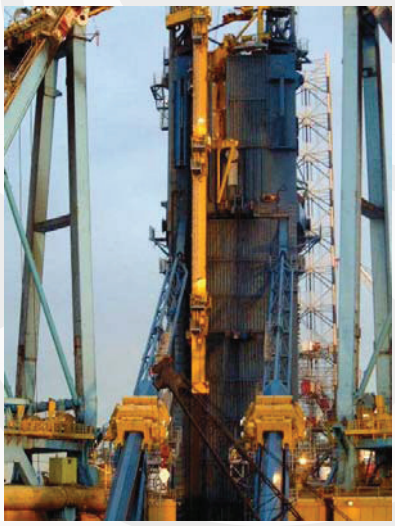
GENERALITIES

Accident Location: International waters between Spain and Algeria

Date of the accident: September 17th, 2008

Type of activity: offshore pipe J-lay operations

Equipment involved: Saipem 7000 J-Lay Tower



ACCIDENT BRIEF DESCRIPTION

The accident occurred on Saipem 7000 during pipe lay operations. A system failure in the hydraulic pipe handling system of the J-Lay Tower (JLT) caused two quadruple joints (QJ) being handled contemporarily in two different areas of the Tower, to suddenly drop. Each QJ pipe was a 24" x 50mts long, weighting approximately 20tons.

One of the two quadruple joints dropped from the pipe transfer system inside the tower landing on the pipe alignment area (upper welding deck), falling approximately 1 meter causing neither injuries nor damages.

The second quadruple joint was retained by the pipe elevator stationing at the top of the J-Lay Tower and was in the process of being handed over to the pipe transfer system. The pipe fell outside the tower crashing through the walkway at the lower section of the tower. It stopped at the bottom structure of the JLT.

Several crewman were present on the walkway. Eight people were affected by the accident. Four were fatally injured, two seriously and two slightly injured.

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Just prior to the Accident the pipe laying operation was stopped. The Operators from the Control Units 1 and 2 (CU1 & CU2) reported a system failure and that the hydraulic power had been lost.

Such an occurrence was not particularly unusual and, in line with company procedures, was investigated immediately.

The appointed team of technicians lead by the chief electrician tried unsuccessfully to resolve the problems initially from CU1, then from CU2 where they stopped and ran the Programmable Logic Controller 4 (PLC4) and restarted the system twice.

After these attempts, a more in depth analysis was made. The chief electrician performed a memory reset as indicated to be necessary by a PLC blinking led. After this sequence the system resulted running correctly. This was the 1st time that a memory reset was requested by the diagnostic of the control system during a project operational phase.

Only after the control units (CU1 & CU2) confirmed that all indication lamps were in order and all systems were up and running again, the chief electrician gave the instruction to CU1 operator to start the power packs again.

As soon as the power packs were started a loud bang together with hydraulic noises were heard. One quadruple joint within the J-Lay tower, held by the transfer system was released and fell down about 1 meter down to the upper welding deck. At the same time, the quadruple joint held by the pipe elevator at the top of the pipe laying tower was also released by its clamps and the hydraulic safety stop swung away, allowing the pipe section to fall down the full height of the tower smashing through the access platform located outside the non destructive test/coating station to the lower deck below.

All the injured people were on the access platform. The force of impact caused some of crew members to fall down onto the lower deck at the base of the pipe laying tower and some to be projected into the open sea.

PRIMARY CAUSES OF THE ACCIDENT

1st Primary Cause

The sudden release of the 2 quadruple joints was caused by a failure in conceptual design of the control system software. In fact the program relevant to the JLT initializing instruction was pre-loaded in the EPROM memory of the PLC4 with the instruction to open all clamps.

2nd Primary Cause

The unnecessary presence and uncontrolled access of working personnel onto the access platform destroyed by the falling pipe have exposed the injured people to suspended load hazard and to this catastrophic event.

CORRECTIVE ACTIONS

A Major Hazards Analysis and Review of the J-Lay Operation Activities has been carried out focusing on Major Hazards and Catastrophic Events in order to define adequate structural, mechanical, electrical, management and procedural actions for improving the overall J-Lay System Safety Level. This activity also considered the lessons learned from previous projects and from September 17th accidental event. The proposed System improvements and corrective actions have been analyzed via a structured hazard identification tool (WHAT-IF Analysis) to identify the benefit gained and solve any potential clash with current design and operational mode.

The 1st Primary Cause has been resolved with the definitive removal of the EPROM memories from the system.

The 2nd Primary Cause has been addressed by a revision of the vessel and JLT working methodologies. The pipe handling activities have been reconsidered through a dropped object philosophy in order to identify mechanical and electrical barriers, additional controls, and new set of operational procedures.

Electrical Blockage

A number of Opening Operations have been inhibited by adding Electrical circuit breakers.

All critical sequences will be called by PLC and must be confirmed by operator via electrical pushbuttons.

Mechanical Protections

Different systems have been and will be implemented to prevent the vertical pipe drop in any section of the JLT, to restrain lateral pipe movement and fall, and to secure the pipe till the internal line up is completed in the upper welding station.

Operational Procedures

In addition to the general procedure Lifting Operations (S7000-PRO-HSE-06) the following procedures have been improved/issued:

- *Safety and Transit Rules during J-lay System Operations*

All pipe handling activities are considered as Working under Suspended Loads. The Procedure defines:

- ACCESS-CONTROLLED AREA: Zone around the JLT are restricted to non essential personnel. Transit to J-Lay tower will be controlled by dedicated watchmen
- EXCLUSION ZONES: zones where no personnel is admitted during J-Lay

- *J-lay Tower Operators Working Instructions*

The procedure defines the Working Instructions for the J-Lay tower operators after the introduction of the new supplementary electrical protections.

- *J-lay System Welding Station Line Up Activities*

The procedures defines the requirements to ensure that quad-joint line-up activities within JLT are carried out in a proficient and safe manner after the introduction of the new mechanical protection.

PA system

It has been installed an additional PA system to be activated during QJ loader lift, and audible and visible alarms for Elevator movements.

A Safety Net

It has been installed underneath J-Lay Tower platforms to guarantee protection against men falling overboard.

CORRECTIVE ACTIONS

Human Resources Management

The Company and Vessel Management shall:

- **Develop and improve the safety culture of personnel working on board through the "Leadership in Safety" initiative**
- **Ensure that procedures are in place and represent working practices**
- **Ensure that the personnel is familiar with the new technologies put in place**
- **Develop training programs to ensure the development of the competency of all personnel**
- **Ensure that the Organization, the personnel roles and responsibilities, communication channel are familiar to all personnel.**

Long Term Corrective Actions

The JLT will undergo a full refurbishment during which all systems will be subject to safety review.