SAFETY FEEDBACK NOTICE
HYDROGEN SULPHIDE (H_2S)

DGEP / HSE	Ref: 02 - 2007	Issued: 16/02/07

THINK SAFETY FIRST

A: Incident description

Three High Potential Incidents involving H_2S in oily water treatment occurred in 2006

Incident 1: The maintenance team was to replace a leaking bellows (rubber device on the discharge pipe of the oily water treatment unit). While the flange was being unbolted, oily water dripped out (problem of passing valve). The Mechanic doing the job inhaled H_2S dissolved in water, fainted but recovered almost immediately. As the bellows had only a small leak, it was decided not to replace it.

Incident 2: A month after incident 1, around 20 people were attending a permit to work meeting in the Control Room when the same leaking bellows burst, and oily water reached the airlock door of the control room as the operators were leaving it. The H_2S detectors, all set at 50 ppm, were triggered, including those in the Control Room. As the operator initiated ESD1, the oily water system was isolated. Several spare bellows units were quickly ordered from a local company and two of them were installed 2 weeks later.

Photo 1 : Incident 3

Incident 3: One and half months later, one of the two new bellows installed after incident 2 ruptured *(see Photo 1)*. The operator who saw the water jet alerted the Control Room and asked for activation of ESD1. The nearest H_2S detector was triggered.

B: Incident causes from site investigation

The main causes were as follows:

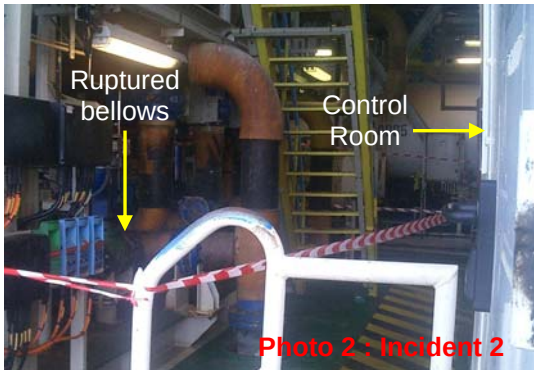

Photo 2 : Incident 2

(1) The **modification** of the operating philosophy following the change of export philosophy had **not been sufficiently analyzed.** There were **vibrations** and **hammer effects** in the oily water system, and **control of the oily water tank** was not optimal (Incidents 1,2,3).

(2) **The bellows in place was more than 14 years old and had aged. No preventive replacement** was planned for this type of equipment. The ageing bellows had been noticed, but **replacement was postponed** for several months, **waiting for shutdown,** without implementation of any specific precautions (Incidents1,2).

(3) **The Control Room location, in front of the oily water system, and its use for permit to work signature are unsafe**. As **the large number of people** present in the Control Room evacuated, **the airlock** (two airtight doors) **was fully opened, allowing H_2S ingress to the Control Room** (Incident 2).

(4) **Lack of mitigation measures**. After incident 1, an **action plan** was drawn up, but **there were no mitigation measures** in place to prevent a similar incident until full implementation of permanent solutions. There was a general **lack of awareness regarding the risk of H_2S** dissolved in oily water. (Incident 2).

(5) **The internal lining of the new bellows installed was not suitable for the service**. Inappropriate bellows were **purchased** and **delivered**. **The material data sheet** which detailed the incompatibility of certain materials with hydrocarbon was **ignored** (Incident 3).

In response to the main causes mentioned above, the affiliate drew up the following action plan:

(1) Revise design and operating philosophy of the oily water network downstream of the oily water tank.

(2) Do the preventive replacement of bellows on lines containing hydrocarbon and insure of their compatibility with H_2S and hydrocarbon.

(3) Enforce correct use of airlocks and restricted access to the Control Room through field instructions.

(4) Downgraded situation follow up at weekly meeting, under GM chairmanship.

(5) Reinforce quality control on spare parts before shipment to site.

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C: DGEP/HSE summary

The accident causes as per CR EP HSE 102 and GM EP HSE 102 definitions are:

Immediate Causes

- Inadequate / defective equipment (2,3,5)

Root Causes

Job factors:

- *Design failure:* inappropriate engineering (1), inadequate design specification (5)
- *Inadequate supervision & leadership:* insufficient risks assessment (2)
- *Equipment management failure:* failing wear or corrosion control (2), lack of equipment specification (2,3,5)

Human factors:

- *Abuse, bad behaviour:* lack of discipline (3)

Management System dysfunctions

- *2-Management responsibilities:* inefficient action plan (4)
- *3-Operational responsibilities:* inappropriate work planning (2,5)
- *4-Risk evaluation & management:* failure to evaluate risks prior to a modification (1), inadequate management of downgraded situation (2,4)
- *10-Incident management:* failure to analyse recurrent causes (4)

D: DGEP/HSE Actions follow-up

The following actions should be carried out in each E&P affiliate:

1. Management of change. Any modification to existing installations is subject to the management of change procedure, which comprises in particular a comprehensive risk assessment, including identification and analysis of all potential impacts. This should guarantee that risks are at an acceptable level *(Reference: CR EP HSE 031).*

   Action: Review the management of change process and procedures (design, operating philosophy, organisation…) (action: all affiliates/sites).

2. Control Room. Control rooms must either be located in a safe area or constitute a safe area (pressurisation with HVAC air intakes in safe area and airlocks). The normal occupancy of Control Room must be strictly limited to only a few authorised persons performing controlled activities, to the exclusion of meetings attended by many people. Appropriate PPE, in quantities matching the number of persons present in the Control Room, must be available for emergency purpose (e.g. breathing apparatus…).
   (Reference: GS EP SAF 021)

   Action: Verify that the airlock doors to the Control Room will never be opened simultaneously, especially in emergency. Where appropriate, establish an airlock procedure (action: all sites).

3. Triggering of H_2S detectors. For the protection of personnel from H_2S, the low alarm must be set to 5 or 10 ppm (depending on local regulations) and high alarm to 10 or 15 ppm (depending on local regulations). *(Reference: GM EP HSE 064* and *GS EP SAF 312* –note: GS EP SAF 312 will be revised to be in accordance with the requirements as mentioned above-*).*

   Action: Verify the triggering of H_2S detectors, ensure it complies with the requirements as described above (action: all sites).

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