

# **Job Safety Analysis as a mean to increase safety awareness and achieve sustainable improvements in safety performance**

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GE Oil & Gas Field Services Activities are part of the GE Oil & Gas Global Services Division. Its activities include at customer site technical assistance, installation, commissioning, start-up, maintenance, upgrades, full turn-key services, as well as project management.

Critical for safety during Service's activities is the high degree of variability of the operating conditions, due to different work scope across various sites, operating procedures, and non-homogeneous background of the manpower. As a consequence, the hazards, risks, and mitigation measures may vary significantly, and the assessment has to be project-specific, to guarantee the same safety standards and the same level of maximum protection as per GE EHS (Environmental Health and Safety) Policy.

To assess the operating hazards and risks GE Oil & Gas implements a Job Safety Analysis process. JSAs are a detailed method, though very simple, to collect stakeholders (workforce, customers, and contractors) operative knowledge, to give them back knowledge and awareness on the evaluated hazards and risks, and to effectively identify, share, and implement EHS best practices, increasing the EHS organizational knowledge performance and self learning process.

Though measuring the effectiveness of the program has been a difficult challenge, GE Oil & Gas measured not the outputs of the process but its outcome to activate a sustainable and sustained continuous improvement process.

## **1. The background**

With more than 12,000 employees operating in 70 countries worldwide, GE's Oil & Gas business is a global player in the supply of technology-based equipment and services for the entire oil and gas industry – from drilling and production, transportation, refining, processing, petrochemicals and plastics.

To provide solutions aimed at enhancing the equipment efficiency and performance, GE Oil & Gas has set up a Business Unit, GE Oil & Gas Global Services, whose activities include contractual services, equipment upgrade solutions parts, repairs and field services, pipeline inspection and integrity services.

Therefore, the work scope can vary from on-site technical assistance, installation, commissioning, maintenance, full turnkey services, as well as project management, and the related activities vary from mechanical, to electrical, to instrumental.

Also, the activities are carried out in different working environments, due to different and often severe climate conditions, varying from desert to arctic climates, and due to the fact that they are performed in different kind of plants, such as in petrochemical plants, offshore platforms, LNG plant, re-injection units and pipeline compressor station operated by National Oil Companies and International Oil Companies.

Contributor factors to overall risk ranking can be segmented in three parts:

- a) the “job task” risks, meaning the risks that are strictly related to the activities that are going to be performed,
- b) the risks undertaken because the working environment is highly variable, due to:
  - different and extremely severe climate conditions;
  - different characteristics of the plants where the activities are performed (different processes, characteristics of the processed fluids, machinery layout);
  - different Health and Safety Management System, even if virtually all companies within the oil and gas industry employ management systems as a principal means of achieving continuous improvement of business performance;
- c) the non-homogeneous background of the manpower.

As a consequence, the hazards, risks, and mitigation measures may vary significantly, and the evaluation has to be project and site-specific, yet meeting GE Oil & Gas safety standards.

## **2. Risk Assessment**

In 2008 GE Oil & Gas has started to implement an excellence path with the final target to cover complex maintenance activities at customer sites, aiming at improving performance indicators, customer satisfaction, and EHS performance as well.

Regarding the EHS performance, the goals have been pursued through an extensive activity of Operative Risk Assessment: all the projects activities have been covered by both site-specific and task-specific risk evaluation.

As a risk assessment method, GE Oil & Gas has implemented a Job Safety Analysis process, a proactive technique to identify, analyse, and record (1) the steps involved in a specific operating procedure, (2) the existing or potential safety and health hazards associated with each step, and (3) the recommended action(s)/procedure(s) that will eliminate, reduce, or mitigate these hazards and the risk of workplace injury or illness.

The Job Safety Analysis is a circular improvement process that starts with collecting stakeholders (workforce, customers, and contractors) operative knowledge and goes on giving them back knowledge and awareness on the evaluated hazards and risks. The increased operative knowledge and awareness improves EHS organizational skills and performance and the self-learning process.

Collecting all the categories operative knowledge is invaluable for finding hazards since they all have a different and unique perspective of the job. Involving all the stakeholders

will help minimize oversights, ensure a quality analysis, and get all of them to “buy in” to the solutions because they will share ownership in their safety and health program.

The representatives of the workforce, customer, and contractors brainstorm for ideas to eliminate, minimize, or control the hazards they know exist in their current work and surrounding. In the hazard identification process, the history of accidents and occupational illnesses that needed treatment, losses that required repair or replacement, and any “near misses” have to be accounted for.

In conducting the Job Safety Analysis, GE Oil & Gas does not account only for the job steps, but also for the undesired behaviours that can be associated to that specific job step, and the interactions between the workers and the working environment.

Heinrich's triangle suggests that for every 330 unsafe acts, 29 will result in minor accident and 1 in a major accident. Over an extended period of time, therefore, the lack of any injuries for those who are consistently unsafe is actually reinforcing the very behaviours that have the chances to lead them to be seriously injured.

GE Oil & Gas has taken advantage from the brainstorming dedicated to the JSA process to focus on stakeholder’s safety behaviours. In this way, the stakeholders are given responsibility and authority for identifying, defining, and monitoring their own safe and unsafe behaviours, as well as setting their own 'safety improvement' targets. As a result, workgroups are able to redefine their own safety related 'norms' in an enabling atmosphere. In this way a 'blame free' pro-active safety culture is created that is so vital for long-term success.

The JSA process output are tables that are used to train the workers and set methods to conduct safe operations. The following figure shows an example of the JSA process output.






Basic Job Steps	Potential Hazard	Hazard Controls / Preventive & Protective Measures
01. Install the scaffolding, to remove the ventilation unit skid and exhaust duct.	01.1. Falling Objects 	01.1.1 Delimit the working area and put warning signs, do not transit under suspended loads, use appropriate handling equipment, avoid manual positioning of elements
		01.1.2 Make sure that all tools are tied up with lanyard and use tool-bags or basket
	01.2. Falling from height 	01.2.1 Handrail and toe boards or full body safety harness and lanyard with shock absorber mechanism attached to an HLL (Horizontal Life Line) shall be used when working at height
		01.2.2 Use anti fall devices (Full Body Safety Harness), if necessary
	01.3. Manual handling injuries 	01.3.1 Avoid sharp edges
		01.3.2 Proper tools inspection shall be carried out before starting to work
	01.4. Ergonomics 	01.3.3 Use appropriate tools in appropriate way
		01.4.1 Avoid repetitive and forceful actions
		01.4.2 Make sure to perform the job in a correct position
	01.5. Unsafe Behaviors 	01.5.1 Follow the talk box meeting instructions
		01.5.2 Use properly and do not modify PPEs, tools and machinery expected for the activities
		01.5.3 Respect the delimited areas, the safety signs, the PTW, the customer's internal rules and the GE Oil&Gas procedures

Figure 1 - JSA output example

Before each shift, the EHS Representative present on site, carries out the workers induction on the ground of the JSA results, highlighting the importance of conducting safely and stressing all the risks listed in the JSAs, and collecting their comments for future improvements.

### **3. Outcome measurement**

GE Oil & Gas decided to measure not the outputs of the process i.e., the quality of the JSA cards produced, but its outcome i.e., the actual safety management process goals, to activate a sustainable continuous improvement process.

The ultimate goal of the safety management process improvement is a decrease of the number of the injuries/near misses.

To evaluate the outcome of the process, GE Oil & Gas decided to monitor (i) direct parameters, such as the sites EHS performances, and (ii) indirect parameters, such as management parameters (increasing productivity, increasing communication, or improving relationships).

With regard to the direct parameters, the JSA process implementation brought excellent results in EHS lagging indicators (i.e., the parameters that are a consequence of a process). The lagging indicators GE Oil & Gas accounted for are Lost Time Injuries (LTI) and Total Recordable Incidents (TRI).

In 2008 the implementation of JSA process has brought to Zero (0) LTI and Zero TRI in 250.000 hours worked by both GE Oil & Gas employees and subcontractors; in 2009 the number of worked hours without LTI or TRI has increased up to 500.000 worked hours.

In some sites, covered by JSAs since 2004, 1.000.000 hours have been worked by GE Oil & Gas employees without LTI or RTI.

With regard to indirect parameters, the introduction of JSAs had a positive impact on productivity.

JSAs prepared by GE Oil & Gas following the process specified above improved the communication of risks introduced by maintenance activities at customer site, giving to customers an effective tool to coordinate contractors and operations. GE Oil & Gas has evidence that our customers saved up to 50% in Permit to Work issuing process and management. This resulted in a reduction of plant's shutdown duration with positive impacts on operation's performances (especially in LNG plants) and reduction of maintenance costs.

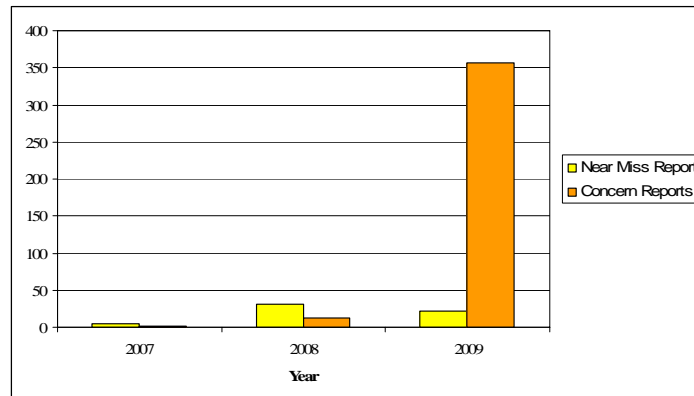
Other indirect parameters GE Oil & Gas decided to monitor is the increasing communication, or improving relationships amongst stakeholders.

The introduction of JSAs process, in some cases, gave GE Oil & Gas the opportunity to open new communication channel with the customers, other than the JSAs-specific ones. Dedicated EHS workout has been planned at different stages of the projects to cover a wider range of EHS deliverables and topics (i.e. safe/unsafe behaviors and the presence of an EHS dedicated resources on the project).

In addition to the above, both internal communications and EHS awareness of GE Oil & Gas personnel working at customer site, improved significantly since the JSA process took place. The evidence of what has been said is the terrific increase in formal safety concerns reported by the workforce from 2007 to 31/10/2009.

One of the driver of safety awareness boost has been identified in the proactive participation of project's team members to risk assessment sessions (JSAs), so that risky/unsafe situation/behaviors have been actually perceived so, and than communicated.

Figure 2 shows the data above presented.



*Figure 2 – Increase in Concern Reports*

#### **4. Conclusions**

By extensively applying an operative Risk Assessment method, the Job Safety Analysis, GE Oil & Gas Field Activities have achieved a significant improvement in the safety management process and its practical implementation. In particular, a considerable number of hours have been worked by both GE Oil & Gas personnel and subcontractors without LTI or TRI, and also indirect parameter, such as management parameters (increasing productivity, increasing communication, or improving relationships) have improved.

The Risk Assessment method foresees brainstorming sessions where all the stakeholders can put together their own operative knowledge improving the EHS risks awareness.

The outcome results of the measured parameters have been presented.

#### **References**

OHSAS Publication 3071 – Job Safety Analysis

OGP – International Association on Oil & Gas Producers - Safety Performance Indicators 2008

GE Health and Safety Framework.