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Quality, Health, Safety and Environment Management in Geothermal Aerated Fluids Drilling Operations in Asia Pacific

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ABSTRACT

The management of quality, health, safety and environmental (QHSE) issues in geothermal aerated fluids drilling operations are distinct from those of other controlled pressure drilling operations that are geared towards the oil and gas industry. Differences in the operational set-up and complexity of geothermal aerated fluids drilling operations, as well as the involvement of equipment that are distinct and specific to this type of application, require QHSE initiatives that are specifically designed for these kinds of projects. This paper presents the programs that have been implemented to help ensure that all issues related to QHSE are managed properly in geothermal aerated fluids drilling operations in the Asia Pacific region, more particularly in Indonesia and the Philippines. The results of these initiatives are also provided for the purpose of evaluating their effectiveness.

1. INTRODUCTION

Controlled pressure drilling (CPD) methods utilize a closed and pressurized wellbore by utilizing a rotating control device (RCD) to close the well at surface, thereby allowing for greater and more precise control over the pressure profile of the well, which can be used to increase the efficiency and effectiveness of drilling operations. One of the main types of CPD methods is air drilling (AD), which is mainly geared towards increasing the rate of penetration.

Air drilling, which is the application of air, mist, aerated liquid or foam fluid systems to lower the density of the drilling fluid, is a widely accepted technique for drilling oil and gas wells, but has also been largely used to assist in geothermal well construction operations.

The use of air drilling in the geothermal setting removes flammability issues specific to hydrocarbons in oil and gas drilling, but also introduces risks pertinent to geothermal operations, which are higher fluid temperatures as well as the presence of hydrogen sulfide.

Special equipment, materials and procedures for geothermal aerated fluid drilling operations are also involved, including the use of geothermal rotating heads, flow tees, flow line and accompanying flowline choke and manual valves, as well as separators, mist pumps, chemical injections pumps and high-temperature corrosion inhibitors and foam systems. For reference, a sample process flow diagram of a typical geothermal aerated fluids drilling operation is provided in Figure 1.

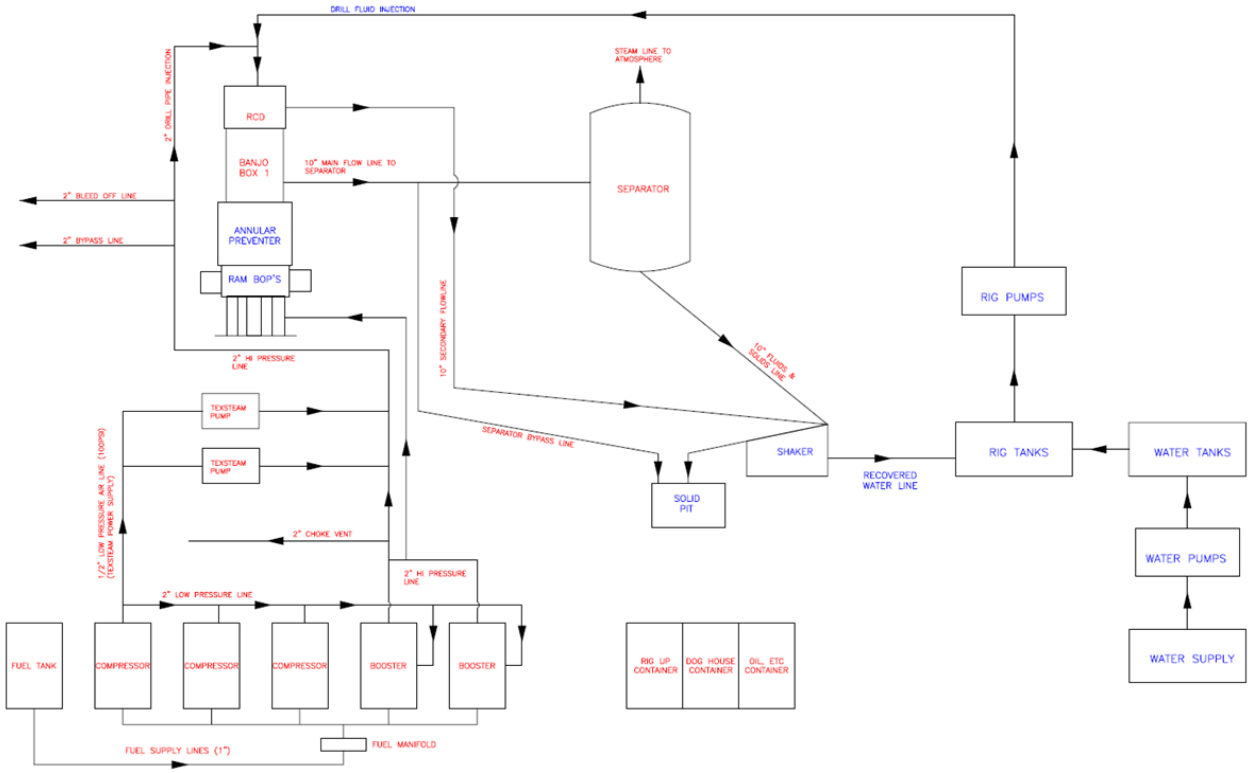

Figure 1: Sample Process Flow Diagram of a Geothermal Aerated Fluids Drilling Operation.

These differences in the operational set-up and complexity of geothermal aerated fluids drilling operations, as well as the involvement of equipment that are distinct and specific to this type of application, require quality, health, safety and environmental (QHSE) initiatives that are specifically designed for these kinds of projects. The QHSE management process for CPD projects and the initiatives specific to aerated fluid drilling projects in the Asia Pacific region are provided in the next section for reference and comparison, respectively.

2. QHSE PLANNING AND MANAGEMENT

The QHSE planning and management process for CPD projects basically involves a review of leadership and commitment in terms of QHSE matters, followed by a description of the QHSE organization, its responsibilities, resources and documentation. A hazards & effects management process (is then followed, which then leads to the development of the QHSE plan and procedures, and the resultant implementation, monitoring and corrective actions. Audit and review provisions are also mentioned in the process. The end view of this process is to create a project-specific QHSE plan that will describe how the aerated fluids drilling contractor will manage QHSE issues on the well sites where they will assist, the client and the drilling contractor in achieving the drilling objectives.

The CPD QHSE plan also serves to harmonize the safety programs of the client and the drilling contractor with that of the aerated fluids drilling service provider.

In addition to this, the development of an aerated fluids drilling QHSE plan also highlights the application-specific QHSE programs that are primarily geared towards ensuring that issues related to the geothermal application of aerated drilling are properly addressed.

QHSE plans and programs for geothermal aerated fluids drilling projects in the Asia Pacific region, particularly those in Indonesia and the Philippines, have been developed and implemented since the year 2003. The results of the implementation and maintenance of the said QHSE plans and programs have been largely successful. The vital components and major initiatives of the QHSE programs are provided in the next section.

3. QHSE INITIATIVES IN AERATED FLUIDS DRILLING OPERATIONS

The key QHSE initiatives involved in the QHSE management program for aerated fluids drilling operations are as follows:

3.1 Client Involvement in Development of QHSE Plan

The QHSE plan developed is reviewed and approved by management, as well as by the client, and this matter is communicated to the project executor. The QHSE plan contains the bridging document for understanding the client's HSE rules and synchronizes with our internal QHSE SOP and policy, therefore making our team and management aware of the client's operation excellence requirements and record for the implementation of the safety programs at site.

3.2 HAZOP/ HAZID Implementation

A vital component of the QHSE plan is the conduct of a hazard identification (HAZID) and hazard operability (HAZOP) exercises specific to the geothermal aerated fluids drilling operation, as well as to the project being implemented. This ensures that all the hazards related to the use of aerated fluids drilling equipment and procedures are addressed. A process and instrumentation diagram (P&ID) with HAZOP nodes for a geothermal aerated fluid drilling operation in the Philippines is shown in Figure 2.

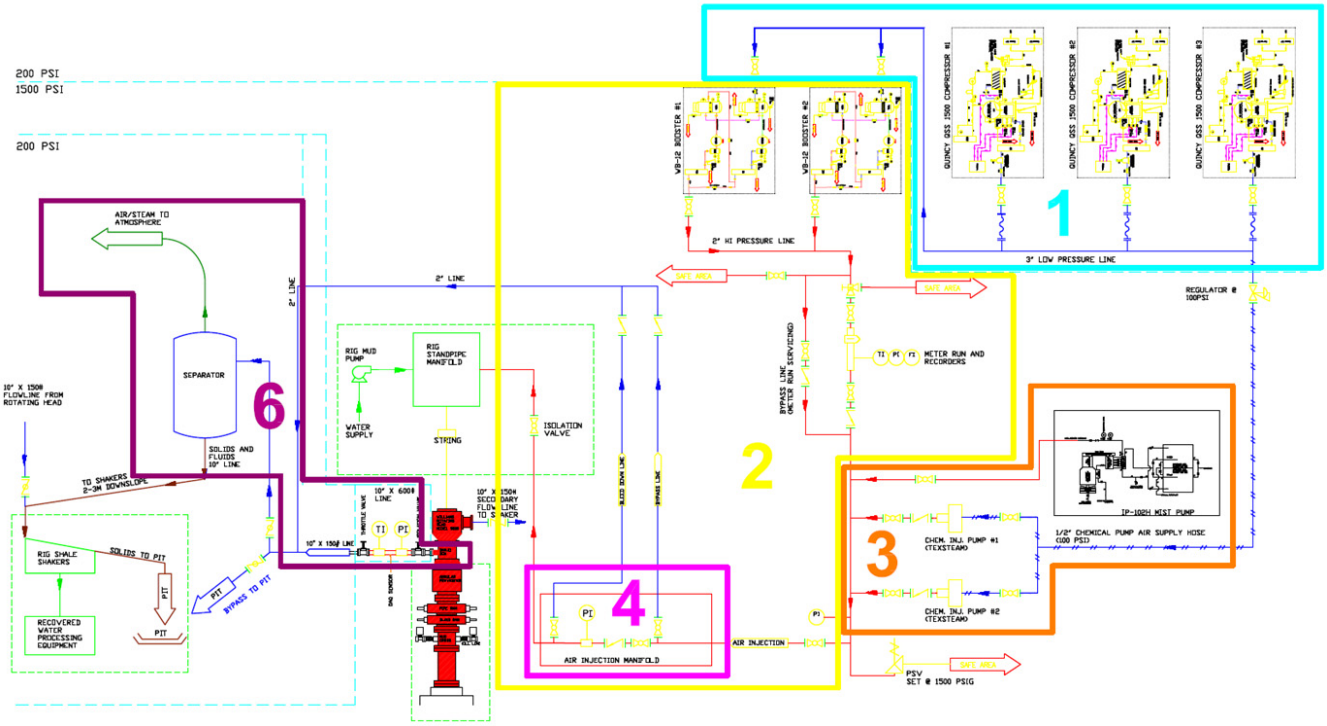

Figure 2: P&ID with HAZOP Nodes for a Geothermal Aerated Fluid Drilling Operation.

For an broader risk management perspective, Figure 3 provides the overall operation risk management process, inclusive of the HAZID and HAZOP, used for the identification of all the risks involved in the operation, as well as the outputs that can be generated to address these risks.

3.3 Internal Training Delivery

Internal training is largely focused on behavioral safety and the utilization of safety observation cards and reports in order to apply behavioral psychology in promoting safe behavior in the workplace using employee involvement. It involves initially identifying practices critical to reducing the risk of injury. These practices are compiled into a checklist that employees use to collect data on safe and unsafe practices within the organization. These observations create an opportunity for "mini safety meetings" so that multiple safety-focused interactions occur throughout the day. Employee teams analyze their observation data to develop action plans that promote continuous improvement in safety.

Other internal safety training courses provided include H_2S safety, confined space entry, first aid and fire fighting training sessions. Safety training modules for rigging and lifting training and hand safety training are also delivered, as well as equipment and tools training, emphasizing on the risks associated with their operation. Defensive driving training is also delivered in conjunction with the driving safety program of the client company and that of the rig. Training courses communicating the safety culture of the company are also delivered to rigsite personnel on a consistent and regular basis.

3.4 QHSE Job Package Implementation

A QHSE job package consisting of QHSE statistic records and forms for management of change, corrective and preventive action report, equipment failure report, lesson learned report, incident investigation report, toolbox minutes, end of well report, is provided to rigsite personnel for reference and utilization during the implementation of the QHSE plan.

The QHSE job package creates personnel ownership by working with a team of personnel to plan and implement the process. It allows personnel can participate in recording QHSE program implementation and the resulting data can be utilized to develop action plans to address hazards and encourage safe work practices.

3.5. Other Initiatives

Other initiatives include the conduct of QHSE and Operational audits, the enhancement of communication on QHSE and operational matters and the monitoring and measurement of project key performance indicators (KPI).

The following parameters are also monitored by both the client and the service company in relation to the implementation of the QHSE Plan, particularly manpower quantity, operating manpower working days, standby hours, man-hours calculation, kilometers driven, motor vehicular accidents, lost time incident, medical treatment case, total recordable incident rate (TRIR), HSE trainings, safety observation cards, safety observation awards, job safety analysis issued, permit to work issued, internal safety meeting, QHSE audits and management participation / audit.

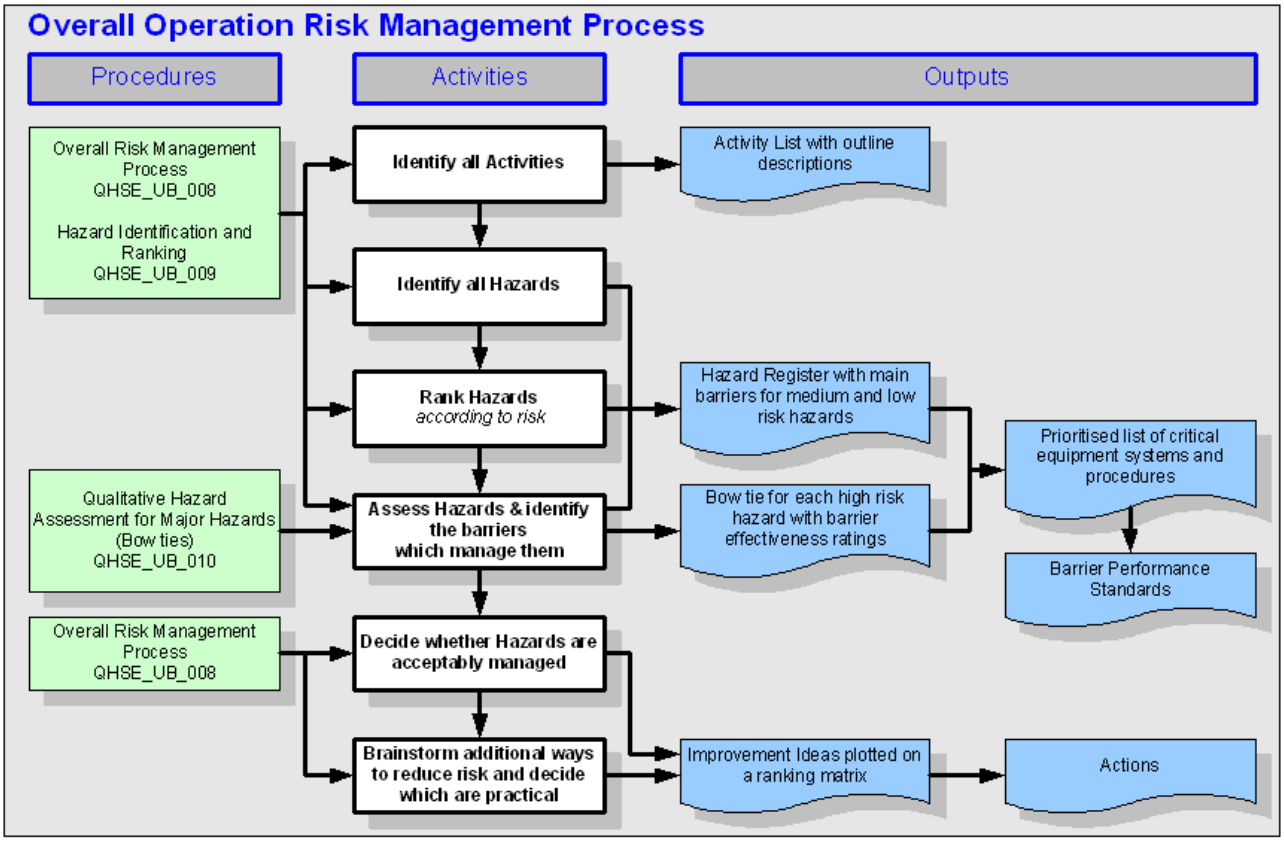

Figure 3: Overall Risk Management Process.

4. QHSE MANAGEMENT RESULTS

The QHSE management initiatives that have been implemented in the geothermal aerated fluids drilling operations that have been conducted in the Asia Pacific region from 2003 up to the present have been effective, as proven by the QHSE accomplishments that have been logged during the course of the implementation of the QHSE plan and programs.

Since 2003, more than 1,200 days of geothermal aerated fluids drilling operations has been recorded with zero LTI (lost time incident) and TRIR (zero medical treatment case, zero first aid case) and zero NPT (Non-Productive Time). This statistic is inclusive of all geothermal aerated fluids drilling operations in the Philippines and Indonesia.

Other achievements attributable to the program include the consistent and exemplary participation of personnel in the on-site safety observation cards system, as proven by the constant stream of awards given to the members of the aerated fluids drilling crew on location for having written the best safety observation for the week, month or quarter since 2006. It has also led to the service company having been given the best score among all the sub-contractors in a QHSE management system audit conducted by one of the clients. These QHSE achievements have also elevated the company as a permanent member of the Wellsite Safety Committee of the client beginning 2006.

5. CONCLUSION

The management of QHSE issues in geothermal aerated fluids drilling operations requires initiatives, plans and programs that are specifically designed for these kinds of projects. QHSE programs that have been implemented in geothermal aerated fluids drilling operations that have been conducted in the Asia Pacific region, particularly in Indonesia and the Philippines, are presented with the end view of featuring how QHSE initiatives were developed for this particular application. It also shows how these have been implemented to produce quantifiable and verifiable results, such as recording more than 1,200 days of geothermal aerated fluids drilling operations with zero LTI (lost time incident) and TRIR (zero medical treatment case, zero first aid case) and zero NPT (Non-Productive Time), thereby proving the effectiveness of the QHSE management initiatives that have been implemented.

REFERENCES

International Association of Drilling Contractors. Underbalanced and Managed Pressure Drilling Operations – HSE Planning Guidelines. Revision 1 (2007).

Weatherford. Weatherford Global Safety Manual. June 27, 2006 version (2006).