# Enhanced Safety for Cable Ship Operations Based on Oil and Gas Practices

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**Abstract:** Sub sea Telecom connectivity for Oil and gas platforms has developed into an emerging market for the cable industry. Traditional cable operations have come under intense scrutiny and transformation to enable compliance with the stringent safety policies of the Oil & Gas industry.
This paper will review the various safety practices required to operate in this environment. We will analyze how these practices can be integrated into traditional cable practices and how implementation can impact safety culture ashore and at sea.
The following practices will be discussed and how they can enhance company wide safety procedures and protocols.

Safety Management and Administration
- EHS Policy
- Strong SMS
- Stop Work Authority
- Incident Investigation and Corrective Action Systems

Hazard & Risk Identification & Control
- Project Risk Analysis
- HAZID
- JSEA
- Workplace Inspections
- BBS

Specific Risk Control Programs
- Permit to Work System (includes hot-work & confined space)
- Lifting Device Safety
- PPE
- Electrical Safety

Emergency Preparedness & Response
- Emergency Procedures/Casualty Response
- DP 2 Operations

Training and Communication
- General Training Programs
- Project Specific Training
- JSEA/Toolbox Talks

Program Evaluation, Metrics, and Reporting
- Project Metrics and Leading Indicators

 

- Contractor Evaluation
- Evaluation feedback loops and program improvement

This paper will conclude with recommendations for Safety practices and how to best implement them to optimize their value during cable operations world-wide.

## 1. INTRODUCTION

Sub sea Telecom connectivity for Oil and Gas platforms has developed into an emerging market for the cable industry. Traditional cable operations have come under intense scrutiny and transformation to enable compliance with the stringent safety policies of the facility owners and operators.

This paper will review the various safety practices required to operate in this environment. We will analyze how these practices can be integrated into traditional cable practices and how implementation can impact safety culture ashore and at sea.

The Development of cable operations in the oil and gas industry demands a higher degree of preparation and risk assessment than that of typical cable operations. Mitigating the increased hazards of operating a large cable ship in the vicinity of an even larger more costly platform or drill ship is paramount. An accident can quickly become catastrophic in proportion costing lives and revenue loss. The scope of work must consider the environmental consequence of possible damage to any element of the field infrastructure. Cable operations in an offshore oil field must be prepared for numerous obstructions on the seabed (i.e. pipe lines, flow lines, umbilical's, wellheads, and subsea controls). Cable operations within the oil field typically require a Remote Operated Vehicle (ROV) support vessel to work in close proximity to the cable ship, and facility, with the ROV maneuvering among pipelines and other seabed assets. The multi-vessel operations require close coordination between the dedicated cable vessels and the vessels supporting the ongoing oil and gas production. There are certifications, trials, audits and procedures that are required by the facility owner, in addition to the extensive list of certificates and audits required by the International Maritime Organization, Flag State and Classification Societies.

The commitment of an oil company to develop a deepwater oil exploration project requires a substantial investment. The process starts with exploration and leads to production activities that could take a decade to complete and reach costs in the multi billon dollar range with no guarantee of success. Modern oil platforms cost several hundred million dollars to build and drilling ships can command daily rates approaching $500,000. With such astronomical sums of money invested, the detailed attention to safety, risk assessment and accident prevention becomes vital. These processes are stringently adhered to throughout the Industry's day - to - day operations whether in the home office, refinery or on the platform.

## 2. SAFETY MANAGEMENT AND ADMINISTRATION

The acceptance of a contractor starts many months in advance of the planned operations. Prior to performing offshore work in the oil and gas industry, the contractor must have their Health, Environment and Safety Plan (HES) evaluated and it must be consistent with the oil company's HES.

Acceptance commences with the formation of a Contractor Safety Leadership Team. This group will work with the contractor to

 

fulfill the requirements of the oil company's HES plan. The team will then set the schedule and strategy for the contractor to reach safety metrics targets. Risk assessments for the work are conducted by the team which then communicates the HES expectations and requirements to the contractor. An evaluation is made to determine what changes or additions to the contractor's HES plan are required. Many of the requirements are already in place and documented for a submarine cable services company whose vessels are in compliance with International Maritime Law.

The oil company's team will then begin the process of gathering and evaluating qualification data provided by the contractor. The data gathered is checked for conflicting or misleading information. An audit is then scheduled to validate the qualifying information and contractor's HES compliance. This audit consists of a review of associated documents, management reviews and an onsite visit. At the conclusion of the audit, the contractor is then assigned a HES rating which determines where the provider stands within the company's HES system and what mitigation plans or corrective actions if any, must be taken prior to the start of work.

All registered ocean-going vessels must be inspected and audited regularly to meet the requirements of international and national standards in order to keep their certification current. Regardless of this being done and documented, the oil and gas industry will perform similar inspections/audits within a pre-determined timeframe. The standard inspection document for vessels operating in the oil field is the Common Marine Inspection Document (CMID). The CMID is drawn up from the International Marine Contractors Association (IMCA) which is the international trade association representing offshore, marine and underwater marine engineering companies. IMCA places particular emphasis on promoting improvements in quality, health, safety, environmental and technical standards. A sampling of the CMID inspection items are a review of the vessel's documentation, International Safety Management Code (ISM) and HES compliance, crew qualifications, firefighting and lifesaving appliances, pollution prevention, bridge and machinery space equipment and construction standards. The CMID audit is often supplemented by additional requirements from the oil company that may require crane operators to be certified; short service employees identified and company specific procedure, process, and documentation in place.

In addition to the CMID audit, annual Dynamic Positioning (DP) trials are also required. Prior to delivery, a vessel equipped with dynamic positioning will undergo an extensive Failure Mode and Effects Analysis (FMEA) test. The objective of the FMEA is to identify the failures and their effects on the position keeping performance of the vessel. Cable ships can not reliably perform plowing and ROV operations as well as safely operate near shore without DP. Vessels classed DP2 have redundant systems so that no single failure of an engineering component should result in a complete blackout of the vessel or loss of position. The need for operational redundancy is perhaps the most important of all the safety requirements imposed by the oil and gas industry. A loss of position or propulsion by a large cable ship with a resulting collision would be catastrophic. An annual trial of the DP system by an independent contractor helps to ensure that vessels are properly prepared and tested prior to operating in the oil field.

Once the contractor has provided any plan changes and implemented corrective actions to the satisfaction of the Contractor Safety Leadership Team and an acceptance

 

HES rating is assigned to the contractor. The team will proceed formalizing the acceptance of the contractor and communicate the expectations and accountability for the contractor's services. Pre-Job meetings are scheduled to ensure the commitment to safety and to establish the HES expectations and complete scope of work for the contractor's services. A Project Safety Plan is implemented by the company and the contractor which along with setting the HES expectations, describes the processes of the work and assigns responsibilities to the appropriate personnel.

After the Project Safety Plan is developed, more detailed aspects of the contractor's work are evaluated. A complete work plan is drawn up and reviewed including material handling plans and near miss and incident reporting. Contracted personnel performing the work must have required training validated and orientations to the company's working practices scheduled. The company will give overall training to the entire vessel's crew concerning communications and the authority to stop work should any unsafe situation arise. Any short service employees defined as personnel working for the contractor for less than six months are identified, managed and trained.

There are a number of programs, procedures and processes that must be in place before starting any work.

The oil and gas industry requires that a Behavior Based Safety Program (BBS) be in place. The heart of the program is the ability for any person to stop work if an unsafe situation develops without repercussions for doing so. The BBS must include a data sheet with critical behaviors that are listed on a Safety Observation Card. The critical behaviors used for BBS are listed as:

- PPE usage
- Tools and Equipment
- Proper Procedures
- Environment
- Other

After a Safety Observation Card and procedure is prepared by the contractor:

1. Training is held with all personnel on the use of the Safety Observation Card and on the observation process.
2. Safety Observation Cards are distributed to work areas and personnel for use.
3. Feedback to personnel involved after observations are recorded (the observer is expected to have a discussion with the observed).
4. Data collection and trend analysis is performed to determine if a specific part of the safety system or procedure requires further investigation or update.
5. Action plans are then created to address unsafe trends and behaviors.
6. Follow up to the action plan is implemented to ensure the closure of all actions.

This procedure provides for continual analysis and safety improvement on a real time basis to reduce the possibility of an incident.

In addition to the HES Project Safety Plans and Behavior Based Safety Program, Hazard Identification (HAZID), Job Safety Analysis (JSAs), and Toolbox Talks are required to be implemented.

Hazard identification or HAZID is a process that applies a structured approach to the identification of potential hazards for the entire scope of work. The HAZID methodology involves assembling a team of experienced engineers, operators and representatives that encompasses all disciplines. This review attempts to list the potential risks associated with each

 

operation. The summary of discussions is recorded and a risk assessment matrix with safeguards to the hazards is completed. The risk assessment matrix is a table used to score the identified hazards severity. Any hazard with an elevated score will be reevaluated for additional safeguards added to reduce any risk.

Examples of HAZID items that would have a high level of importance include:

1. Inclement weather: safe working sea states, decision process for stopping work, escape routes, hurricane action plans
2. Dropped Objects: risk of damage to existing seabed structures
3. System or Machinery Failures: Cable machinery or DP failures, navigational system failures, spares onboard, redundant systems
4. Shipboard and Ship-to-ship communications: loss of communications between vessels, decision process for stopping work, redundant systems available

The next phase is the creation of the JSAs. A JSA describes job tasks step-by-step, identifies associated hazards at each step, and outlines proper hazard controls that minimize the risk of injury to the individual(s) performing that task. An example of the jobs requiring JSAs are the installation of mattresses, deployment pallets and fusible links.

Finally, personnel reporting to work receive a Tool Box Talk at the beginning of each shift. This discussion describes the anticipated work that will be performed on that shift and any special requirements such as proper PPE or specialized instructions. The JSAs and Toolbox Talks are in addition to the established contractor procedures that cover confined space entry, hot work or unregulated permits to work that are dictated by the contractors HSE plan.

## 2. SPECIFIC RISK CONTROL PROGRAMS

There are several risk control programs specific to cable operations in a deepwater oil field. Installation work in these areas often involves a ROV equipped support vessel to monitor precision placement of subsea assets. This monitoring may involve both vessels operating in close proximity to a platform or drill ship. These procedures to safely perform the work are known as Simultaneous Operations or SIMOPS. SIMOPS describes the responsibilities of the Captains and Engineers in Charge on the vessels as well as the Offshore Installation Manager (OIM). The OIM has the authority to postpone work or place limitations on the vessels working in the vicinity of the platform for weather conditions or other circumstances. The OIM must also coordinate the installation work with any arriving vessels to the platform. Participation in a daily SIMOPS conference call is mandatory for all vessels, platforms and drill ships. The call describes the details of the anticipated activities of the day as well as discussions of operational changes or weather forecasts. In conjunction with the SIMOPS call, there is SIMOPS document which describes the installation of the cable and seabed equipment, as well as graphics that outline the separation between the vessels and seabed assets. Emergency responsibilities are detailed for each vessel during cable deployment to ensure safe exit from the operating area.

As stated previously a vessel's DP system is tested annually when work is performed in a deepwater oilfield. Prior to a cable ship entering within 500 meters of an offshore installation, special protocol and hazard mitigations must be performed to minimize risk to the installation. Entrance into the 500 meter safety zone needs to be well planned, executed and documented. There are additional precautions taken by

 

the vessel which include manning the engine room, enabling redundant power and propulsion systems and allowing time for the DP to acquire a model from existing conditions. When the vessel is in close proximity to the installation, DP warnings and alarms for positioning and heading must be properly set so they alert the DP operator of any changes. This will ensures adequate safety margins to allow for appropriate action. Typically two certified DP operators are required to be on the bridge when the vessel is operating within the 500 meter zone. DP certification requires a deck officer to first complete an Induction Class along with 30 days of observation time. After the initial training period, the Deck Officer must take an Advanced DP class. The officer will only be eligible for full DP certification once he has taken the advanced DP class and has 6 months of operational experience validated by the Captain.

## 4. CONCLUSION

There are many additional requirements for a cable ship operator to work in the oil and gas industry that involve significant investments of time, effort and capital. Weeks are spent in preparation within the company's departments to ensure the requirements are met. The HES supervisors and Designated Person must author and document the HES plan, the BBS plan and the SMS additions. The shipboard supervisors must then train the crew in these additional protocols. Project Engineers and Managers workup extensive Project Risk Analysis and HAZIDs to identify and mitigate all possible risks during each phase of an installation. Operations and Engineering must ensure the vessel's annual DP trials and CMID inspection are carried out. The company must ensure that the DP operators are certified by attending the required classes and obtaining operational experience.

The increased costs of preparing the company, vessels and crews for oil and gas work should be viewed as an investment. The implementation of HES policies adopted during the past two years has seen a significant decrease in both Total Recordable Injuries and Lost Time Injuries throughout the fleet. The annual DP trials and CMID inspection test the functionality of the ship systems and allow the crew to review procedures and experience tests in a controlled, real time environment. An officer with a DP certificate is recognized as trained and experienced in the safe and efficient operation of a vessel.

The onboard Safety Culture has been strengthened with all crewmembers participating in and taking ownership of the additional HES programs. Crews that have been closely instructed in their duties concerning work in which a JSA has been implemented are more likely to intelligently participate in the work at hand. Toolbox talks reinforce the emphasis on situational awareness and the need for personnel to utilize PPE to minimize injuries. Interaction and communication between the office and the fleet has increased with the introduction of these procedures. The requirements implemented by the oil and gas industry are focused on all company personnel working as one team with safe operations as the ultimate goal. The true value of investments made when hazards are identified and mitigated in advance of an unplanned event. The ship's crew and office personnel participating in an active safety culture enable cable operations to become more efficient as accidents, injuries, down time and related costs are reduced.

 