Webinar on Health, Safety & Environment for DSF Operators

Best Practices on HSE: With Rig operations

by

T. K. Sengupta, Director (E&P), FIPI
[Former Director (Offshore) ONGC and Former Chief Well Services, ONGC]

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Importance of HSE in Oil & Gas Industry

• This industry involves high risk activities including but not limited to exploration, production and processing of highly inflammable & explosive materials

• Massive investment with skilled manpower, expensive machineries like rigs, pumps, compressors, processing equipment etc are required

• High investment and medium to long payback period

• Strategic and vital industry for the country

• Environment can be remote, harsh and challenging

• Accident consequences could be catastrophic, in terms of number of casualties, environmental pollution, property damage and reputation damage also
Worst worldwide Oil and Gas Accident

• Piper Alpha platform, UK North Sea
  • Operated by Occidental Petroleum ltd which was producing 10% of North Sea Oil Production exploded in July 1988 killing 167 men . Total loss 3.4 billion USD

• BP Macondo –Deepwater Horizon Rig US GOM
  • Well Blow out in April 2010 in Macondo prospect operated by BP resulting explosion in the semisubmersible rig .11 people lost their live .
  • Oil keep flowing for 87 days until capped in July 2010 resulting estimated total discharge of 4.9 million barrels in Gulf of Mexico ,
  • BP agreed to pay penalty of 18.7 billion USD for damaging environment
Worst Indian Oil & Gas Accident

• Fire at BHN platform of ONGC in July 2005 resulting in loss of 18 persons and loss of entire process complex

• Blow out and fire in ONGC drilling rig at Pasarlapudi in 1995 which could be controlled after 67 days of fire. Though no loss of casualties but entire drilling rig got damaged and environment got affected.

• Blow out and Fire at ONGC offshore rig Sagar Vikas in 1982
Controlling Oil & Gas Hazards

• In general hazard elimination is simply impossible in many cases & that’s why oil & gas industry had been a long time considered as a high risk industry

• However due to its high and strategic value oil & gas experts had developed special engineering to ensure the safety of the industry
  
  • **Process safety:** Focus on preventing fire, explosion accident in process facilities
  
  • **Occupational safety & health:** Focus on the management of personal safety

• Since safety engineering is not sufficient, specific procedures, guidelines and permit to work must be applied for specific activities in the field

• PPE shall be considered as the last protection to human and certain job need special PPE in addition to standard PPE.
Types of Rigs and the Best Practices

• **Drilling rigs** are required for drilling exploratory and development wells in any Oil field exploration and exploitation programme.

• **Workover rigs** are used for Well Servicing and Remedial engineering for production enhancement /production optimisation in the entire life cycle of the well

• As we are addressing today DSF operators, my presentation will be limited to best practices in HSE in Workover Rig Operations
Best Practices in Workover Rigs

• **Workover Best Practices** – Design phase (What is to be done)

• **Workover Procedures** – Execution phase (How to perform workover operations)

• **Workover Rules & Guidelines** - Set of principles as mentioned in SOP

• Workover Best practices need to be developed by every company in the form of a technical document containing engineering solutions and equipment & tools required for workover operations.
Workover Best Practices Methodology

- WO process definition and description
- WO types/categories
- Best Practice content definition
- Development of detailed technology workflows
- Downhole and surface equipment specifications dependent on well conditions
- Quality assurance and HSE requirements
- Technology and technical details and specifications
Onshore Rig

Workover Rigs (Truck Mounted)
Selection of a Workover Rig

Factors influencing the selection of a workover rig:

• The nature of the operation to be conducted e.g. tubing size and hence the suspended weights of the tubing string, pressure control requirements for well re-entry, etc.

• Depth or load capacity (rig capacities are commonly spoken of in terms of depth rating with a particularly size and rig capacity is primarily depends on braking capacity, derrick capacity, and drawworks power.

• Logistical constraints - location of well, proximity to operating company base, availability, space on rig/platform, crane lift capacity.

• Economics - cost, availability and its impact on deferred production.

• Reservoir characteristics (type of fluid, fluid contaminants e.g. H2S content, pressure, temperature, fluid rate, depth of well etc.).
Safety Arrangements

- Ladder
- Fall Prevention Device (FPD)
- Topman Emergency Escape Device (TEED)
- Working Platform
- Hand Rails/Guard Rails
- Toe-Board
- Covers
- Full Body harness
- Safety belt
Rig Operations that can be injurious or fatal

RIG UP & RIG DOWN OPERATION

LIFTING OPERATION
Work Over Fluid

• Work over fluid can be placed in the well bore in either:

  1. Under balanced condition

     The underbalanced or near balance condition is used in low pressure wells to prevent fluid loss and formation damage, in operations like CTU, snubbing, wireline and perforations.

  2. Over balanced condition

     To have positive well pressure control during workover operations, overbalanced fluid is used with special non invading lost circulation materials or compatible clean fluids.
Well Control

- Prevention of kicks by maintaining wellbore hydrostatic pressure equal to or slightly greater than formation pressure
- Early detection of kicks and initiation of corrective action to prevent kicks from developing into uncontrolled flow
- Have always, ready to use, appropriate surface equipment on the rig floor, in case a kick occurs

Well Control Principles

- Interpret surface indicator data correctly.
- Eliminate small problems before they become bigger on the surface
- Determine the controls needed to execute a workover kill operation
- Choose the appropriate well control procedure for a given situation
- Diagnose problems and take corrective action
Well Testing

First activity after completion of drilling for new wells and after re-completion of existing wells.

Objectives

• Identify produced fluids, sample analysis
• Measure reservoir pressure, temperature & evaluate reservoir parameters
• Determine well productivity by flow measurements

Production Testing Surface (PTS) Equipments

• Surface equipment- safe and reliable for
• Quick control of flows / close the well
• Separate the well fluid - oil, gas & water
• Accurate measurement of each
• Collection of surface samples for further analysis
• Dispose off the well fluids in an environmentally safe manner
PTS Equipments

• Control Head / Flow Head/ X-mas tree
• Surface Safety Valve
• Sand Filters / Sand Trap
• Data header
• Choke manifold
• Emergency Shutdown System
• Heat Exchanger
• 3-Phase Horizontal Test Separator
• Gauge / Surge Tank

• Transfer Pump
• Oil & Gas Manifolds
• Oil & Gas Burners
• Piping
• Pneumatic Pump / Chemical Injection Pump
• Air Compressors
**Christmas Tree**

- Tree cap and gauge
- Tree adapter
- Swab valve
- Production wing valve
- Surface choke
- To production facilities
- Upper master valve
- Lower master valve
- Tubing-head adapter
- Production string

**Choke Manifold**
Test Separator
Layout of Production Testing Surface (PTS) equipments

• Equipment layout and spacing in accordance with classified zones.

• Properly grounding of all the PTS equipments.

• Proper anchoring of Piping used in HP wells.

• Colour coding of Piping for different working pressure and fluid flowing through it.

• Gas flare considering wind direction.
Precautions to be taken during erection of equipment & testing

• Within 30 m radius of the X-mas tree should be marked as danger zone with proper warning signs at prominent places. No smoking or open flame in danger zone.

• All electrical equipments should be de-energized in danger zone.

• Earthing of Bunk house and store.

• The separator should be located at a distance of not less than 10 m from the well.

• The open pit and flare should be located at a distance of not less than 45 m from the well.

• No hot work where flammable /combustible materials exist. Relocate work and equipment outside hazardous areas, if possible.

• Keep fire-extinguishing equipment such as water, buckets of sand, portable extinguishers, etc. at work place.

• Deploy personnel (fire watchers) to guard against fire while hot work (welding/cutting/heating) is being performed.
While working on an active well one should know the following symbols:
Personal factors Causing Injuries

The most common causes of hand injuries are:
• Lack of awareness
• Disregard for safety procedures
• Distractions
• Boredom
• Sub-standard Act (say Casual approach)
• Sub-standard Conditions (say Housekeeping, unhygienic habits)
Use PPE and Proper tool to prevent Injuries

• Choose correct Tool for the task.
• Choose correct PPE for the task.
• Adhere to safe work Behaviors while performing the task.
Recruitment, Training and Skill development

• The workover rig crew recruited should be well qualified and have sufficient experience as laid down in the policy of the company.

• The supervisor /driller /production engineer should have complete understanding of all the well related information, reservoir condition, type of fluid, equipment and SOP related to the operation and all the regulatory rules & regulations.

• Training for periodic development is necessary by the operator to upgrade the knowledge of the crew and engineers.

• The best practices of Rig based safe operation should be available with each member of the rig crew.
Thank You