FAMOR
Drilling & Well Control Services

Engineering and Consultancy Service Deliverables

Famor Drilling and Well Control Services (FDS)


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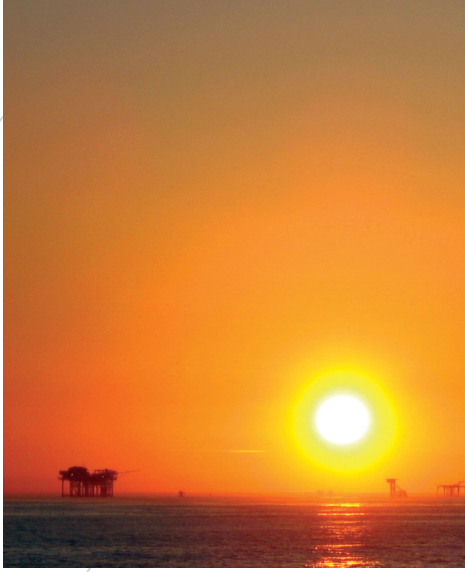


Famor Drilling & Well Control Services

Delivers comprehensive upstream oil and gas engineering, management and operation services supporting both single independent and integrated wellbore drilling, well testing, completion and reservoir management challenges to provide best project engineering and management solutions.

Leading know-how systems spans around well's life cycle to ensure optimized wellbore drilling and maximizing hydrocarbon recovery while securing client's core business and assets. In-house well management systems and proven standards frameworks have been developed and implemented by experienced staff and support associates based on Global Best Practices and worldwide guidelines to assure wellbore drilling efficiency, well productivity and sustainable well project performance.

Integrated Well Engineering & Management System

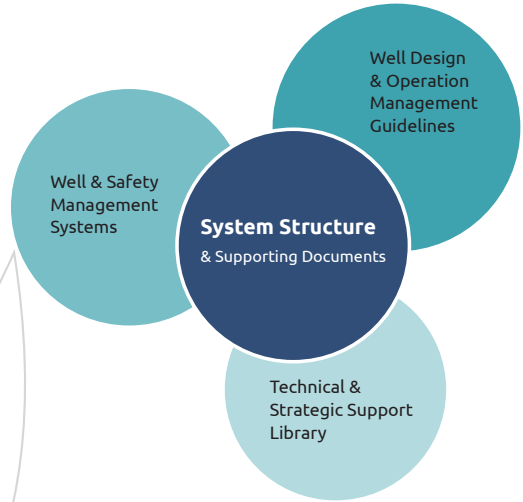
Introduction

Integrated Well Engineering & Management

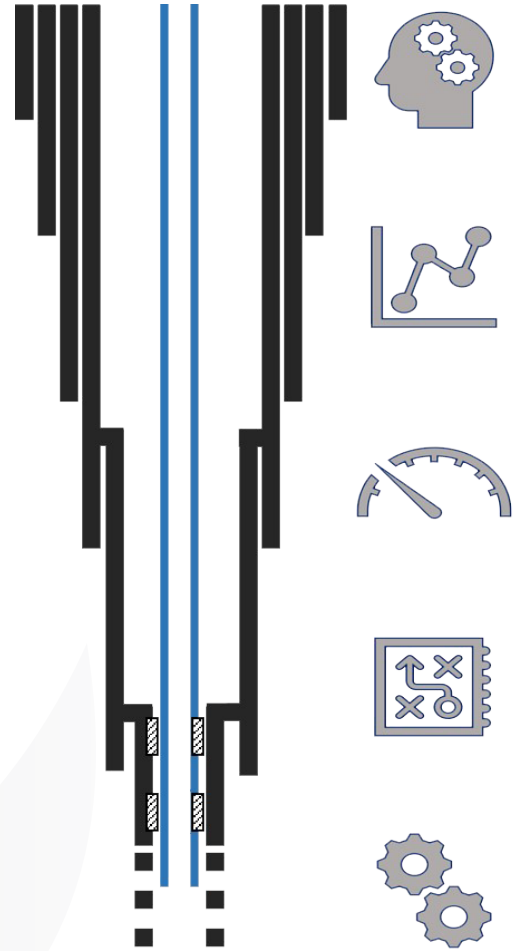
Systems (IWEMS)

Innovative well engineering and management solutions are represented as an independent project assurance and delivery services through different well's life-cycle. Wellbore quality, high performance engineering and safe efficient operation are main principal achievements aligned with industrial codes, standards and best practices through well delivery. Flexible format to be fitted-in with any organization's needs and supporting existing gaps and lacks through drilling, completion and testing to enhance final well program efficiency.

System is developed for both internal and external application; For internal aspects, we follow different guidelines and procedures mentioned in our documents to be fitted like a worldwide service provider company and for external aspects, we ***evaluate clients against established metrics, develop tailored criteria, implement the system***, and finally ***monitor and update the structure.***



Well & Safety Management Systems (WSMS)	is specific organization-wide loss control approach to manage associated and identified risks through different phases of projects. As a comprehensive strategic and tactical solution, SMS will secure not only safety-driven elements, but also assures engineering and operations performance. In well engineering and operations SMS should be defined with flexible elements to be fitted into project as it requires.
Well Design & Operation Management Guidelines	Is prepared to cover general policies, standard compliance and all references applicable to projects. Roles and responsibilities, risk assessment guidance, well examination considerations, well handover and delivery process as per required for different life cycle of the well.
Technical & Strategic Support Library	Provides the main components of detailed designs, safety margins, design factors, best practices, process & procedures, reporting systems, performance monitoring and other relevant parameters and metrics to ensure safe, effective, and efficient delivery.



Well Project Management, Planning & Delivery

Integrated Well Engineering & Management Services

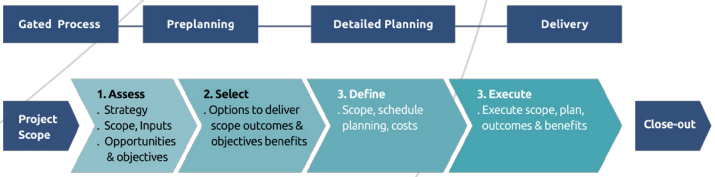
Well Project Management, Planning & Delivery

As the wells are getting deeper and fields getting more complex with increasing trends of uncertain dynamic circumstances, high performing project delivery is becoming a concern for all oil and gas operators. In addition, the rapid growth of technology and project's requirements has created a new challenges for who plan, design, control and execute complex projects.

Innovative well engineering and management solutions are represented as an independent project assurance and delivery services through different well's life-cycle. Wellbore quality, high performance engineering and safe efficient operation are main principal achievements aligned with industrial codes, standards and best practices through well delivery. Flexible format to be fitted-in with any organization's needs and supporting existing gaps and lacks through drilling, testing and completion to enhance final well program efficiency.

FDS provides well project management services and performs as the project prime consultant/contractor under taking various disciplines managed by in-house teams and support associates. Implementing consistent project management approach supported by specific well management system, safety management system and other measures and metrics to develop High-Performance framework with flexible characteristics to be adopted by any project with different level of maturity and complexity.

4-gated Process of Project Management is a strategic system and framework allowing us to assess, select, define and execute based on each specific project's requirements. The presence of 'gates' between phases provide a series of focal points to both manage and control the well design, engineering, planning and project execution through each distinct process gate stages. Each gate is working as checkpoint which requires an input data, well-defined responsibilities and appropriate procedures to make progress resulting in the specific gate's output.



1) Assess;

Preliminary investigations of the opportunity and technical considerations/authorities review for each of G&G, drilling, engineering and commercial. Through this phase, different studies would be conducted to ensure sufficient data and input are available to move on further. This phase output is summarized as ***Statement of Requirement (SoR), Well Proposal*** and ***Pre-drilling Data Package (PDDP).***

2) Select;

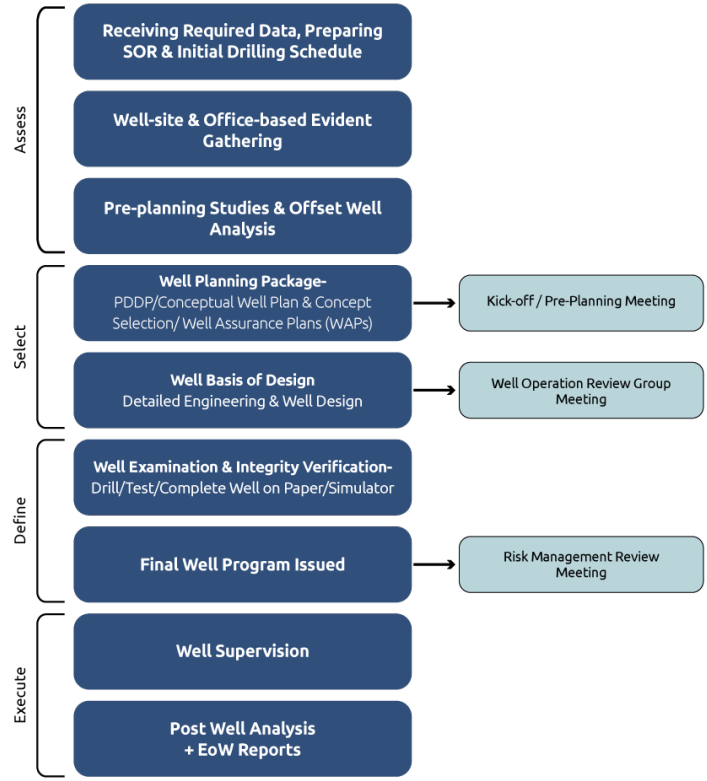
Different options would be reviewed against the well proposal, PDDP and SoR to select the best available concept(s). Technical risk and uncertainty assessment, contingency planning, contract and procurement strategy etc. would be developed and reviewed. After decisions has been made, ***Final Concept of Well Design, Basis of Design (BOD)*** and ***level 1 Project Schedule*** would be delivered.

3) Define;

At this stage, rig contract and audit should be procced by authorities. In addition detailed well design, blowout contingency plans, relief well plan, well drilling program etc. should be prepared well examination and DWOP/DWOS would be conducted and as the result ***AFE*** is issued. From this phase, operational perspectives of project management is concerned.

4) Execute;

Rig would be mobilized and spud in accordance with plans and drilling/well operations would be commenced as per details including each project execution plan. ***Drilling/Well performance monitoring and optimization*** and also periodic ***well examination*** supports the well integrity and project efficiency during this phase. ***Cost Reconciliation*** would be reported and review in addition with project close-out and performance reviews which would be summarized in ***End of Well (EoW), Lessons Learnt*** reports and ***Post Well Analysis.***



Individual Service Deliverables

High Performance Project Management Services;

From Pre-planning Through Complex Well Engineering, Supervision & Delivery.

Comprehensive Studies & Review

Appropriate objective driven studies have to be carried out in accordance with project's definition, complexity level and desired/realistic achievements. Various studies will support fundamental understanding of project, root & latent failure causes and well's characteristics in early planning phase. Famor Drilling & Well Control Services conduct various fit-for-purpose studies through well's life cycle to successfully address different project goals and targets through different stages of field life cycle from drilling to abandonment.

• Pre-planning & Feasibility Studies

Feasibility studies and pre-planning considerations assures project's values with all associated elements and applicable path way to adding these values into our project's goals. Providing sufficient background and conceptual frameworks supported by academic and industry proven techniques should be carried out with respect to project's definition and constraints.

• Offset Well Analysis & Review

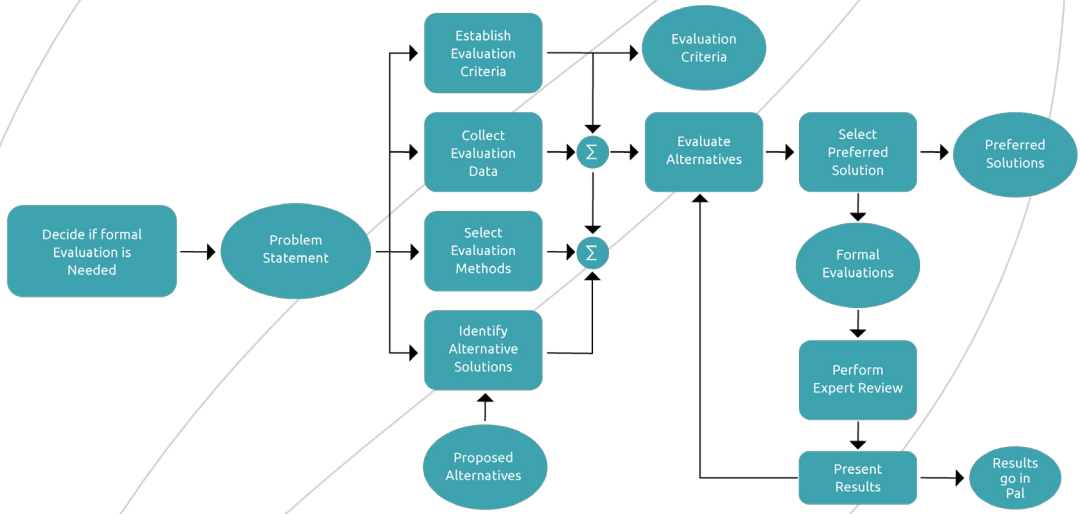
Well's review and studies as the very first essential stage of any project should be carried out to identify various engineering and management failures in addition with operational conflicts. Subsurface and well's team works together to realize geological hazards, drilling/well problems, pressure and temperature regimes, well logs, daily drilling reports, final well reports and formation integrity and stability. Offset and nearby well analysis would be conducted within predetermined Statement of Requirement (SOR) which is received from subsurface teams

• Technical & Economic Trade-off Study

A Trade-off study is giving up one option, strategy etc. to keep another; in more specific terms, trade-off study is a consensual multidisciplinary process to define and analyze available options, minimize variations and select the most appropriate option(s) among a set of proposed viable solutions. Different project's dimensions, definition, objectives, technology applications, etc. will be clearly understand and best available/applicable strategy will be represented and kicked-off with client. In a bigger picture, Trade-off studies are considered as a technique to support Decision Analysis & Resolution (DAR) process. This technique is an iterative cyclic process of decision making which each stage might get addressed as project complexity requires through project life-cycle.

• Decision Analysis & Resolution (DAR)

The purpose of DAR process is to analyze possible decisions using a formal evaluation process that evaluates identified alternatives against established criteria.



This is why,

It is important to carry out appropriate and fit-for-purpose studies

- **Project Definition, Problem Understanding, Goals & Objectives;**
  What are we going to do? *Why* we are heading to this project?

- **Technical & Budget Understanding;**
  What different aspects we have? *What* we need to have in place? *What* inputs we need & *What* outcomes we expecting? All associated risks and hazards are clearly explained and discussed? *With* what resources and references?

- **Strategies & Scheduling;**
  What directions and visions we have? *Is* there any other options available? *How* we need to plan this? *How* long the project will take? *Who* should be assigned for *What* task? Which teams, experts and technology we need?

Well's Life Cycle

Front-end Engineering Design & Detailed Project Planning

Well Engineering, Design & Performance Improvement

FDS represent independent engineering and detailed fit-for-purpose designs following latest worldwide techniques. Different practices utilizing cost-effective technology have tremendous impact on final well program efficiency and productivity. Modern well design and engineering techniques are covering different simple elements through shallow formation drilling, transition zones and reservoir drilling intervals to minimize drilling impacts on formations. In further, performance driven well design is supporting testing technologies, completion and production recovery which results in smooth and integrated well delivery, handover to production team and assure the best of the class well envelope.

Engineering analysis, empirical and mathematical modeling and data analysis are provided by FDS technical teams to provide best of class well engineering solutions and performance improvement techniques. Appropriate metrics are defined to make a better vision of how technical constraints and project complexity should be addressed in matter of proactive engineering analysis and detailed designs through well's life cycle.

Drilling

- Optimized Modern Well Design
- Risk Management & Analysis
- Torque and Drag Modelling & Analysis
- Cumulative Mud Weight/Pressure Management
- Wellbore Stability Analysis & Drilling Geomechanics
- Drilling Dynamics & Drillstring Failure Analysis
- Hydraulic Modelling, Optimization & Hole Cleaning Enhancement
- HMSE/MSE/ ROP Enhancement
- Stabilizer Design Improvement
- Well Re-entry & Maximum Reservoir Contact (MRC) Wells
- Deepwater Well Design, Structural & Foundation Design
- HPHT Narrow Window Drilling Management
- Multilateral Drilling Design & Planning
- Subsea Wellhead Engineering

Well Testing/Extended Well Testing

- Well Test/EWT Design, Engineering & Planning
- Temporary Completion String & Landing String Design
- Surface/Downhole Sampling & Data Acquisition Planning
- Surface Well Testing Package Design & Planning
- Early Production Review & Compliance

Well Completion

- Well Completion Mode Selection
- Upper Completion & Reservoir Completion
- Sand Control Management
- Tubing Stress Analysis
- Material Selection & Considerations
- Multiphase Flow Analysis & Tubing Well Performance
- Heat Transfer, Temperature Prediction & Control
- Completion/Packer Fluid Design & Selection
- Well Stimulation, Hydraulic Fracturing, etc.
- Artificial Lift Design & Selection

Well Control Assurance Program & Support

Well Control Assurance Management & Blowout Control Response

A suitable Well Control Assurance Program and further Wellbore Crisis Management planning needs to be initiated and implement long before a well control event begins to arise. FDS provides Well Control Assurance Management & Blowout Control Response Services to support onshore, offshore and Deepwater well operations from design to supervision.

Through well engineering and design stages there should be specific documented plans for each well/field assuring that wells are supported by perfect well control and blowout mitigation procedures which are defined and widely explained to all engineering and operational teams. In addition with planning and documentation, on-site well control supports will be defined according to project scope of work and customers' needs.

Well Control Assurance Management

(before well control and blowout situation)

Is a proactive planning and procedures to define well/field specific worst cases scenarios for well discharge and well out-of-control. Various elements would be considered to ensure safe and effective crisis management and emergency response supports;

1. Well Control Emergency Response Plans (WCERP)
2. Blowout Contingency Plans (BCP)
    - Well Capping & Containment Plans
    - Relief Well Plans
    - Jet Cutting Procedures
    - Freezing Techniques Procedures
    - Hot Tapping Procedures
    - Snubbing Operation Procedures
3. Oil Spill Contingency Plans (OSCP)
4. Design & Engineering Assurance
5. Rig & Equipment Quality Management
6. Crew Competency Management

Well Control Emergency Response Plans (WCERP)

WCERPs are strategic and tactical plans addresses well control emergencies, namely out of the ordinary well incidents and blowouts where the well cannot be controlled using ordinary measures with the standing procedures, equipment and personnel on hand.

Blowout Contingency Plan (BCP)

BCPs are Project/Field/Well specific plan for the intervention to an out of control well with respect to applicable and practicable existing methods (e.g. Well capping, relief well, etc.). The BCP's main objective is to stop the flow as quickly as possible in a manner that does not expose the environment to an extended release of hydrocarbon which is driven by schedule not by cost.

- Well Capping & Containment Plans
- Relief Well Plans
- Jet Cutting Procedures
- Freezing Techniques Procedures
- Hot Tapping Procedures
- Snubbing Operation Procedures

Design & Engineering Assurance

High-end Well Control Assurance Reviews, Studies, Scenarios, Modelling & Sensitivity Analysis. Well control plans and programs will be designed in detail to support client's specific needs. Different complex dynamic scenarios will be considered and unconventional killing and controlling methods will be modeled;

- Well control event modeling and engineering using Drillbench, and Olga.
- Steady State and Dynamic Modeling of Drilling Hydraulics
- Risk Evaluation through Dynamic Well Control Modelling proper risk evaluation performed with a dynamic multiphase well control model is increasingly needed as well conditions become more extreme.
- Shallow flow, gas, water flow, mud volcanoes
- Shallow gas modelling, sensitivity analysis
- Worst case discharges
- Kick tolerance reviews

Blowout Control Response – Deepwater Offshore

(during the out-of-control situation)

Due to well-out-of-control or well blowout in Deepwater environment with subsea wellheads, different tools and equipment such as, specific well control equipment, subsea operation survey and monitoring, support vessels, firefighting etc. need to be considered based on initial studies, predetermined scenarios and applicable strategies. In general, following areas should be covered for Deepwater Blowout Control Response as a surface and subsea Simultaneous Operations Procedures (SIMOPS);

- **Seabed Survey & Subsea Monitoring:** Inspection and mapping of the area around the incident well.
- **Unconventional BOP/Well Intervention:** The task of stopping or attempting to stop the flow using the existing BOP or after well shut-in due to regain access to well and subsea systems.
- **Debris Removal:** Providing access to the BOP capping stack attachment point, if obstructed
- **Subsea Dispersant:** Delivering dispersant to the flow path to reduce the amount of volatile hydrocarbons and restore working conditions over the well to the responders.
- **Capping & Containment:** Mobilizing and installing the capping stack + utilizing temporary production, storage and offloading facilities to control the well flow.
- **Oil Spill Recovery & Shoreline Clean-up**
- **Offshore Firefighting**
- **Relief Well Rig Contractor**

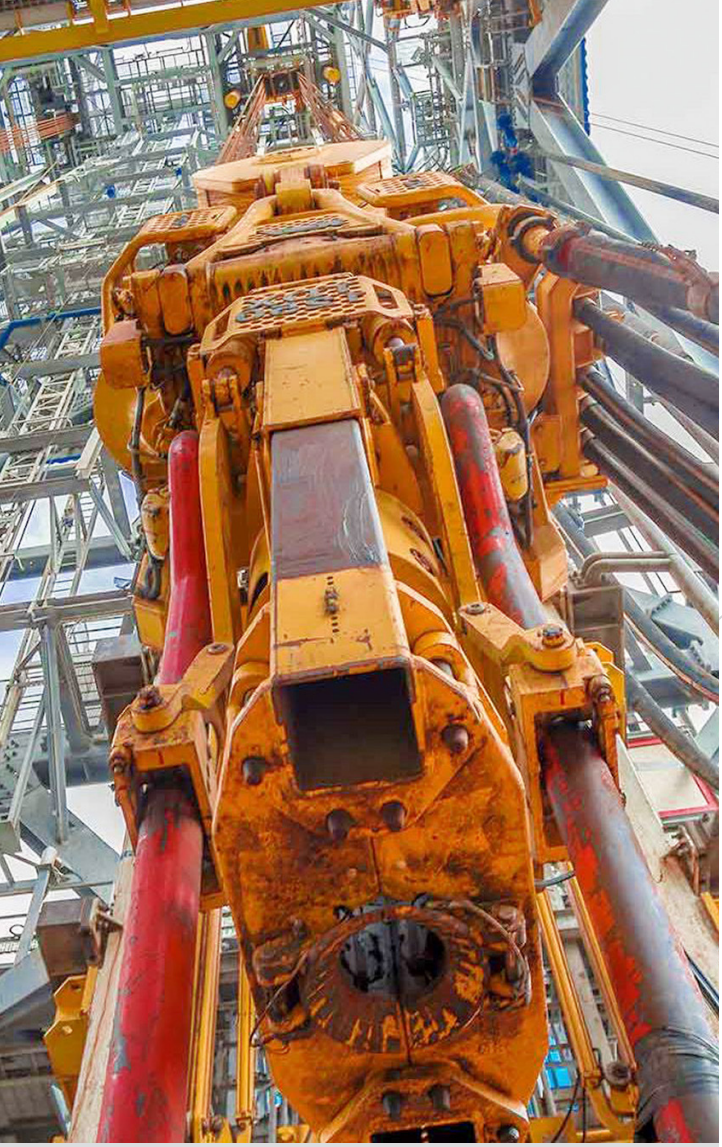
Drill Well on Simulator/Paper (DWOS/P)

DWOS/P facilitated sessions are defined as a performance improvement method to analyze well program and well construction process to review all different restrictions, challenges and potential improvement areas from participated teams. Drilling the well on paper and further on simulator can get incorporated into well planning and design process at different stages. Best value adding time to get engaged with DWOS/P is in early planning stages supported by different teams from engineering department, operational crew, drilling contractor, services and consultancy support teams.

- Real-life situation for challenging sections based on preliminary designs
- Pro-active decision making
- Apply changes to plans
- Bridging concerns between operational crew ,engineering teams and other 3rd party supports
- Team-based scenario
- Performance improvement strategies
- Drilling rig replication and customizable well conditions

Well Examination & Integrity Verification

Well examination and integrity verification process is defined as an independent service and analysis of application of technical, operational and organizational solutions to reduce risk of uncontrolled release of formation fluids and discharges throughout the onshore and offshore wells' life cycle. Additionally, these procedures confirm that well is designed, constructed, operated, maintained, modified, suspended and abandoned consistent with acceptable industry standards and worldwide codes, regulations and best existing practices for which are covering sum of individual component integrity plus the integrity of each component interface in means of physical verification and acceptance.



Independent examination of well design, programming and operations shall be undertaken for all well operations in accordance with the FDS Independent Well Examination. Well integrity of well's life cycle and operations e.g. drilling, testing, completion, production would be covered and verified through well examination process.

- Well Examiner Responsibilities
- Reporting Relationships & Examination Issues
- Reporting Relationships and Examination Issues
- Relationships with Installation Verification and Land Well Equipment
- Well Examination Process - Drilling and Workovers
- Production Well Examination
- Periodic Review & Audit Procedures
- Weekly/Periodic Reporting & Compliance

Well Examination Guidelines; Oil & Gas UK

Well Project Supervision, Coaching & Consulting

Technical supports for both well-site crew and in-house personnel apply during different phases of projects based on project's definition and complexity. FDS undertaking different responsibilities during well planning, design, execution and operation phases as the supervisor and technical support to ensure safe, effective and efficient performance of complex drilling intervals by highly competent personnel and associates.

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Well Project Supervision

Supervising drilling, testing and completion operations and complex project management monitoring

Managing and supervising execution phase through drilling, testing and well completion to safe and efficient well delivery. Well supervision team would be assigned appropriately to fulfill daily operational tasks, operation coordination with office-based supports, reporting and ensure operation compliance with well program, regulations and standards. Well (drilling, testing, completion, etc.) supervisor would be entitled based on FDS well management system with well-defined roles and responsibilities described in specific project management manual and other associated standards.

Coaching & Mentoring

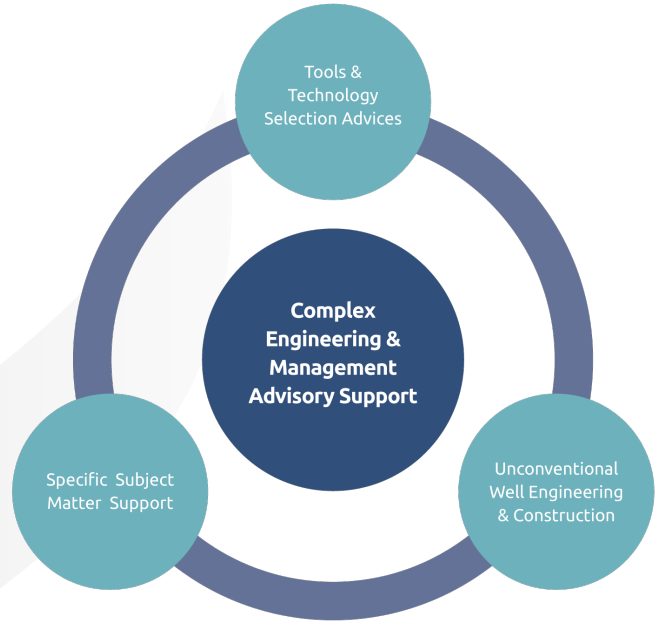
Complex well operation and section drilling couching and crew mentoring;

Drilling, testing and completion of complex intervals with different associated technical restrictions would be easier to handle when it is supported by on-site specific subject matter experts. Wells objectives with challenging engineering and operational aspects such as Extended-reach targets, HPHT intervals, Deepwater environments, high-risk pipe sticking sections, highly corrosive systems, Managed Pressure Drilling lead and other conflicts are supported to be safely and efficiently delivered within time and budget.

Consultancy & Technical Support

Consultancy and advisory supports through different stages of well design and construction;

Technical advices and troubleshooting for specific engineering and design challenges and operational difficulties can make considerable impact upon project's efficiency. FDS technical support teams provide suggestions to clients picking the best fitted cost effective solutions supported by industrial evidence and feedback. FDS support teams can deliver worldwide accepted solutions for complex engineering and execution in Deepwater, HPHT, ERD and challenging environments and also unconventional resources such as gas hydrate.



Post Well Analysis

After-action review, post well and well failure analysis are conducted as a detailed well and operation study after project close-out or after-interval in batch drilling operations. These will help providing general KPIs for safe and efficient project delivery for upcoming wells and fields.

This study will help better understanding of geological and stratigraphically sequences, wellbore uncertainties and challenges through different intervals. Further reviews try to explain how to improve well plans, design and operation practices for next wells and make detail comparison against predicted values and margins during planning and real evident results after close-out.

Appendix; Case A Review

Through Case A which has been defined in 2 phases, offset wells' Review and well management/assurance planning conducted based on received information and input such as Re-entry DDRs, Final Well Report, Drilling Program, Drilling Fluids Program and Geology & Geomechanics Review from client. As it is identified there are huge rate of technical, operational and systematic management failures leading to severe low project's performance. Metrics which have been set are showing lack of consistency through various stages in well design and management process;

Well & Operational Planning

- Lack of EWM Management & Wellbore Stability
- Bit & BHA Inefficiency
- Lack of Enhanced Flow Modeling
- Inaccurate Geomechanic Modeling
- Bad Drilling & Cementing Practices

Well Integrity
Risk & Hazard Management
Program Readiness & Execution

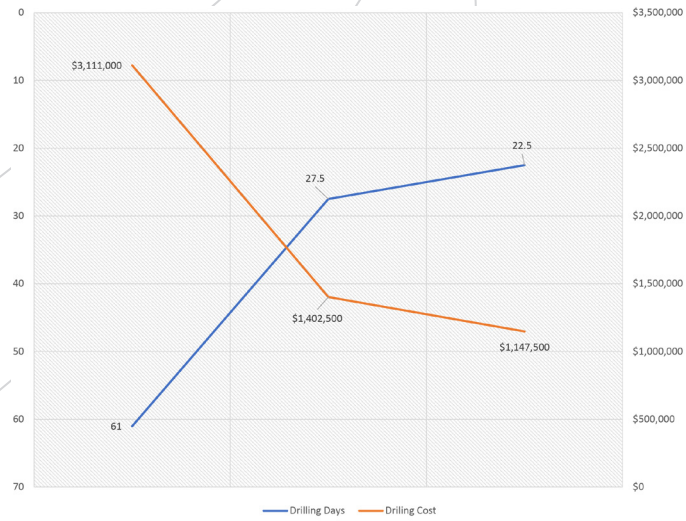
- Well Control Emergency Response Planning

Final results showing that there are almost %44 Significant Loss existing in the client's engineering, operation and management system which finally leads to low systematic efficiency.

Well Program Efficiency = 37-45%
Well Evident Loss & Waste = 55-63%

Mid-Best scenario shows promising results reducing rig days from 61 to 27.5 days with further 1,708,500 million dollars cost saving in different engineering, management and operational routines and best scenario showing 5 more rig-days constraints which leads to additional 255,000 dollars cost saving. These results are not obtained by single well management solution or performance improvement technique; more than 20 elements have been identified as loss/waste area and several KPIs have been considered to be implemented for further projects.

These results would be appear after giving sufficient time to the client's system to be adapted with new changes.



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