

1. Production Engineering Capabilities Dept 1

Overview

Production engineering department deals with the core areas of oil and gas production technology in various types of reservoirs viz. sandstone, carbonate, CBM, shale gas, etc. The major capabilities of the department include:

- Well Stimulation
 - ✓ Matrix Acidizing
 - ✓ Acid and Hydraulic Fracturing
 - ✓ Stimulation of unconventional reservoirs viz., basement, basal clastic, CBM, etc.
- Mitigation of Organic Deposits
- Sand Control
- Fines Stabilization
- Water and Gas Control
- Well Testing
- Well Completion
- Well Intervention/ Work Over

The department has the capabilities to carry out in depth analysis and provide innovative solutions for the problems related to well stimulation, sand control, well completion/intervention and water/gas shut off. This is done through a combination of laboratory evaluation, simulations, modeling, and rich experience developed from carrying out large number of R&D studies, their implementation and association with the assets/basins in the past decades.

Laboratory Facilities:

The department is equipped with state-of-the-art laboratory equipment and facilities like:

Core Flooding Set Up:

- Determination of core permeability under simulated reservoir conditions up to 150 degree Celsius.
- Optimization of acidizing formulation for sandstone and limestone formations
- Designing of suitable diverter for uniform acid placement
- Compatibility study of injected/completion fluid with reservoir rock
- Simulation of fines migration in reservoir and devising methods for arresting the same.
- Determination of relative permeability curves for two phase (water – crude oil) system
- Analysing effects of oil field chemicals on wettability changes/relative permeability modification
- Analysing effectiveness of various gels for water control.

Atomic Absorption Spectrometer:

- Measurement of elemental concentration of metals (Al, Si, Fe, Ca, Mg, Sr, etc.) commonly encountered in produced water/spent acid samples.
- Identification of the precipitate formed, if any, during core flooding of reservoir cores with various stimulation fluids
- Identification of type of scale formed in the production systems
- Reaction rate measurement of reservoir minerals with various acid formulations

Sieve Shaker

- Determination of particle size distribution (PSD) of produced sand/core sample
- Results from this study used as input for selecting and designing suitable sand control technique.

Linear Flow Set Up for Sand Control:

- Study of gravel pack efficiency in various flow conditions.

HPHT Rheometer

- To perform rheological studies for crude oil, frac gels and stimulation formulations at reservoir conditions upto 200 Deg C at 150 bars.

Softwares:

The state-of-the-art software for treatment optimization, design and evaluation of well stimulation jobs are:

Fieldpro Suite:

- Database and design of advanced Hydraulic fracturing jobs
- Design of Hydraulic Fracturing jobs.
- Design of matrix stimulation jobs.
- Production prediction for single well basis.

WellCat

- Design and analysis of well completion.

2. Core Competencies of Process Engineering & Surface facilities Dept 2

The Core Competencies of Process Engineering & Surface Facilities department are as follows:

Capabilities:

- Conceptual Engineering of Oil, Gas & Water Handling Facilities at Onshore & Offshore
- Conceptual Engineering of Hydrocarbon Processing Plants
- Conceptualisation of gas lift & water injection network
- Adequacy checks of existing surface facilities
- Debottlenecking Studies for Capacity Enhancements
- Optimisation of Process Plants for Enhanced Recovery of Value Added Products
- Trouble shooting of oil & gas handling installations and process plants
- Flare System Conceptualisation, Analysis & Solutions for Statutory Compliance
- Produced Water Systems Debottlenecking for Improved Environment Management
- Development of Layout Plan for onshore surface facilities
- Preparation of Process Package for Surface Facilities.
- Nodal Analysis and Flow Assurance Studies
- Fluid Characterization.
- Rheological properties of fluid at high temperature and pressure
- Evaluation of crude oil, natural gas and condensate.
- Carbon Profiling of wax and crude oil.
- Saturates, Aromatic, Resins and Asphaltene (SARA) Analysis.

Simulation Software:

- **Aspen Engineering Suite:** Steady state and dynamic process simulation
- **PIPESIM:** Steady state single/multiphase flow in pipeline & pipeline networks.
- **FlareSim:** Thermal radiation study of flare systems
- **IPROCAL:** IOGPT developed software for process equipment sizing
- **AUTOCAD:** PFD and P&ID development for process facilities

Laboratory Facilities:

- Natural Gas Analyser
- SIMDIS Analyser
- Detailed Hydrocarbon Analyser
- Flow Assurance Laboratory

- Rheometer
- Pour point apparatus
- Atmospheric Distillation Apparatus
- Rotary Vacuum Evaporator

3. Core Competencies of Corrosion & Scale Management Dept 3

The Corrosion and Scale Management Department investigates problems related to occurrence of corrosion and scale in oil-field wells/equipment and offers remedial measures to combat the same.

The **Core Competencies** of this department include:

1. Corrosion Estimation
2. Designing Internal Corrosion control systems
3. Adequacy Checks of Existing Metallurgy
4. Material Selection for tubing and downhole equipment, wellhead and X-mas tree, pipelines and surface facilities
5. Inorganic Scaling Prediction
6. Produced Water Analysis
7. Scale Sample Analysis
8. Scale Inhibitor Efficiency Evaluation
9. Designing Scale Mitigation Jobs
10. Designing Scale Prevention systems.

Simulation Software:

The department uses three state of the art software to carry out corrosion and scale related simulations which include:

1. Predict 7.1: Prediction of corrosion of carbon steel in multiphase oil & gas production or transmission systems, estimation of pitting probability and rate of erosion.
2. Socrates 10.1: Comprehensive Corrosion Resistant Alloy (CRA) material selection system for corrosive oil & gas environments.
3. Downhole SAT 7.50B: Inorganic scaling tendency prediction.

Laboratory facilities:

The department is equipped with state of the art laboratory equipment and facilities such as:

1. Wheel test apparatus: Determination of corrosion rates of metal specimen under static and dynamic conditions and evaluation of corrosion inhibitors under simulated conditions
2. Liquid ion chromatograph: Quantitative analysis of produced water to predict water chemistry i.e. cations, anions and heavy metals based on the principle of ion chromatography.
3. Thermostatic Oven: Used in the process of high-temperature evaluation of chemicals, drying of glassware & other equipment and preheating.
4. Auto Titrator: For making the titration process for ionic measurements more accurate and exact.

4. Core Competencies of Artificial Lift Department Dept 4

Following are the core competencies of the artificial lift department:

1. Selection of suitable artificial lift mode for the wells which are unable to flow naturally (self).
2. Conceptualization of artificial lift scheme.
3. Design of the artificial lift systems.
4. Performance analysis of the wells flowing with artificial lift systems.
5. Studies for optimization & trouble shooting of the wells flowing with artificial lift systems, and suggesting suitable remedial measures for optimizing the wells for enhancing the production.
6. Providing solutions in different areas of artificial lift.
7. Deliquification study of the gas lift wells and suggesting suitable remedial measures/deliquification technique to unload the well for maximizing gas production.
8. Network analysis of the gas lift wells to find out possibility (ies) of debottlenecking in the systems and accordingly suggesting suitable remedial measures.
9. Integrated production modelling of the wells on artificial lift systems to find out possibility (ies) of debottlenecking in the systems and accordingly suggesting suitable remedial measures.
10. Formulating standard operating practices (SOPs) for artificial lift systems.
11. Inspection of gas lift equipment at vendors manufacturing sites for quality assurance of the of gas lift equipment.
12. Inspection of plant & facilities of vendors to find out their capabilities to manufacture/supply gas lift equipment to ONGC.
13. Imparting specialized artificial lift training.

5. Deep Water & Field Development Dept 5

This department works closely with all stakeholders to carry out conceptual, feasibility and Pre-FEED field development studies for oil and gas green field, brown field located in Shallow water, Deepwater and On-land including HP-HT. The department formulates and screens various development alternatives followed by detailed evaluation for shortlisted options. The studies cover Flow assurance, Operability studies, Pipeline network sizing and Tie-back strategy, Look for opportunities to utilize nearby existing infra structures, MOC selection, Vertical lift performance(VLP), Nodal analysis, Well completion, Artificial lift mode Mitigation of issues like Wax, Hydrate, Slugging, Corrosion & Scale, CO₂, N₂, H₂S, etc.

Core competencies of the department

- Conceptual Studies for oil and gas green field / brown field development
- Pre-Feasibility studies
- Development scheme and flow assurance studies for DOC, FDP/FR
- Fluid characterization and modelling
- Vertical lift performance
- Flow hydraulics study
- Nodal analysis
- Wax & Hydrate management solution
- Slug management and Pipeline pigging study

- Transient simulation and Operability studies
- Optimization and troubleshooting of facilities including remedial measures
- Pressure surge analysis for cross country oil trunk lines as per regulatory guidelines.

Software:

PIPESIM: Steady State Multiphase flow Simulator

It provides accurate modeling and study of the production and transportation systems in oil and gas industry, which relies on three core areas of science:

- Multiphase Flow
- Heat Transfer
- Fluid Behavior

This software enables us with the capability of

- Design and optimization of well completions and artificial lift systems.
- Well performance analysis.
- Design and optimize pipeline and equipment such as pumps, compressor, and multiphase boosters to maximize production
- Identify production bottlenecks and constraints.
- Optimize production from complex networks.
- Design production systems to mitigate various flow assurance challenges in life of field development projects

OLGA: Dynamic Multiphase Flow Simulator

- Dynamic multiphase flow simulator models time-dependent for steady state & transient flow behaviors to improve production
- Transient simulation with the OLGA simulator provides an added dimension to steady-state analyses by predicting system dynamics such as time-varying changes in flow rates, fluid compositions, temperature, solids deposition and operational changes.
- From wellbore dynamics for any well completion to pipeline systems with all types of process equipment, the OLGA simulator provides an accurate prediction of key operational conditions involving transient flow.

Multiphase: PVT simulation tool

Versatile equation of state (EOS) modeling software that allows the user to simulate fluid properties and experimental PVT data.

QUESTOR: Oil & Gas cost estimation software

Cost estimation for evaluation field development concepts - Offshore & Onshore. It helps in estimation of the capital and operating costs of oil and gas field developments and also assist with project modelling, evaluation

and subsequent decision making in the oil and gas industry. It provides a reliable, consistent methodology for producing cost estimates and creates efficiency when optimizing field developments. It gives access to latest global cost information with bi-annual updates. The benefits are in many applications, including:

- Screening studies
- Feasibility studies
- Conceptual studies
- Optimization studies

6. Well Analysis Dept 6

Core Competencies:

- The study of wells with suboptimal performance for production improvement
- Comprehensive review of well performance and analysis w.r.t issues/ problems like formation damage, sand/organic/inorganic deposition etc. related to well bore of different reservoirs/sands
- Optimization of production from the wells w.r.t stimulation/well services/lift etc.
- Well analysis considering production history/completions/interventions and subsequent remedies

Process Flow:

- Collection of data from the reservoirs/fields/wells
- Screening of data w.r.t established parameters and identifying the deviations
- Analysing the deviations/problems/issues by using software's like PIPESIM, PROSPER etc
- Identifying the problems of respective areas such as stimulation/well completions/ artificial lift/corrosion etc.
- Studying the identified problems in depth w.r.t areas
- Preparing the final solution and report.

7. Capabilities of Training & Business Development Section

Trainings:

1. IADC Accredited Course –Workover well control operations
2. Simulator based Hands on Training on Offshore Process operations
3. General Training on Artificial Lift systems
4. Training on Gas Lift systems
5. Training on Sucker Rod Pump systems
6. Training on Well Stimulation Techniques
7. Specialisation Training on Production Operations covering
 - Production
 - Surface Facilities & Process Engg
 - Corrosion & Scale management
 - Artificial Lift systems
 - Deepwater & Field development
 - Well Analysis

Business Development:

Capability for consultancy services to External Agencies in the areas of

- Production
- Surface Facilities & Process Engg
- Corrosion & Scale management
- Artificial Lift systems
- Field development
- Well Analysis