A Case Study on Gamij Field using Coiled Tubing Intervention

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Abstract: This article aims to study an oil field intervention of a specified oil field in the state of Gujarat. Gamij field confirms the possibility of probable oil reserves on primary field exploration. The application of this intervention is proving to be a breakthrough in quick and exploring deep oil reserves with minimal loss and disadvantages. In this paper, we thoroughly study the outcomes of the explored field by using Multi stage fracturing of a horizontal well. Multistage fracturing is employed to access multiple pay zones of an oil reserve with a single well. Multistage fracturing systems allow various stage levels to be stimulated of the well using a singular uninterrupted operation. Cemented or open-hole, these systems help get the most from a reservoir with increased efficiency.

I. Introduction
Gamij is a field which is situated in Khedha district of Dehram taluka of Gujarat state under ONGC Ahmedabad [1]. The multistage fracturing is done along with the coiled tubing operation in the horizontal new well. ONGC has invested 1,881 Crores in the Gamij oil field which yielded 25.94 million tons of crude oil and 23.52 billion cubic meters of gas which goes to the nearest Gas Gathering System (GGS) units numbered as GGS#1, GGS#2, GGS#3. Gamij becomes the first small marginal field of ONGC to produce 15,000 standard cubic meters/day (SCMD) for period of 5 years.

The details of Gamij field is given below (Figure 1): -
- Coordinates of Gamij field: Latitude – 72° 55” 58.01” (N) Longitude – 23° 55” 6.01” (E)
- Nearest Railway station – Chandkheda, Ahmedabad, Kalol Railway Station – 15 kms.
- Nearest town/city/ village – Kheda Village, Gujarat.
- ONGC Tender No: D 16BC15013
- Well Details: Services for multistage fracturing in four zones of horizontal well of Gamij field of ONGC, Ahmedabad asset.
- Cost to Capital: 1,881 crores (282.52 million USD approx.).

Figure 1: Picture of Well head site
II. Process Description

Hydraulic fracturing is believed to be very common well stimulation method since ages for its effective deliverability application. But, without a proper technology update on the design management and wellbore tools involved, limited additional improvement is experienced. Over the last decade, many technical developments and solutions have been made to better stimulate pay zones containing hydrocarbons [2]. Multistage fracturing can be done in a unique way, and well completion design is done with objective to intervene the borehole effectively. A coiled tubing attached to well head is shown below (Figure 2):

Figure 2: Coiled Tube attached to well head.

III. Coiled Tubing Components

The coiled tubing unit comprises of a series if adequate and essential parts to perform standard drilling procedures on the oil field.

The unit consists of four basic elements (Figure 3):

1. **Reel** – the store house of the CT.
2. **Injector Head** – facilitates in the CT operation
3. **Control Cabin** – used for regular monitoring and support to the CT operation.
4. **Power Pack** – generation of sufficient power required for the CT operation.
IV. Hydra jet Hydraulic Fracturing

Hydra jet assisted fracturing is a relatively new technology combining hydra jet perforation tunnel creation and hydraulic fracturing. Although the hydra jet system can be deployed on jointed tubing pipes, coiled tubing, drill pipes or combination of jointed pipes and coiled tubing, the most frequent usage is with coiled tubing [3]. Basically, the technique consists of 3 steps mainly:

- Hydra jetting,
- Hydraulic fracturing through tubing, and
- Injection down the tubing/casing annulus.

V. Completion Methods

Plug ‘N’ Perf Method

Plug-and-perf completions are lateral well completion techniques for cased hole wells [4]. The engineer can apply from each preceding stage to optimize treatment of the current stage. The process is depicted as follows in the figure. (Figure 4).

VI. Technical Details of the Gamij Field

- tubing: 2\(\frac{7}{8}\) inches
- Casing: 5\(\frac{1}{2}\) inches
- Total Depth: 1960 ft or 597.408 m
- Packer: 1916 ft or 583.998 m
- Maximum psi: 2500 psi
- Running in hole (RIH): 1.5 inches with foam and N2 pumping
- Perforations:
  - 1927-30 ft (3 ft)
  - 1932-34 ft (2 ft)
  - 1936-41 ft (5 ft)
  - 1943-46 ft (3 ft)
VII. Results and Summary from the field

- Little sand in return line.
- Foam obtained along with chemical used for pumping.
- Broken gel obtained in return from Hydro-Fracturing (HF) job done.
- N₂ obtained in return creating a self-flow.
- Pumped N₂ gas in return.
- No sticking/buckling in pipes so job easily done.
- No fishing operations required.
- Return bottom obtained.
- Effective hole cleaning and less trips required.
- Reciprocating action in the tubing string to avoid sticking.

VIII. Summary

- Some calculations show that straight wall tubing strings can reach total depth greater than 33,000 feet using available 120,000-psi material, and tapered tubing strings can reach 40,000 feet for reasonable buoyancy and pressure.
- The optimum tubing diameter for tradeoff of pump pressure and fatigue life is from 2\(\frac{3}{8}\) inch to 2\(\frac{7}{8}\) inches.
- Fatigue life goes down as tubing diameter increases, and flow loss goes up as tubing diameter decreases. These factors determine the choice of tubing, which in turn defines the maximum weight of tubing and therefore the maximum anticipated deck load for the CT reel.
- The maximum load on the motion isolation system (MIS) is the weight of the injector, plus, the breaking strength of the tubing.
- Nitrogen job circulated along with foam is useful for hole cleaning jobs.
- Hydro-fracturing done with Coiled Tubing proves advantageous as it saves time, tripping time, labor, capital, ease of completing job, etc.

REFERENCES