

## **IOGPT PATENTS/COPYRIGHTS :-**

### **A) PATENTS OBTAINED:-**

- 1: An improved device for separation of gas from petroleum liquid in the well bore.  
(Modified poorboy Gas Anchor for SRP wells)
- 2: A process for preparing X-linked polymer gel for W&GSO in HT oil wells.
- 3: A process for preparing relative permeability modifier bio-polymer gel for blocking/limiting water production in oil sand (GOPLAL SHANKAR).
- 4: Improved Gas Lift Valve with Modified Seat
- 5: A Formulation for Dissolving Asphaltene Precipitates
- 6: Polymer doped scale inhibitor for oil field produced brines in Calcium stressed environment.
- 7: Energy Integration in Amine Based Gas Sweetening Process.
- 8: Slim-hole Gas Lift completion with Macaroni tubing carried Gas Lifts Valves.
- 9: Enzyme application for well bore cleaning to remove mud cake in oil/gas wells.
- 10: Gelled Acid Emulsified system for Carbonate Reservoir.
- 11: Composition and process for preparation of a fracturing fluid  
(Development of suitable alternative for Guar based Frac fluid)
- 12: Method for Recovering Heavier Hydrocarbons from Liquefied Natural Gas  
(Utilization of cold energy of Liquefied Natural Gas to recover heavier Hydrocarbons)
- 13: Novel Demulsifiers for Separation of Water from Oil and Preparation Thereof  
(Joint Patent with NCL, Pune)
- 14: A process for preparing an improved sealing agent  
(Original Title: Development of Green Gel for channel repair & casing leaks and conformance control)
- 15: Venturi type surface chokes for stabilized flow.

### **B) PATENTS FILED / UNDER PROCESS BY PATENT OFFICE:-**

- 1: Recovery of Heater Teeter Gas for Fuel Gas Purpose
- 2: Composition and method for preparation of a fracturing fluid  
(Development of High Pressure High Temperature Hydro-fracturing Fluid)
- 3: Production Enhancement Apparatus for a Sucker Rod Pump  
(Production enhancement device with adjustable non-lubricated site-fabricated system for Sucker Rod Pumps)
- 4: Debris catcher for offshore process platforms.
- 5: A shockwave assisted fracking apparatus using an in-situ generated Oxy-Hydrogen mixture  
(Joint application with M/s SWTPL, Bangalore)
- 6: System and method for fracking deep well for oil and natural gases using shock waves  
(Joint application with M/s SWTPL, Bangalore).

### **C) APPLICATIONS SUBMITTED TO CIPC, DEHRADUN:-**

- 1: A Method of Fuel Gas Reduction for Indirect Bath Heater (IDBH)

### **D) COPYRIGHTS:-**

- 1: Composite Catalogue of ONGC field, installations & pipelines.

2: Software for determination of bottom hole & surface choke size in case of commingled production.

3: ESP-GL-PC based software for designing electrical submersible pump – Gas lift combination lift.

4: JET-DES-PC based software for design of jet pump. This software determines the power fluid quantity, nozzle and throat sizes, horse power of the surface power fluid pump for a given design liquid rate and a particular nozzle to throat ratio of a down hole jet pump. Cavitation conditions in the jet pump are also predicted.

5: GLIDE-PC based software for advanced gas lift design. It is a gas lift design software including continuous and intermittent gas lift with various options of valve spacing design. The software can also be used for optimizing gas lift wells.

6: DYNA-PC based software for SRP design & diagnosis. It is a dynamic sucker rod pump simulator, primarily used for the optimization of SRP well using down hole pump card technique.

7: INFLOW: PC based software design of intermittent gas lift and chamber lift.

8: PROTEST: Probe testing of G/L valve and its significance in field application. It is a developmental laboratory work. It leads to an accurate method of selecting the gas lift valve port sizes in gas lift design rather than using theoretical equations as previously being followed. The results of probe testing extensively done on different makes of gas lift valves were incorporated in the gas lift design to make the design more accurate for field use.

9: iPROCAL: The in-house process design software is prepared in visual basic based software for sizing and rating of various process systems. It is worth mentioning that all the above aspects can be managed in a single software. The basic correlations/formula used for the calculations have been referred from open literature, process guidelines such as API, ASME etc. and in-house expertise and utilising wide experience of field operations. The graphics user interface of the software is made simple and user friendly which will help field personal in troubleshooting day to day operation in minimal time without a need of any cost intensive software. (The software is extensively used in house as well as in the fields of ONGC. Mail received from Mehsana Asset in January 2020.)

10: iPROCAL V-1: In this new version “iPROCAL V-1” an attempt was made to introduce new features in the existing modules (iPROCAL). In addition to the available existing features “iPROCAL V-1” is having a capability of sizing pressure vessels specially sizing of three phase separators which are predominantly operated in oil and gas industry to separate various phases such as gas, oil, water. It is worth to mention that sizing of three phase vessels are very tedious which requires extensive knowledge in phase behaviour of fluid being handled, density, viscosity, pressure, temperature conditions, particle sizes, settling velocities, surge and swell factors etc. Therefore, the three phase separators sizing software’s are rare in market. (The software is extensively used in house as well as in the fields of ONGC.)

11: LIFT SELECTOR:- For identifying the most suitable Artificial lift mode for given field conditions in a field, using a Multi Criteria Decision Making (MCDM) tool. The MCDM tool

works on the principle of selecting the alternative which has the shortest distance from the positive ideal solution and largest distance from the negative ideal solution. (The software is extensively used in house as well as in the fields of ONGC. Mail received from Assam Asset on 31.01.2020.)

12: Easylift:- The software can be used for carrying out design of intermittent gas lift wells. The key feature of EASYLIFT is the user-friendly interface and on the fly customization of the installation design while ensuring functional safety at the same time. Methods based on both surface opening (PSO) and closing (PSC) pressures have been provided. Since the in-house software GLIDE is limited to 32-bit computers, EASYLIFT may be used on 64-bit computers for the purposes mentioned above.

13:- Gflow: Gflow evaluates the gas flow regime and then calculates the gas flow rate through 1inch OD GLVs, 1.5 In OD GLVs and Pilot valves for given pressure, temperature conditions, dome pressure and valve port size. Simple Thornhill Craver equation is used to calculate flow through Pilot valve while TUALP's dynamic flow performance has been used to calculate gas flow rate through Nitrogen charged Unbalanced GLVs.

#### **E) COPYRIGHT APPLICATIONS SUBMITTED TO CIPC, DEHRADUN:-**

1: PLUNGLift: The in-house developed software is used to determine the liquid loading propensity of a well. It is also used to assess the suitability of a well for Plunger Lift system and provides the indicative design of the Plunger Lift system.

2: Diagnostic Software: Diagnostic software has been developed, in MATLAB, which can convert Surface Dynagraphs to Sub-surface / Pump Dynagraphs. The software uses finite difference method to solve Gibbs 1D wave equation, for converting loads recorded at surface to sub-surface / pump loads.

3: Supervisory Software: Expert software based on Artificial Intelligence (AI) has been developed in MATLAB to diagnose the beam pump in real time. The software can identify / interpret pump dynacards, by pattern recognition, and predict the health of rod pumping system. Graphical user interface has been developed, in which Dynacard to be identified is selected / fed and then using AI based model the sub-surface Dynacard is identified.

4: DAIL Software: Dynamic Application of Intermittent Gas Lift (DAIL)" is a mechanistic software based on first principle which carries out dynamic simulation of the Intermittent Gas Lift process to predict, analyze and optimize its performance. As a Physics based model, it performs a realistic simulation of the transient physical processes in an Intermittent Gas Lift cycle.

5: System Analysis for Sucker Rod Pump (SAS): System Analysis for Sucker Rod Pump (SAS) may be used to arrive at optimum pump placement depth for a given target rate, desired volumetric efficiency, and gas anchor characteristics. Plots related to pump efficiency, liquid level and pump intake pressure are generated.

6: PEBUL SOFTWARE: