OIL & GAS DEVELOPMENT COMPANY LIMITED
PROCUREMENT DEPARTMENT, ISLAMABAD
FOREIGN SECTION A

(To be completed, filled in, signe
and stamped by the principal

ANNEXURE '

Material JET PUMP PACKAGES
Tender Enquiry No PROC–FA/CB/PROD/PUMP–4023/2018
Due Date 17-09-2018
Evaluation Criteria FULL

SCHEDULE OF REQUIREMENT

Sr No	Description	Unit	Quantity	Unit Price (FOB)	Total Price (FOB)	Unit Price C & F BY SEA	Total Price C & F BY SEA	Deviated From Tender Spec. If Any
1	JET PUMPING SYSTEM , DETAIL SPECIFICATION ATTACHED ANNEXURE 'AA'.	Number	6					

Note:

1. Bid bond and Bid Validity.:-Pursuant to tender clause # 2.2, 11.4, 13 & 35.3.2, bid(s) must be accompanied by an upfront bid bond in the form of pay order/ demand draft or bank guarantee issued by scheduled bank of Pakistan or a branch of foreign bank operating in Pakistan, for an amount of **US$ 100,000/-** (US$ One hundred thousand only) or equivalent Pak Rupees, with technical bid and valid for **160 days** from the date of opening of the bids. The bank guarantee must be issued in accordance with the format as per Annexure-C of the tender documents. The bid validity required is **150 days.**

2. Shipment from ACU member Countries: In case of shipment from ACU member countries, the LC beneficiary should be of that particular country from where the consignment is being shipped.

3. Terms and conditions:-Bidders are advice to carefully read all the terms and conditions of the Tender Document available at OGDCL web site in the master tender document.

4. Summary rejection criteria: - The summary rejection criteria at clause 35 of the tender document may also be examined carefully. Any bid not meeting the criteria spelled in the clause # 35 shall be summarily rejected without any right of appeal. The detailed tender document is available on OGDCL website as" Master set of tender document-Foreign".

5. Payment Terms: Clause No: 3 of Section-III (Part-B) i.e. Conditions of Contract "Special" of Tender Document has been amended and following will be the payments methods.

i. **Tender value less than or equal to US$ 200,000:-**Payment to the Contractor/ bidder in foreign currency shall be made by establishing in favor of the Contractor an irrevocable Letter of Credit (hereinafter called the L/C). 70 % Payment (s) under the L/C will be made for the FOB/ CFR / CPT (as the ca se may be) price of material of each shipment upon submission of the shipping documents. Balance 30% Payment will be released after receipt, inspection and acceptance of material.

ii. **Tender value more than US$ 200,000:** Payment to the Contractor/ bidder in foreign currency shall be made by establishing in favor of the Contractor an irrevocable Letter of Credit (hereinafter called the L/C). 80 % Payment (s) under the L/C will be made for the FOB/ CFR / CPT (as the case may be) price of material of each shipment upon submission of the shipping documents. Balance 20% Payment will be released after receipt, inspection (in addition of pre-shipment inspection) and acceptance of material.

Annexure "AA"

Specification of Gas Engine Driven

Jet Pump Unit

TECHNICAL SPECIFICATIONS

1.0 SCOPE.

1.1 This specification defines the design and quality requirements for Brand new jet pump unit, complete with bottom hole assemblies, high volume free jet pump, natural gas engine driven surface pumping unit for jet pumps artificial lift service, wellhead, instruments and control system furnished as part of, or in connections with, "package" equipment and its auxiliaries. This specification covers minimum requirements for the design, fabrication and shop testing of Oil Industry standard Jet Pumping Units used in the artificial lift of well bore fluid for continuous service.

1.2 In order to provide standardization and complete compatibility of all the individual packaged units and with infield instrumentation, the vendor shall furnish all instruments for the package units. In general, the instrumentation to be furnished by the "packaged" equipment vendor shall not be limited but shall include each and every instrument required on the package unit as per the P & ID and recommended by the vendor after approval by the Purchaser.

1.3 No other instrumentation shall be required to be furnished by the Purchaser for the complete operation of the package unit. Interfacing terminals shall also be provided in a terminal box by the vendor of the package unit for specific signals as marked on the P & ID for wiring to control room panels etc. by the purchaser.

1.4 The extent of the instrumentation required in connection with the equipment is defined in the specification for the equipment or in the purchase order.

2.0 Criteria for Admission to Detailed Technical Evaluation.

All the bidders must fulfill the following requirements in order to be considered for the detailed technical evaluation.

2.1 The bidders must respond to all of above clauses of the detailed technical specifications and deviations (if any) should be clearly stated.

2.2 The bidder should be either jet pump packager or manufacturer. Bidder to provide details of its capacity in this regard along with technical bid.

2.3 Bidders should have a minimum of 10 years experience in the manufacturing/packaging of jet pump packages and provide necessary documentary evidence in this regards with minimum of following:

2.3.1 A list of pumping systems/packages sold in the last 10 years should also be provided containing a brief description (maximum flow rate, maximum pressure, horse power etc.)

2.3.2 The volume of Pump system/packages sold during this time frame. The minimum criteria for sales are 50 pump systems/packages in 10 years or the amount of sold packages be 20 million US$ in same period.

2.3.3 The sales record should be completed as number of the pumping systems /packages sold against an order, year of supply, name of the customer, name of the contact person, contact person, phone, fax, e-mail etc. This record should be supported with copies of purchase orders.

2.3.4 The evaluation of company's experience will be at OGDCL own desecration. However company track record, financial statement, mergers and general reputation and performance will be considered in defining the experience. In this regard bidder to provide last 3 year audited report, previous mergers, history etc. with technical bid.

2.4 The bidder to provide original authority letters from Gas Engine and Triplex pump manufacturers for using their equipment in the Jet Pumping System being offered to OGDCL under this tender enquiry, the tender enquiry number should be clearly mentioned on these authority letters.

2.5 Bidder to provide original authority letters from down hole equipment manufacturer (i.e BHA and Jet Pump and its accessories) being offered to OGDCL under this tender enquiry, the tender enquiry number should be clearly mentioned on these authority letters.

2.6 No copy or replacement equipment/parts are acceptable.

2.7 The vessel should be manufactured according to ASME Section VIII (Boiler and Pressure Vessel Code) and must be U-stamped. Accordingly bidder has to submit the U-stamp certificate of vessel manufacturer and authority letter of manufacturer as well with Technical Bid.

2.8 The bidder is to provide manufacturer's warrantee / guarantee of the quoted Gas Engine, Triplex pump, BHA and Jet Pump and other equipment used in the package.

2.9 The bidder is to confirm his ability to provide training to OGDCL engineers both at its production facilities and at OGDCL field sites in Pakistan.

2.10 The bidder is to confirm his ability to provide service engineer during installation, commissioning, start-up of the equipment, and later on as and when required by OGDCL at site in Pakistan.

2.11 The bidder must submit along with his bid the brochures and technical literature regarding the triplex pump, Diesel/Gas Engine, Jet pump and all other equipment included in the package.

2.12 The bidder must provide the Break-up cost for all major components & additionally required Items in the financial bid only. (Triplex Pump, Separator Vessel, Gas Engine, BHA, Standing Valve, Free Jet Pump, Wellhead, Control Panel, Nozzle, Throat, Service tools, Spare parts etc.)

3.0 Bottom Hole Equipment

3.1 Equipment should be suitable for a maximum bottom-hole temperature of 270 F.

3.2 The 2-7/8" jet pump BHA (High Volume casing fee pump installation of 2-7/8", 6.5 lbs/ft API EUE Tubing) should be complete with nozzle and the throat of size 11 & 12 respectively.

3.3 The bottom hole assembly for the quoted jet pumps should include packer & nose assembly along with pump-out cups for 2-7/8", 6.5 lbs/ft API EUE tubing (the packer nose should be latch able into wellhead pump catcher / pump fishing tool. It should have wire-line fishing neck on the nose body and lower box thread for connection to the jet pump. 2-1/2" retrievable standing valve for the above B.H.A., complete with all accessories.

3.4 The Bottom Hole Assembly should be of L-80 Material for good resistance against corrosion and should confirm to NACE-MR-0175.

3.5 The standing valve should be wire line/slick line retrievable.

3.6 No copy or replacement equipment/parts are acceptable.

3.7 Bidder to provide following X-Over in mentioned quantity along with each quoted BHA to be installed/run in the well with existing OGDCL completion scheme.

- X-over, 2-7/8" EUE (Box) x 2-7/8" CSHydril or equivalent (Pin), 6.5 lbs/ft, L-80 Material, 2 feet length as per API 5CT. **(02 no/package.)**
- X-over, 2-7/8" CSHydril or equivalent (Box) x 2-7/8" EUE (Pin), 6.5 lbs/ft, L-80 Material, 2 feet length as per API 5CT. **(02 no/package.)**

3.8 Following Servicing Tools to be provided along with quoted Jet Pump packages.

- Dummy pump assembly (03 no.)
- Blanking tool assembly (03 no.)
- Standing valve retrieving & running tool assembly (03 no.)
- Pump retrieving tool assembly (03 no.)

4.0 Wellhead Equipment

Wellhead equipment should be rated at 5000 psi and a maximum wellhead flowing temperature of 200 F and consist of

- Wellhead with four way required flow control valves for pump installation and retrieval and isolates well tubing from the flow line and power fluid supply line
- Pump catcher assembly compatible with supplied Free Jet Pump and Dummy pump.
- The wellhead should be supplied with flange connection/matching flange for installation on 2- 9/16" 5K X-mass tree.
- The supplied wellhead assembly must have appropriate inside clearance and vertical space for installation/retrieval of 2-1/2" jet pump or dummy pump. The length/height of the wellhead should be 2 ft more than the length of free jet pump or its dummy to perform the safe operations by closing the x-mass tree valves.
- Production/Reversing Manifold complete with valves, bends, flanges and fittings etc. for pump installation, retrieval, and isolates well tubing from the flow line and power fluid supply line.

5.0 Skid Mounted Power Fluid Circulating System.

5.1 Triplex Pump

5.1.1 A Diesel/Gas Engine driven Horizontal Triplex Pump according to API specification 674, suitable for both oil and water service.

5.1.2 The preferable triplex pump is M/s National Oil Well Varco USA model 200 T-5M with plunger size of 2-1/8". An equivalent pump can be quoted.

5.1.3 The pump should have Aluminum Bronze fluid end, 17-4PH stainless steel liners, disc type cartridge valves, plunger with self adjusting kevlar plunger packing, plunger lubricator to lubricate the plunger and other accessories like flanges, piping, relief valves, discharge pulsation dampener, pressure control valve, manual by pass, shut down system for pump lube oil level and pressure, pump high / low intake and discharge pressure.

5.1.4 The metallurgy of plungers and other fluid handling parts of the pump should be selected to give prolonged life when produced highly saline water will be used as power fluid as indicated at Annexure-I. Ceramics or alloy steels may be considered to suit the requirements.

5.2 Gas Engine

5.2.1 Caterpillar is the preferred brands for Gas Engine. The Gas Engine manufacturer should guarantee the required trouble free performance for all load conditions.

5.2.2 Caterpillar 3406TA Gas Engine is the preferred engine model. Turbo charged engines are preferred. Bidder to justify his selection of engine.

5.2.3 Gas Engine should have sufficient BHP at 1800 RPM to drive the 200 HP Triplex pump, booster pump, chemical injection pump, radiator etc. plus site de-rating and 10% extra power.

5.2.4 Gas engine BHP after de-rating should also provided in the technical bid. The site conditions and the fuel gas specifications are mentioned in Annexure-I.

5.2.5 Gas Engine should be complete with standard equipment, controls and accessories including inlet air filter, fuel filter, exhaust air system should be manufacturer's standard with a flame proof silencer, etc.

5.2.6 The Gas Engines will be provided with exhaust temperature sensors.

5.2.7 Engine control panel should have danger alarms and shut down capability for low oil pressure, low oil level, coolant temperature raise, and over speed etc.

5.3 Power end should have a flexible drive coupling with guard, and bolt-on gear reducer and a gear driven lube oil pump.

5.4 The power fluid skid should have booster pump having flow compatibility with overall system. The pump should have SS body, shaft and impeller. Booster pump should be belt driven with appropriate pulley design to provide the required rpm/flow for any triplex pump speed. This booster pump will be installed at the suction of triplex pump.

5.5 The power fluid skid should have chemical injection (corrosion and scale inhibition) pump(s) (with a minimum capacity of 1 USGPD and a maximum capacity of 8 USGPD). On-skid storage tank of chemical(s) should be provided with a storage capacity of at least 100 liters for individual chemical. Chemical injection pump(s) should be belt driven from the triplex pump. The preferable brand should be Textseam which are available with other jet pumping of OGDCL.

5.6 The gas engine should be provided with the sufficient capacity gas volume vessel/tank to be operated at 50 psi gas pressure. The proposed vessel capacity is 200 gallons along with gas scrubber and regulators. The gas scrubber should be installed such that to either utilize gas directly from source or through gas volume tank.

5.7 The cooler should be belt driven from the engine. Cooler drive shaft and pulleys should be designed considering the maximum acceptable vibration.

5.8 Pulsation dampeners should be installed on the discharge line and sized in accordance with API requirements.

5.9 Manual bypass for charge / booster pump should be provided.

5.10 Check valve at discharge of triplex should be provided.

5.11 The unit should be completed with all required auxiliaries, accessories and instrumentation for operating the unit independently. It will be the responsibility of the supplier / packager to ensure supply of Jet Pump Package capable of operating independently.

5.12 Gas Engine, Triplex Pump, Charge Pump, Chemical Injection pump will be installed on power fluid circulating skid with appropriate degree of protection against falling dirt, rain, sleet, snow, windblown dust, splashing water, hose-directed water, and corrosion, and that all couplings / connections will be designed to reduce the noise level of the entire surface unit.

5.13 All piping shall terminate at edge of the skid.

6.0 Skid Mounted Vessel Unit

6.1 The vessel unit should be a single vessel type with minimum capacity of 50 bbl and designed for working pressure range of 20 to 240 psi at 200 F temperatures. The vessel should have an elliptical man way, two sight glasses, pressure & temperature gages, pressure relief valves.

6.2 The vessel should be manufactured according to ASME Section VIII (Boiler and Pressure Vessel Code) and must be U-stamped. Accordingly bidder has to submit the U-stamp certificate of vessel manufacturer and authority letter of manufacturer as well with Technical Bid.

6.3 The inside of the vessel should be protected against corrosion with NACE complained protective coating against designed temperature range.

6.4 The vessel outlet / inlet and sizing should be so designed that it should hold up level of 50% each for oil and water, out of total liquid hold up section for optimized storage of both fluids. There should be such arrangement on the skid to use both fluids as power fluid.

6.5 Vessel should have connections for well returns inlet, triplex bypass and cyclone underflow inlets, power fluid outlet, produced gas outlet with gravity dump level control piping, cyclones type de-sander, overflow control valve, check valve, back pressure valves, throttle valves etc. All connections to be fabricated with piping to the edge of skid, complete with companion flanges, studs, nuts and gaskets.

6.6 Suitable metering devices should be provided at the discharge of gas outlet and oil outlet from the separator vessel.

6.7 All piping shall terminate at edge of the skid.

7.0 Skid Design

7.1 Adequate space shall be left on the power fluid and vessel skid to facilitate quick and easy access for operations, during normal and emergency events.

7.2 Lifting eyes shall be provided at an appropriate location for the balanced lifting of skid with crane.

7.3 Total weight and center of gravity of the skid (with all equipment installed) shall be mentioned in the preliminary issue of drawings.

7.4 Provision for properly sized anchor bolts shall be left on the structure of power skid frame.

7.5 An adequate strength of the skid shall be considered in the structural design to avoid deformation of any part / component and any functional disorder. The base frame shall be welded and rectangular in shape. Any member on the skid shall not be extended out of the skid dimensions in horizontal plane.

7.6 The contractor shall submit all design calculations and drawings for the support base and lifting devices to the purchaser for approval prior to manufacturer.

7.7 The contractor shall be responsible for all errors and omissions in the design, detailing, layout and fabrication of the skid.

7.8 All connections to be fabricated with piping to the edge of skid, complete with companion flanges, studs, nuts and gaskets.

7.9 The skids should be heavy-duty oil field type with tow bars, primer coated and painted.

7.10 Maximum allowable skid size in 3M (H) 3M (W) X 10M (L).

7.11 Maximum equipment weight per skid is 30 Tons.

8.0 Painting and Protective Coating

8.1 General.

8.1.1 The piping and structural material shall be painted in accordance to acceptable standards and good industrial practices.

8.1.2 All equipment will be located in an open exposed area, therefore all environmental effects shall be carefully considered to design the painting and protective coatings.

8.1.3 The contractor shall provide minimum of 5% (of the total paint used) of final coat enamel paint in manufacturer's standard packing. This paint shall be applied to cover the equipment surface damages during transportation and installation.

8.1.4 The equipment shall be surface prepared, primed and finished in accordance with the manufacturer's standard, however in general the paint application shall be followed as under:-

- Primer – Inorganic zinc silicate, average dry Film Thickness (DFT) 100 microns (60 – 200 microns).
- High build High solids epoxy, average dry Film Thickness (DFT) 100 microns (70 – 130).
- Urethane enamel, average dry Film Thickness (DFT) 50 microns (45 – 60 microns)
- One coat of primer, One coat of epoxy, Two coats of enamel
- Structural Colour Off White BS 4800 00A01
- Piping Colour Off White BS4800 00A01
- Grating Galvanized.

8.2 Codes and Standards.

BS 4800 Specification for paint colours for building purposes

ASTM A123 Zinc, Hot galvanized coating on products from rolled, pressed and forged steel shapes, plates, bars and strips.

SIS-05.5900 Surface preparation standards for painting steel surfaces.

9.0 Control Panel

9.1 Control Panel should be designed to monitor and control all the equipments in the package, which included engine, pump, vessel, flow line, etc.

9.2 Control panel shall be equipped with controller preferably Murphy Tattletale model TTD, capable to monitor and control all signals as per safe practices outlined in API RP-505.

9.3 Control panel should monitor engine/pump speed, suction/discharge flow rate and pressures. All pneumatic instrumentation, according to the P&ID, shall be installed on the skid, while their signals shall be transmitted to the control panel. ESD panic button shall be mounted on the control panel for emergency shut down of the unit.

9.4 All pressure and temperature transmitters shall be monitored through the control panel.

9.5 The engine automatic shut down shall be initiated through the control panel and operated automatically in case of High Pressure, High Temperature or High Discharge.

9.6 Engine start and shut down (off/on) switch should be provided on the Control Panel. Digital tachometers should be provided on the control panel. Well mass flow rate, at downstream of separation vessel should also be displayed on the control panel.

9.7 An electric operated alarm beacon / hooter shall be mounted on the control panel enclosure / hut / canopy, which will be automatically activated through the Controller upon receiving and executing the emergency shut down sequence.

9.8 Control panel shall be free standing IP54 rated enclosure mounted approx. 30 meters away from the unit. Bidder shall provide all necessary cables for interconnecting the control panel, Controller, field transmitters, field sensors, alarm beacons and any other equipment monitored / controlled through the control panel.

9.9 Quick coupling connections shall be installed on control panel, power/vessel skid and on jointing cables to avoid cable termination each time when unit moves from one to other location and to facilitate quick installation & operation.

9.10 Control panel shall have DC power supply. As the units are to be operated at remote locations and no outer source of electricity is available.

9.11 Control panel program and license to be provided in order to revise the program setting/configuration.

10.0 Spare Parts.

10.1 Commissioning and start up spares if any, for engine, pump and other equipment are to be quoted separately. These will be included in financial evaluation.

10.2 Bidder should necessarily quote in their bid recommended spare parts for 2 years service of all the quoted equipment including engine, triplex pump, pumps (CI & booster) and other down–hole and surface equipment. Bidder to quote different sizes of nozzles & throat (size 9 to 13) along other spares of down hole and surface unit spares. Individual price of each spare part to be quoted along with its quantity and part number. These spares shall not be included in the financial evaluation and overall spares price should not increase 10 % of the package value. OGDCL reserve right to change the quantity of an item, reduce or delete any item from the spare parts list.

11.0 Operation / Services Manuals.

The successful bidder will provide one set of the following literature with each of the Jet Pumping System supplied.

a. Service / operation / overhauling / Spare Parts manual for Diesel/Gas Engine. — One each

b. Service / operation / overhauling / spares Parts manual for triplex pump — One each

c. Service / operation / overhauling / spare part manuals for other equipment/instruments installed — One each

on the skids and in the package

d. Wiring and termination diagram of Package — One each

e. Drawings of vessel skid along with Vessel dozier and catalogs of equipment installed on skid. — One each

The above manuals should be provided along with the shipping document.

12.0 Factory Acceptance Test (FAT)

Factory Acceptance Test will be carried out before shipment of consignment. Factory Acceptance Test of the complete consignment, Power fluid circulating skid, vessel unit skid and all its ancillaries shall be performance tested. The said test will be witnessed by OGDCL Engineers / TPI at the packager/manufacturer's manufacturing facilities. The OGDCL Engineers visit/TPI will be on OGDCL account.

12.1 FAT Procedure for Jet Pump Units

(i) The FAT test will include visual checks on workmanship, functional tests, with full simulation of all inputs and outputs, application tests and system integrity test. Supplier shall provide all personnel and test facilities to perform the FAT.

(ii) Full load test of the pumping units will be carried out at the manufacturer's facilities as per the guide lines of API-674.

(iii) The packaged unit will be fully tested for integration with all installed instrumentation and control.

(iv) If any failures are discovered and replacements made, these should be logged in the final FAT test report.

(v) Supplier shall perform all testing according to agreed-upon test procedures. Supplier shall prepare test procedures and submit to the company eight weeks before the system ships. Company shall have the option of observing all tests and to re-run these tests if deemed necessary by the company.

(vi) Supplier shall correct all defects, imperfections or deviations from specifications found during test in shortest possible time after completion of the FAT.

13.0 Installation & Commissioning

13.1 The successful bidder will be required necessarily to provide competent supervision/commissioning engineer(s) during installation, commissioning, start up and O&M training of Jet Pumping packaged Unit at site in Pakistan.

13.2 Supervision/commissioning engineer(s) will be responsible for the mechanical works, E&I, control system related activities.

13.3 The supervision engineer will also be responsible for selection of optimum nozzle/throat combination for producing maximum possible well fluid returns as per actual condition.

13.4 Cost of the commissioning activity should be quoted as lump sump in the financial bid. OGDCL will only provide the boarding / lodging at site in Pakistan. This cost shall be the part of financial evaluation.

13.5 It is the responsibility of bidder to complete the commissioning job to the satisfaction level of company in stipulated time frame. No extra charges will be paid in account of extra time or visit required by bidder's commissioning team.

14.0 Warrantee / Guarantee.

14.1 The supplier shall provide equipment warrantees and performance guarantees of the supplied equipment against this requirement. The supplier shall essentially furnish following warranties and guarantees.

a. Engine manufacturers warrantee and guarantee.
b. Triplex pump manufacturers warrantee and guarantee.
c. Guarantees, warranties for other quoted equipment.
d. Performance guarantee of the overall Engine-triplex pump package.
e. The packager / contractor will warrant that all goods / equipment supplied under this tender / contract shall be new and have no defects arising from design, materials or workmanship or from any act of commissioning of the packager, that may develop

under normal use of the equipment under the design condition stated in the tender inquiry / contract in the country of final destination.

14.2 The duration of warranty shall be 12 months from the date of initial start up or 18 months from the date of shipment.

14.3 The purchaser shall promptly notify the packager / contractor in writing of any claims arising under this warranty. Upon receipt of such notice, the contractor shall, with all reasonable speed, repair of replace the defective goods or parts thereof, without any cost to the purchaser.

14.4 The packagers are required to confirm in their bids to provide the above warranty for packaged equipment.

Appendix-I

OIL /WATER ANALYSIS

These maximum and minimum values are of entire field for design & selection of equipment.

OIL ANALYSIS

	Minimum	Maximum
API Gravity	39	45.5
Salt (PTB)	17	12000

WATER ANALYSIS

	Minimum	Maximum
Specific Gravity	1.04	1.12
Chlorides (PPM)	24550	49700
PH Value	7.5	7.5

FUEL GAS COMPOSITION

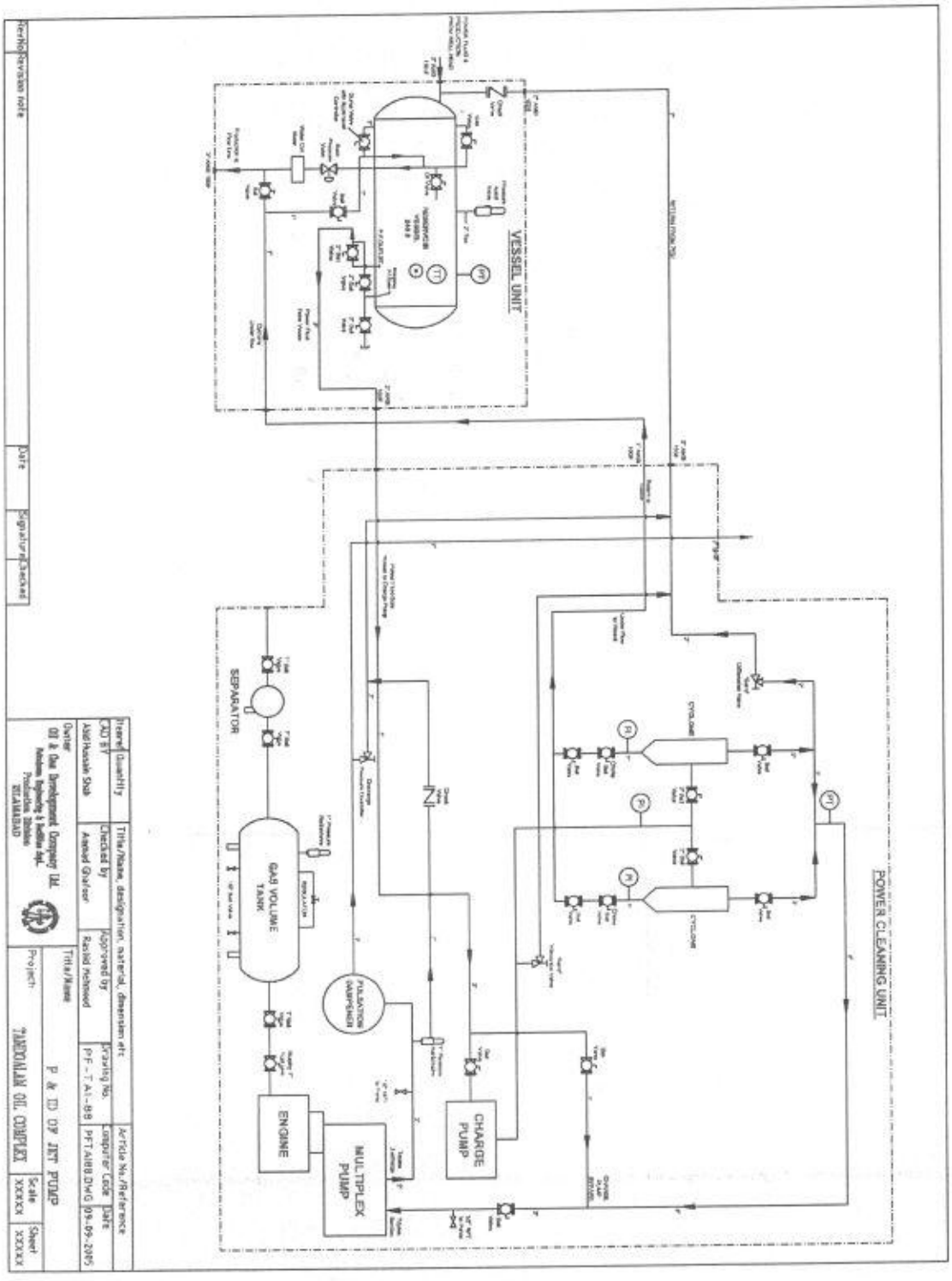
Composition	Mole %
Methane (C1)	75.95
Ethane (C2)	11.55
Propane (C3)	4.62
Iso-Butane (iC-4)	0.62
N-Butane (n-C4)	0.96
Iso-Pentane (iC-5)	1.17
N-Pentane (n-C5)	0.08
Hexane Plus (C6+)	0.21
C.V (BTU/SCF)	1162
CO2 (%)	1.40
N2 (%)	4.43
H2S	Nil
Specific Gravity	0.7217

Appendix-I

ENVIRONMENTAL DATA

Maximum Ambient Temperature:	118 °F (128 °F design temperature for air cooler)
Ambient Temperature:	64 °F (min. avg.) & 93 °F (max. avg.)
Minimum Ambient Temperature:	88 °F
Relative Humidity	20 - 77 %
Direction of Prevailing Wind:	The prevailing wind directions are either blowing from the North to the North-East, or blowing from the South-West to South-East.
Wind Velocity (Max / Normal):	45 m/s at 10 m elevation, Exposure factor C – flat open terrain, Importance factor 1.15 – essential facility
Elevation above mean sea level (GPF):	21 m (69 ft.)
Airborne dust Particles:	Possible effect of airborne dust particles shall be considered when developing the design
Ice / Snow:	None
Seismic Zone :	Zone 2A of Uniform Building Code- UBC-1997.
Max. Daily Rainfall:	251 mm (recorded over 24 hours)
Max. Monthly Rainfall:	286 mm

Appendix-II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ENGINE
MULTIPLEX PUMP
CHARGE PUMP
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Pakistan Engineering & Auxiliary Dept.
Production Division
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Checked by
Aamad Ghafoor
Approved by
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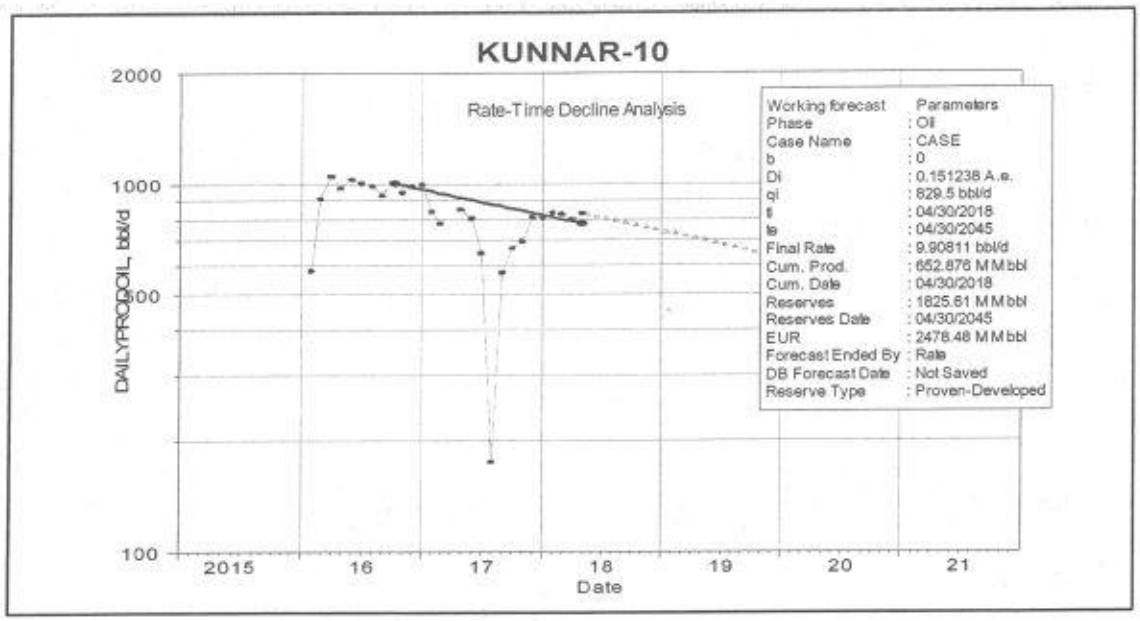


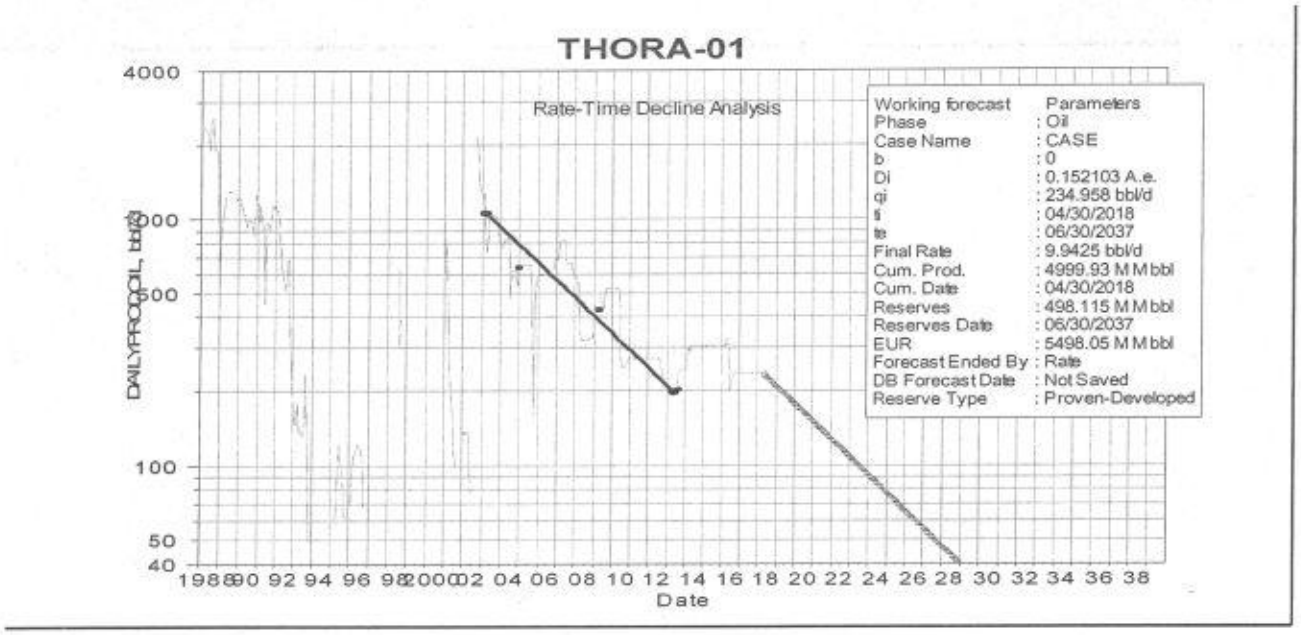
CASE: KUNNAR-10

	Date	Average Rate bbl/d	Annual Volume Mbbl
1	2018	785.51	192.45
2	2019	685.41	250.175
3	2020	581.69	212.898
4	2021	493.66	180.185
5	2022	419.04	152.951
6	2023	355.71	129.834
7	2024	301.88	110.488
8	2025	256.19	93.511
9	2026	217.47	79.378
10	2027	184.6	67.38
11	2028	156.67	57.34
12	2029	132.96	48.53
13	2030	112.86	41.195
14	2031	95.8	34.968
15	2032	81.31	29.758
16	2033	69	25.186
17	2034	58.57	21.379
18	2035	49.72	18.148
19	2036	42.2	15.444
20	2037	35.81	13.071
21	2038	30.4	11.095
22	2039	25.8	9.418
23	2040	21.9	8.015
24	2041	18.58	6.783
25	2042	15.78	5.758
26	2043	13.39	4.888
27	2044	11.36	4.159
28	2045	10.18	1.222

Special Note:-

All kinds of forecasts/Projections mean expected qauntities of best estimates in future based on some assumptions.

Actual quantities in time could differ the expected one. Therefore the regular updation is required atleast twice a year to refine the future expected quantities depending on actual production & pressure performance of existing & planned wells in field.



CASE: THORA-01

	Date	Average Rate bbl/d	Annual Volume Mbbl
1	2018	222.42	54.494
2	2019	193.92	70.779
3	2020	164.4	60.171
4	2021	139.38	50.874
5	2022	118.19	43.141
6	2023	100.23	36.583
7	2024	84.97	31.1
8	2025	72.04	26.295
9	2026	61.09	22.298
10	2027	51.8	18.908
11	2028	43.92	16.074
12	2029	37.23	13.591
13	2030	31.57	11.525
14	2031	26.78	9.773
15	2032	22.7	8.308
16	2033	19.25	7.024
17	2034	16.32	5.957
18	2035	13.84	5.051
19	2036	11.73	4.294
20	2037	10.36	1.875

Special Note:-

All kinds of forecasts/Projections mean expected qauntities of best estimates in future based on some assumptions.

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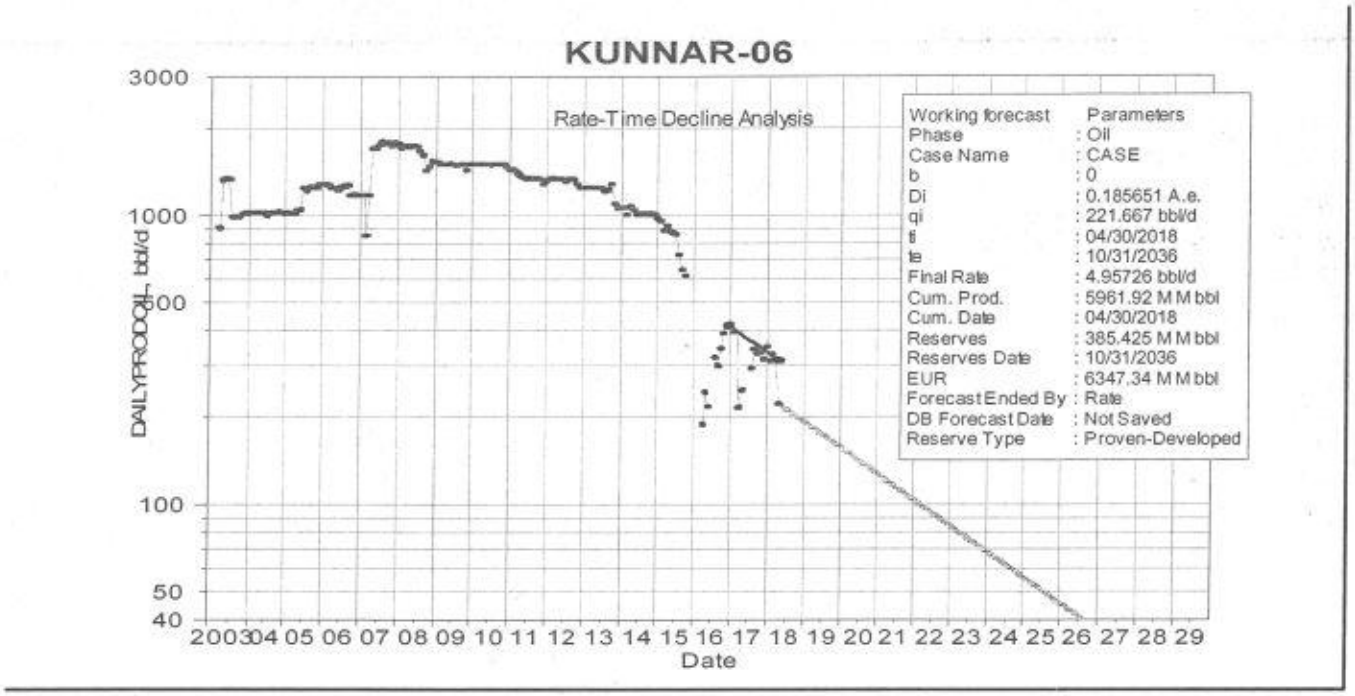

CASE: KUNNAR-06

	Date	Average Rate bbl/d	Annual Volume Mbbl
1	2018	207.08	50.734
2	2019	174.61	63.733
3	2020	142.18	52.036
4	2021	115.76	42.254
5	2022	94.29	34.414
6	2023	76.79	28.029
7	2024	62.53	22.885
8	2025	50.91	18.583
9	2026	41.47	15.135
10	2027	33.77	12.327
11	2028	27.5	10.065
12	2029	22.39	8.172
13	2030	18.24	6.656
14	2031	14.85	5.421
15	2032	12.09	4.426
16	2033	9.85	3.594
17	2034	8.02	2.927
18	2035	6.53	2.384
19	2036	5.41	1.649

Special Notes:-

All kinds of forecasts/Projections mean expected qauntities of best estimates in future based on some assumptions.

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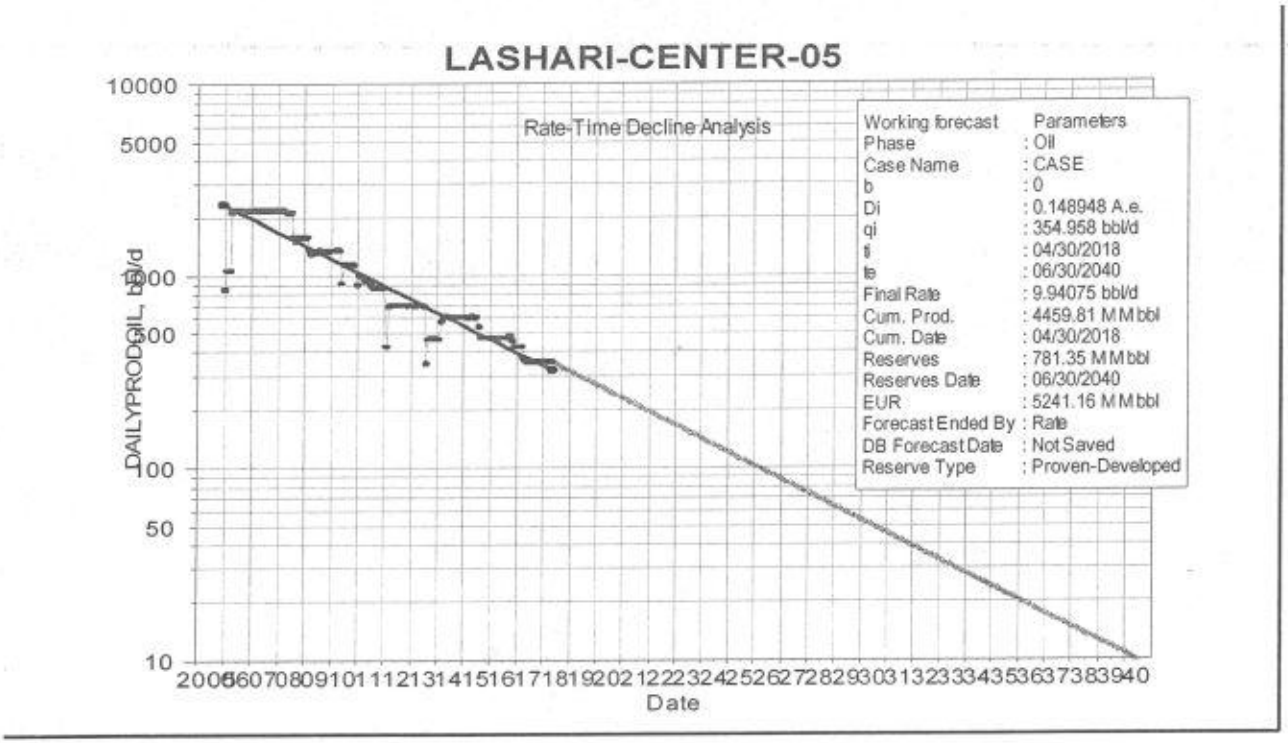

CASE: LASHARI-CENTER-05

	Date	Average Rate bbl/d	Annual Volume Mbbl
1	2018	336.43	82.426
2	2019	294.22	107.389
3	2020	250.37	91.634
4	2021	213.05	77.763
5	2022	181.34	66.188
6	2023	154.34	56.336
7	2024	131.34	48.071
8	2025	111.77	40.794
9	2026	95.13	34.722
10	2027	80.97	29.553
11	2028	68.9	25.218
12	2029	58.63	21.401
13	2030	49.9	18.215
14	2031	42.48	15.504
15	2032	36.15	13.229
16	2033	30.76	11.227
17	2034	26.18	9.555
18	2035	22.28	8.133
19	2036	18.96	6.94
20	2037	16.14	5.889
21	2038	13.73	5.013
22	2039	11.69	4.267
23	2040	10.35	1.884

Special Note:-

All kinds of forecasts/Projections mean expected qauntities of best estimates in future based on some assumptions.

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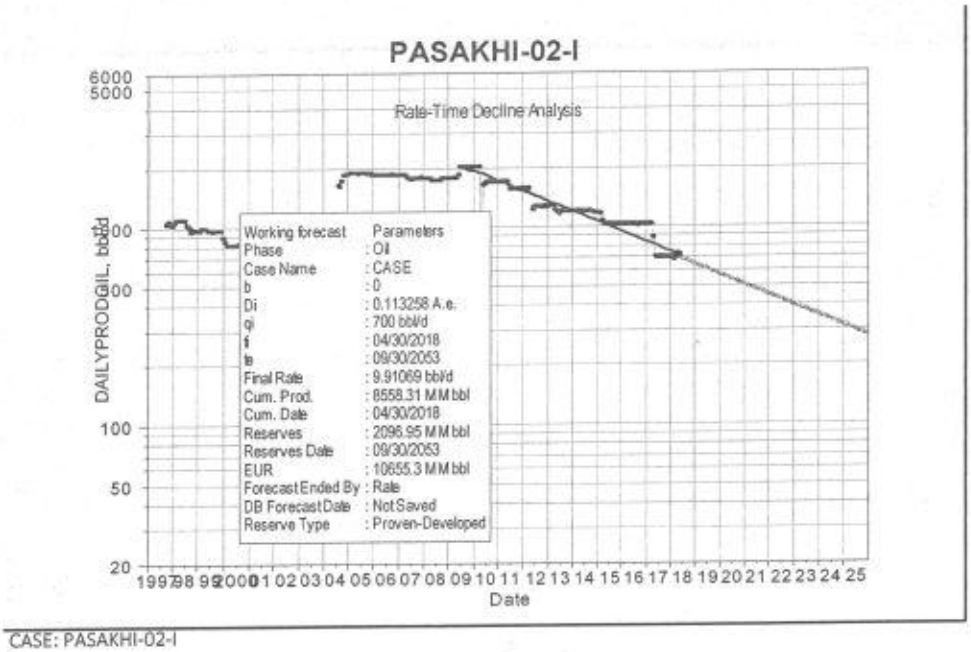


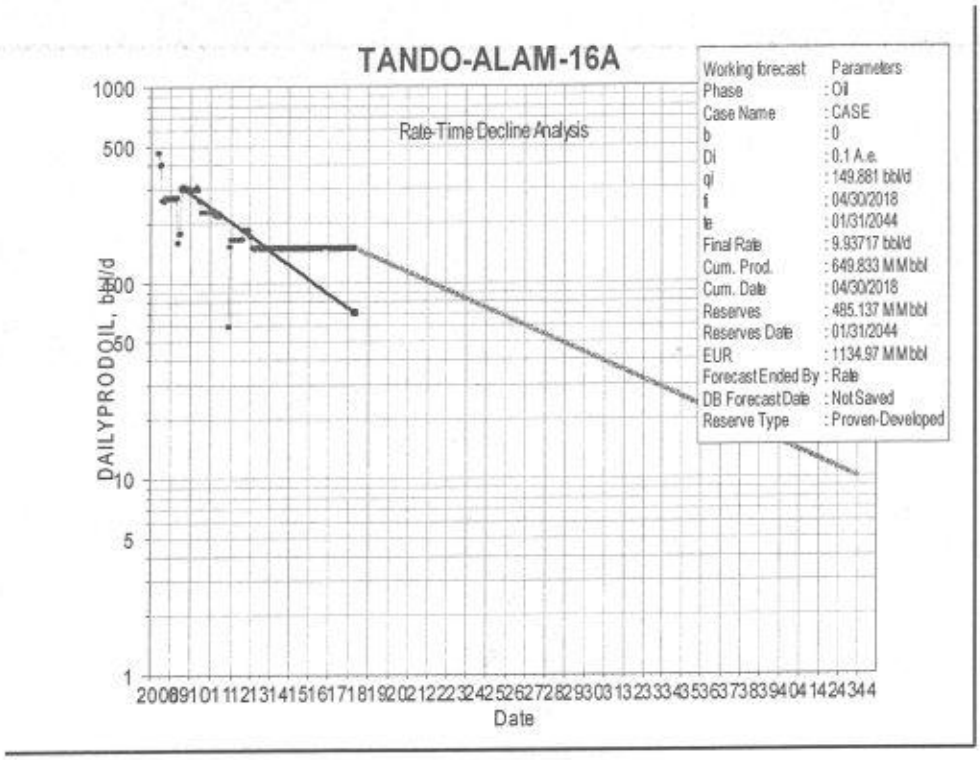
CASE: PASAKHI-02-I

	Date	Average Rate bbl/d	Annual Volume Mbbl
1	2018	672.52	164.768
2	2019	608.5	222.102
3	2020	539.54	197.471
4	2021	478.39	174.613
5	2022	424.24	154.849
6	2023	376.23	137.323
7	2024	333.59	122.094
8	2025	295.78	107.961
9	2026	262.3	95.741
10	2027	232.62	84.905
11	2028	206.25	75.489
12	2029	182.88	66.751
13	2030	162.18	59.195
14	2031	143.82	52.495
15	2032	127.52	46.674
16	2033	113.07	41.271
17	2034	100.27	36.6
18	2035	88.92	32.457
19	2036	78.85	28.858
20	2037	69.91	25.517
21	2038	62	22.629
22	2039	54.98	20.068
23	2040	48.75	17.842
24	2041	43.22	15.777
25	2042	38.33	13.991
26	2043	33.99	12.408
27	2044	30.14	11.032
28	2045	26.73	9.755
29	2046	23.7	8.651
30	2047	21.02	7.671
31	2048	18.64	6.821
32	2049	16.52	6.031
33	2050	14.65	5.349
34	2051	13	4.743
35	2052	11.52	4.217
36	2053	10.37	2.831

Special Notes:

All kinds of forecasts/Projections mean expected qauntities of best estimates in future based on some assumptions.

Actual quantities in time could differ the expected one. Therefore the regular updation is required atleast twice a year to refine the future expected quantities depending on actual production & pressure performance of existing & planned wells in field.

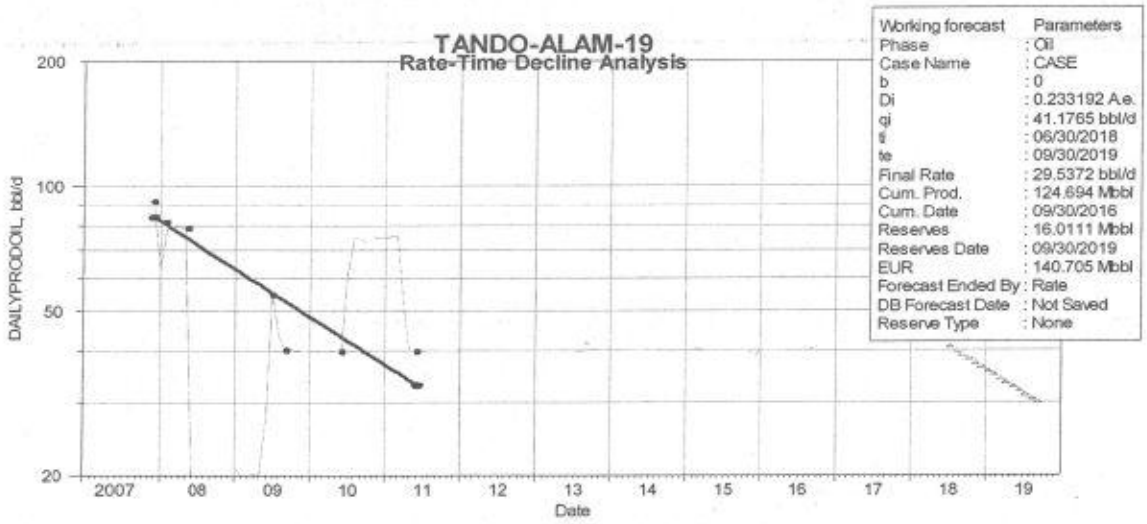


	Date	Average Rate bbl/d	Cumulative Volume MMbbl
1	2018	144.71	35.453
2	2019	132.55	83.835
3	2020	119.29	127.495
4	2021	107.35	166.679
5	2022	96.62	201.946
6	2023	86.97	233.69
7	2024	78.27	262.335
8	2025	70.43	288.043
9	2026	63.4	311.183
10	2027	57.06	332.01
11	2028	51.35	350.804
12	2029	46.21	367.671
13	2030	41.59	382.853
14	2031	37.44	396.517
15	2032	33.69	408.848
16	2033	30.32	419.915
17	2034	27.29	429.875
18	2035	24.56	438.841
19	2036	22.1	446.931
20	2037	19.89	454.192
21	2038	17.9	460.727
22	2039	16.12	466.609
23	2040	14.5	471.917
24	2041	13.05	476.681
25	2042	11.75	480.968
26	2043	10.57	484.828
27	2044	9.98	485.137

Special Note:-

All kinds of forecasts/Projections mean expected qauntities of best estimates in future based on some assumptions.

Actual quantities in time could differ the expected one. Therefore the regular updation is required atleast twice a year to refine the future expected quantities depending on actual production & pressure performance of existing & planned wells in field.



CASE: TANDO-ALAM-19

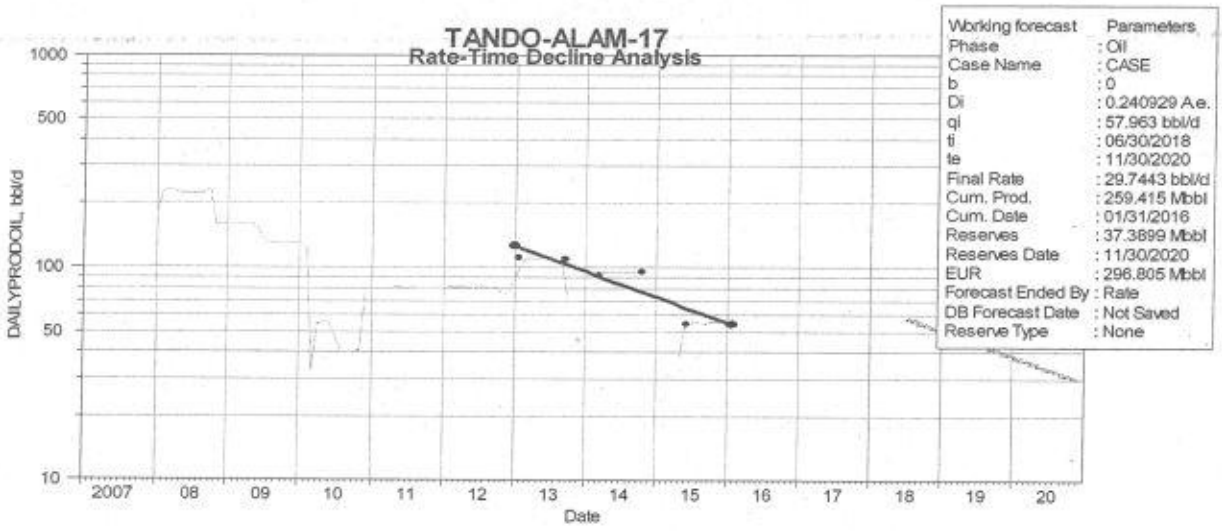
Equation

01

Working Forecast and Actual Production Comparison

Working Forecast Period	06/30/2018 - 09/30/2019
Forecasted Production	16.011
Remaining Forecasted Period	06/30/2018 - 09/30/2019
Remaining Forecasted Reserv	16.011
Ultimate Recoverable Reserve	140.705

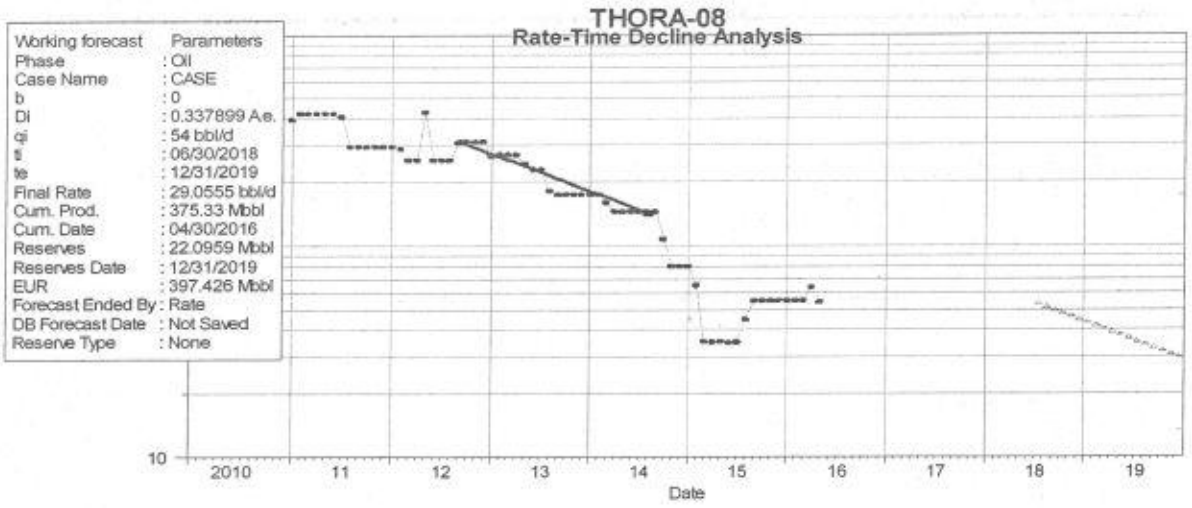
	Date	Average Rate bbl/d	Annual Volume Mbbl	Cumulative Volume Mbbl	Schedule
1	12/31/2018	38.54	7.092	7.092	# 01
2	9/30/2019	32.67	8.919	16.011	# 01



CASE: TANDO-ALAM-17
Equation
01
'Working Forecast and Actual Production Comparison

Working Forecast Period	06/30/2018 - 11/30/2020
Forecasted Production	37.39
Remaining Forecasted Period	06/30/2018 - 11/30/2020
Remaining Forecasted Reserves	37.39
Ultimate Recoverable Reserves	296.805

	Date	Average Rate bbl/d	Annual Volume MMbbl	Cumulative Volume MMbbl	Schedule
Schedule: # 01 (Ended By: Rate)					
1	12/31/2018	54.12	9.958	9.958	# 01
2	12/31/2019	44.1	16.095	26.053	# 01
3	11/30/2020	33.84	11.337	37.39	# 01



CASE: THORA-08

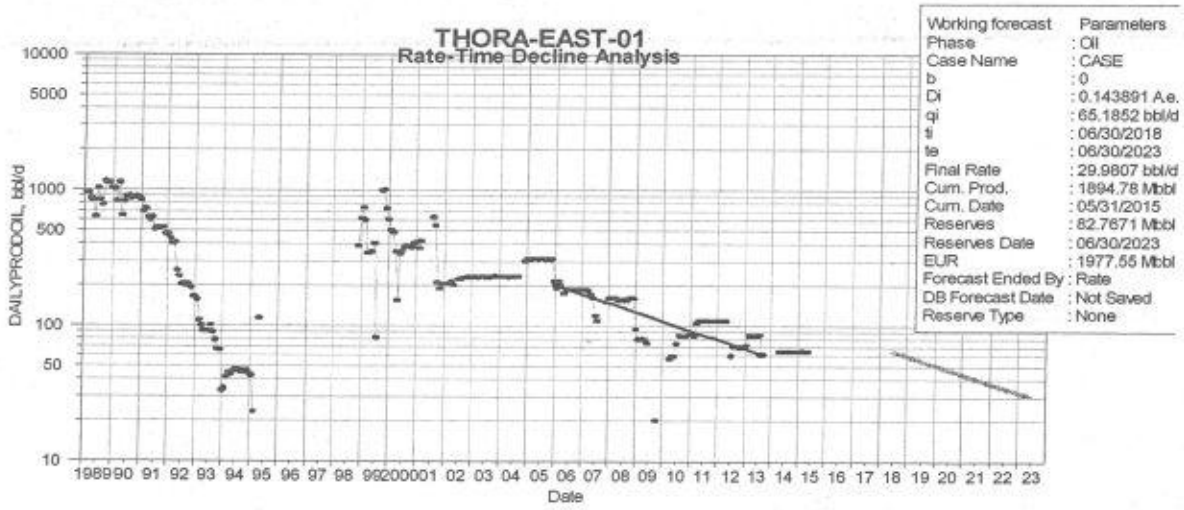
Equation

01

Working Forecast and Actual Production Comparison

Working Forecast Period	06/30/2018 - 12/31/2019
Forecasted Production	22.096
Remaining Forecasted Period	06/30/2018 - 12/31/2019
Remaining Forecasted Reserves	22.096
Ultimate Recoverable Reserves	397.426

	Date	Average Rate bbl/d	Annual Volume Mbbl	Cumulative Volume Mbbl	Schedule
1	12/31/2018	48.76	8.972	8.972	# 01
2	12/31/2019	35.96	13.124	22.096	# 01



CASE: THORA-EAST-01

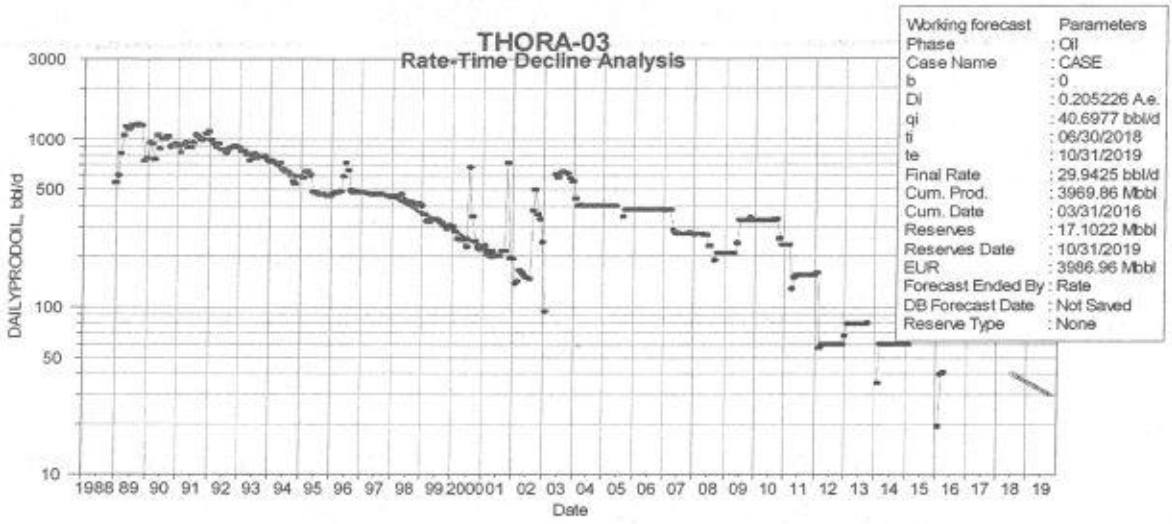
Equation

01

Working Forecast and Actual Production Comparison

Working Forecast Period	06/30/2018 - 06/30/2023
Forecasted Production	82.767
Remaining Forecasted Period	06/30/2018 - 06/30/2023
Remaining Forecasted Reserve	82.767
Ultimate Recoverable Reserve	1977.546

	Date	Average Rate bbl/d	Annual Volume Mbbl	Cumulative Volume Mbbl	Schedule
Schedule: # 01 (Ended By: Rate)					
1	12/31/2018	62.7	11.537	11.537	# 01
2	12/31/2019	55.83	20.379	31.915	# 01
3	12/31/2020	47.79	17.492	49.408	# 01
4	12/31/2021	40.91	14.933	64.341	# 01
5	12/31/2022	35.03	12.786	77.126	# 01
6	6/30/2023	31.16	5.641	82.767	# 01



CASE: THORA-03

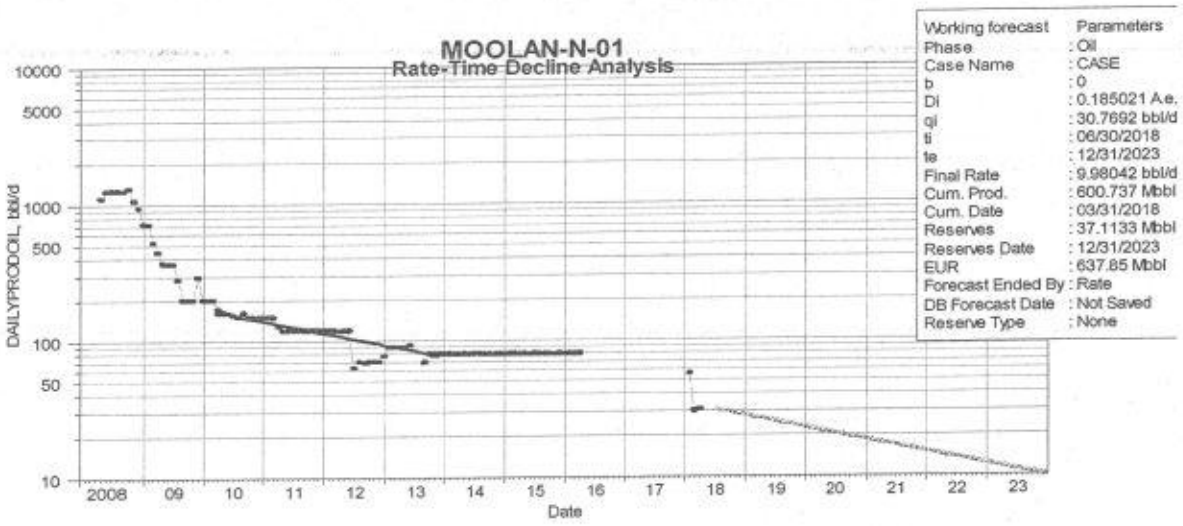
Equation

01

Working Forecast and Actual Production Comparison

Working Forecast Period	06/30/2018 - 10/31/2019
Forecasted Production	17.102
Remaining Forecasted Period	06/30/2018 - 10/31/2019
Remaining Forecasted Reserves	17.102
Ultimate Recoverable Reserves	3986.958

	Date	Average Rate bbl/d	Annual Volume Mbbl	Cumulative Volume Mbbl	Schedule
Schedule: # 01 (Ended By: Rate)					
1	12/31/2018	38.43	7.071	7.071	# 01
2	10/31/2019	33	10.031	17.102	# 01



CASE: MOOLAN-N-01

Equation

01

Working Forecast and Actual Production Comparison

Working Forecast Period	06/30/2018 - 12/31/2023
Forecasted Production	37.113
Remaining Forecasted Period	06/30/2018 - 12/31/2023
Remaining Forecasted Reserv	37.113
Ultimate Recoverable Reserve	637.85

	Date	Average Rate bbl/d	Annual Volume Mbbl	Cumulative Volume Mbbl	Schedule
Schedule: # 01 (Ended By: Rate)					
1	12/31/2018	29.24	5.38	5.38	# 01
2	12/31/2019	25.1	9.162	14.542	# 01
3	12/31/2020	20.46	7.487	22.029	# 01
4	12/31/2021	16.67	6.084	28.112	# 01
5	12/31/2022	13.59	4.959	33.071	# 01
6	12/31/2023	11.07	4.042	37.113	# 01