WELL PRODUCTION SERVICES

Surface Boosting Plants to Achieve Enhanced Oil Recovery (EOR)

by Bonatti Multiphase Pumping Systems



Operating Worldwide as a Local Contractor

13 local companies

more than **75** years of experience

97% average local workforce

9,000 employees

19,000,000 hours worked in 2023

850,000,000 euro: revenues 2023

4.8 billion euro: backlog as of June 2024



WHAT WE DO



OUR WELL PRODUCTION SERVICES

Well Production Services is offering surface & fast track rental solutions to enable Operators to increase production in the following cases:

• REMOTE & MARGINAL WELLS

• GREEN FIELD

far away from terminals / EPF approach

• **BROWN FIELD**

with high depletion rate

• MANIFOLD/WELLS

with high back-pressure





CLIENT ® BRINP © CSE © PERTAMINA © SH-DP © SH-REB

Bonatti WPS offers 18 years experience in Multiphase operations

combining water/chemical and injections and treatment skids

in detail

Multiphase pumping systems (more than 50 operational systems)

ensuring 98,5% average uptime, applied both to Oil field & Gas Field in onshore applications. Offshore application can be implemented.







WELL PRODUCTION SERVICES – KEY FACTORS

Well Production Service is able to replicate the same organization already present in Algeria and composed by:

- Reservoir, petroleum and production engineering expertise to support Client in identifying the well / network needs and implement the most suitable production solution
- **Technology leadership department** to select and customize the most updated market solutions

in order to fulfil any Customer's production need

Project Management Team

implementing the selected solution, from concept design up to installation and start-up on site

 In-house personnel for construction and commissioning

to minimize start-up time



WELL PRODUCTION SERVICES – KEY FACTORS



WELL PRODUCTION SERVICES – KEY FACTORS

Well Production Service offers full control of the whole service chain, thanks to fully dedicated TASK FORCE, composed by:

Skilled operation & maintenance team with dedicated facilities

ensuring 24/7 assistance for Screw / Pressure Cavity / Piston / Centrifugal pumps, Compressors and Treatment skids

- Control Room with On-line monitoring system based on satellite trasmission, giving in-time full remote control of operations
- Bareshaft availability

to provide premium service minimizing production downtime

• Multiple size of pumps hydraulics

allowing to cover wider range of Client well / network production profile and ensuring a wider operational flexibility



WELL PRODUCTION SERVICES





MPP WORKSHOP



GENSET WORKSHOP



SPARE PARTS WAREHOUSE

WPS Facilities



EQUIPMENT WAREHOUSE 100M X 200M AREA



Central + Satellite Bases with:

- workshop for MPP & GenSets maint.
- warehouse for spares
- laydown area for MPP equipment
- Control Room for MPP monitoring



WELL PRODUCTION SERVICES

KEY FACTORS

Maintenance skills

 MPP intensive exploitation leads to higher maintenance intervention ratio (capital spares as rotors & liners become as consumables)



ROTORS



MECHANICAL SEALS



- Rotor: 2 per year
- Liner: 1 per year
- Mech. Seals: 16 per year





WELL PRODUCTION SERVICES - TOTAL APPROACH

Engineering

- Reservoir & Petroleum analysis
- Plot Layout & 3D modeling
- Control philosophy
- Heat & Mass Balance
- Equipment Lists
- Process Data Sheets
- Detailed Engineering
- HAZID/HAZOP/SIL studies





Rental with O&M

- Operation & Maintenance
- 24/7 available crew
- In country Logistic
- Fast Track maintenance intervention
- Bare-Shaft exchange

Manufacturing & Construction

- Manufacturing
- Power generation
- Electrical Substation
- Instrument Air Generation
- Control room and Site facilities
- Mobilization
- Inter-mobilization
- Demobilization and Site restoring



WELL PRODUCTION SERVICES

CLIENT KEY ADVANTAGES NO INVESTMENTS on Client's side ONLY OPEX to cover the Service as soon as the PRODUCTION STARTS

The O&G Companies CASH FLOW is always positive

«One stop shop model»

Bonatti, as Service Provider, implements the full life cycle of the projects (engineering, procurement, installation, start-up, maintenance and operation), including spare parts, interface with production and reservoir engineers for production enhancement



Environmentally friendly approach with best HSE international practices

EQUIPMENT TECHNICAL DATA

MULTIPHASE PUMPING SYSTEMS	LOW TEMPERATURE APPLICATION	technology / main technical features Fully Packaged solutions, with 3 standardized "sizes"	HIGH TEMPERATURE APPLICATION	98,5% Uptime when installed with premium
	Sonatti I	SMALL SIZE based on progressive cavity pumps technology Pump Flow: from 73 to 190 Em3/hr (30KBBLPD) Pump differential pressure: from 20 to 60 bar Gas Volume Fraction (GVF): up to 95% Pump Installed Power: up to 160 kW Min Suction Pressure: 2 bar Max Suction Pressure: 85 bar	Bonatti Ise fennec	O&M package 99% GVF treatable avg. max
	Sonatti I	MEDIUM SIZE based on twin screw pumps technology Pump Flow: up to 660 Em3/hr (100KBBLPD) Pump Differential Pressure: from 20 to 60 Gas Volume Fraction (GVF): up to 100% Pump Installed Power: 600 kW Min Suction Pressure: 2 bar Max Suction Pressure: 85 bar	Sonatti I	18 years designing, constructing and operating MPPP
	Bonatti ls mammoth	BIG SIZE based on twin screw pumps technology Pump Flow: up to 2700 Em3/hr (400KBBLPD) Pump Differential Pressure: from 20 to 60 Gas Volume Fraction (GVF): up to 100% Pump Installed Power: up to 2200 kW Min Suction Pressure: 2 bar Max Suction Pressure: 85 bar	Bonatti	2 bars min. suction pressure, outlet pressure according to client network (max 93 barg)
	All the systems are remotely monitored by means of proprietary Monitoring System *Note: The "E" in front of the flow unit stands for "Equivalent" or in some cases called "Actual" flow, i.e. flow at suction pressure and temperature (when gas portion is compressed to "Suction" as opposed to "Standard").			NO FLARING







The Twin Screw technology allows high performance and wide range of flowrate and DeltaP















Wide

Narrow

What is the result of the Multiphase Pump technology application?









TYPE I and TYPE II SIZE

skid-mounted equipment, complete also with control cabin. Easy to be transported/moved from one site to another upon Client requests.

Suitable to work with GVF from 96% to 99% Fully packaged solution.



- TYPE I and TYPE II Flow rate: 1,000 EBPD (with low GOR) up to 120,000 EBPD up to 60bar Δp
- Min suction Pressure: 2 bar
- Installed Power: 180 ÷ 750 kW
- Available gas and diesel generators
- Remotely monitored







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TYPE III SIZE

Multi-skid-mounted equipment, complete also with control cabin, customized solutions can be supplied.

Suitable to work with GVF up to 99% Fully packaged solution.





- Flow rates: 110,000 EBPD
 up to 420,000 EBPD at 20 ÷ 60 bar of Δp
- Min suction Pressure: 2 bar
- Installed Power: till 2.5 ÷ 2.7 MW
- Preferable on electrical grid connection
- Remotely monitored

Bonatti provide remote control & monitoring system both for Multiphase Pump and Chemical Injection systems with following main features:

- all Bonatti WPS applications could be unmanned
- the local control system use a Satellite connection
- data in real time available for 24/7 monitoring of machines parameters
- machines can be remotely adjusted and/or shutted down
- data available worldwide for Clients and for Bonatti Parma HQ support team.
- system fully redundant (multiple servers and control rooms approach)
- all data are backed up continuously and confidentiality covered





Easy Web specifications:

- Easy and Secure, Easy navigation, and secure data transfer from server to server by VPN.
- Secure access available to the Customer, access by 2048 Bit certificate SSL
- Real Time Data update every 5 seconds for main signals









Different parameter can be acquired form remote monitoring system:

- Equipment status (in operation or not)
- Pressure and Temperature
- Vibration and speed
- Liquids Level
- Current, voltage, power and frequency
- Actuated valve status







The WPS Remote Monitoring System can therefore be summarized in the following surplus values:

- ✓ Increased security:
 - > Operating Sites can be unmanned
- Increased production reactivity:
 - > 24/7 accessibility of data in real time or remotely at any time and anywhere in the world

Improvement of maintenance engineering:

- Possibility to carry out predictive maintenance according to the progress of the monitored parameters.
- Minimization of troubleshooting times, by changing the plant operating parameters, that is, preventing unwanted shutdown equipment.
- Greater deepening and global vision in failure and route cause analysis
- Storage and analysis of operational parameter records and fault events







Bonatti



WELL PRODUCTION SERVICES

SALT DILUTION, WATER INJECTION & CHEMICAL INJECTION FACILITIES

SALT DILUTION FACILITIES

Bonatti's salt dilution system allows the dilution of the salt solution contained in the oil by injecting high pressure water mixed with chemicals into the well, avoiding the crystallization and accumulation of salt, which can cause clogging of the well's pipelines.

To perform this task, Bonatti has in its fleet different kind of models that can be installed based on client's needs and well requirement:

- Chemical injection station
- Mobile chemical injection Mega-Skid
- Mobile chemical injection mini-skids



CHEMICAL INJECTION STATION (TYPE-P)

Total= 3 Installed= 3 Available= 0 The **"TYPE-P"** chemical injection station is installed where high pressure water-chemical mixture needs to be injected into large number of wells simultaneously.



Technical data:

- Chemical dosage Pump flow rate: up to 33 liter/hr
- Chemical injection Pressure: up to 300 bar
- Design temperature: -5°C +80°C
- Design pressure: 363 bar
- Diesel engine: 100kVA
- Remotely monitored
- Remotely operated (VLR)
- Data acquisition system

<u>MoC</u>: water line C.S

Chemical line S.S

CHEMICAL INJECTION STATION (TYPE-P)

Total= 3 Installed= 3 Available= 0 "TYPE-P" chemical injection station is installed where high pressure water-chemical mixture needs to be injected into large number of wells simultaneously.

The main features of the "TYPE-P" chemical injection station are:

- High pressure water filtration unit composed of:
 - n°2 basket strainers (one running and one stand-by) having filtration grade of 10microns
 - manual valves ,
 - pneumatic valves,
 - pressure transmitters, safety valves etc.

• Chemical dosing unit composed of:

- n°6 chemical tanks (1000 liter each) equipped with level indicators,
- n°12 dosing pumps. N° 2 serving each tank (one running and one stand-by),
- n°6 chemical agitators,
- n° 6 flow transmitters,
- n°6 calibration pot,
- valves, pressure transmitters, safety valves etc.
- N°1 Static Mixer
- N° 4 water distribution manifold skid (n° 5 fingers each) quipped with flow transmitters
- N° 1 control cabin equipped with Ac , air compressor room, toilet for operators
- N°2 diesel generator 100kVA (one running and the other as back-up)
- N°1 diesel tank for generators

"TYPE-P" CHEMICAL INJECTION STATION



Chemical tanks

Static mixer



Filtration Skid



CHEMICAL INJECTION STATION (TYPE-EA)

Total= 8 Installed= 5 Available= 3 The **"TYPE-EA"** chemical injection station is installed where high pressure water-chemical mixture needs to be injected into large number of wells simultaneously.



Technical data:

- Chemical dosage Pump flow rate: up to 30 liter/hr
- Chemical injection Pressure: up to 300 bar
- Design temperature: -5°C +80°C
- Design pressure: 330 bar
- Diesel engine: 110kVA
- Remotely monitored
- Remotely controlled (VLR)
- Data acquisition system

<u>MoC</u>: water line C.S

Chemical line S.S

CHEMICAL INJECTION STATION (TYPE-EA)

Total= 8 Installed= 5 Available= 3 The "TYPE-EA" chemical injection station is installed where high pressure water-chemical mixture needs to be injected into large number of wells simultaneously.

The main features of "TYPE-EA" chemical injection station are:

- N°1 High pressure water filtration skid composed of:
 - n°2 cartridge strainers (one running and one stand-by) having filtration grade of 2microns
 - manual valves ,
 - pneumatic valves,
 - pressure transmitters, safety valves etc.

• N°4 Chemical dosing skids, each skid composed of:

- n°1 chemical tank (1000 liters) equipped with level indicators,
- n°2 dosing pumps (one running and one stand-by),
- n°1 chemical agitator,
- n° 1 flow transmitters,
- n°1 calibration pot,
- valves, pressure transmitters, safety valves etc.
- N°1 Static Mixer
- N° 4 water distribution manifold skid (n° 5 fingers each) quipped with flow transmitters
- N° 1 control cabin equipped with Ac , air compressor room, toilet for operators
- N°2 diesel generator 100kVA (one running and the other as back-up)
- N°1 diesel tank for generators

Chemicals are provided by client

TYPE-EA" CHEMICAL INJECTION STATION

Chemical dosing skid



Calibration pot



TYPE-EA" CHEMICAL INJECTION STATION

Finger Manifold SKID



Filtration Skid



Total= 5 Installed= 5 Available= 0 The **"TYPE-C"** mobile mega skid is a skid-mounted complete water injection plant easily transportable from one site to another.

<u>Technical data:</u>

- Chemical dosage Pump flow rate: up to 20 liter/h
- Chemical injection Pressure: up to 400 bar
- Water Piston pump flow rate: 30 lit/min
- Design temperature: -5°C +80°C
- Operating pressure: up to 600 bar
- Diesel engine: 100kVA
- Remotely monitored
- Remotely controlled (VLR)
- Data acquisition system

<u>MoC</u>: water line C.S

Chemical line S.S

Total= 5 Installed= 5 Available= 0 With this type of installation, the injection is generally done into a single well therefore no high-pressure manifold skid is foreseen.

The main features of the "TYPE-C" chemical injection mega skid are:

- n°1 water booster pump
- N°2 cartridge strainers (one working one standby)
- N°1 Chemical dosing unit composed of:
 - n°1 chemical tank (1000 liter each) equipped with level indicators,
 - n°2 dosing pumps(one running and one stand-by),
 - n°1 chemical agitator,
 - n° 2 flow transmitters,
 - n°1 calibration pot,
 - valves, pressure transmitters, safety valves etc.
- N° 2 high pressure water pumps for water injection into well
- N° 1 control cabin equipped with Ac
- * N°1 filtration system

- * N°2 diesel generator 100kVA (one running and the other as back-up)
- * N°1 diesel tank for generators
- * N°1 water tank of 50m3

(*) To be agreed with client

Total= 5 Installed= 5 Available= 0

"TYPE-C" CHEMICAL INJECTION MEGA SKID

High pressure piston pump.

Calibration pot

On-board local JB

Total= 5 Installed= 5 Available= 0

"TYPE-C" CHEMICAL INJECTION MEGA SKID

Chemical tank with agitator

Instrumentation

Diesel generator

Total= 6 Installed= 6 Available= 0 The **"TYPE-A"** mobile mega skid is a skid-mounted complete water injection plant easily transportable from one site to another.

Technical data:

- Chemical dosage Pump flow rate: up to 25 liter/h
- Chemical injection Pressure: up to 12 bar
- Water Piston pump flow rate: 30 lit/min
- Design temperature: -5°C +55°C
- Operating pressure: up to 600 bar
- Diesel engine: 100kVA
- Remotely monitored
- Remotely controlled (VLR)
- Data acquisition system

<u>MoC</u>: water line C.S

Chemical line S.S

Total= 6 Installed= 6 Available= 0 With this type of installation, the injection is generally done into a single well therefore no high-pressure manifold skid is foreseen.

The main features of the "TYPE-A" chemical injection mega skid are:

- n°1 water booster pump
- N°2 cartridge strainers (one working one standby)
- N°1 Chemical dosing unit composed of:
 - n°1 chemical tank (1000 liter each) equipped with level indicators,
 - n°1 dosing pump,
 - n°1 chemical agitator,
 - n° 2 flow transmitters,
 - n°1 calibration pot,
 - valves, pressure transmitters, safety valves etc.
- N° 2 high pressure water pumps for water injection into well
- N° 1 control cabin equipped with Ac
- * N°1 filtration system
- * N°2 diesel generator 100kVA (one running and the other as back-up)
- * N°1 diesel tank for generators
- * N°1 water tank of 50m3

(*) To be agreed with client

Total= 6 Installed= 6 Available= 0

"TYPE-A" CHEMICAL INJECTION MEGA SKID

Strainers

High pressure water pumps

Chemical tank

Flow meter

MOBILE SALT DILUTION SKID (TYPE-O)

Total= 11 Installed= 0 Available= 11 The **"TYPE-O"** mobile skid is a skid-mounted chemical injection mini plant easily transportable from one site to another.

Technical data:

- Chemical dosage Pump flow rate: up to 5 liter/h
- Chemical injection Pressure: up to 600 bar
- Design temperature: -5°C +80°C
- Operating pressure: up to 400 bar
- Diesel engine: 110kVA
- Manual control

MoC: Stainless Steel

MOBILE SALT DILUTION SKID (TYPE-O)

Total= 11 Installed= 0 Available= 11 With this type of installation, the chemical is generally injected into pressurized water pipeline provided by client.

This system is a completely manual configuration, therefore can be operated by client's personnel (after receiving training from Bonatti's staff).

The main features of the "TYPE-O" chemical injection skid are:

- N°1 chemical tank of maximum 500 liters capacity
- N°1 Chemical dosing pump:
- Valves, instrumentations and safety devices
- * N° 1 control cabin equipped with Ac
- * N°2 diesel generator 110kVA (one running and the other as back-up)
- * N°1 diesel tank for generators

(*) To be agreed with client

Chemicals are provided by client

MOBILE SALT DILUTION SKID (TYPE-O)

Total= 11 Installed= 0 Available= 11

<u>"TYPE-O" CHEMICAL INJECTION SKID</u>

Multiple installation

Single installation

Flow rate regulator

WATER INJECTION FACILITIES

- Bonatti's water injection systems are used to inject water into wells to increase their internal pressure, stimulating the production especially in terms of oil recovery.
- To perform this task, Bonatti has in its fleet different kind of models that can be installed based on client's needs and well requirement:
 - Pump type TW 708
 - Pump type TW 600
 - Pump type PMST50S
 - Pump type PMS100-4

HIGH PRESSURE WATER INJECTION PUMPS

The high-pressure water pumps are used to inject water into wells to increase their internal pressure, stimulating the production especially in terms of oil recovery.

Technical data: Diesel engine driven Pump flow: up to 33 m3/hr Pressure: up to 350 bar Diesel engine: 600HP/440kw Remotely monitored HIGH PRESSURE WATER INJECTION PUMPS

TW600 Total= 12 Installed= 3 Available= 4 Revamping= 5 **HIGH-PRESSURE WATER INJECTION PUMPS**

Suitable for water injection and salt dilution activities

PUMP TYPE TW 600: Diesel engine driven Nominal flow rate – 33mc/h Maximum allowable working pressure – 350bar HIGH PRESSURE WATER INJECTION PUMPS

TW 708 Total= 3 Installed= 0 Available= 2 Revamping= 1 **HIGH-PRESSURE WATER INJECTION PUMPS**

PUMP TYPE TW 708: Diesel engine driven Nominal flow rate – 60mc/h Maximum allowable working pressure – 150bar 1 complete pump set is also available

Suitable for water injection and salt dilution activities

GAS BOOSTING SOLUTIONS

GAS BOOSTING, GASJACK AND GAS LIFT

GAS COMPRESSOR - Low Pressure and High Pressure

The Scope of this section is to provide to Client the status of the market research that Bonatti WPS is performing for equipment able to be used for "fast track" production solutions both for Gas and Oil wells and network development and enhancement.

Technology considered in this market research:

 Reciprocating Compressors driven by Gas Engine

Are available different sizes of boosting compressors, with gas engine and with electric motor. The treatable flow rates vary between 0,2 and 1 MMSCM/D. Pressure is expressed in bar.

Delivery time on site are based on OEM/Vendor availability and normal transportation time and might be modified due to market conditions.

BONATTI is able to propose the procurement, installation and start-up with the following options:

- EPC + O&M solution with separate contract
- Rental with O&M (36 months minimum period)

GAS BOOSTING, GASJACK AND GAS LIFT

Bonatti decided to enlarge their fleet of Well Production Services in Algeria thanks to the collaboration with ARC-Energy a US company expert in gas boosting and early production activities:

\Rightarrow Different range of application:

- Gas boosting or gas lift
- Early production facilities

\Rightarrow Main features for compressors:

- Reciprocating gas engine-driven compressor
- Waukesha or Caterpillar gas engine
- Low Suction pressure: less than 1 barg
- High Discharge pressure: more than 100 barg
- Various Inlet Flow: till 50 MMSCFD
- Various stage and cylinders configuration
- Compressor rated speed more than 1000 rpm

ARC Energy and Bonatti WPS: Partnership for Gas Production Service Development

Gas compression Power generation Flare capture

Bonatti and ARC advantages: Holistic synergy on the Service Value Chain

ARC Energy and Bonatti WPS: Partnership for Gas Production Service Development

ARC Energy

- Inhouse Process & Design capability
- Inhouse manufacturing (most of equipment)
- Project Founding
- Equipment (new or second) market direct access
- Nominated Supplier

Bonatti

- Direct installation & logistics for remote area
- Inhouse O&M capability
- Project Founding
- Countries commercial & intelligence
- Prime versus Clients

ARC & Bonatti Mission

Become the main Gas Production Enhancement Service Provider (OPEX no CAPEX) for Algerian Market targeting EPF/Compression/Deflaring/Gas Treatment

FLARE GAS RECOVERY SYSTEM AND VRU

FGR Main goal: flared gas cutting with both fuel gas and semi-stabilized condensate production

The system is connected directly to the flare pipeline (with Tie-In connection if possible or Hot-Tap).

Dedicated design based on client specifications and selection of equipment with fast mobilization and installation: gas compressor, gas cooler, condensate separation and treatment, auxiliaries.

COULING SYSTEM COULING SYSTEM

CONCLUSIONS

Bonatti Well Production Service division is able to provide a wide range of services in support of oil and gas production under highly flexible scheme (on rental or acquisition basis).

The proposed services cover a wide range of operations coming from multiphase pumping, to the reinjection of fluids in the reservoir, to oil and gas pre-treatment up to energy recovery systems.

In order to better illustrate the various services offered and focus attention on those most interesting please visit:

DISCOVER OUR Multiphase pumping system

DISCOVER OUR Well Production Services

or select: Bonatti Youtube Channel

Bonatti also provide maximum availability to study real cases and/or to propose solutions to operating problems encountered and suggested by the Client.

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