

MEHRAN WELLTESTING

MEHRAN
Engineering and Well Services



The logo features a stylized 'X' shape formed by overlapping blue and black geometric shapes. The text 'MEHRAN WEWELLTESTING' is centered in white on a black background within the 'X' shape.

MEHRAN WEWELLTESTING

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OUR COMPANY



MEHRAN Engineering and Well Services Co. is one of the most reputable Iranian companies in delivering full chain of petroleum engineering and field services in onshore and offshore throughout over one decade of continuous presence in the market.

With over 500 employees, more than nine tremendous operation bases in Kish island, and Ahwaz City and all latest technologies, the company serves customized innovative upstream services from engineering, design, consultancy and planning to drilling, well construction, completion and optimization in the oil and gas industry.

Immediately after being founded in 2000 by a team of highly experienced professionals, MEHRAN began its rapid development in fleet, technology, and man power. This fact alongside with the company commitment to high standard services, HSEQ policies, continuous improvement and integrated management resulted in accomplishment of many projects for international and domestic clients such as TOTAL, ENI, PTTEP, POGC, IOOC, NIDC, PETROPARS, PETROIRAN, DANA, OIEC, NIOCEXP, ICOFC, etc.

We proudly provide following services to the market:

Cementing, Stimulation and Fracturing, Coiled Tubing and Thru Tubing, Welltesting and DST, Pumping and Nitrogen lifting, Slickline, Wellhead and Completions, H2S Safety, Directional Drilling and Surveying, Integrated Drilling Services, Petroleum Engineering & Supplies and Sales.

THE CORPORATION

Mehran is a multi-disciplined oilfield service company focused on our home markets in the Iranian Offshore market with more than 15 years experience. Through our people's commitment to service delivery, we provide best in class industry standard service through passion, knowledge and on-ground local experience. Our internationally experienced personnel are determined on solving our customer's challenges by utilizing state-of-the-art equipment. Our strong track-record with Iranian major oil companies and operators has been the key proof of our trust worthiness to our valued customers. It is the source of our pride and success.



MISSION

To be our client's first choice and most trusted partner in all our business lines through the passionate and consistent engagement of our people, by considering every single operation as «mission critical» and successfully delivering the best service available, following quality driven processes in a safe and environmentally responsible manner.

 <p>+500 PROFFESIONAL STAFF</p>	 <p>HIGH QUALITY EQUIPMENT, MATERIAL</p>	 <p>ASSET MANAGEMENT SYSTEM</p>	 <p>ENGINEERING, SIMULATION & ANALYSIS</p>
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Values:

Passionate and consistent engagement Relentless approach to service quality Constant improvement within organization best in class industry-standard training

WELLTEST DEPARTMENT



MEHRAN Well Testing has been operating in both oil and gas fields since 2012, delivering full scope of both conventional and high rate surface well testing and cleanup services with its fleet of separator-based and MPFM-based solution packages in Iran. We adhere to highest service standards and state-of-the-art procedures and international regulations. We offer industry accepted well testing solutions and data services that MEHRAN has engineered to meet international industry compliance standards in terms of reliability, safety forefront in

operations and operation/engineering efficiency.

Our field-proven testing experience, engineering know-how and our team work with our customers enable us provide diagnostic information and hence solutions to variety of circumstances to increase well productivity. Our professionals are on top of our game round the clock to support our customers through team work and engagement at all the stages of design, engineering, risk assessment, execution and data processing.



We've left an inclining trend of improvement since we started operating in Persian Gulf and Oman Sea both in quality and statistics. We benefit our commitment to feedback analysis and continuous improvement.

MEHRAN BENEFITS THE COMPETITIVE ADVANTAGE OF THE CAPABILITY TO RUN STANDALONE RIGLESS OFFSHORE SURFACE WELL TESTING AND CLEANUP SERVICES VIA ITS FLEET OF MODERN STIMULATION-AND-TESTING VESSELS.

In addition to the equipment and qualified personnel, our well testing services would not be complete without accurate data. Thus, the well test engineering team with trained, highly experienced and expert engineers attempt to provide the highest quality of engineering services based on global standards. So we increase our engineering efficiency parallel to our operations to cover our all clients' requests. As a result, well test engineering team utilize the latest update software to reach our clients' goals. These activities contain of detailed and careful analyses on various subjects which play a vital role before and during well test operations and are able to be described as the following items:

Heat and noise Radiation (HR) analyses:

The engineering team use advanced predictive modeling software to determine Heat and noise radiations in the worst scenarios of offshore rigs, enhance the safety of the well test environment and provide the most effective solution to guide and help clients in reducing it effects.

Check data accuracy:

We provide our clients with immediate access to the data coming from the field, in this regard, we use some software

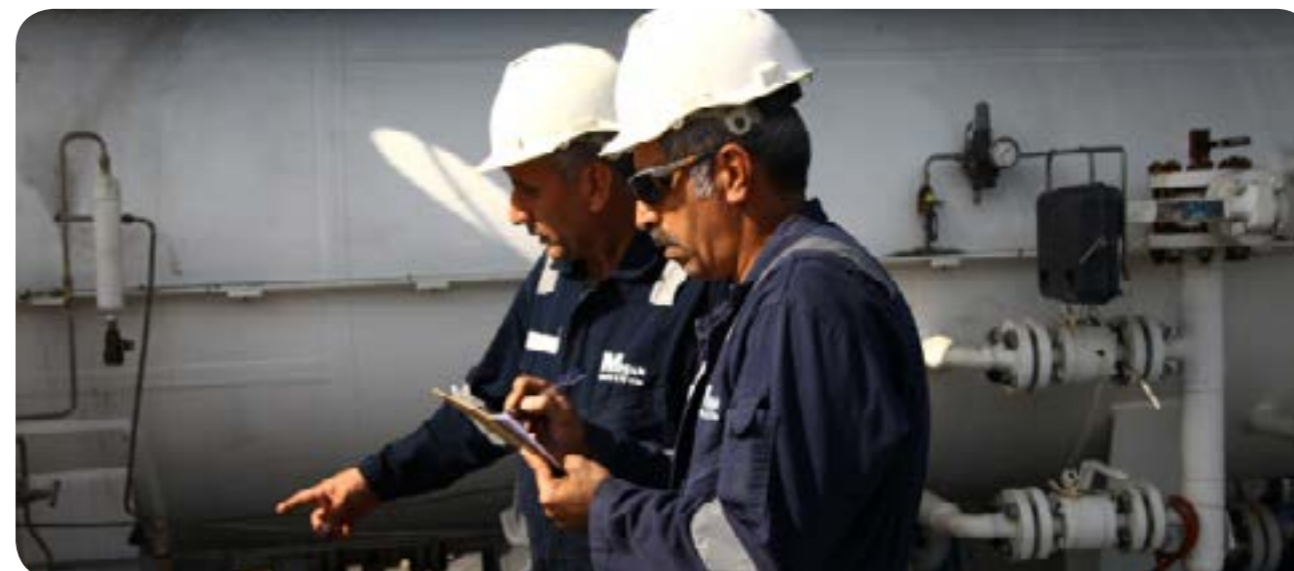
to check the accuracy and validity of data calculated by data acquisition system (DAS) onboard to assure all data are correct and truly input in software during the job.

Well Test Analyses:

Since parameters such as pressure, temperature, rate, and velocity play a vital role in well test operations, we have to estimate, calculate and analyze them by our software previous and during the jobs to avoid any serious problems.

Research & Development:

The last but not least, prepare and present the novel and the safest methods of well test operations in the offshore/onshore fields. These methods will help our clients to diminish their cost in comparison with other routine well test operations. The engineering team considers all aspects which must pay attention to have a safe job by a service company.



OUR SERVICE

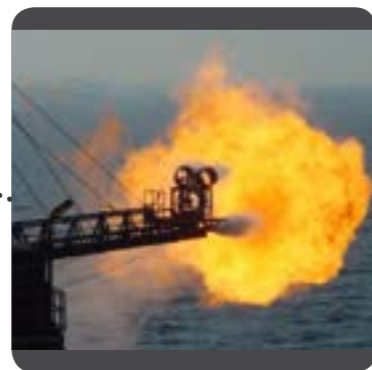
From reservoir to disposal, Mehran provides safe, efficient and accurate well testing services to meet the needs of our customers in any well, anywhere.

As one of the largest well testing service operators, we provide mobile process solutions that accurately measures the performance of our customers' wells both offshore and land. The data that we provide allows our customers to plan the optimal exploitation of their reservoirs.

Mehran works to develop newer, faster and more precise testing solutions. We aim to offer perfect well testing operations and processes and make them as effective and efficient as possible. Our ability to offer the combination of superior service quality and technological innovation enhances the performance of our customers.



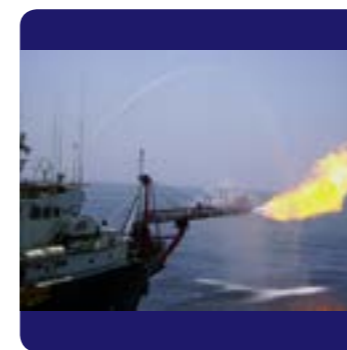
EXPLORATION AND APPRAISAL WELL TESTING (SURFACE & DOWNHOLE)



DEVELOPMENT WELL TESTING (CLEAN-UP) AND FLOW-BACK



PRODUCTION WELL TESTING



RIG-LESS CLEAN UP WITH OUR HIGH PERFORMANCE STIMULATION AND CLEAN-UP VESSEL



RIG-LESS CLEAN-UP OPERATION ON PLATFORM



MPFM (MULTI PHASE FLOW METER)

Our well testing solutions can be used across a range of applications, including:

•Onshore and offshore reservoirs

Our equipment portfolio covers all eventualities from offshore skid mounted packages to purpose built trailer mounted well testing units.

•High rate

Our track record in high rate gas testing is extensive.

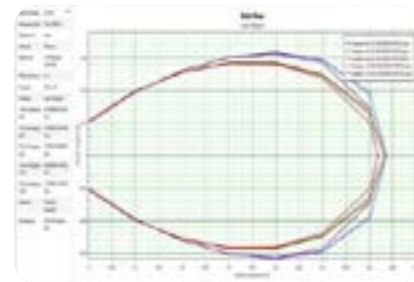
•Heavy oil

Well testing and extended well testing in designated heavy oil reservoirs.

WELLTEST ENGINEERING

Through the experience and knowledge of our people and a commitment to innovation, Mehran decided to hire high quality-experienced petroleum graduated engineer in welltest department that have capability to design and simulation of actual field conditions to facilitate surface welltest to find the optimum condition for surface equipment rig-up such as heat radiation, actual and erosion

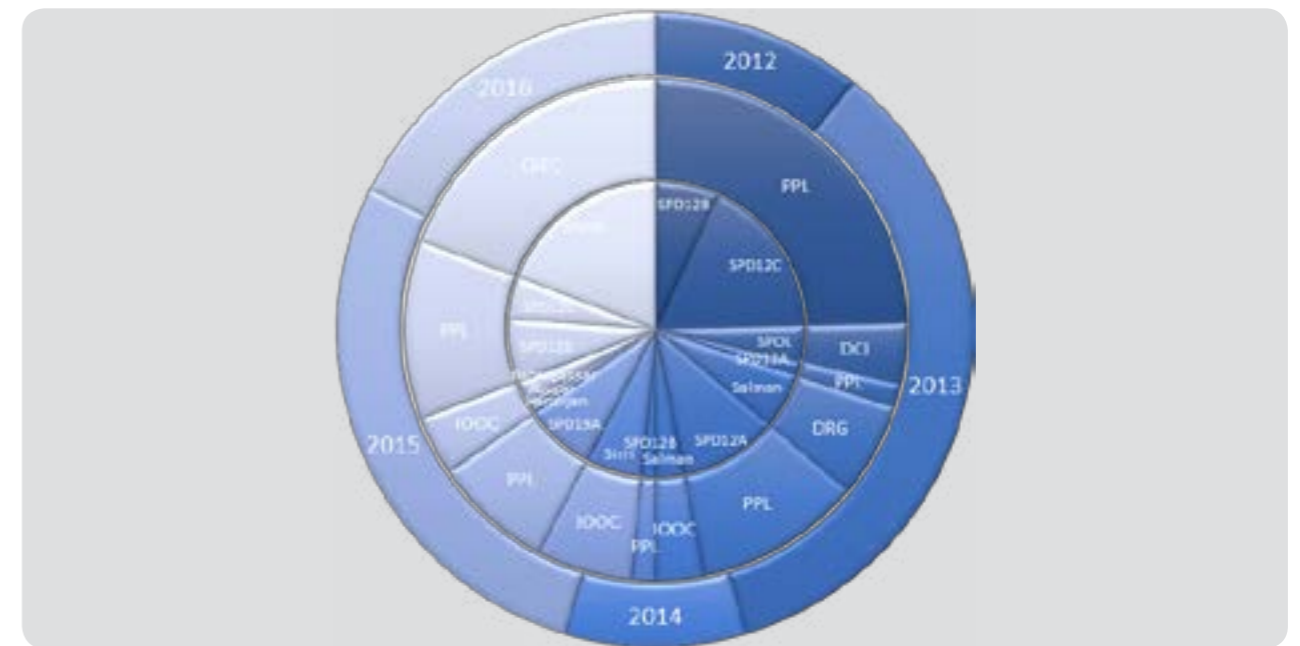
velocity, cold flaring analysis (Gas dispersion). Also, our engineering team predominate to interpretation welltest downhole data to achieve short-term and long-term welltest objectives (Identify formation, fluids, Identify production rates, Measure initial reservoir pressures, Calculate permeability, Calculate skin, Existence of heterogeneities, Discontinuities, Connectivity).



WELLTEST DEPARTMENT HISTORY

Since 2012, Mehran well testing department official records shows astonishing progress of professional career in both engineering and operation. Less none productive time while operation, more clear track and lesson learnt of equipment failures and human errors, updated and strict standards and policies regarding well test operation performance and etc. Performing the first MPFM operation in Persian

Gulf by an Iranian company in 2015 is another outstanding professional career for Mehran well testing department. Performing more than 300,000 hrs.person job without LTI in safe and highly efficient manner accompanied with precise engineering consults to the client in headquarter offices is a routine outcome of trusting Mehran well testing department.



2012

Establishment and perform first rig-less operation onboard a platform by installed Burner Boom, cooling system, logistic arrangement, firefighting vessel presence, etc. performed high rate clean-up successfully.

2013

Perform a high rate well test operation by over 120,000 ppm H2S presence and high temperature circumstance with an unstable well which the cement job has been failed on casing and the well was moving upward totally.
For the first time rig-less operation perform in South Pars. This operation was held on SPD12A by installation of a Burner Boom on Platform's Bridge.

2014

Perform first high rate cold flare clean-up operation onboard a jack-up rig. Considering client very limited time, perform the fastest rig-up and fastest rig down ever, respecting client requirements in safest and most efficient manner.

2015

Performing the first MPFM job on Persian Gulf by an Iranian company. Perform a well test operation measuring gas rate accompanied by measuring oil and water production both in a single surge tank despite using flowmeters on separator. Flow high rate gas effluent on both burner booms at the same time for several occasions to help faster clean-up procedure according to client requirement in a safest and most

2016

Mehran Engineering & Well Services, in the light of its development plan for downhole welltesting service in partnership with a reputable Canadian DST manufacture & service provider, NORTHSTAR, established "MEHRAN-NORTHSTAR Kish" to achieve and implement new technology of Drill Stem Testing in Iran oil and gas upstream industry in accordance with the demands of Iranian Oilfield.

2017

We extend new solution for rigless stimulation and clean-up with high performance Stimulation and clean-up vessel in South Pars field. this proposal investigate in POGC project value engineering workshop by attending expert persons (clients and service companies) so, this solution achieve No.1 in compare to conventional method and rigless clean-up on platform.

OPERATION EXPERIENCE

Following sections will shed light on MEHRAN Well Testing Department experiences with different clients in different fields:

Rig-less clean-up operations on conventional Wells

Even before official establishment of Well Test Department in MEHRAN Co. possessed M. V. Mehravar (Mehran Explorer) stimulation boat was busy to perform rig-less clean-up operations on stimulated well for desired duration to evacuate undesired stimulation or completion fluids from assigned wells. All such operations were performed under close monitoring of IOOC as the client in very safe and professional manner. For more details, see list of M. V. Mehravar (Mehran Explorer) rig-less operations.

Petropars Limited (PPL):

Experiences with PPL related to SPD12 in platforms A, B, & C and also SPD19A.

SPD12A:

Two series of rig-less operation has been performed on this platform in two years in-a-row (June 2012 and then June- September 2013) on two high rate gas wells each time. First rig-less operation was done on board M.V. Mehravar (Mehran Explorer) and second campaign was held on the same location by installation of a Burner Boom on Platform's Bridge. Both were the first time rig-less operation performance in South Pars.

Also high rate well test and clean-up operation were performed onboard this platform in presence of Shahid Rajaie jack-up rig for some other wells till 11th Jan 2014.

SPD12B:

In this platform, 3 wells was cleaned up and tested during September to October 2012 that was our first testing job. Then in 2014, before rig moving to new location (SPD23) Petropars had requested to perform a test job on well 10, Mehran prefers to remember this operation as Miracle as the following reasons;

- The Fastest response to client request in shortest time possible to perform job onboard ABAN VIII.
- Hang off Both Burner Booms in less than 10 hrs., in a very same day. (PORT: 5:45 hrs., STBD: 3:45 hrs.)
- The Shortest rig up ever for complete WT package (54:30 hrs. during 5 days.)
- The Shortest rig down ever for complete WT package (less than 31:30 hrs. during 2 days.)
- Rig down both burner booms in less than 4 hrs. in a very same day.
- Perfect performance of WT crew while job from beginning to end.
- Astonished performance of BBs ignition system while COLD FLARE operation.

This platform was also our last operation in phase 12 where PETROPARS cleaned up 3 new development wells and work-over 3 other wells which were in productions during July -2015/January 2016.

SPD12C:

This platform contains of 10 wells that were cleaned and test during November 2012 up to August 2013. Petropars has planned to perform work-over on 3 production wells in 2015 again. This operation took two months in presence of SAHAR II rig.

SPD19A:

This platform contains of 5 wells that all of them was cleaned up in presence of SAHAR II rig.

IOOC:

The operations which was related to IOOC including two main parts:

- Testing operation of 2 wells in Salman gas field onboard FD-III in 2014.
- Clean up operation of 5 wells in Abouzar, Hendijan and Bahregansar in 2015.

DCI:

This operation including 2 wells clean up and 1 well test which was performed in South Pars Oil Layer (SPOL) during 15-1 April 2013.

DRG Oil:

This operation including 6 wells clean up & test in Salman gas field (2SKB, 2SKC) during August to November 2013.

OIEC:

Our Experience by OIEC pertains to SPD20 platforms:

SPD20:

In this platform the clean-up and test operation has being performed in 2 separate parts. The first campaign which includes 7 wells has started from December 2015 to March 2016. We cleaned up all 7 wells and test 4 of them. The second campaign was started from July 2016 to clean up 4 other wells.

MPFM/ IOOC

For the first time in Iranian offshore filed, an Iranian private company performed a MPFM operation on Esfand & Ilam oil field for 4 wells in a very safe and professional manner.



53
Clean-Up

Total number of clean-up operation on jack-up rig

30
WellTest

Total number of welltest operation + MPFM

18
Rigless

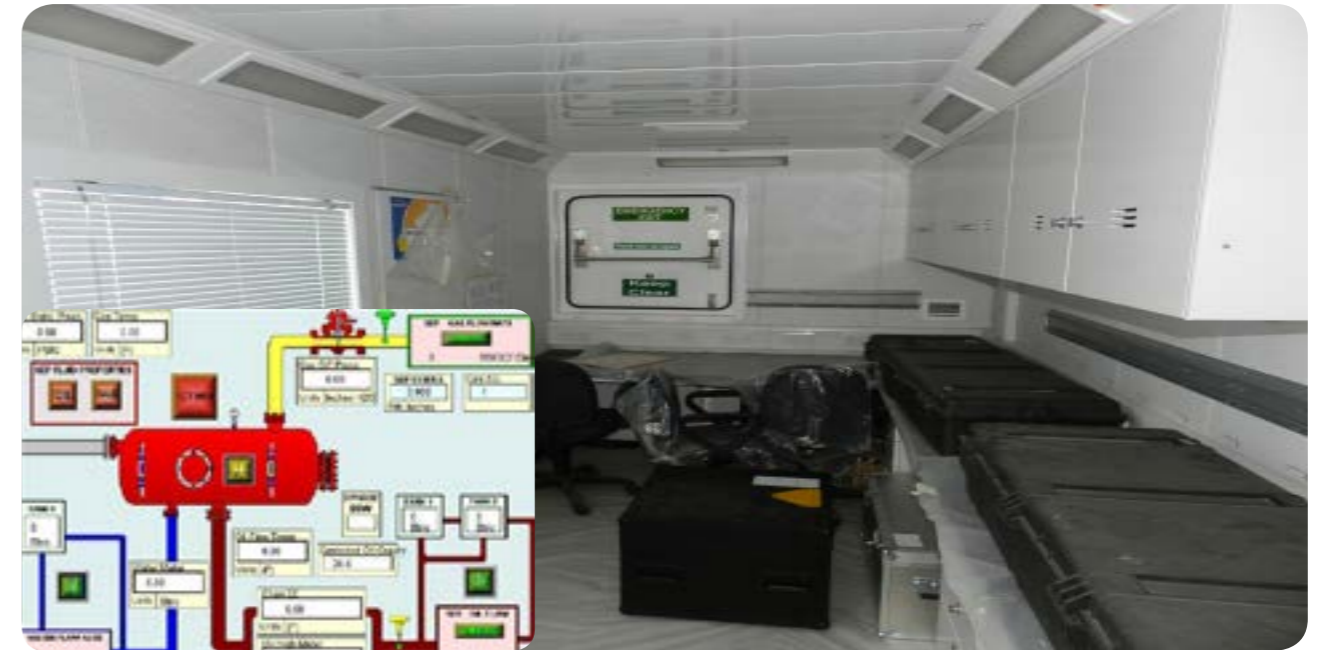
Number of rigless operation. by Stimulation- Cleanup vessels and also on platform

OPERATION EXPERIENCE

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ELECTRONIC DATA ACQUISITION SYSTEM



DESCRIPTION

The intelligent data acquisition and analysis system is designed to monitor and record all pertinent well and well test equipment data.

The Fardux software lite version has been used as welltesting data acquisition software as real time monitoring and reporting onboard/on site location.

Fardux software has been designed as a core product framed initially by the selection of one of a number of USB security dongles. Each different logger (IDEA Enterprise, IDEA Lite, Airwave, Cube, and Well Services) uses a different version of the software. Acquire data from multiple sources; monitor multiple jobs.

Fardux software has always been central to our success in the data acquisition and process control market.

Our software has always been HMI intuitive, logical and particularly easy to understand; this is just one of the reasons our clients come back to us time and time again. Fardux software package can then be further honed in to your requirement to include a large range of selectable bolt on functions, which we call features. The selection of these additional features defines the functionality of exactly what the application code delivers.

As always with Fardux products, we set out to get the job done with the minimum amount of complexity and maximum logical clarity.

3-PHASE HIGH RATE SEPARATOR



DESCRIPTION

The 3-Phase High Rate well test Separator is a self-contained modular unit containing the valves and pneumatic controllers needed to regulate vessel pressure and fluid levels during a well test. It uses CAMERON flow meters and flow analyzer on the water and oil lines to enable flow metering of each phase at the separator outlets. Its operating parameters, such as level, interface, pressure, are remotely set from the data acquisition and control Unit.

The 3-Phase High Rate well test Separator is a large and pressure vessel designed and utilized to separate a well stream into gaseous and liquid component. In other words, it is able to separate production fluids into their constituent components of oil, gas and water. The separator can be used in well-testing applications as well as cleanup operations for newly completed or stimulated wells. They are installed either in an onshore or on an offshore rigs during well testing operations. For land operations, it can be retro-fitted to purpose-designed trailers. Based on the vessel configurations, the oil/gas separators can be divided into horizontal, vertical separators. Based on separation function, the oil/gas separators can also classified into primary phase separator, test separator, high-pressure separator, low-pressure separator, etc. To meet our clients' requirements, Mehran utilize 3-phase high rate horizontal separator in well test operations.

All separators are manufactured under a Type Approval and are provided with a Certificate of Conformity and a full quality file.

Benefits

- Accommodate fluctuating water flow rates during well test cleanup
- Eliminate disposal of unseparated fluids, minimizing risks to the environment
- Improve safety by flowing initial cleanup into a separator instead of low- pressure tanks
- Provide reliable flow rate data
- Reduce cleanup time by allowing higher flow rates and monitoring cumulative volumes of nonhydrocarbon fluids
- Saves time and cost by using standardized equipment to facilitate ease of transportation, maintenance, and operations
- Designed and operated in accordance with industry standards and best practices to preserve equipment integrity and client test objectives
- Relief system sizing designed to API RP 520 (Design of Service)

Feature

- Exploration and appraisal well testing
- Cleanup and flowback
- Production, in-line testing (including multi-phase flow metering)
- Extended well testing fluids

Specification

	Specialist Services (SPS)	Sparklet
Brand	Specialist Services (SPS)	Sparklet
External Dimension [LxWxH], mm	6850 x 2800 x 3077	8500 x 2500 x 3277
Vessel size, horizontal, in x ft.	48 x 12.5	48 x 12.5
Manhole, in	20	20
Working pressure, psi at degF	1440 at 122	1440 at 250
	1345 at 212	1345 at 250
Hydro Test Pressure, psi [kPa]	2160	2160
Min. Operating Temperature, degF	32	-20
Max. Operating Temperature, degF	212	212
Min. Design Material Temperature, degF	-20	-20
Safety valve set pressure, psi [kPa]	1440	1440
Max. Gross Mass, lbm [kg]	57320	55115
Tare Mass, lbm [kg]	18520	18520
Payload, lbm [kg]	38800	38800
Max. gas flow rate		
Low liquid level, MMscf/d at psi	90 at 1440	90 at 1440
High liquid level, MMscf/d at psi	75 at 1440	75 at 1440
Max. oil flow rate		
Low interface level, bbl/d	12,300	12,300
High interface level, bbl/d	16,500	16,500
Connections		
Inlet	6 -in Fig 206, Female	6 -in Fig 206, Female
Gas Outlet	6 -in Fig 206, Male	6 -in Fig 206, Male
Oil Outlet	3 -in Fig 602, Male	3 -in Fig 602, Male
Water Outlet	2 -in Fig 602, Male	2 -in Fig 602, Male
Relief Outlet	4 -in Fig 602, Male	4 -in Fig 602, Male
Sand Jet Line	2 -in Fig 602, Female	2 -in Fig 602, Female

SURGE TANK



DESCRIPTION

The surge tank is a vertical H₂S service vessel designed to store liquid hydrocarbons after separation. The ST is utilized to measure liquid flow rates and the combined shrinkage and meter factor. It can also be used as a second-stage separator and can hold a constant backpressure by using its automatic pressure control valve on the gas outlet.

The ST usually consists of either a single- or a double-compartment vessel and a level-measuring system with sight glasses or magnetic levels. Dual-compartment STs provide a way to empty one tank compartment while filling another. To prevent overpressure and overflowing, the VST is fitted with a pressure-relief valve and a high- and low-level alarm system. The ST is designed with a diverter, a vortex breaker, and stiffening rings capable of withstanding a vacuum in the vessel. It is also fitted with sampling, pressure, and temperature ports, and a bypass manifold is included.

All STs are shock protected by a frame, and both models are designed to the Det Norske Veritas (DNV) 1-2.7 standard. STs operate in the vertical position, but they are transported in a horizontal position.

All surge tanks are manufactured under Type Approval or Design Verification Review and are provided with a Certificate of Conformity and full quality file.

Benefits

- Liquid flow rate, shrinkage factor, and meter factor measurement
- Large-volume dead oil sampling
- Constant backpressure maintenance when used as a second-stage separator
- Single or double compartment
- Sight glasses or magnetic level indicators
- High- and low-level alarm system on each compartment
- Automatic pressure controlled valve that is open on gas outlet
- Diverter, vortex breaker, and stiffening rings

Specification

Brand	Specialist Services (SPS)	Sparklet
External Dimension [LxWxH], mm	6200 x 2538 x 3238	
Vessel Capacity, bbl	2 x 50	2 x 50
Manhole, in	20	
Working pressure, psi	150	
Hydro Test Pressure, psi	225	225
Temperature Range, degF		
Max. Operating Temperature, degF	250	
Min. Design Material Temperature, degF	-20	
Min. Design Material Temperature, degF	-20	
Max. Gross Mass, lbm	44,092	
Tare Mass, lbm	27,117	
Payload, lbm	16,975	
Max. oil flow rate, bbl/d	15,000	
Level Measurement System	Sight Glass	
Connections		
Oil Inlet	3 -in Fig 602, Female	
Oil Outlet	3 -in Fig 602, Male	
Gas Outlet	4 -in Fig 602, Male	
Drain	4 -in Fig 602, Male	

TRANSFER PUMP



DESCRIPTION

The transfer pump (PMP) is designed to pump oil from a tank to a burner or from a tank into an existing flow line. Normally fitted with an explosion-proof electrical motor for operations in Zone 2 regions. The characteristics of the fluid being pumped and the specific application for the pump determine which pump technology (Gear, screw, and centrifugal pump designs) is most suitable.

To prevent overpressure conditions, non-centrifugal PMP models are fitted with a pressure relief bypass valve. The centrifugal models are self-protected. PMPs are shock-protected by a frame, and some are rated to Det Norske Veritas (DNV) 1-2.7 standard.

All PMPs are manufactured under Type Approval or Design Verification Review and are provided with a Certificate of Conformity.

Benefits

- Can be used to empty one tank compartment while filling another
- Able to increase pressure for burner operation
- Protected against overpressure by a relief bypass (except centrifugal designs, which are self-protected)
- Explosion-proof electrical motors
- Shock-protected by a frame
- Compliant with ASME B31.3; electrical motor compliant with EExd IIB T4

Application

- Well testing surge tanks or gauge tank transfer
- Reinjection of separator oil into an existing flow line
- Pump liquids to a tanker

Specification

Brand	Specialist Services (SPS)
External Dimension [LxWxH], mm	3500 x 1710 x 1750
Capacity, bbl/d	4,000
Differential Pressure, psi	300
Design Temperature Range, degF	-20 to 250
Operating Temperature, degF [degC]	32 to 212
Liquid Description	Crude Oil - Sour Service
Specific Gravity	Greater than API °20
Suction Pressure	Atmospheric to 150 psi(g)
Pump Speed, rpm	651
Motor Speed, rpm	1500
Electrical Supply	50/3/380 or 60/3/415
Inlet	3 -in Fig 602, Female
Outlet	3 -in Fig 602, Male

OIL AND GAS MANIFOLD



DESCRIPTION

Oil and gas manifold diverts oil or gas, without flow interruption, from the separator to crude oil burner for disposal, to surge tank or gauge tank for measurements or storage, or to a production line. Two burners are normally available for offshore operations to allow continuous testing under any prevailing wind direction. Either the port or starboard burner can be selected without stopping the well tests. Oil and gas manifold also isolates the test equipment to prevent flow interruption if the testing equipment is pulled out of service temporarily.

From the surge tank or gauge tank and through a transfer pump that boosts the pressure, flow is also piped to the oil manifold so that the oil can be supplied to a burner or reinjected to a flow line. The oil manifold allows for flow to one tank compartment while a pump empties the other tank. The oil manifold typically consists of five ball valves arranged as a manifold and is skid-mounted. The gas manifold is fitted with two ball valves and also mounted on a skid.

Oil and gas manifold valves adopt a proven metal-to-metal, double-sealing design to resist harsh environment operations. All manifolds are manufactured under Type Approval or Design Verification Review and are provided with Certificate of Conformity and quality file

Benefits

- Able to divert oil and gas to the safest burner with respect to wind direction and direct oil to a burner or storage tank;
- Allows tank fluids to be pumped to the burner or flow line
- Fitted with two reliable ball valves for gas or five reliable ball valves for oil
- Skid-mounted
- Onshore and offshore operations
- Exploration and development oil and gas well testing
- Production wells

GAS MANIFOLD

Specification

	Specialist Services (SPS)	Specialist Services (SPS)
Brand	Specialist Services (SPS)	Specialist Services (SPS)
External Dimension [LxWxH], mm	2,350 x 750 x 910	2,350 x 750 x 910
Working pressure, psi at degF	1,440 at 100	1,440 at 100
	1,345 at 212	1,345 at 212
Hydro Test Pressure, psi	2,160	2,160
Design Temperature, degF	-20 to 212	-20 to 212
Max. Gross Mass, lbm	850	850
Tare Mass, lbm	240	240
Payload, lbm	610	610
Gas Inlet	6 -in Fig 602, Female	6 -in Fig 602, Female
Gas Outlets (2 No.)	6 -in Fig 602, Male	6 -in Fig 602, Male

OIL MANIFOLD

Specification

	Specialist Services (SPS)	Sparklet
Brand	Specialist Services (SPS)	Sparklet
External Dimension [LxWxH], mm	2,300 x 800 x 520	2650 x 1030 x 480
Working pressure, psi at degF	1,440 at 100	1,440 at 100
	1,345 at 212	1,345 at 212
Hydro Test Pressure, psi	2,160	2,160
Design Temperature, degF	-20 to 212	-20 to 212
Max. Gross Mass, lbm	850	850
Tare Mass, lbm	240	240
Payload, lbm	610	610
Oil Inlet (2 No.)	3 -in Fig 602, Female	3 -in Fig 602, Female
Oil Outlets (3 No.)	3 -in Fig 602, Male	3 -in Fig 602, Male

EMERGENCY SHUT DOWN



DESCRIPTION

The ESD system and a minimum of two remote control stations are recommended for all well test operations. The remote stations are to be located at the separator and in an area removed from all pressurized equipment on an escape route.

During testing operations, the shutdown system controls the hydraulically operated flow line valve on the flowhead and permits manual or remote closure in response to a pipe leak or break, equipment malfunction, fire, or similar emergency. The ESD system is also used to reopen the valve and, if needed, can control an additional surface safety valve upstream of the choke.

Pressure from the system's air-driven hydraulic pump is applied to open the valves and released to close them.

Backing up the remote stations are high- and low-pressure pilots that are installed on the flow line to automatically close the flow line valve in case of an emergency. The high-pressure pilots initiate well closure when the pressure in the flow line rises above a high-level threshold, as would occur if the line were plugged. The low-pressure pilots initiate well closure when pressure falls below a low-level threshold, as it would in the event of a flow line rupture or leak.

In an H₂S environment or for high-pressure tests of 5,000 psi [34 MPa] or greater, one of the remote control stations must be at the separator. Other stations can be set up at the customer's discretion. One station must be on an escape route and in an area away from all pressurized equipment.

Benefits

- Improved safety for personnel and equipment, with established fail-safe well test conditions

Feature

- Skid-mounted control console
- Air-driven hydraulic pump with four air outlets
- Preset pressure values for well closure
- Storage space for remote emergency shutdown (ESD) stations and three hose reels
- Ports for additional or optional pilots
- Hydraulic tank
- High-pressure hose for use with a shutdown-valve actuator
- Low-pressure hoses for connection to the ESD stations or the high- and low-pressure pilots

Specification

Brand	Proserv	Proserv	Check Point
Serial No.	MES-WST-ESD-01	MES-WST-ESD-02	MES-WST-ESD-03
External Dimension [LxWxH], mm	800 x 550 x 800	1400 x 900 x 1100	1500 x 1150 x 1350
Weight, lbm	661	1,102	441

BURNER BOOMS



DESCRIPTION

The Burner Boom is a portable assembly comprised of -30ft sections easily configured to accommodate -60 and -90ft lengths. The length of the boom is determined by the level of heat radiation and anticipated flow rates documented during the development of the Design of Service which facilitates safe and effective well testing operations.

The self-contained boom is secured to the rig structure by a king post, back struts, vertical suspension, and horizontal wind-stay cables and does not need additional support from the rig crane. All oil, gas, and pilot lines are mounted inside the box sections for easy servicing and makeup by way of a metal walkway designed into the center of the boom itself. The vent, air, and water lines are incorporated into the structure of the boom to keep the overall boom as light as possible. Typically installed on either side of an offshore rig, the flow to the burner can be diverted to the downwind boom for safe operations by use of a diverter manifold system.

Benefits

- Modular boom can be easily configured as -60 or -90ft units.
- Designed for horizontal racking, saving time between rig moves
- Lightweight design reduces crane capacity restrictions and simplifies installation.
- Integral air, water, and vent lines reduce weight and piping congestion.
- Protected walkway for added safety
- Simplified boom/king post interface connection minimizes personnel exposure during rig up and rig down.
- Design of Service software package is used to predict heat radiation and noise levels during flaring of hydrocarbons under different environmental conditions to determine whether the radiant heat levels have been reduced to satisfactory levels outlined in API 521.
- Designed for offshore applications

Application

- Exploration and appraisal well testing
- Cleanup and flowback
- Extended well testing

Specification

Brand	MIKODA	Sparklet	Sparklet
Serial No.	MES-WST-BB- 01	MES-WST-BB- 03	MES-WST-BB- 05
	MES-WST-BB- 02	MES-WST-BB- 04	MES-WST-BB- 06
External Dimension [LxWxH], m	27.4 x 2.5 x 2.1	26 x 2.5 x 3.2	28.3 x 3.2 x 2.7
Max. Gross Mass, lbm	26,455	19,842	22,046
Tare Mass, lbm	26,455	19,842	22,046
Working Pressure, psi	1,440	1,440	1,440
Working Temperature, degF	-20 to 250	-20 to 250	-20 to 250
Hydro Test Pressure, psi	2,160	2,160	2,160
Max. Oil flow rate, bbl/d	15,000	20000	20000
Max. Gas flow rate, MMscf/d	100	100	100
Gas Line	6"	6"	6"
Oil Line	2"	3"	3"
Water Line	3"	3"	3"
Air Line	3"	2"	2"
LPG Line		4/3"	4/3"

CHOKE MANIFOLD



DESCRIPTION

Choke Manifold consists of four manual valves and is used to control the flow rate and reduce well pressure before the flow enters the processing equipment.

The C/M also includes a variable choke box, a fixed choke box, several pressure or sampling ports and thermowells to monitor pressure, temperature, and fluid characteristics.

The C/M design allows the well to flow, through positive chokes for flow rate reference as well as adjustable chokes. Dual flow paths allow fast choke changes without interrupting the flow.

A number of choke manifold configurations and sizes are available for different pressures and temperatures to meet the client's demands and well conditions.

Benefits

- Reduces effluent pressure before flow enters process equipment, which helps control the well and increases safety
- Allow fast choke changes without interrupting the flow
- Control flow with a calibrated orifice for flow rate reference
- Complies with API6-A PR2 (PSL3) H2S (NACE MR0175), DNV 3-2.7
- Ensure reliable shut-in in harsh environment operations
- Has seal design that ensures reliability in harsh environments
- Is equipped with hammer unions but can be fitted with Gryloc or API-6A flange
- Enable fluid sampling, real-time pressure and temperature monitoring

Application

- Onshore and offshore oil and gas well testing, and clean-up operations
- Flow back after stimulation operations and workovers HPHT

Specification

Brand	WOM	Anson
Nominal Size, in	4- 1/16	3-1/16
Working Pressure, psi	10,000	10,000
Test Pressure, psi	15,000	15,000
Temperature Class, deg °F	P+X, (20- to 350)	
Inlet/ Outlet Connection	3 -in Fig 1502 Female/Male Or 4-1/16 Flange	3 -in Fig 1502 Female/Male Or 4-1/16 Flange
Service	Crude Oil - Sour Service	
API Flange on Tee	4-1/16 Flange BX-155	
Bypass	No	No
Design Temperature, deg °F	-20	
Max. Choke size(Fixed or Adjustable), in	3	2
Tapping Points number and Type Upstream and Downstream	3 * ½ NPT	
Dimension(L * W * H), m	1.176 * 2.168 * 2.246	1.176 * 2.168 * 2.246
Gross Weight, Kg	3855.53	2800
Material Class	DD	

FLEXIBLE FLOW LINE



DESCRIPTION

Flexible flow lines are used in all offshore fields to transport high pressure and high temperature fluids while flexing with variable subsea current and wave action.

To prevent overpressure conditions, non-centrifugal PMP models are fitted with a pressure relief bypass valve. The centrifugal models are self-protected. PMPs are shock-protected by a frame, and some are rated to Det Norske Veritas (DNV) 1-2.7 standard.

All PMPs are manufactured under Type Approval or Design Verification Review and are provided with a Certificate of Conformity.

Feature

- Complies with API Specification 6A and 16A, NACE MR0175

Application

- Pumping
- Well Testing
- Flowback
- Production
- Transfer
- Vented-Drill Stem Test Lines
- High Temperature
- Sour Service

Specification

	Technip	Technip
Brand	Technip	Technip
ID, in	4	3
OD, in	7.9	6.481
Length, ft	60	60
Minimum Bending Radius (MBR) - for storage, ft	3.88	3.32
Minimum Bending Radius (MBR) - in service, ft	5.82	4.98
Volume - Internal, cuft/ft	0.087	0.049
Volume - External, cuft/ft	0.294	0.221
Weight - in air Empty, lbs/ft	60.31	52.55
Weight - in air Full of Sea Water, lbs/ft	65.89	55.69
Working Pressure, psi	10,000	15,000
Test Pressure, psi	15,000	22,500
Service Temperature Range, deg °F	-4 to 226	-4 to 226
Max Bearable Pressure - Bursting Pressure, psi	22880	34080
Damaging Pull in Straight Line, lbf	401594	331673
Max allowable velocity, ft/sec	50	50
End Connection (Both)	16/1-4 Flange API 6BX 10K BX 155	EMB. HUB 16/1-3 BX15 154K

CHEMICAL INJECTION PUMP



DESCRIPTION

The purpose of the Chemical Injection Pump is to inject methanol upstream of the choke manifold to inhibit hydrate freezing as a result of the pressure drop. This increases the reliability and range for pressure drop through the choke. The methanol is typically injected through the Data Header's chemical injection port which includes one check valve.

To prevent overpressure conditions, non-centrifugal PMP models are fitted with a pressure relief bypass valve. The centrifugal models are self-protected. PMPs are shock-protected by a frame, and some are rated to Det Norske Veritas (DNV) 1-2.7 standard.

All PMPs are manufactured under Type Approval or Design Verification Review and are provided with a Certificate of Conformity.

Application

- During well testing of HPHT wells where considerable pressure drops are occurring
- During day to day, well testing or maintenance operations
- Methanol and alcohol injection in gas systems to prevent freezing
- General high pressure injection application

Feature

- High volume displacement
- Reliability and easy maintenance when working in harsh environments
- All wetted parts such as pump head, valves, tubing and fittings are made of stainless steel

Specification

Brand	TEXSTEAM
Max. Discharge, psi	3000
Max. Supply Air, psi	50
Min. Flow Rate for Chemical Injection Pump, USG/day	145
Tank Capacity, Lit	15
Dimension(L * W * H), m	0.49 * 0.66 * 0.711

AIR COMPRESSOR



DESCRIPTION

The purpose of the air compressor is to mix the compressed air with produced oil during well test operation for atomizing oil to burn completely also prevent spill of oil to sea and environment pollution.

Application

- Welltesting

Benefits

- Portable air compressor
- Easy access side wing doors
- Small Footprints
- Designed for -10 to +50 °C ambient temperature
- Skid mounted, with fork-lift receptacles

Specification

Brand/ Model	CompAir/ C230TS- 17
Operational Data	
Volume Flow1), m3/min	23
Operating Pressure, bar	17
Compressed Air Outlet	2*1"
Engine	Cummins QSB 6.7
Installed Engine Power, kw	228
Engine Off Load Speed, 1/min	1000
Engine Full Load Speed, 1/min	2400
Full Tank Capacity, Lit	370
Portable Compressor (adjustable towbar braked), kg	3350
Skid Mount, kg	3410
Base Mount, kg	3250
Dimensions	
Length, m	5440-5195
Width, m	1960
Height, m	2350
Length of Canopy, m	3750
Sound Level	
Power Sound Level3), dB(A) LWA	100
Pressure Sound Level4), dB(A) LPA	71

DATA HEADER



DESCRIPTION

The data header is a short sub connected to the upstream side of the choke manifold to provide additional pressure gauge, thermowell, and sampling or injection ports. The data header allows connection of pressure and temperature monitoring equipment, as well as sampling or injection equipment.

Feature

- Complies with API Specification 6A and 16A, NACE MR0175

Specification

Brand	WOM	Sparklet
Nominal Size, in	16/1-4	6 SCH80
Working Pressure, psi	10,000	2000
Test Pressure, psi	15,000	3000
Temperature Class, deg °F	P+U, (20- to 250)	
Inlet/ Outlet Connection	16/1-4 Flange BX155	6" Fig 206 Thread, 6" Fig 206 Wing
Ports	6 Nos. 16/9" Autoclave	3 Nos. 2/1" NPT
	2 No. 1" Autoclave for Thermowell	2 Nos. 4/3" NPT for Thermowell
Dimension(L * ID * OD), in	8 * 4 * 24	6 * 6 * 40
Material Class	DD-NL	

DIESEL INJECTION FACILITY



DESCRIPTION

The purpose of the diesel pump is to provide a continual flame on burner head during flow as a barrier to prevent of gase off flare in case of water batch.

Application

- Welltesting

Feature

- Air- Operated Oil
- For dispensing oil, fixed type for standard 200 liters drum
- Premium quality, reliable & excellent for high volume oil user

Specification

Brand	Actwell
Model	F80
Air Inlet, in	3/8 NPT (F)
Fluid Outlet	8/3 NPT (F)
Pressure Ratio	5:1
Operating Pressure, psi	45-130
Delivery Rate, Lit/min	14.6
Container Capacity	Suitable for 200 liters Original Drum

ELECTRICAL CANTRIGUGE



DESCRIPTION

The Oil Test Centrifuge is a portable model centrifuge designed expressly for the determination of water and sediment of crude oil during field custody transfers.

Application

- Clean-up
- Welltesting

Feature

- Analog Speed Control
- Switchable Temperature Display between °C and °F
- Substantial Insulation for Reduced Heat Loss

Specification

Brand	Koehler	ROTOFIX
Model	K60094	32A
Electrical Requirement	12V DC 40A	208-240V 1.4A
Temperature Range, °F	Ambient to 160	35.6 to 104
Temperature Readout	Two Independent Digital Display for Centrifugal Bowl and Pre-Heater	---
Speed Range, RPM	300-1800	6000
Capacity	Two Short Cone 6" Tubes	4 x 100 ml
Dimensions (L*D*H), mm		
With pre-heater lid open	207.9*234.3*139.1 528.0*595.0*353.3	366*430*257
Net Weight, kg	22.7	23

RANAREX GRAVITOMETER



DESCRIPTION

Ranarex Gravimeters measure the specific gravity of gases as compared to air. For many industrial process gases there is a definite connection between the analysis of the gas mixture and its specific gravity. When the specific gravity is involved in the analysis of the total mixture, or when the instruments are used with orifice metering in gas volume, they are graduated in specific gravity.

Application

- Welltesting

Feature

- Eliminates span drift to ensure permanently accurate calibration
- Advanced design develops large measuring forces and is virtually friction-free
- Gas sample flows continuously at a high rate through a small measuring chamber that purges rapidly
- Indicating scale is 6» wide on portable model

Specification

Brand	RANAREX
Model	388
Accuracy	± %0.5 of actual value
Reading	Indicating Only
Drive Motor	115 VAC, 60 Hz or 230 VAC, 50 Hz
Sample Flow Rate, Scf/hour	10-15
Sample Pressure, psig	20 maximum
Specific Gravity Range	Dual Scale: 0.52 to 1.03 and 0.97 to 1.9
Ambient Air Reference Dryer	Silica Gel
Ship Weight, kg	23
Case	Portable With Carrying Handle

DEAD WEIGHT TESTER



DESCRIPTION

Dead Weight Testers are used as primary standards in industry, laboratories and academia worldwide for precise measurement of pressure. All pressure measuring instruments whether pressure gauges, transmitters, transfer standards, switches, recorders, pressure data loggers, digital calibrators etc. are ultimately calibrated using dead weight testers. Till date no other equipment has been able to beat dead weight testers long time stability, accuracy & repeatability. In rare cases like hydrotesting, dead weight testers are used to directly measure system pressures because the measurement precision required is very high.

Application

- Clean-up
- Welltesting

Feature

- Accuracy better than 0.015% of reading
- Pressure generated by a ram screw

Specification

Brand	YANTRIKA
Model	---
Accuracy	± %0.015 of Reading
Pressure Range, psi	10 to 10,000
Operating Fluid	Hydraulic Oil
Base Unit Size and Weight, (L*D*H), mm, kg	361*382 *245,12
Box Size, (L*D*H), mm	304.8*304.8*304.8

CHART RECORDER



DESCRIPTION

On medium and high-pressure ranges, (0 to 15,000 psi) pressure is applied at the recorder connection through capillary tubing to a spiral wound bourdon tube. An increase in pressure partially uncoils the bourdon tube to which is fitted a take-off assembly arm converting the rotational movement into linear movement. A horizontal adjustable linkage is pivoted from the take-off arm to a pen mechanism bracket, incorporating a pivot mounted onto an adjustable ratio post, locked into position on the pen bracket. The ratio post provides span adjustment; its position setting the pivot distance of the center of rotation of the pen arm itself. The pen attached to the pen arm records the pressure on a calibrated chart.

Application

- Clean-up
- Welltesting

Feature

- Single pen circular pressure
- Suitable for surface or panel mounting. (Pipe mounting and portable options available)

Specification

Brand	Rototherm
Model	Clearscan
Accuracy	± 1% FS
Pressure Range, psi	0 to 15,000
Connection, in	¼ F Autoclave
Clock	24 Hours/ 7 Day
Dimension, (L*H), mm	350*405
Weight, kg	6.5

WELLTESTING SERVICES



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