

THE PROVISION OF WELL SERVICES DIVISION



1- Coiled Tubing Services

Coiled Tubing (CT) are designed to improve your well and reservoir performance. CT applications include Acid Stimulation, Milling, Paraffin Removal, Cementing, and Sand Clean Out, Nitrogen Lifting, Setting Packers and Plugs, Solid Removal, thru- tubing fishing.



2- Stimulation Services

SAKNAFTA- EGYPT 1000/500 HHP high – Pressure pumping system are designed for coiled tubing support and stimulation services. They are comprised of a twin or single 10 BBL displacement tanks, all required controls and instrumentation and a hydraulic system to drive fluid handling and mixing. The unit is complies with the strict safety standards for offshore industry.



3- Nitrogen Services

This system is designed to supply a continuous flow of N₂ at a total flow rate of 3000 scfm at a delivery pressure of 10.000 psi. The system mounted on a

- skid for ease of movement and transport.

Table of Contents

I- Equipment Listing

- 1.0 Coiled Tubing Units 11/2, 1 1/2, 1 3/4
- 2.0 Nitrogen Equipment
- 3.0 High Pressure Fluid Pumps
- 4.0 Transfer Pumps
- 5.0 Storage and Mixing Tanks
- 6.0 Filtration Unit
- 7.0 Data Acquisition System
- 8.0 Transportation System
- 9.0 Acid and Stimulation Products

II- Coiled Tubing Service

- 1.0 Coiled Tubing Unit
- 2.0 Coiled Tubing Application
- 3.0 Coiled Tubing Units Available in Egypt
- 4.0 Coiled Tubing Specification
 - 4.1 High Pressure open loop power pack
 - 4.2 Control cabin Skid – Model 501
 - 4.3 D 3000 Tubing Reel Assembly
 - 4.4 Injector Head Hydra Rig Model HR - 680
- 5.0 Pressure Control Equipment
 - 5.1 4.06" 10K DSA 4 Side Door Stripper Package
 - 5.2 4.06" 10K EH 44 Quad BOP
 - 5.3 4.06" 10K "EH 44" Dual Combi BOP
- 6.0 Coiled Tubing Test Equipment
 - 6.1 Coiled Tubing Pressure Test Sub – 2 ea
 - 6.2 Coiled Tubing Pull Test Sub – 2 ea
 - 6.3 Coiled Tubing Pull Test Plate – 2 ea
 - 6.4 Well Head Cross Over – Different Sizes & Different Flanges

III- Stimulation Service

MUL TI-PURPOSE DOUBLE PUMP SKID

- 1.0 General Description
 - 1.1 Triplex Pump
 - 1.2 Double Pump Skid
 - 1.3 Single Pump Skid
 - 1.4 Triplex pump Rate
- 2.0 Standard Equipment Specification
- 3.0 Environment Parameters
- 4.0 Operational Performance
- 5.0 Power System (Diesel Engines)
- 6.0 Engine Accessories
- 7.0 Power Distribution System (Transmissions)
- 8.0 Power End Lubrication system
- 9.0 Plunger Packing Lubrication System
- 10.0 Fluid Handling System (Displacement Tanks)
- 11.0 Roadside / Curbside Centrifugal pump
- 12.0 The Following Design will be provided in the low-pressure piping
- 13.0 High Pressure Discharged manifold
- 14.0 Operation and Display System
 - 14.1. Operators Platform

- 14.2. Operator Console
- 14.3. Remote Record & Display

- 15.0 Mixing Equipment
 - 15.1 Twin 50 bbl & 100 bbl Batch Mixer
 - 15.2 Stimulation Fluid Storage and Transport Equipment
 - 15.3 Acidizing and Stimulation Products
 - 15.4 15.5 laboratory Services
- 16.0 Cartridge Filter Unit
- 17.0 High Pressure Iron

IV- Nitrogen Service

180K HEAT RECOVERY NITROGEN PUMPING SKID

- 1.0 Equipment Specification
- 2.0 Performance & Physical Specification
- 3.0 Principles of operation
- 4.0 Major Component Specifications
 - 4.1 Engine
 - 4.2 Triplex pump
 - 4.3 Boost Pump
 - 4.4 Vaporizer
 - 4.5 Controls / Gauges
 - 4.6 Piping
- 5.0 Nitrogen Tanks
 - 5.1 Applications
 - 5.2 Specification

V- Data Acquisition

- 1.0 Tubing Analysis System(TAS)
 - 1.1 Data Acquisition and Real Time Processing Dart
 - 1.2 Fatigue Analysis for Coiled Tubing (Fact)
 - 1.3 Ream HMI
 - 1.4 Tubing Ovality Monitor (TOM)
- 2.0 Measurements
- 3.0 Displays

VI- Down Hole Tools

- 1.0 2 ea Motor Head Assemblies (Hydraulic disconnect, D.V.C, Cive. Value)
- 2.0 2 ea Hydraulic Accelerators & Hydraulic Jars
- 3.0 2 ea Knuckle Joints
- 4.0 4 ea Tubing End Connector
- 5.0 4 ea Double Check Valve
- 6.0 4 ea Straight Bars
- 7.0 2 ea Jetting Nozzle of 1.75" to 2.75"
- 8.0 2 ea Rotating Jetting Nozzle
- 9.0 2 ea Centralize 2" to 3.53"
- 10.0 2 ea CT Fishing Tools

VII- New Technology for Acid Stimulation

I- Equipment Listing

SAKNAFTA's equipment list that are available to provide the oil industry with the Coiled Tubing, Nitrogen and Stimulation services

1.0 Coiled Tubing Units 1 ½", 1 ½", 1 ¾"

- 1 ea 1 ½" Coiled Tubing Unit complete with ≈ 15,700 ft Tbg.
- 1 ea 1 ½" Coiled Tubing Unit complete with ≈ 12,160 ft Tbg.
- 1 ea 1 ¾" Coiled Tubing Unit complete with ≈ 14,760 ft Tbg.
- 1 ea 1 ½" Coiled Tubing unit complete with = 16,050 ft Tbg
- 1 ea 1 ½" Spare Tubing Reel ≈ 16,000 ft complete with conversion kit for Injector & BOP.
- 1 ea 1 ¼" conversion kit for injector & BOP.
- 3 set High Quality Down hole special & fishing Tools.

2.0 Nitrogen Equipment

- 3 ea 180 K N2 Unit
- 6 ea 2000 USG LN2 Tanks
- 1 ea 5500 Gal LN2 Tanks

3.0 High Pressure Fluid Pumps

- 2 ea SPM 3 ½" "500 HP" High Pressure fluid pump
- 2 ea SPM 4" "500 HP" High Pressure fluid pump
- 4 Set 2" Iron (10,8 & 4 ft) joint, Loop, Swivel & Valves,.....
- 4 Set Hoses 4" & 2" (low & high pressure)

4.0 Transfer Pumps

- 2 ea C-Pumps Skid
- 2 ea Acid Transfer Pumps (Delasco Pumps)

5.0 Storage and Mixing Tanks

- 2 ea 6300 USG (150 BBL) Storage and mixing tanks
- 1 ea 10,500 USG (250 BBL) Storage and mixing Tanks
- 9 ea 1300 USG Raw Acid Storage Tanks
- 2 ea Batch Mixing (50,100 BBL)

6.0 Filtration Unit

- 2 ea Duplex Filter Unit CW/hoses

7.0 Data Acquisition System

- 4 ea Complete Data Acquisition systems
- 1 ea pumping Data Acquisition systems.

8.0 Transportation System

- 6x6 Trucks, Trailers, Cranes and 4x4 Light vehicles for Equipment and Personnel Transportation.
(Details shall be supplied on request)

9.0 Acid and Stimulation Products

A wide range of acidizing and stimulation fluid system additives can be sourced such as:

Acid	Fluid Loss Control	Scale Inhibitors
Acid gel system	Friction reducers	Scale removal additives
Anti Sludge Additives	Iron control	Surfactants
Clay Stabilizers	Mutual Solvents	Water based polymer and gel systems
Corrosion Inhibitors	Non Emulsifiers	Stim Well Dissolve
Cross-linked gel system	Paraffin removal systems	
Diverting Agents	Retarded Acid	
Emulsifiers	Sandstone Acidizing	

II- Coiled Tubing Services

1.0 COILED TUBING UNIT

This Skidded Desert CTU TRILER system is designed to maximize chances for live well workover for success by providing comprehensive technical support for CT operations. Our units are designed to the customer's specific requirements for depth, tubing size and environmental conditions for both land and offshore operation.



2.0 COILED TUBING APPLICATION

Coiled Tubing services range from conventional to more advanced types applications. the company's engineers experts in the application of coiled tubing use tested, reliable and versatile equipment to meet each client's need in every type of situation to help increase production at lower costs safety is key on every coiled tubing job We offer land and offshore coiled tubing units along with nitrogen and pressure pumping equipment with varying capabilities and specifications.

Acid Stimulation
Paraffin Removal
Sand Clean Out
Setting Packers and plugs
Thru- tubing fishing

Milling
Cementing
Nitrogen Lifting
Solid Removal



3.0 Coiled Tubing Units Available:

	SN.CTU-1	SN.CTU-2	SN.CTU-4	SNCTU-3
C.T Size (in)	1 ½"	1 ¾"	1 ½ "	1 ½"
No. of Units available	1	1	1	1
Manufacture Year	2008	2008	2015	2011
Maximum Pull (LB)	80,000	80,000	80,000	80,000
Maximum Snubbing (LB)	40,000	40,000	40,000	40,000
Length of Tubing On Operating Reel (Ft)	15,700 ft	14,760 ft	16,050 ft	12,160ft
W eight of Operating Reel(Ton)	16.4	20	18	11
Reel Dimension W x L x H	102" X 175" X 144"	102" X 175" X 144"	2.48 M X 4.17 M X 3.5 M	1.03 M X 1.34 M X 1.44 M

UNIT	LENGTH Cm	WIDTH	HEIGHT	WEIGHT KG
OPERATOR'S CAB	244	244	244	2,800
POWERPACK	244	213	244	5450
INJECTOR (680)	142	106	226	3,720
GOOSENECK 72"	95	320	170	364
BOP	193	78	208	2,364

4.0 COILED TUBING SPECIFICATION

PIPE SIZES	1-1/2", 1-1/2", 1-3/4"
INJECTOR CAPACITY	80,000 / 40,000
P. CONTROL EQUIPMENT	4-1/16 "10,000 PSI



1.0 HIGH PRESSURE OPEN LOOP POWER PACK

THE POWER PACK HAS A DETROIT DIESEL ENGINE ZONE TWO LESS PYROBAN, RATED FOR 328 BHP AT 2100 RPM. THE POWER PACK IS SKID MOUNTED WITH PROTECTIVE FRAME. THIS FRAME COMPLETELY SURROUNDS THE POWER PACK. THE POWER PACK MOUNTED CONTROL PANEL IS STAINLESS STEEL / WATERPROOF AND INCLUDES:



1. THROTTLE SYSTEM FOR ENGINE SPEED CONTROL
2. ENGINE KILL.
3. EMERGENCY ENGINE AIR SHUTOFF.
4. REMOTE SHUTOFF DEVICE.
5. ANTISTATIC FAN DRIVE BELTS.
6. SPARK ARRESTOR
7. AIR STARTER

8. ENGINE HAS SYSTEM FOR SHUTDOWN ON ;
OVER TEMPERATURE,

OVER SPEED,

LOSS OF COOLANT,

LOSS OF OIL PRESSURE.

FUEL SHUTDOWN VALVE,



9. THE DRIVE BELTS ARE FULLY GUARDED
10. A 40 GALLON BOP ACCUMULATOR SYSTEM IS RATED AT 3000 PSI. THIS PROVIDES ADEQUATE VOLUME FOR OPERATING A 3.06 QUAD.
11. THE INJECTOR DRIVE SYSTEM UTILIZES A DENISON P-12 AXIAL PISTON HIGH PRESSURE OPEN LOOP PUMP. THIS SYSTEM, INCLUDING HOSES, IS RATED AT 5000 PSI.

2.0 CONTROL CABIN SKID - MODEL 501

THE CABIN IS CONSTRUCTED OF COMPOSITE WALLS AND FLOOR JOINED SO THAT CABIN ELEVATES AS A UNIT VIA FOUR (4) HYDRAULIC CYLINDERS. INTERIOR SPACE IS APPROXIMATELY 111" LONG X 76" TALL. A MECHANICAL LOCK IS PROVIDED TO ENSURE THE CABIN STAYS IN POSITION ONCE ELEVATED.

1. ACCESS TO THE CABIN IS VIA A PLATFORM THAT SLIDES OUT BEYOND THE PROTECTIVE FRAME, WITH A LADDER, THAT FORCES THE OPERATOR TO MOUNT THE PLATFORM PARALLEL TO THE CABIN RATHER THAN FACING IT. THE ACCESS LADDER AND PLATFORM WILL HAVE HANDRAILS. THE GRATING OF THE PLATFORM IS DESIGNED TO MINIMIZE RISK OF SLIPPING.
2. THE CAB IS TOTALLY ENCLOSED AND INSULATED WITH A SWING OUT ACCESS DOOR.
3. THE CABIN HAS A FRONT WINDOW IS MADE OF HIGH STRENGTH GLASS, 1/4" THICK . THIS WINDOW IS THE FULL WIDTH OF THE CABIN. THE MESH IN THE CRASH FRAME PROTECTING THIS WINDOW IS MOUNTED IN-BOARD OF THE FRAME.
4. TWO SLIDING WINDOWS ARE PLACED ON THE REAR AND SIDE OF CABIN.
5. 2 EXTERIOR AND 2 INTERIOR FLOOD LIGHTS EXPLOSION PROOF ARE FURNISHED.
6. AIR HORN THAT IS OPERATED FROM CABIN PANEL IS PROVIDED.
7. EXPLOSION PROOF ELECTRICAL AIR CONDITIONING AND HEATING UNIT TOP MOUNTED,
8. BREAKER BOX IN CABIN AND SHORE POWER RECEPTACLE INSTALLED EXTERIOR.
9. A SMALL PANEL MOUNTED ON THE WALL
10. CHARTS FOR RECOMMENDED PRESSURES FOR INJECTOR TRACTION AND TENSION PRESSURES.
11. CONTROL CONSOLE, OF THE " L " SHAPE DESIGN, INCLUDES THE FOLLOWING:
 12. 9-BANK VALVE FOR BOP CONTROL, WITH LOCKOUT
 13. LATCH. ONE BANK WILL BE USED TO ACTIVATE THE VALVE.
 14. BOP PRESSURE GAUGE.
 15. WEIGHT INDICATOR FOR INJECTOR, 80,000 LBS. TO BE MOUNTED CENTER OF PANEL.



16. AIR REGULATOR VALVE, PRESSURE VALVE, BLEED VALVE AND GAUGES TO OPERATE TWO (2) DUAL ACTING STRIPPERS. HYDRAULIC SUPPLY FOR STRIPPER IS AIR-OVER-PUMP WITH MANUAL OVERRIDE.
17. PRESSURE REGULATOR VALVE WITH ISOLATION AND GAUGES FOR THREE (3) INJECTION TRACTION CIRCUITS.
18. CONTROL VALVE FOR INJECTOR SPEED AND DIRECTION, WITH 0-600 PSI GAUGE.
19. SELECTOR VALVE FOR INJECTOR BRAKE AND VARIABLE DISPLACEMENT CONTROL FOR INJECTOR MOTOR.
20. GAUGE FOR INJECTOR BRAKE PRESSURE
21. PRESSURE GAUGE FOR REEL TENSION
22. VALVE FOR REEL BRAKE
23. HYDRAULIC PRESSURE GAUGE (4") FOR INJECTOR PULL.
24. HYDRAULIC VALVE, 3-BANK FOR REEL CONTROL. I.E. REEL PAY-OFF OR TAKE-UP, LEVELW IND RAISE AND LOWER, AND LEVELWIND OVERRIDE.
25. RELIEF VALVE FOR REEL TENSION CONTROLS.
26. PRESSURE CONTROL VALVE FOR SETTING INJECTOR PULL CONTROL.
27. TWO (2) 6", 15,000 PSI PRESSURE GAUGES FOR WELLHEAD PRESSURE AND CIRCULATING PRESSURE TO BE MOUNTED TO RIGHT OF WEIGHT INDICATOR. BOTH GAUGES 4:1 DEBOOSTED.
 - a. AIR CONTROLS FOR ENGINE SPEED, KILL AND EMERGENCY KILL.
 - b. PRESSURE CONTROL WITH GAUGE FOR INJECTOR OUTSIDE CHAIN TENSION CONTROL.
 - c. AIR PRESSURE GAUGE.
 - d. VALVE FOR SLOW SPEED CONTROL.
 - e. INJECTOR INSIDE TRACTION PRESSURE DRAIN VALVE.



3.0 D3000 TUBING REEL ASSEMBLY

3.1 TUBING SPOOL : GEAR DRIVE, WITH FULL SKID DESIGN FOR MOUNTING ON TRAILER.

3.2 TUBING GUIDE COUNTER HYDRA RIG MODEL RC-203, FULLY
ADJUSTABLE FOR TUBING SIZES OF 1" THROUGH 2.88". WITH VERTICAL SLIDE MOUNT TO
COMPENSATE FOR PAY-OFF ANGLE

3.3 INTERNAL & EXTERNAL PLUMBING
FMC 2X2 VALVES STANDARD, H2S FMC INTEGRAL 1502 TYPE FITTINGS RATED AT 10,000 PSI
SOUR SERVICE; TEE FOR BALL LAUNCHING OR WIRELINE ADAPTATION; 2X2 SHUTOFF VALVE
BETWEEN SWIVEL AND DRUM CORE.
DUAL INLET CONNECTIONS AND 2X2 SHUTOFF VALVES BETWEEN SWIVEL AND INLETS;
FLANGE MOUNTED CIRCULATING SWIVEL: 10,000 PSI 2" BORE SWIVEL; PROOF- TESTED TO
15,000 PSI; SUITABLE FOR H2S SERVICE; COMPONENTS EXPOSED TO CIRCULATING FLUIDS
ARE REPLACEABLE. 4:1 DEBOOSTER TO MONITOR CIRCULATING PRESSURE.

3.4 C.T REELS: 1 ½" and 1 ¾" HEAVY WALL {0.125": 0.134"}

3.5 LUBRICATION SYSTEM: TBG OILER MOUNTED FROM COUNTER; 30-GAL. LUB. RESERVIOR;

3.6 TWO POINT LIFT SYSTEM: SPREADER BAR ARRANGEMENT FOR LIFTING ENTIRE LOADED
REEL ASSEMBLY OR LOADED DRUM ONLY; SOLID LINK DESIGN;
SPREADER BAR STAMPED "100,000 LBS"; TWO LEG SLING WITH SHACKLES, MASTER LINK
AND THIMBLES, TAGGED WITH LOAD LIMIT

3.7 DATA ACQUISITION: MOUNT FOR ENCODER
INSTALLED.

3.8 QTY TWO (2), SPOOL D3084: 142" OUTSIDE
DIAMETER RIM, 72" INSIDE WIDTH, 84" CORE
DIAMETER; LIFT LUGS; TIE DOWN PLATES ON
OUTER RIM. BOTH SPOOLS FITTED WITH
INTERNAL PLUMBING AND SWIVEL. EACH
SPOOL CAPABLE OF ACCOMMODATING



25,000 FEET OF 1.50 TUBING, OR 13,500 FT OF 2.00 TUBING

4.0 INJECTOR HEAD HYDRA RIG MODEL HR- 680

THEIS INJECTOR IS DESIGNED FOR HANDLING C.T. SIZES FROM 1-1/4" OD THROUGH 3-1/2" OD. WITH THE FOLLOWING CAPACITIES :
80,000 LBS. CONTINUOUS PULL CAPACITY
SNUBBING CAPACITY IS 40,000 LBS.
MAXIMUM SPEED 200 FEET PER MINUTE
ALL STRUCTURES AND ANCILLARY SYSTEMS ARE DESIGNED TO THE 80,000 LB. TUBING LOAD LIMIT, PLUS GROSS WEIGHT OF INJECTOR (12,500 LBS.)
GOOSENECK 72 INCH



- 4.1 THE INJECTOR DRIVE CONSISTS OF DUAL PLANETARY GEAR TRANSMISSIONS WITH DEEP REDUCTION RATIOS.
- 4.2 THE DRIVE SPROCKETS ARE ONE PIECE FOR PRECISE ALIGNMENT AND STRENGTH.
- 4.3 THE BRAKE CONTROL SYSTEM IS AUTOMATIC / MANUAL SET. ARE SPRING APPLIED / PRESSURE RELEASED.
- 4.4 THE HYDRAULIC DRIVE MOTORS ARE DIRECTLY ATTACHED TO COUNTERBALANCE SAFETY VALVES TO PREVENT LOSS OF CONTROL IF POWER FAILURE OCCURS.
- 4.5 INJECTOR SUPPLIED WITH THE PATENTED "QUICK CONNECT" CHAIN ASSEMBLY CAPABLE OF RUNNING GRIPPERS FOR 1-1/4", 1-1/2", 1-3/4", 2", 2-3/8", 2-5/8", 2-7/8" AND 3-1/2" TUBING.
- 4.6 THE TUBING GRIPPERS ARE A GROOVED AND HARDENED, SINGLE PIECE, HALF ROUND CONFIGURATION, ELASTOMERICALLY BALANCED FOR OPTIMUM TUBING GRIP. EACH OF THE CARRIERS IS SUPPORTED BY DUAL, SEALED FOR LIFE, HEAVY DUTY BEARINGS.
- 4.7 TUBING TRACTION SYSTEM INCORPORATES THREE (3) INDEPENDENT SETS OF TWO (2) ROD TYPE HYDRAULIC CYLINDERS. TUBING TRACTION IS APPLIED TO THE CHAIN SYSTEM THROUGH A PAIR OF
- 4.8 SINGLE PIECE REVERSIBLE, THRU HARDENED AND GROUND STEEL SKATES. THE SKATE SYSTEM IS DESIGNED FOR SELF-CENTERING FOR UNIFORM GRIPPER AND TUBING LOADING. THE TRACTION SYSTEM IS REMOTE CONTROLLED FROM THE OPERATOR'S CONSOLE.
- 4.9 ADJUSTABLE POSITION, 72" RADIUS, TUBING GUIDE ARCH, WITH FLARED FOLD UNDER TAIL AND CONTOURED STEEL ROLLERS.
- 4.10 DUAL SINGLE ACTING HYDRAULIC LOAD CELLS TO PROVIDE DIRECT PIPE HEAVY / PIPE LIGHT WEIGHT INDICATION.

4.11 A PIN ON MOUNT FOR STRIPPER IS PROVIDED ON THE INJECTOR BASE

4.12 LIFTING/CRASH FRAME HAS 4-POINT SLING ATTACHMENT POINTS AND IS RATED FOR 95,000 LBS OPERATIONAL LIFTING CAPACITY. THE STANDARD 4-LEG SLING ASSEMBLY IS PROVIDED. THIS SLING ASSEMBLY IS FOR LIFTING THE INJECTOR DURING SHIPMENT AND WELLSITE INSTALLATION

4.13 ONE (1) SET OF STEEL SHORT FIXED LEGS FOR SUPPORTING THE INJECTOR WITH STRIPPER MOUNTED IS PROVIDED IN ADDITION FOUR ALUMINUM EXTENTION LEGS.

4.14 A STAINLESS STEEL INJECTOR LOAD CHART FOR CABIN INCLUDED



5.0 PRESSUER CONTROL EQUIPMENT

All alloy components in contact with pressurized well fluids conform to NACE specification MR-01-75 for H₂S SERVICE

5-1 (4.06" 10K DSA4 SIDE DOOR STRIPPER PACKER)

The Texas Oil Tools Side Door Stripper Packer is designed to pack-off on coiled tubing as it is stripped in and out of the well, at working pressures up to 10,000 psi. This design permits the replacement of the packing elements and bushings through the open "window" below the injector. Changing packers is always easier, but it is particularly advantageous when changing packers with tubing in the well.



5-2 (4.06" 10K EH44 Quad BOP)

The 4.06" 10K ES BOP is designed for coiled tubing and snubbing operations. The ES is the lightest in the industry. The compact size allows easier handling

along with easier maintenance. All actuators feature power hydraulic ram change, low bonnet bolt torque requirement, and a pressure balance piston For shear operations (no booster required). Internally ported hydraulics (no external plumbing) eliminate the making and breaking of oil seals when changing or servicing rams; thus removing the possibility of environmental pollution.



FEATURES

- Light and Compact
- Low Bonnet Bolt Torque
- Well Pressure Isolated Seals
- Internal Porting
- No Welds - Solid Body
- Rams - Blind, Pipe, Slip, Shear, Shear Seal, Pipe Slip
- Pressure Balance Piston
- Internal Equalizing Valves
- Hydraulic Ram Change
- Independent Bonnet Testing
- Ram Position Indicator



5-3 (4.06", 10K "EH44" Dual Combi BOP)

The Combi BOP is designed to accept rams that combine the function of two rams.

The most obvious benefit is the reduced height and weight of a combi BOP. The second advantage is with the shear seal rams. Pipe can be cut and the rams closed as blind, without the need to move the pipe.



**24' 10 K CB44
LUBRICATOR/
EACH PACKAGE**



**FULL SET OF WELL
HEAD X-OVER**

III – Stimulation Services

MULTI-PURPOSE DOUBLE PUMP SKID



1.0 GENERAL DESCRIPTION

The MPS-1000D is a Double Pump Skid. The unit is comprised of a high-pressure pumping system, twin 10bbl displacement tanks, all required controls and instrumentation and a hydraulic system to drive fluid handling and mixing. The unit incorporates emergency shut-off valve for air intake, Anti-static fan belts, non-sparking fans and spark arresting silencers.

1.1 Triplex Pump

The SPM TW S-600S triplex pumps are 600 BHP rated horizontal single acting plunger. Pumps fluid ends are made of alloy steel and are recommended for pumping acid, water, brine, drilling fluids, cement and other Well service fluids. The displacement tanks consist of two 10bbl compartments with calibrated ½ bbl marks. Tanks have full flow piping for ease of cleanup.



1.2 Single Pump Skid

Plunger Size	Weight	Length	Width	Height
3.5"	11 T	7.3 m	1.3 m	3.35 m
4"	11 T	7.3 m	1.3 m	3.35 m

1.3 Triplex Pump Rates

(0.88 bpm @ 10,400 psi)	Maximum flow rate (3.5" Plunger):	8.0 bpm
(1.17 bpm @ 7,958 psi)	Maximum flow rate (4" Plunger):	10.5 bpm
Total:		18.5 bpm

2.0 STANDARD EQUIPMENT SPECIFICATION:

Heavy duty oilfield skid with crash frame
 Twin 10bbl displacement tanks Two centrifugal pumps for loading displacement tanks and boosting triplex
 Control panel labeled
 Figure 1502 (15,000 psi) sour gas discharge manifold
 Fire Extinguisher
 Remote readout capability for CT unit compatible with D.A.S for CT
 Two Detroit Diesel Series 60 engines rated at 600 hp each
 Two SPM TW S-600S triplex pumps, with 3.5" & 4" diameter plungers
 Two Allison HT750DR Automatic Transmissions with torque converters
 Two Fuller 2:1 gear reduction boxes
 Two 90 US gallon fuel tanks, 180 gallons total – minimum
 Sufficient lights for night operations



3.0 ENVIRONMENT PARAMETERS

The equipment will meet or exceed the following operating parameters:

50° C	-20° :	Operating Temperature
	<90%	Relative Humidity

4.0 OPERATIONAL PERFORMANCE

The unit will be capable of operating on land or offshore
 The unit will be equipped with sufficient lighting for night operation.

5.0 POWER SYSTEM (Diesel Engines)

Two diesel engines will be mounted reasonably and used to drive two high-pressure triplex pumps via transmissions and flexible drivelines. The engines will also power hydraulic pumps to drive the two centrifugal pumps and will be remote controlled from the operator console.

6.0 Engine Accessories

Type: Detroit Diesel Series 60 Model 6063HK73 rated Power: 600 BHP @ 2100 rpm
Air starter w/non-sparking engagement
Electronic governor
Water circulating pump and radiator assembly
Non-sparking exhaust fans driven by anti-static belts
Lube oil pump and filter and cooling system
Fuel pump and filter system
Heavy duty air filter (dry element type) with restriction indicators
Throttle actuator - Stop actuator
Emergency kill actuator for air intake shutdown
Spark arresting steel mufflers with flexible connection and rain cap
Air compressor and receiver system to meet pneumatic requirements of the unit.
Alternator, 12 volt (both engines)
Triplex pump overpressure shutdown switch to return engine to idle
Two (2) 90 US Gallon (378.5 liters) fuel tanks, 180 US Gallons (681 liters) total.
Fuel coolers will be mounted securely to the radiator frame.

7.0 POWER DISTRIBUTION SYSTEM (Transmissions)

Allison HT750DR rebuilt automatic transmission with torque converter rated at 1575 ft lb torque, complete with fill tube, dipstick gauge, torque converter, and 1800 series output flange. The transmission will have power shift capabilities.



8.0 POWER END LUBRICATION SYSTEM

Positive displacement pumps driven by full time PTOs supply the lubrication system for each triplex pump power end or engine accessory drives if required to accommodate power requirements. The following components are standard equipment for the lubrication system.

Lube oil reservoir with manual temperature gauge
Pressure gauge and Pressure relief valve
Required plumbing and hoses
Full flow filter with element condition indicator & by-pass

9.0 Plunger Packing Lubrication System

The plunger lubrication system is provided by a pressurized oil supply system. The following components are standard equipment for the lubrication system.

- Lube oil reservoir
- Distribution manifold
- Required plumbing and hoses
- Pressure gauge
- Pressure regulator
- Packing lube catch tank



10.0 FLUID HANDLING SYSTEM (Displacement Tanks)

The displacement tanks will consist of two 10 bbl compartments each having graduated markers measuring in increments of $\frac{1}{2}$ bbl for a tank total volume of 20 bbl and hydraulically driven agitators. The tanks are constructed of steel with reinforced structures. The discharge ports from the displacement tanks are 6-inch butterfly valves leading into a 4-inch pipe for gravity flow to the boost pump and triplex pumps. A flow back release line is provided to allow the triplex pump pressure to be discharged back to the displacement tanks. Standpipes provide overflow protection and are connected to drain hoses to control overflow off deck components. 3-inch remote operated drain valves are also provided for each tank compartment. The piping manifold is designed with sufficient couplings to allow complete disassembly of the piping.



11.0 Roadside / Curbside Centrifugal Pump

The 5x4 Mission Magnum Sandmaster curbside centrifugal pump will meet the following specifications:

- Suction: 5 inch (152.4 mm) pipe size
- Discharge: 4 inch (127 mm) pipe size
- Max. flow rate at WP rating: 11 bpm
- Rated working pressure: 50 psi
- Lubricated opposed double lip seals
- Mechanical face seals

The curbside centrifugal pump receives fluid from an outboard source via a 4-inch figure 207 connection or from the displacement tanks.

The curbside centrifugal pump will discharge fluid into the displacement tanks,

Off board via a 4-inch figure 207 connection or boost the triplex pumps.

12.0 The following design will be provided in the low-pressure piping.

Suction stabilizers will be used on the inlet side of the triplex pumps.
The suction manifold working pressure rating is 175 psi .
Remote valves that are required for normal operation will be air actuated.
will feed to the suction manifold of the plunger pumps via 4-inch pipe and butterfly valves.
The suction manifold of the triplex pumps will take from the displacement tanks and from outside source via 4-inch male figure 207 connections.
An over pressure relief valve is included
and is located to facilitate easy removal and maintenance.
The roadside and curbside centrifugal pumps are plumbed such that either pump can receive fluid from an outboard source or from the displacement tanks and discharge to one or both triplex pumps or the displacement tanks. In a typical operation one centrifugal pump would fill the displacement tanks while the other pump charges the triplex pumps.

13.0 HIGH PRESSURE DISCHARGE MANIFOLD

Each of the triplex pump fluid end discharge ports will be 2-inch threads. The manifold will be rated for sour gas service. Connected to the discharge ports will be 2-inch 1502 integral plug valves. The two triplex pumps will be manifolded together configured so as to be capable of discharging singularly or simultaneously to the same or separate outlet joints. The release manifold will have a flow-back pressure release line with an open end connected to the displacement tanks. A 2-inch x 2 inch 1502 integral plug valve stacked in series with a 2 inch x 1 inch 1502 integral plug valve will control the release line. Manifold pressure will be measured via a 15,000-psi pressure gauge. A pressure relief safety valve will be provided and will be plumbed to direct discharge down.
The following specifications will be standard for the discharge manifold.

Diameter of discharge pipe and fittings: 2 inch (50.8 mm)
Rated working pressure of discharge pipe and fittings: 15,000 psi
Test Pressure of Discharge pipe and fittings: 22,500 psi
Rated Working Pressure of Plug Valves: 15,000 psi
Discharge pipe couplings: NPS pup joints w/1502 Union
All the high-pressure piping & components shall be FMC.
Sour gas service

14.0 OPERATION AND DISPLAY SYSTEM

14.1 Operators Platform

The operator's platform will provide access to the discharge valves. This platform extension will extend to the rear of the triplex pumps and then to the skid base.



14.2 Operator Console

The Operator Console is a custom-built steel cabinet with a protective steel cover. The location of the console will allow the operator a full view of the well site operation. The console is mounted on the operator's platform.

The engine gauges will include oil pressure gauges, water temperature gauges and voltmeter. The transmission gauges will include the main oil pressure, oil temp. and fluid level sight gauge.

The triplex pump gauges will include oil pressure gauge, oil temperature, and an oil level sight gauge. The pressure and temperature gauges will be the switch gauge type that will activate a warning light whenever a certain level is reached.

The hydraulic system will have pressure gauges for each pump circuit and an oil temperature gauge mounted on the oil reservoir.

The console will have sufficient light to allow for operation during night hours.

Most gauges shall be dampened to normalize minor pressure fluctuations and instruments will read in both Imperial and Metric standards.

The centrifugal pumps are equipped with pressure gauges.

Pump displacement rate will be measured at the input to the triplex pump by a proximity switch.

Triplex pump pressure will be measured via a Viatran 0 – 15,000 PSI pressure transducer.

Integrated over-pressure shut down will return engine to idle and shift the transmission to neutral.

14.3 Remote Record & Display

The discharge pressure will be recorded on a Martin Decker circular chart recorder.

The recorder will have a 4 hour clock, single pen and 5" gauge. The unit will be equipped to provide a rate signal for either pump to an offboard D.A.S. for CT

system display and recorder. The cable for the each rate sensor will terminate on the curb side of the unit and be mounted on the triplex pump base.



15.0 Mixing Equipment

Various types and sizes of mixing equipment are available for stimulation treatments depending on job volumes and design. Simple batch type mixing tanks or recirculating mixers can be used for small volume fluid blending whilst more sophisticated fit for purpose continuous mixing blenders are used for high volume operations.

Recirculating mixer sizes typically range from 25 bbl recirculation mixers to 50 bbl and 50 bbl twin compartment batch mixers. These will mix and recirculate the stimulation fluid and delivers it to the pumping unit. The fluid is maintained as a homogeneous and consistent blend. The mixers are capable of transferring fluid from remote sources whilst simultaneously recirculating. Raw acid is usually transferred from lined or coated tanks using fit for purpose acid transfer pumps.

The Twin 50 bbl Batch Mixer is the most common size, capable of mixing 100bbl of fluid at one time and conforms to the following general specifications or similar:



15.1 Twin 50 bbl Batch Mixer

- Diesel Engine with air start and spark arrestor
- Two mixing centrifugal pumps
- Twin 50 bbl cylindrical batch tanks
- Two paddle mixers (hydraulic driven)
- Equipped with Hopper
- Tank level gauges



15.2 Stimulation Fluid Storage and Transport Equipment

Depending on requirements a number of types and sizes of bulk storage and transport equipment can be offered. This may range from small acid carboys (30bbl capacity) up to 250 bbl large volume fluid storage tanks. Fluid transporters typically come in 150 bbl sizes. Raw acid transporters usually have rubber lined tanks.



15.3 Acidizing and Stimulation Products

A wide range of acidizing and stimulation fluid system additives can be sourced

Whether you need a small matrix acidizing package, a high pressure pumping unit, a certain chemical, a specific fluid system or a whole fleet SAKNAFTA has the ability to meet your needs.



15.4 Laboratory Services

SAKNAFTA bases have central laboratory to carry out all needed analyses for field operations. These base laboratories are run by qualified personnel who provide support and services to all the mobile labs in all the sites where we operate.

Acid Tests

- Emulsion
- Solubility
- Corrosion
- Water Analysis

UNIT	LENGTH Cm	WIDTH	HEIGHT	WEIGHT KG
150BBIStorage Tank	900	230	230	8,500
250 BBI Storage Tank	900	250	250	10,000
1300 Gel Raw Acid Tank	200	200	240	6,000
100 BBI Batch Mixer	700	240	300	8,500
50 BBI Batch Mixer	600	220	300	8,500
Dual Pod Filter Unit	200	120	230	2,000
Acid Transfer Pump	120	100	100	0.750

16.0 CARTRIDGE FILTER UNIT

Filtration is a key element to a cost-effective oil and gas field services; in drilling, work over and completion operations. Fluids which are not carefully sized can cause costly formation damage. SAKNAFTA provides filtration services to its clients to meet with their requirement, save additional cost of well stimulation and avoid related operational problems due to non-filtered fluids especially across the pay zone.

On a typical job, SAKNAFTA would provide its two stages, skid mounted, easy to handle filtration vessels. A primary and a secondary filtration stage are usually carried out together. In the primary filtration stage the fluid is cleaned from debris and bigger solid particles using 200 to 50 Meshes. Using the primary stage reduces cost and time spent by saving the secondary stage cartridges from plugging so often. As the fluid exits the primary stage it enters the secondary filtration stage where it is cleaned to the desired size of solid particles 20 to 2 micron cartridges. Size of mesh or cartridge is always discussed between SAKNAFTA and client engineers for optimum results and cost-efficiency. Both meshes and cartridges could be replaced during the job whenever plugged. Number of sets required depends on the cleanliness of fluid and volume to be filtered.



17.0 HIGH PRESSURE IRON

The unit will have 2 removable pipe boxes mounted on the upper deck. These boxes will provide storage and transportation for the following list of high pressure iron. The pipe boxes will have lift lugs located at each corner for hoisting onto work boats and platforms.

The iron will be FMC Sour Gas service rated. The straight joints will have integral 1502 unions.

The in-line flow meters are Cameron Measurement Systems turbine style meters with Fig. 1502 hammer union ends. They are made with stainless steel bodies and vanes. The 2" flow meter has a linearity of +/- 1% over a flow range of 0.9bpm to 9bpm. The 3" flow meter has a linearity of +/-1% over flow range of 1.9bpm to 19bpm. Each meter has a magnetic pickup and 50ft of signal cable.

The pressure transducers are Viatran brand 0 – 15,000psi with Fig. 1502 hammer union connections and 50 ft of signal cable..



QTY	U/M	DESCRIPTION
1	EA	Choke,2" 1502
5	EA	Swivel,2" style 50 1502
2	EA	Swivel,2" style 10 1502
2	EA	Elbow,2" 1502
2	EA	Tee,2" MxFxF 1502
2	EA	Wye,2" MxFxF 1502
2	EA	Joint,2" 4ft 1502
10	EA	Joint,2" 8ft 1502
10	EA	Joint,2" 10ft 1502
6	EA	Loop,2" 6ft 1502
40	EA	Safety Cables
1	EA	Pressure Transducer
1	EA	HP flow meter
3	EA	Valve,2" 2x2 1502

IV – Nitrogen Equipment

180K HEAT RECOVERY NITROGEN PUMPING SKID



1.0 EQUIPMENT SPECIFICATION

The pumping unit will consist of a skid, diesel engine, self-contained liquid nitrogen pump and vaporizer system. The skid will have a steel formed channel base with fork lift slots. The nitrogen pump and vaporizer system will include a triplex liquid nitrogen pump, centrifugal charge pump, liquid nitrogen vaporizer and all necessary gauges and controls for local operation

2.0 PERFORMANCE & PHYSICAL SPECIFICATIONS

Maximum unit design working pressure	10.000 PSI (69 mPa)
Maximum working pressure, 1.625" cold ends	10.000 PSI (69 MPa)
Maximum pump flow rating	3.000 SCFM /180,000 SCFH (85 SCMM)
Hydrostatic test pressure	15.000 PSI (103 MPa)

Maximum Envelope Dimensions:

Width:	96"	(2.44m) "
Length:	132"	(3.35 m) "
Height:	107"	(2.72m) "

Estimated Weights:	20.000 lbs (9.072 kg)
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3.0 PRINCIPLES OF OPERATION

During normal operation, liquid flows from a tank through the centrifugal charge pump (where suction pressure is boosted) to the triplex pump, where it is pressurized by reciprocating pistons to downstream pressure. The high pressure liquid then flows through the nitrogen vaporizer, absorbs a sufficient amount of heat from the power unit cooling system to raise the temperature to 60°-70° Fahrenheit (16°-21° Celsius) and flows out through the discharge valve as high pressure gas at the maximum flow rate of 180,000 SCFH

To balance the heat load on the cooling system, waste system heat and heat generated by using a water brake to load the engine provide sufficient heat for nitrogen vaporization, while simultaneously insuring that heat influx to the hydraulic system and diesel engine is properly dissipated under all conditions.

4.0 MAJOR COMPONENT SPECIFICATIONS -:

4.1 Engine

- 4.1.1 Air start lubricator, 12 CFM compressor, 60 gal air tank
- 4.1.2 Engine EDM safety shutdowns to include overheating, low oil pressure, emergency Kill
- 4.1.3 Spark arresting muffler with heat wrap from turbo to rain cap
- 4.1.4 Anti-static fan and belt
- 4.1.5 Pneumatic shutdown system, with manual emergency stop, also designed to give automatic shutdown of both intake air and fuel in the event of
 - *Engine over speed
 - *High exhaust gas temperature
 - *High coolant temperature
 - *Low oil pressure



4.2 TRIPLEX PUMP

- 4.2.1 1.375" stroke
- 4.2.2 1.625" standard Hydra Rig cold ends

4.3 BOOST PUMP

- 4.3.1 Hydra Rig 1-1/2" x 1-1/2" x 6" centrifugal pump

4.4 VAPORIZER

- 4.4.1 Water bath vaporizer utilizes the power unit waste heat recovering system
- 4.4.2 A water break is used to load the engine to produce additional heat for LN2 Vaporization

4.5 CONTROLS / GAUGES

4.5.1 Four channel MD/TOTCO display will be provided for discharge rate, discharge temperature, discharge pressure, and total product .

4.5.2 The control panel will include the following

4.2.1 Engine start I stop

4.2.2 Engine electronic data monitor

4.2.3 Engine throttle

4.2.4 Emergency kill

4.2.5 MD/TOTCO 4 channel display



4.6 PIPING

4.6.1 Low Pressure piping will be stainless steel and will have relief valves installed where the possibility of trapping liquid nitrogen could occur

4.6.2 All high pressure piping and connections will be capable of 15,000 psi working Pressure

4.6.3 A recirculation line will be installed to allow the triplex pump to circulate back to the tank or vented to the ground, with A 1-1/2" CGA fitting,

4.6.4 The triplex pump liquid discharge will have a 3/4" Autoclave recirculation valve to allow the operator to rotate the triplex pump without pressuring up The recirculation line

4.6.5 A 9/16" Autoclave temping valve and line will be installed on the unit to allow the operator to cool the discharge gas to the desired temperature. (Accessible from the control panel).

4.6.6 A high pressure relief will be installed on the LN2 discharge side of the triplex pump.

4.6.7 All high pressure fittings and valves will be autoclave or equivalent.

4.6.8 The discharge line will exit on the curb side at the rear of the skid and will incorporate a check valve C/W bleeder valve and a plug valve with a 1" 1502 W ECO wing to the wellhead

	SNNU-1	SNNU-2	SNNU-3	SNNU-4
Model	Hydra-Rig	Hydra-Rig	Hydra-Rig	Hydra-Rig
Manufacture Year	2009	2009	2011	2014
Max. Injection Rate(SCF/H)	180,000	180,000	90,000	180,000
Max. Working Perssure (PSI)	10,000	10,000	10,000	10,000
Length (m)	3.4	3.4	3.4	3.4
W idth (m)	2.4	2.4	2.4	2.4
Height (m)	2.54	2.54	2.54	2.54
W eight (ton)	7.86	7.86	7.86	7.86



5.0 Nitrogen Tanks

5.1 Applications

The Nitrogen Tank is used for supply, transportation and storage of cryogenic liquid nitrogen. Suitable for, nitrogen operations at any worksite on land, offshore and in remote or local areas. It can be utilized for any of SAKNAFTA's specialized nitrogen services including: foam, coiled tubing operations, gas lifting, purging, leak testing, foam inerting and pipeline dewatering and drying.

Safety

- Strong protective frames
- Drip trays fitted as standard
- Double valves fitted on discharge lines
- Certified for worldwide operations
- All tanks fitted with relief valves and burst discs

Design

- Vacuum and perlite double insulated
- Certified lifting sling for craneage
- Fork lift pockets built into base of frame
- Access ladders form integral part of frame



5.2 SPECIFICATION

WORKING PRESSURE : 3 bar.

HYDRO TEST PRESSURE : 4.2 bar actual with vacuum in place.

SERVICE TEMP. : -196°C to 50°C. Inner/ outer vessel and pipe work.

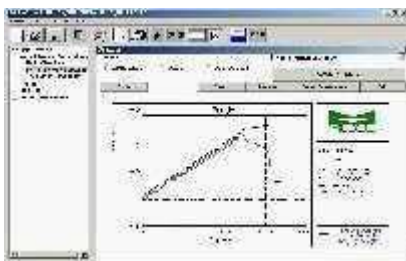
PERFORMANCE : 0.5% Per day based on LN2.

UNIT	LENGTH	WIDTH	HEIGHT	WEIGHT KG
6X2000 USG LN2 Tanks	290	240	250	10,480
5500 Gal Tank	340	240	250	21

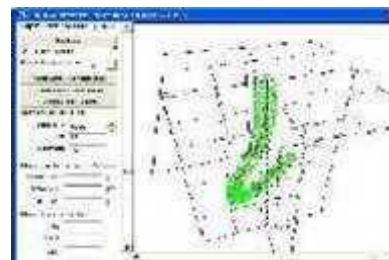
V- Data Acquisition

1.0 Tubing Analysis System TAS

TAS is a computer program designed to perform various calculations and simulations often needed in tubular applications. TAS is used as a coiled tubing job simulator, designing velocity strings, drill pipe applications, under-balanced drilling, cementing, and wireline simulations. TAS is an integrated modular program incorporating **Force and Stress Analysis, Fluid Circulation, and Transient Simulator**, in addition to numerous quick computations often needed in tubular computations.



Fluid Circulation Module

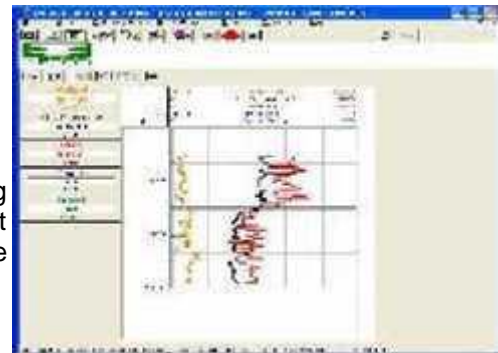


Force and Stress Analysis

1.1 Data Acquisition and Real Time Processing

DART

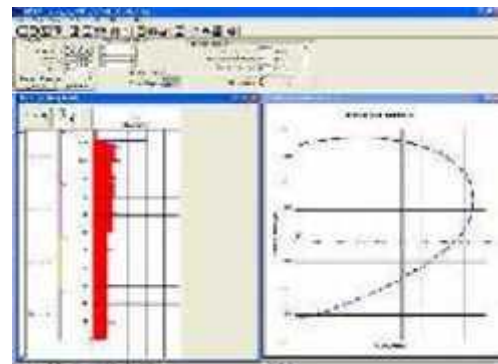
Dart is a flexible data acquisition software capable of logging data from any hardware through serial port or through Ethernet TCP/IP. DART can be used for any application where real time data is required.



1.2 Fatigue Analysis for Coiled Tubing

FACT

FACT is a management tool that can be used to maximize the safe use of coiled tubing strings. the Fatigue Analysis, tracks life consumption of individual coiled tubing strings and parts of the strings subject to the jobs carried out in wells or in the yard, showing consumption per job



1.3 REAM HMI

(Real-time Electronic Acquisition & Monitoring with Human Machine Interface)

The REAM HMI is a user-friendly data acquisition system that reads data from electronic sensors and displays the data on an 8.4" TFT touch screen, which acts as both an input and an output device. The system records the data on solid state Compact Flash memory and allows remote monitoring of the data.



1.4 TOM (Tubing Ovality Monitor)

TOM is a fast and accurate laser diameter measuring tool. It has user friendly handling, does not require a computer in real-time operation and has high dirt and dust tolerance...



2.0 Measurements

For coiled tubing operations, the following describes the sensors and measurements needed.

Depth / Speed

Circulating / Well Head Pressure

String Weight

Flow Rate / Flow Total



3.0 Displays

LED displays can be used with the REAM HMI system to display digital readings of the various parameters being measured.

VI – Down Hole Tools

Motor Head Assemblies

Technical Specifications							
Min. I.D.	1 1/16"	1 1/8"	2 1/8"	2 1/4"	2 3/8"	2 1/2"	2 1/4"
Make-Up Length	27"	27"	25"	25"	25"	23"	20"
Min. I.D.	0.406"	0.406"	0.406"	0.587"	0.687"	0.750"	0.750"
Tensile Strength (Standard Service)	40,000lbs	45,000lbs	55,000lbs	65,000lbs	70,000lbs	120,000lbs	150,000lbs
Twin Flapper Check Valve I.D.	0.687"	0.687"	0.850"	0.990"	0.890"	1.031"	1.375"
HD Hydraulic Disconnect Flare Neck (Internal)	2" x .65"	2" x .65"	2" x .65"	2 1/4" x .65"	2 1/4" x .65"	3" x .65"	2" x .65"
HD Hydraulic Disconnect Min I.D.	0.466"	0.466"	0.466"	0.782"	0.782"	0.875"	1.625"
HD Hydraulic Disconnect Drop Ball	5/8"	5/8"	5/8" min	5/8" min	5/8" min	5/8"	1 1/8"
HD Hydraulic Disconnect Fish Neck Tensile	25,000lbs	48,000lbs	70,000lbs	81,000lbs	134,000lbs	185,000lbs	295,000lbs
Dual Circulation Valve Drop Ball O.D.	7/8"	7/8"	7/8"	1"	3/4"	9/8"	7/8"



Twin Flapper Check Valves

Technical Specifications				
Maximum O.D.	Minimum I.D.	Tensile Strength (Standard Service)	Make-Up Length	Internal Ball Clearance
1.587"	0.687"	60,000lbs	18"	1/2"
1.750"	0.807"	75,000lbs	18"	3/4"
2.125"	0.921"	100,000lbs	12"	1"
2.250"	1.031"	75,000lbs	18"	1"
2.375"	1.151"	75,000lbs	18"	1"
2.625"	1.375"	120,000lbs	17"	1 1/4"
3.125"	1.625"	75,000lbs	18"	1 1/4"

Clearance of Twin Flapper Check Valves up to 25% are available on completion

Flapper Cartridge Technical Specifications		
O.D.	I.D.	Net Contents
1.311"	0.842"	Ball
1.313"	0.842"	2 1/4" O.D.
1.311"	0.841"	2 1/4" O.D.
1.803"	1.031"	Body Seal & Flapper
1.801"	1.031"	17-4 PH Stainless Steel
2.203"	1.375"	Hinge Pin
2.201"	1.375"	Rockwell C50



Hydraulic Accelerators / Jars

Technical Specifications					
Maximum O.D.	Minimum I.D.	Max Working Tensile (Standard Jar)	Overall Length (Closed)	Internal Ball Clearance	Stroke Length
2.125"	0.250"	60,000lbs	67"	-	6"
2.250"	0.250"	60,000lbs	67"	-	6"
2.875"	0.380"	100,000lbs	72"	1/4"	6"
3.125"	0.500"	150,000lbs	72"	7/8"	6"



CT Knuckle Joints



Technical Specifications					
Maximum O.D.	Minimum I.D.	Tensile Strength (Standard Service)	Make-Up Length	Internal Ball Clearance	Angle of Deviation
1.887"	0.500"	40,000lbs	10.461"	7/8"	15°
1.753"	0.500"	60,000lbs	10.461"	7/8"	15°
2.125"	0.500"	86,000lbs	9.260"	7/8"	15°
2.375"	0.750"	60,000lbs	9.604"	7/8"	15°
3.125"	1.000"	100,000lbs	11.000"	1 1/2"	15°

Tubing End Connector

Technical Specifications

Coiled Tubing Diameter	Maximum O.D.	Minimum I.D.	Tensile Strength (Standard Service)	Make-up Length	Internal Ball Clearance
1 1/4"	1.667" to 2.250"	Subject to	45,000 lbs to 66,000 lbs	5.261"	Subject to
1 3/8"	2.000" to 2.250"	maximum through	35,000 lbs to 66,000 lbs	4.667"	maximum through
1 3/4"	2.125" to 2.395"	bore of chosen	45,000 lbs to 66,000 lbs	4.625" to 4.937"	bore of chosen
2"	2.750" to 2.875"	thread connection	80,000 lbs to 131,000 lbs	5.500"	thread connection

Other sizes available on request



Straight Bar



Technical Specifications

Maximum O.D.	Minimum I.D.	Tensile Strength (Standard Service)	Internal Ball Clearance
1.667"	0.500"	45,000 lbs	7/8"
1.750"	0.500"	48,000 lbs	7/8"
2.125"	0.500"	78,000 lbs	7/8"
2.250"	0.500"	78,000 lbs	7/8"
2.375"	0.750"	60,000 lbs	1 1/8"
3.125"	0.750"	100,000 lbs	1 1/8"

Jetting Nozzles

Single Port Flow Thru Nozzle				Multiple Flow Port Nozzle			
Maximum O.C.	Minimum I.D.	Overall Length	Nozzle Configuration	Maximum O.D.	Minimum I.D.	Overall Length	Nozzle Configuration
1.687"	0.250"	5.500"	1 x 0.250"	1.687"	N/A	6.000"	1 x 0.250" 4 x 0.250" @ 45°
2.125"	0.500"	6.000"	1 x 0.500"	2.125"	N/A	4.500"	1 x 0.250" 4 x 0.250" @ 45°
2.375"	0.750"	6.000"	1 x 0.750"	2.375"	N/A	6.000"	1 x 0.312" 4 x 0.312" @ 45°
3.125"	0.875"	6.000"	1 x 0.875"	3.125"	N/A	8.000"	1 x 0.312" 4 x 0.375" @ 45°
Multiple Back Flow Port Nozzle				Multiple Up Flow Port Nozzle			
Maximum O.C.	Minimum I.D.	Overall Length	Nozzle Configuration	Maximum O.D.	Minimum I.D.	Overall Length	Nozzle Configuration
1.687"	N/A	6.000"	4 x 0.250" @ 135°	1.687"	0.500"	6.000"	1 x 0.500" 4 x 0.187" @ 45° 4 x 0.187" @ 90°
2.125"	N/A	6.000"	4 x 0.250" @ 135°	2.125"	0.875"	6.000"	1 x 0.500" 4 x 0.250" @ 45° 4 x 0.250" @ 90°
2.375"	N/A	6.000"	4 x 0.312" @ 135°	2.375"	0.875"	6.000"	1 x 0.625" 4 x 0.312" @ 45° 4 x 0.312" @ 90°
3.125"	N/A	6.000"	4 x 0.375" @ 135°	3.125"	0.875"	6.000"	1 x 0.750" 4 x 0.375" @ 45° 4 x 0.375" @ 90°
Multiple Side Flow Port Nozzle				Single Flow Port Muleshoe Nozzle			
Maximum O.C.	Minimum I.D.	Overall Length	Nozzle Configuration	Maximum O.D.	Minimum I.D.	Overall Length	Nozzle Configuration
1.687"	N/A	5.500"	1 x 0.250" 4 x 0.250" @ 90°	1.687"	0.625"	5.500"	1 x 0.625" @ 45°
2.125"	N/A	6.000"	1 x 0.250" 4 x 0.250" @ 90°	2.125"	0.875"	6.875"	1 x 0.875" @ 45°
2.375"	N/A	6.000"	1 x 0.3125" 4 x 0.312" @ 90°	2.375"	0.875"	6.875"	1 x 0.875" @ 45°
3.125"	N/A	6.000"	1 x 0.375" 4 x 0.375" @ 90°	3.125"	1.000"	8.000"	1 x 1.000" @ 45°

Single Port Flow Thru Nozzle



Multiple Back Flow Port Nozzle



Multiple Side Flow Port Nozzle



Multiple Flow Port Nozzle



Multiple Up Flow Port Nozzle



Single Flow Port Muleshoe Nozzle



Rotating Jetting Nozzle

Technical Specifications

Maximum O.D.	Overall Length	Jetting Nozzle Inserts
1.687"	8.250"	(12) M6 x 1.0 - 0.7812" (2mm) Dia Hole
1.750"	8.250"	(12) M6 x 1.0 - 0.7812" (2mm) Dia Hole
2.125"	8.520"	(12) M6 x 1.0 - 0.7812" (2mm) Dia Hole
2.375"	8.520"	(12) M6 x 1.0 - 0.7812" (2mm) Dia Hole
3.125"	10.380"	(12) M6 x 1.0 - 0.7812" (2mm) Dia Hole



Centralizer

Technical Specifications

Maximum O.D.	Minimum I.D. (Typical)	Tensile Strength (Standard Service)	Make-Up Length (Typical)	Internal Ball Clearance (Typical)
2.000"	0.750"	46,000lbs	6.000"	1/8"
2.250"	0.750"	48,000lbs	6.000"	1/8"
2.625"	0.875"	78,000lbs	6.000"	3/4"
2.750"	1.000"	78,000lbs	6.000"	5/8"
3.000"	1.000"	78,000lbs	6.000"	5/8"
3.500"	1.000"	80,000lbs	6.000"	5/8"
4.000"	1.000"	80,000lbs	6.000"	5/8"
4.250"	1.000"	100,000lbs	10.000"	5/8"
4.500"	1.250"	100,000lbs	10.000"	1 1/8"



CT Fishing Tools

Technical Specifications

Nominal Size	Maximum O.D.	Min I.D. (without choke)	Tensile Strength (Std Service)	Make-Up Length	Standard Slips Supplied	Tool Activation Pressure (psi)
2"	1.850"	0.250"	41,000lbs	19.830"	¾" to 1 ¼"	650
2 ½"	2.125"	0.390"	66,000lbs	19.830"	1 ½" to 1 ¾"	650
2 ¾"	2.250"	0.390"	92,000lbs	20.185"	1 ½" to 1 ¾"	650
3"	2.625"	0.390"	82,000lbs	20.850"	1 ½" to 2 ½"	1100
3 ½"	3.250"	0.390"	167,000lbs	20.500"	2" to 2 ¾"	900
4"	3.600"	0.390"	191,000lbs	21.645"	2 ¾" to 2 ¾"	900



Flow Activated Releasable Overshot Slips Table

Nominal Size	2"	2 ½"	2 ¾"	3 ½"	4"
Actual O.D.	1.850"	2.210"	2.625"	3.250"	3.600"
Nominal Slip Size	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)	Catch Range (Part Number)
¾"	¾" to ¾" (OO-16024)	¾" to ¾" (OO-16032)	¾" to ¾" (OO-16038)	-	3/8" to 5/8" (OO-16042)
1"	¾" to 1 ¼" (OO-16026)	¾" to 1 ¼" (OO-16033)	¾" to 1 ¼" (OO-16038)	¾" to 1 ¼" (OO-17491)	-
1 ¼"	1 ¼" to 1 ¼" (OO-16027)	1 ¼" to 1 ¼" (OO-16034)	-	1 ¼" to 1 ¼" (OO-17492)	5/8" to 1 ¼" (OO-16043)
1 ½"	1 ½" to 1 ½" (OO-16027)	1 ½" to 1 ½" (OO-16047)	1 ½" to 1 ½" (OO-16040)	-	-
1 ¾"	1 ½" to 1 ¾" (OO-16028)	1 ½" to 1 ¾" (OO-16025)	1 ½" to 1 ¾" (OO-16041)	1 ½" to 1 ¾" (OO-17493)	1 ½" to 1 ¾" (OO-16044)
2"	1 ¾" to 2" (OO-16028)	1 ¾" to 2" (OO-16036)	-	1 ¾" to 2" (OO-17494)	-
2 ½"	1 ¾" to 2 ½" (OO-16029)	1 ¾" to 2 ½" (OO-16048)	1 ¾" to 2 ½" (OO-16050)	-	1 ¾" to 2 ½" (OO-16045)
2 ¾"	1 ¾" to 2 ¾" (OO-16030)	1 ¾" to 2 ¾" (OO-16048)	1 ¾" to 2 ¾" (OO-16050)	1 ¾" to 2 ¾" (OO-17495)	-
3"	1 ¾" to 3" (OO-16031)	1 ¾" to 3" (OO-16054)	-	1 ¾" to 3" (OO-17496)	1 ¾" to 3" (OO-16046)
3 ½"	-	1 ¾" to 3 ½" (OO-16055)	1 ¾" to 3 ½" (OO-16055)	-	-
3 ¾"	-	1 ¾" to 3 ¾" (OO-16057)	1 ¾" to 3 ¾" (OO-16057)	1 ¾" to 3 ¾" (OO-17497)	1 ¾" to 3 ¾" (OO-16047)
4"	-	-	-	1 ¾" to 4" (OO-17498)	-
2"	-	-	1 ¾" to 2 ½" (OO-16059)	2" to 2 ½" (OO-16532)	1 ¾" to 2 ½" (OO-16196)
2 ½"	-	-	-	2 ½" to 2 ½" (OO-17499)	2 ½" to 2 ½" (OO-16197)
2 ¾"	-	-	-	-	2 ¾" to 2 ¾" (OO-16198)
3"	-	-	-	-	2 ¾" to 3" (OO-16199)

Sizes highlighted indicate Overshot Slip standard fitment.

VIII- New Technology for Acid Stimulation Dissolvine StimWell

Introduction:

The production of oil and gas is being challenged by increasingly difficult conditions. Extreme temperatures and high pressure, expensive metallurgy of the tubular, extended reach wells and strict health, safety and environment regulations will dictate the future of the industry. Dissolvine StimWell combines the effectiveness of widely-used acids such as hydrochloric acid (HCL) or mud acid with the ability to dissolve or prevent most types of problematic scales. Dissolvine StimWell is an excellent acid stimulation fluid for both carbonate and sandstone reservoirs by improves the permeability of these formations (dissolving calcium carbonate and controlling iron at the same time).

Dissolvine StimWell Advantages:

- Effectively improves the permeability of the formation.

- Causes no face dissolution.

- Compatible with clays.

- Control iron.

- Prevents sludge formation.

- Does not need many additives.

- High thermal stability.

- High solubility over a wide pH range.

- Low corrosion potential.

- Environmentally – friendly characteristics.