



Geophysical and Geological analysis. Technical Program for HSP well re-completion.

1	Collect/purchase/sorting/processing of necessary information:
a	Well operation/exploitation history (production data)
	<ul style="list-style-type: none"> monthly/daily productive inflow of oil, gas and water number of productive and non-productive days per month start and end (maximum and minimum) debit tubing pressure (internal pressure of productive formation) extent the fall of productive inflow stops and possible transitions to the next productive intervals
b	All possible logging (logs)
	<ul style="list-style-type: none"> induction (electric) log neutron and gamma-ray acoustic (casing/cement) log mud-log, chat-log
c	Well information/documentation
	<ul style="list-style-type: none"> design/construction (depths, casing (OD/ID)) opened productive intervals techniques of opening the productive formations (casing, cement, productive formation) using of hydraulic fracturing, chemical treatment, stimulation, etc. previous closing and transitions to new productive intervals packers, retainers, cementation, insulation/waterproofing, etc.
d	All possible tests results
	<ul style="list-style-type: none"> oil gas water pressure
e	Well position map (preferably with an altitude)
	<ul style="list-style-type: none"> position (distance) relative to the neighboring oil wells position (distance) relative to the nearest injection wells
f	Core analysis, lithology, etc. (core)
	<ul style="list-style-type: none"> core analysis rock sample's pictures previous geology, lithology, core analysis
\$ 500.00	

2	Geophysical and Geological analysis for HSP well's re-completion:
a	Location of well's position in the deposit-field
	<ul style="list-style-type: none"> well's map position relative to the neighboring oil/injection's wells major characteristics of producing field
b	Geological and Geophysical structure/structures
	<ul style="list-style-type: none"> core, lithology, rock, formations porosity, permeability, pore's structure oil, gas and water saturation
c	Design and Logging
	<ul style="list-style-type: none"> logging (induction (electric), neutron and gamma-ray, acoustic (casing/cement), mud-log, chat-log) correlation with neighboring oil/injection's wells lithological analysis
d	Summary analysis of geological and geophysical data
	<ul style="list-style-type: none"> perspective productive Intervals recommended for HSP cutting productive intervals pressure
e	Prospects analysis
	<ul style="list-style-type: none"> residual stock analysis by cumulative production method prospects analysis after HSP re-completion
\$ 500.00	

3	Technical Project ("Cut Program", specification, schedule)
a	Calculation of technological parameters for HSP re-completion
	<ul style="list-style-type: none"> Initial data calculation of technological parameters results of calculation of technological parameters
b	Technical Parameters
	<ul style="list-style-type: none"> flow control valve pressure-temperature-cutting speed dependence nozzles, erosion, rate, connections surface equipment scheme hydro-slotting perforation process graph
c	Hydro-slotting perforation Program
	<ul style="list-style-type: none"> preparation for slot perforation process hydro-slotting perforation (HSP) process start- ending of HSP process possible violations of HSP process hydro-slotting perforation (HSP) technical schedule
d	Safety and operational requirements
	<ul style="list-style-type: none"> emergency medical response procedure fire emergency procedure spill or release procedure H2S emergency procedure emergency response for storm response to a bomb threat emergency medical information forms
\$ 500.00	



Example of Geophysical and Geological analysis, and Technical Program for HSP well re-completion:
<http://www.maxxwell.net/10-15.pdf>





Preparation, preparatory, and HSP process expenses.

(based for standard HSP process during 10 days (2 days HSP process), with two HSP tool/equipment sets, and performed by two HSP experts)

1 Preparation of Hydro-slotting Perforation (HSP) tool/equipment				
a Consumable and spare parts for HSP tool/equipment				
	• Perforator MAXXWELL-P120ES4-D-1/2 (ergonomic one piece solid metal D-1/D-2 for 4/2 nozzles and ball valve seat)	\$ 2,500.00	2	\$ 5,000.00
	• Nozzle MAXXWELL-NL1-07-06-0.2CONE	\$ 150.00	8	\$ 1,200.00
	• Nozzle-holder (hardy/T ^o) MAXXWELL-NH1.2-1-1	\$ 130.00	8	\$ 1,040.00
	• Plug/cup (one piece solid metal D-1/D-2)	\$ 120.00	4	\$ 480.00
	• Copper sealing ring MAXXWELL-CR0.1	\$ 25.00	8	\$ 200.00
	• Spring (for return unit) MAXXWELL-SP70X2.5	\$ 1,000.00	1	\$ 1,000.00
	• Sinter metal valve ball to test the tightness of tubing connections	\$ 300.00	1	\$ 300.00
	• Steel valve ball for HSP perforator	\$ 10.00	5	\$ 50.00
	• Hydraulic oil "MAXXWELL-T" low temperature dependence of the viscosity	\$ 35.00	4	\$ 140.00
	• Grease "MOBILE" for medium and high temperatures	\$ 10.00	12	\$ 120.00
				\$ 9,530.00
b Preparation of HSP tool/equipment				
Preparation of two HSP tool/equipment sets for each working day (two installer x 10 days)				
	• assembly-disassembly, cleaning, inspection, adjustment	\$ 2,500.00	2	\$ 5,000.00
	• installation and adjustment of control flow device for required temperature			
	• assembly-disassembly, testing HSP tool/equipment under required pressure and temperature, drawing up a table of measurements			
	• drawing up the individual graph of dependence for pressure, temperature, and cutting speed, separately for each HSP tool/equipment sets			
	• packaging/conservation			
				\$ 5,000.00
				\$ 14,530.00

2 Well re-completion process with HSP Technology (directly on the well-site)				
a Trip/travel expenses (two HSP experts x 10 days)				
	• fuel/transport/service expenses (trip + local)			\$ 1,000.00
	• shipping/delivery, and other unexpected but possible expenses (loading and unloading, assistants expenses, etc.)			\$ 500.00
	• accommodation (nearest hotel/motel, RV/trailer, mobile house) (2 experts)	\$ 100.00	10	\$ 1,000.00
	• meal/food (2 experts x \$ 50/day)	\$ 100.00	10	\$ 1,000.00
	• temporary space for travel laboratory (including electricity, water, heating/ air conditioning, communication, internet, work desks, etc.)	\$ 200.00	10	\$ 2,000.00
				\$ 5,500.00
b Well re-completion process with HSP Technology (directly on the well-site)				
	• organization of well-site, necessary services and service-companies, tool/equipment and materials, consumable and spare parts, etc.	\$ 2,500.00	2	\$ 5,000.00
	• supervision/management, engineering, control, coordination and monitoring the whole HSP process, accident prevention (from start to end)			
	• completion of the process, assembly-disassembly, cleaning, inspection of HSP tool/equipment, packaging/conservation, cleaning of work-space			
	• well further exploitation recommendations			
				\$ 5,000.00
				\$ 10,500.00
Sum				\$ 25,530.00
3 Amortization coefficient (other additional amortization and current expenses)				
a Amortization coefficient (for each well)				
	• Amortization coefficient for HSP service (description on the next page)		10%	\$ 2,553.00
				\$ 2,503.00
Total				\$ 27,533.00

Example of invoice for standard well re-completion Geophysical and Geological analysis, and Technical Program for HSP well re-completion:

<http://www.maxxwell.net/Invoice.pdf>





Amortizations and current expenses.

Maxwell Production does not charges any additional fees for Geophysical and Geological analysis (only salary analysts), consumable and spare parts (manufacturer price), preparation HSP tool/equipment (only salary installers), and HSP re-completion process (only salary experts), therefore, to maintain the company in a good condition we are forced to charge a symbolic percentage for amortizations and current expenses.

1	Consumption of amortization percentage (amortization and current expenses) - 10% from service (approximately \$ 2,000.00 - \$ 3,000.00 from each well)
a	Office, workshop, laboratory expenses
	<ul style="list-style-type: none"> office, workshop, laboratory leases electricity, water, gas, Internet, communications, security, CCTV furniture and office equipment (computers, printers, copier, scanner, coffee maker, fridge, etc. consumables materials for office, workshop and laboratory office staff and helpers salary
b	Transport
	<ul style="list-style-type: none"> gasoline service and maintenance consumables materials and spear parts purchase of additional transport
c	Tool/equipment
	<ul style="list-style-type: none"> manufacture and replacement of HSP tool/equipment parts manufacture of new HSP tool/equipment manufacture of special tool/equipment purchase of a new tool/equipment working consumables materials for workshop and laboratory
d	Research, development and improvement
	<ul style="list-style-type: none"> styling/design, engineering/development, planning/projecting calculations, mathematical and physical tests/analysis prototyping and testing, improvement, introduction of new models writing and implementation of new applications and patents creating computer programs, publication of scientific articles participation in scientific conferences, forums, special exhibitions

e	Permits, licenses, certifications, insurances
	Professional Service Liability Insurance
	Commercial General Liability
	<ul style="list-style-type: none"> Body Injury Property damage Inclusive limits Products Completed Operations Personal & Advertising Injury
	Pollution Liability
	<ul style="list-style-type: none"> Aggregate Limit Per each Incident
	Umbrella Liability
	<ul style="list-style-type: none"> Aggregate Limit Per Occurrences Limit
	Control of Well Insurance
	<ul style="list-style-type: none"> Each Occurrences Combined Single Limit Each Occurrences
	Personal insurance
	<ul style="list-style-type: none"> medical insurance policy travel medical insurance policy
	Periodic training, testing and examinations
	<ul style="list-style-type: none"> Safe land USA H2S Awareness Certificate WHIMS Workplace Hazardous Materials Information System Certificate

	<ul style="list-style-type: none"> TDG Transportation of Dangerous Goods by Ground Certificate IADC Rig Pass First Aid Certificate
f	Safety and PPE (special personal protective equipment)
	<ul style="list-style-type: none"> Active and tested H2S Gas Indicator to determine the level of permissible (fatal) values of toxic gases Special protective body suit (dielectric, oil-resistant, non-flammable, protection level # 2 minimum) Personal protective helmet Personal protective boots Personal protective rubber boots Personal protective glasses Personal protective gloves Personal protective rubber gloves Personal protective Face Shield (protect the entire face area from chemical splashes and flying objects) Personal protective Dust Mask (protect from inhaling airborne dust particles, fibers or mechanically generated particles) Personal protective Cartridge Respirator (protect from airborne contaminants and toxic gases) Personal protective Self Contained Breathing Apparatus (protect when require oxygen during hazard assessment)
g	Marketing and Advertising
	<ul style="list-style-type: none"> creation and maintenance of websites and advertisings technical conferences, meetings, presentations, exhibitions research for potential customers, negotiations, consultations business correspondence, conclusion of contracts and agreements
h	Education and training of new HSP Technology specialists/experts





Third-party services and equipment, necessary for well re-completion with HSP Technology.

(approximate prices, can vary depending on the complexity of the project)

1 Services and supplies			
a Well-site preparatory and organization			
	Site work: preparation & maintenance (cleaning/leveling/strengthening, access roads/driveways, digging trenches/reservoir, fencing: attention tapes and warning signs/posters, supervisor/command post with communication, CB-radio, safety equipment, first aid, PPE, H ₂ S equipment, wind direction flag, arrange an immediate challenge (if necessary) of police, ambulance, fire service, environment service, etc.)		\$ 690.00
	tractor/bulldozer/small excavator		\$ 375.00
			\$ 1,065.00
b Equipment and supplies (10 days)			
	wellhead (wellhead top hole equipment with standard BOP)		\$ 750.00
	surface piping, connections, low pressure line		\$ 420.00
	misc., valves, fittings, joint-pipes		\$ 130.00
	tubing: 2-7/8"(or 3-1/2") (correction according to the program)	\$ 1.85/foot x 4000'	\$ 7,400.00
	rods - (D grade) @ (correction according to the program) rental		\$ 780.00
	scraper and caliber (4.0" or 5.0") (correction according to the program)	\$ 120.00+\$ 150.00	\$ 270.00
	water tank (water hauling) (300 bbl.)		\$ 515.00
	brine (formation/layer) water (with delivery)		\$ 585.00
	cutting tank (cut tank/shale shaker) with vibrator (180 bbl.)		\$ 1,510.00
	empty tank (empty hauling) (200 bbl.)		\$ 340.00
	40 intermediary pumping unit w/ 7.5 HP motor		\$ 155.00
	abrasive quartz sand 20/40 (optional 10/35) (optional garnet sand) w/delivery	\$ 455.00 x 38 ton	\$ 17,290.00
			\$ 30,145.00
c Wellsite Supervision/Engineering			
	wellsite Supervisor	\$ 535/day x 10 days	\$ 5,350.00
	wellsite Engineer	\$ 258/day x 10 days	\$ 2,580.00
	wellsite Safety Manager	\$ 125/day x 10 days	\$ 1,250.00
			\$ 9,180.00

d Services and equipment			
Workover (Rig + rig's pump + team/stuff)			
	Workover (Rig + team/staff + Labor: installation/construction/re-completion)	\$2750/day x10 days	\$ 27,500.00
Wireline logging service			
	Cased hole logging (neutron/gamma-ray, acoustic/casing logging)		\$ 5,730.00
Fracking (pumping) service with crew			
	Triplex Plunger Pump (up to 6000 psi pressure, and up to 10000 bbl./min rate)		\$ 26,250.00
	Frack-van (monitoring center)		-
	high pressure line, connections, misc., valves, fittings, joint-pipes		-
	Manifold-block (direct-back flushing)		\$ 250.00
	Blender track (or mobile mixer)		\$ 545.00
	Pressure, flow rate, density, concentration, temperature sensors (indicators)		-
Trucking, Hauling, Winch truck, electricity service, delivery service, clean-up service			
	Trucking, Hauling, Winch truck, electricity/fuel service, delivery service, clean-up service		\$ 350.00
Acid treatment service			
	Acid treatment service (5,000 gallon acetic acid Job)		\$ 3,570.00
Completion works			
	pumping (swabbing) water from the well until produce productive inflows		\$ 1,660.00
	completion unit		-
Downhole Pump & Accessories service			
	downhole pump (pump-jack) & accessories service		\$ 625.00
	downhole rod, downhole pump, electric motor, starter control box		\$ 1,170.00
Other possible potential unaccounted operating costs and administrative expenses			
			-
			\$ 67,650.00
			\$ 108,040.00
Contingencies			
	contingencies coefficient (5%)		\$ 5,402.00
			\$ 113,442.00





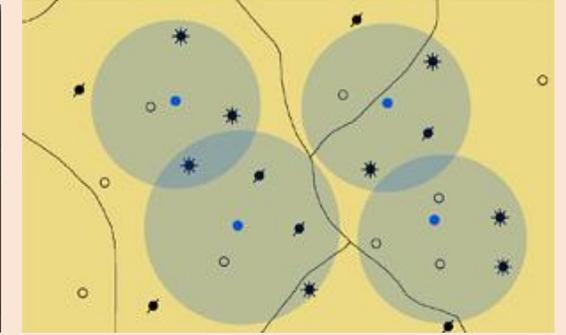
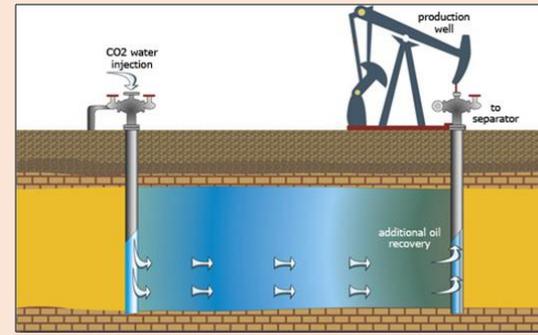
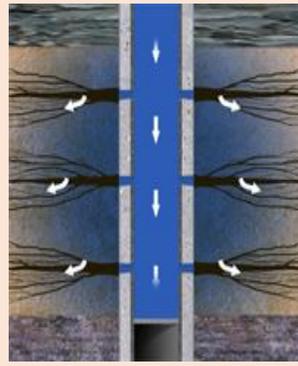
Re-completion of nearby injector well with HSP Technology

(Determined according to the results of Geophysical and Geological analysis)

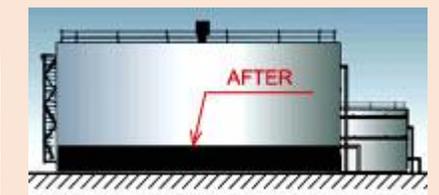
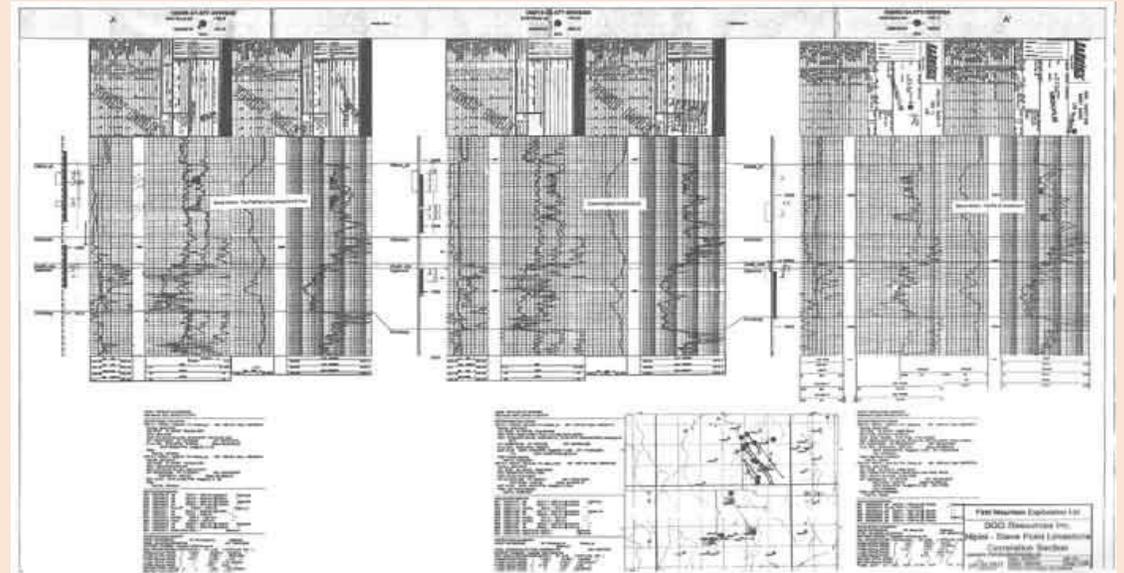
During long-time exploitation of oil well the internal pressure of productive formation is decreasing (sometimes to zero), although the remaining reserves have been extracted only at **40-50%** (and the remaining **50%** reserves are still in the ground). To increase the internal pressure of the productive formation using injection wells (existing or remaking an old oil well in the injector). The water from the injection well displaces oil and pushes it to the oil wells. Thus, in the neighboring oil wells, located nearby the injection well, the internal pressure of productive formation is increasing.

HSP perfectly restores the injection wells, increases the working area, creates geometry directed action, cleans and removes clogging, mudding, and colmatation (depends on the salt's composition of impurities and admixture). HSP allows reduce pumping rate in three (**3**) times less, and increase the beneficial effect in ten (**10**) times.

Injection wells increases the productive inflow in nearby oil wells up to **20%**. Usually **3 or 4** low productivity oil wells used one injection well.



1	Re-completion of injector well with HSP Technology (similar procedure as for oil well)			
a	Hydro-slotting Perforation			
	• Consumable and spare parts for HSP tool/equipment			\$ 9,530.00
	• Preparation of two HSP tool/equipment sets for each working day			\$ 5,000.00
	• Trip/travel expenses	\$ 150.00	8	\$ 5,500.00
	• Well re-completion process with HSP Technology (directly on the well-site)	\$ 130.00	8	\$ 5,000.00
				\$ 25,030.00
	• Amortization coefficient for HSP service (10%)	\$ 25.00	8	\$ 2,503.00
				\$ 27,533.00
b	Third-party services and equipment			
	• Well-site preparatory and organization	\$ 300.00	1	\$ 1,065.00
	• Equipment and supplies	\$ 10.00	5	\$ 30,145.00
	• Wellsite Supervision/Engineering	\$ 35.00	4	\$ 9,180.00
	• Workover (Rig + team/staff + Labor: installation/construction/re-completion)	\$ 10.00	12	\$ 27,500.00
	• Cased hole logging (neutron/gamma-ray, acoustic/casing logging)			\$ 5,730.00
	• Fracking (pumping) service with crew			\$ 27,045.00
	• Trucking, Hauling, Winch truck, electricity/fuel service, delivery, clean-up			\$ 350.00
	• Completion works			\$ 955.00
				\$ 101,970.00
	• contingencies coefficient (5%)			\$ 5,099.00
				\$ 107,069.00
	Total			\$ 134,602.00

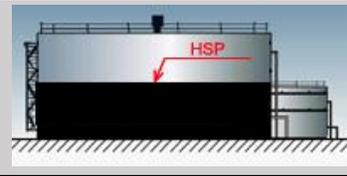




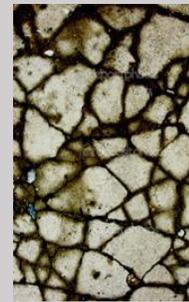
Additional operations and expenses, if it recommended after Geophysical and Geological analysis

(Additional operations determined according to the results of Geophysical and Geological analysis)

Hydro-slotted perforation opens the whole zone of productive layer (all the pores of matrix), forms an excellent hydrodynamic connection well with the productive formation, unloads stress conditions in the near wellbore area and improves reservoir properties (increases the permeability and improves porosity). HSP increases productive inflow in dozens of times with lasting positive effect 10-15 years. However, this is not the limit. There are additional operations that can still increase the percent of productive inflow.



PROBLEM	Cement ring in a bad condition (cracks and micro cracks)
CAUSE	Bad cement composition, or cement cracked from long time of exploitation, cement cracked in resulting of use cumulative perforation and subsequent hydraulic fracturing
AFFECT	Cracks and micro cracks are forms capillary movement of water from water reservoirs to the productive layer, that leads to very rapid water flooding the producing formation
RISK	If the borehole located near the water reservoirs, there is a risk of very rapid water flooding the producing formation
SOLUTION	Repair cement ring or isolation packers watered productive interval, and transition to another productive interval (if there)



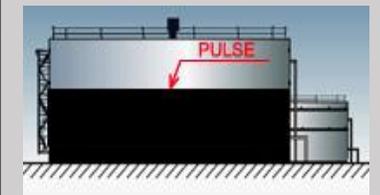
a REPAIR of cement sheath			
	• setting of packer (retainer) (packer-service company)	\$ 2,250 x 2	\$ 4,500.00
	• workover (Rig + team/staff + labor)	\$ 2,750/day x 2 day	\$ 5,500.00
	• bentonite sealing solution (amount according to the project)		\$ 1,250.00
	• sealing the borehole with bentonite solution		-
	• one passage the borehole by scraper + one passage the borehole by caliber		-
			\$ 11,250.00

b ISOLATION of water flooding interval with permanent non-removable packers or/and cementation			
	• setting of packer (packer-service company)	\$ 2,250 x 1	\$ 2,250.00
	• workover (Rig + team/staff + labor)	\$ 2,750/day x 2 day	\$ 5,500.00
	• sealing cement bags (amount according to the project)		\$ 3,500.00
	• sealing the borehole with cement		-
	• one passage the borehole by scraper + one passage the borehole by caliber		-
			\$ 11,250.00

	• contingencies coefficient (5%)		\$ 1,125.00
			\$ 12,375.00

Additional stimulation of productive inflows with PULSED ELECTRIC HYDRAULIC SHOCKS

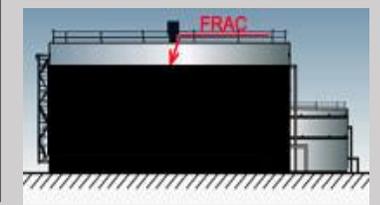
Additional stimulation of productive inflows with pulsed electric hydraulic shocks is performing after complete Hydro-slotted perforation (HSP) process, and flushing all cut intervals and borehole. It stimulates the formation of more micro cracks, and further increases the area of hydrodynamic contact the well with productive formation. According to statistics, this procedure can stimulate an increase of productive inflow **30%** more from existing).



c Additional stimulation of productive inflows with pulsed electric hydraulic shocks			
	• Wireline logging service (similar procedure for cased hole logging)		\$ 5,730.00
	• Pulsed electric hydraulic shocks service (tool/equipment + team/staff + labor)		\$ 15,000.00
			\$ 20,730.00

Additional stimulation of productive inflows with gentle HYDRAULIC FRACTURING

Additional stimulation of productive inflows with gentle hydraulic fracturing (4000 psi) is performing after complete Hydro-slotted perforation (HSP) process, and flushing all cut intervals and borehole. HSP sets a good geometry for subsequent hydraulic fracturing, and stimulates the formation of more extended deep and long cracks and micro cracks, and further increases the area of hydrodynamic contact the well with productive formation. According to statistics, this procedure can stimulate an increase of productive inflow **60%** more from existing).



d Additional stimulation of productive inflows with gentle hydraulic fracturing			
Workover (Rig + rig's pump + team/stuff)			
	• Workover (Rig + team/staff + Labor: installation/construction/re-completion)	\$ 2,750/day x 1 day	\$ 2,750.00
Fracking (pumping) service with crew			
	• Triplex Plunger Pump (up to 6000 psi pressure, and up to 10000 bbl./min rate)		\$ 15,850.00
	• Frack-van (monitoring center)		-
	• high pressure line, connections, misc., valves, fittings, joint-pipes		-
	• Manifold-block (direct-back flushing)		\$ 250.00
	• Blender track (or mobile mixer)		\$ 500.00
	• Proppant (sticky sand sand) with delivery	\$ 500.00 x 18 ton	\$ 9,000.00
	• abrasive quartz/glass sand (optional garnet sand) with delivery	\$ 300.00 x 12 ton	\$ 3,600.00
	• setting of packer/retainer (one passing) (packer-service company)	\$ 2,250 x 2 packers	\$ 4,500.00
			\$ 36,450.00
	• contingencies coefficient (5%)	\$ 1,125.00	\$ 3,645.00
			\$ 40,095.00