

**RE-FIT TWO STRIPPER WELLS WITH EXISTING LARGE DIAMETER OR OPEN HOLE  
COMPLETIONS WITH SPOOLABLE NON-METALLIC TUBING, TRANSITION CONNECTIONS,  
VARIABLE DIAMETER SEAL CUPS AND MODIFIED G.O.A.L.  
CASING SWAB TO AUTOMATICALLY LIFT FLUIDS AND ENHANCE PERFORMANCE**

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Energy usage of oil in the United States is expected to increase by 30% by the year 2020. Natural gas demand is on course to double within the next two decades. Current stripper well domestic production of oil meets ~ 28% [~ 324,000,000 barrels/ yr in 2002] of the nation's needs. Natural gas production from domestic stripper gas wells produces ~ 8% [1 TCF equivalent/yr. = 8%] of current US consumption needs.

Over the past two decades within the Appalachian basin, several tens of thousands of shallow oil and gas wells [1000' – 3500'] have been completed using open hole techniques with multiple zones notched, fractured and produced. The foci for these open hole wells is Pennsylvania, West Virginia and New York. These wells are often configured with 7.0" to 8 5/8" steel surface casing cemented through the water table aquifers, then open rock hole well bore [6.25" to 7 7/8"] to the total depth of well. These wells follow a similar production performance history as their predecessor-cased wells. Several months of flush production are followed by decreasing well pressure and yield of oil/ gas. These wells like many others within a relative short period fall into the category of stripper well production. Down hole pressure in these wells declines to a point where the well is no longer able to lift the fluid in an unassisted manner to the surface. Often time in these multi-zone completion wells an up hole zone [s] will act as a thief for down hole higher pressure producing zones further complicating their operation and production. In on going stripper well production from these wells 'Beam Pumps', tubing velocity strings, small diameter tubing and plungers and other conventional techniques are often employed with some finite success. Most of these techniques do not allow the well to produce itself down to within several tens to a hundred psi of the Fm. pressure. The result is non-captured reserves and higher operation cost for hydrocarbon produced.

This project will select and refit two- [2] existing 6.25" or larger gas or oil and gas, open hole stripper wells with a re-fit well system comprised of a slip lined 3.0" or 4.0" ID spooled non –metallic tubing, metal to non metal connectors, open hole packer assembly, casing stand /stop, and modified G.O.A.L. PetroPump with unique variable diameter seal cups to automatically lift fluids. The operating system will be designed and constructed to allow shallow up well, low pressure, gas to produce off the back side of the casing above the packer. The non- metallic spoolable tubing coupled with modified 'GOAL Tool' with new flex diameter cups [allows passage, without fluid/ pressure loss, across necessary non-metallic to metallic well head connections] will afford automatic and regularly lift of fluids to the surface and foster improved gas and fluids production. Comparison of pre system and post system use production and cost will be developed to project applicability and upside impacts on the stripper well industry.

Historic testing of GOAL PetroPump alone under SWC subcontract #2052-BEDC-DOE-1025, jointly sponsored by NYSERDA and SWC of the Tool in standard J-55 steel cased-perforated stripper wells has demonstrated 1.5 fold to 3 fold improved production at a fraction of the service necessary to operate other stripper well operating systems. Similar improvement is expected in re-fit wells. [Figures 1,2 & 3]

This unique new system of modified GOAL PetroPump, new variable diameter cups, packer assembly, metallic to non- metallic connection of spoolable tubing is unique for maximizing yield through re-completion of large diameter and or open hole stripper wells. Coupling non metallic spoolable tubing with a new flex wall cup accommodates passage with out pressure and or fluid loss across diameter changing transitions in tubing and packers. This coupled with the simple elegant design of the GOAL tools on board valve control allows it to free travel within the re-fitted well bore. The new system will allow the re-fitted wells to "pump themselves" despite natural declining down hole pressures. The system is "smart" in both directions, dropping down hole when pressure at the well head is low/ reduced by down hole fluid accumulation. The system is "smart" up hole using below tool formation pressure to lift tool and fluid [oil/brine] to the surface, subsequently free floating in the well head lubricator allowing down hole pressure/ gas to flow to the process unit. At such time as pressure has declined below system control pressure, the system will once again repeating the automatic pumping cycle.

Successful application of the outlined system will have positive economic impact on the 10,000+ existing potential candidate wells. Open hole well re-fit cost at \$30,000- \$49,000/ well could be offset in a 1 to 1.5 year period at achievable 1.5 X to 3 X increase yield on target wells.