Executive Summary

Stripper Well Characterization with Low-Cost Micro-Electronic Linked Probe

This grant is a continuation of stripper well research at the Taylor University Center for Research and Innovation (CRI), in conjunction with Airlift Services International (ASI). In previous work, we have successfully modeled the ASI compressed air pumping system using computational fluid dynamics programs and an advanced diagnostic probe module in a down-hole environment.

In this grant we plan to leverage our data module probe experience to characterize stripper wells with much greater detail and at much lower cost so that proper action can be readily taken regarding well viability, re-stimulation, advanced well-logging, new perforations, or ultimate plugging (AIP E3). The problem exists that low-cost well information is not readily available to make a decision to either invest or plug a well while the alternative outcomes many times result in environmental damage, project standstill, or improper abandonment (orphan wells).

The overall project objective is to provide vital data for stripper well and reservoir characterization in a low-cost (~$5K) and easily deployable package that will help improve the efficiency and profitability of oil and gas production. The overall method employed is to advance the down-hole environment sensing using inexpensive and miniature technologies developed for our previous SWC grant, for NASA and Air Force Nanosatellites and for high-altitude balloons. A further innovation includes a small coil reel to tether the probe with a real-time communication link to the surface for rapid data processing and focus on regions of interest. The proposed characterization probe has broad applicability in the energy industry and can also be used for down-hole seismic, advanced well logging tools, pump control and diagnostics.

This proposal will focus on two areas: an advanced instrumentation probe and a communication link between the down-hole probe environment and the surface ground control. The proposed instrumentation will include development of low-power, ruggedized down-hole electronics for data acquisition, storage, and telemetry, including mechanical design of the data module probe. Multiple sensors will be evaluated in a trade-off matrix, a working probe will be developed and tested, and a real-time tether link will be connected to ground control. Instruments for well characterization and well logging include a digital image and video camera, 3-axis flux gate MEMS magnetic field sensor, temperature, EM waves, and Gamma/X-ray detection (similar to nanosatellite designs). Water quality pH, conductivity, sampling and well conductivity and resistivity will also be measured.

We also are part of the Airlift Systems International 2007 grant proposal, “Expanding a New Technology for the Cost Effective Re-Completion of Stripper Wells”, as a $30,000 subcontract to the Stripper Well Consortium. For this effort we will be improving pump design by using the AmeSim fluid dynamic software and data module to help model and optimize the system.

The PI, Co-I and proposed team are highly qualified, experienced, and have the manpower to carry out the design and construction, to safely complete and operate this new development project, and document, assess, and publish the initial results. Undergraduate student participation encourages interest and education in novel gas and oil technologies and careers.