



# AIRWELL OIL & GAS LLC

## Airwell “Slug Lift” Pump Trial



### Deviated Barnett Shale Gas Well

(Due to the experimental nature of the installation pictured above, the instrumentation on this well head is considerably more complicated than what would be normally required.)

### The Technology

The Airwell Slug Lift technology works off of the U-tube principle. Using *Positive Gas Displacement principles*, a compressor at the surface displaces fluid in down-hole strings and brings the fluid to the surface as a slug of fluid. The design is simple with only 2 balls and seats as moving parts. The control unit & fluid detection equipment are located at the surface and allows Airwell to monitor and control the rate of de-liquefying.

Features of this system include:

- Gas is continuously produced up the casing with no shut in periods.
- The compressor at the surface performs double duty, it provides the pressure & volume of gas need to displace the fluid and also acts as a well head compression unit to lower BHP pressure by minimizing line pressure.
- Ability to handle frac sand and/or other formation particulates without risk of damage to the system.
- The system is equipped with full telemetry & automation for remote monitoring and operation.
- Controls are Class1 \_ Div1 rated and compatible with existing telemetry if present.
- Down hole maintenance is minimized due to low number of moving parts (two ball & seats).
- Multi well pads provide extra efficiency and economy of scale.
- Well head compression achieves better production rates for all wells.
- The only energy consumption is the energy used to run the compressor.
- The compressed gas is vented back into the system but is not double measured.
- Production gas is constantly produced up the casing at all times.
- The system is self modulating as fluid rates vary over time.
- The system has an extensive range of operational depths - down to 15,000 feet.

### **Trial Objectives**

- To test and prove the Airwell “Slug Lift” technology under normal field conditions.
- Monitor, identify and correct any issues with the system.
- Obtain data on the pump performance and the gas well production to prove to the Oil & Gas industry that there is a viable solution for liquid loaded gas wells.

### **Actions**

Install the Airwell “Slug Lift” technology to de-liquefying a deviated Barnett Shale gas well from a depth of 7,350 feet.

Previously, this well had been equipped with conventional artificial lift methods (plunger lift and poor boy gas lift). The well became a candidate for the trial when the bottom hole pressure declined to a point that it became completely liquid loaded and stopped producing gas.

### **Actions/Timelines**

On 27<sup>th</sup> of May date 2011 Airwell Oil & Gas began the first commercial trial of its patented “Slug Lift” technology down a deviated Barnett Shale gas well at a depth of 7,350 feet (2,240 meters).

On commissioning of the system commenced pumping fluid from the gas well however we were unable to maintain constant pumping over long periods due to an unreliable and constant compressed gas supply (compressor). Pumping data that was obtained during this period showed that the Airwell “Slug Lift” system was capable of removing 120 barrels of fluid per day. Due to the stop start pumping situation we were unable to collect data on the well performance.

Once the compressor issues had been resolved regular uninterrupted pumping was achieved. At the commencement of pumping the gas well was producing 120 barrels of liquid per day. Within two weeks of the trial restarting, the well’s liquid production had steadily declined to around 50 barrels per day.

After 4 weeks of continuous pumping, the gas production rate was beginning to re-establish itself back to levels before liquid loading.

After 5 weeks the trial encountered an obstacle when a seating nipple became unseated. The trial had to be temporally suspended after an attempt to re-seat nipple with a traditional work-over rig failed. The trial will recommence when a coiled tubing unit can be arranged to pull the pump from the well and we are able to investigate why the seal failed and take corrective action. As this trial is being coordinated & conducted by the well owners and their production personnel it has taken longer than expected to coordinate the coil tubing rig and resume the trial. The coiled tubing unit is expected to be onsite in mid December 2011.



**Typical Compressor**

The compressor provides compressed gas to operate the Slug Lift system and also serves as a well head compression unit to reduce line pressure i.e. bottom hole pressure.

## **Summary**

While the delays and breakdowns are disappointing, Airwell is pleased with the results of the field trials to date. Our overall engineering model has proven successful and after some investigations into the seating nipple issue we will be ready to complete this trial.

While our first trial was implemented in a deviated well environment, Airwells engineering model also indicates that this pumping method will operate in fully horizontal wells just as effectively.

The next trialling phase will be to install the system in a horizontal well which will again allow Airwell to validate its engineering model

## **Contact**

**Please contact Steve at Airwell Oil & Gas LLC by email to [steve@airwellpumps.com](mailto:steve@airwellpumps.com) or calling telephone 940-228-7637 for interested parties wishing to conduct their own trials or testing of the Airwell “Slug Lift” technology.**

Also register your interest in receiving updates on this trial by to [steve@airwellpumps.com](mailto:steve@airwellpumps.com) or calling telephone 940-228-7637.

### **Alan K. Brown**

Managing Director of Airwell Oil & Gas