Artificial Lift R&D Council

H&H WELL SERVICES, LLC
ENSURING MAXIMUM PRODUCTION AND MINIMUM OPERATING COSTS

Pursuit of Ultra Low LOE

Business Financial Protocols Cause Operators to Have More Failures and Realize Less Profit

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Historically operators, vendors, and industry professionals have worked together towards a common goal; profit for themselves and the industry.

Today financial protocols drive operational decisions at all levels of the industry.

Some protocols entice operators to make short term decisions that limit production, cause future failures, increase downtime, and ultimately reduce profit.

Artificial Lift production is most impacted by this situation, the pursuit of Ultra Low LOE.

Why are Assets / Operators judged by LOE?

- Private Equity
- Institutional Lenders
- Share Holders
- Accountants

<u>Alternative Metrics</u> could be:

- Net Profit
- Realized Production vs Reservoir Estimates
- Average Well Life Cycle Cost
- Standardized LOE Reporting

What is Ultra Low LOE?

It is the point where operators stop making data driven engineering decisions and make decisions on present day costs.

LOE Accounting methods are not consistent between operators. Operators design their accounting methods around their business goals and tax situations.

Their interpretations of what constitutes LOE may include <u>or exclude</u> the following.

- The use of "owner" and "operator" companies.
- General and Administrative Expense (G&A) – Company Labor
- Workovers may be LOE or nonrecurring expenses.

Lease Operating Expenses

600 - Pumping
602 - Auto & Truck Expense
604 - Labor & roustabout
606 - Communications
608 - Road & location maintenance
610 - Vacuum truck, clean-up
614 - Produced Water Disposal - SWD
615 - Disposal of Fluids, Chemicals, Mud
616 - Well servicing
618 - Hot Oil & other treatments
620 - Chemicals
622 - Supervision
630 - Gas measurement & analysis
636 - Marketing cost deductions
638 - Misc parts and supplies
639 - Preventative Maintenance
640 - Equipment repairs
641 - Compressor Rental
642 - Equipment rental
643 - Compressor Maintenance
644 - Trucking & transportation
647 - Surface Use/Easment Agreements
652 - Insurance
664 - Environmental
665 - Field Office Expenses
666 - Safety
675 - Diesel Fuel
677 - Electricity

Production is the only phase of operations in the life of a well that generates revenue.

Almost all wells will require some type of artificial lift during their lives.

Artificial Lift decisions are most often influenced by the pursuit of Ultra Low LOE.

Pushing the field to Ultra Low LOE leads to poor planning, execution, operation, and maintenance of artificial lift systems

- Lost (deferred) production
- Increased operations cost
- Increased downtime
- Increased workovers

Example Well #1

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August 2019 thru July 2021

Failure Cost		
	Date	Amount
Initial Rod Up	9/13/2019	$94,060
Failure 1 - Rod Part	1/17/2020	$8,519
Failure 2 - Rod part	4/8/2020	$8,005
Failure 3 - HIT	7/19/2020	$15,909
Failure 4 - HIT	8/3/2020	$27,525
Failure 6 - HIT	8/13/2020	$13,870
Failure 7 - ?	8/27/2020	$30,090
Failure 8 - HIT	10/14/2020	$20,375
Redesign	12/11/2020	$52,830
Total Failures		**$124,293**
Total Failures + Redesign		**$177,123**

Downtime		
Possible Production Days	**708**	
Downtime Cause	**Downtime (HRs)**	**Downtime (Days)**
Initial Rod Up	**216**	**9.0**
Intermit	**168**	**7.0**
Engine	**339**	**14.1**
Supply Gas	**508**	**21.2**
Production Equipment	**103**	**4.3**
Pressure Switch	**36**	**1.5**
Unknown	**240**	**10.0**
Failure	**848**	**35.3**
Total Downtime Days		**102.4**
Total Downtime Percentage		**14.5%**
Downtime Cause	**Downtime (Days)**	**Percent Downtime**
Initial Production	**16.0**	**2.3%**
Field Operations	**51.1**	**7.2%**
Failure	**35.3**	**5.0%**

Oil Sales		
	Estimated Gross Revenue	**Estimated Unrealized Gross Revenue**
Totals	**$2,192,586.75**	**$234,043.95**

Example Well #1

August 2019 thru July 2021

Total Failure and Redesign Cost	Total Estimated Unrealized Gross Revenue From Oil Sales	Total Estimated Unrealized Gross Revenue
$177,123	$234,044	$411,167

Elimination of direct labor costs leads to loss of knowledge & experience managing artificial lift systems.

Contracted field personnel are “lower cost” but do not generally have the skillset and knowledge for all of the systems required for field operations.

As contractors are generally specialized, more contractors or vendors are required to realize the same level of operations as skilled company personnel.

Reliance on vendors, automation, and “artificial intelligence” in the search for the “Magic Bullet” answer increases life cycle costs and downtime.

Automation and “artificial intelligence” can be a force multiplier but can’t replace skilled personnel.

Matching artificial lift systems to a well rather than using cost as the primary driver will ensure best revenue.

Is it more important to make a profit or pursue Ultra Low LOE?

The bitterness of poor quality remains long after the sweetness of low price is forgotten
– Benjamin Franklin

If we must operate pursuing Ultra Low LOE, how can we efficiently and effectively operate while minimizing downtime and maximizing production?

Evaluate operations based on a 3 year window.
Select artificial lift systems that will be appropriate for the well's production and conditions for at least 3 years.
Design artificial lift systems with a planed life of 3 years.

Make purchase decisions based on life cycle cost instead of cost today.

Routine Maintenance maintains value, reduces downtime, reduces costs.

(pursuing Ultra Low LOE, cont.)

Test and evaluate all wells on a regular basis. Fluid level, dynamometer, flow rates, pressures, actual production including water and gas.

Maintain good production records – BOPD, BWPD, Mscf/D, pressures, and production notes.

Regular diagnostic testing and accurate production provides you the basis to make intelligent decisions to maximize uptime/production and reduce operating costs.

Can we stop the pursuit of Ultra Low LOE and return to the days of production and profitability?

If you think it's expensive to hire a professional to do the job, wait until you hire an amateur.
- Red Adair -

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