

Case Study:
50 HP Pump Jack in Lea County, NM
The Solar Jack Energy Management System
Reduces Pump Jack Operating Costs

August 15, 2014

SOLARJACK 

About Solar Jack

Solar Jack, LLC is a solar-centric, energy efficiency management company that specializes in providing state-of-the-art technologies to the artificial lift segment of the oil and gas industry.

The Solar Jack Energy Management System (EMS) captures and combines the otherwise wasted regen energy created by the pump jack combined with solar energy, lowering the energy cost for pump jack operators. The system also allows operators to easily optimize the strokes per minute of pump jacks; saving energy and lowering maintenance costs.

Solar Jack offers two models of our Energy Management System:

- Net-Meter model – combines solar, variable speed regen drive with soft-start technology, and regenerative power whereby an operator can qualify for Net-Metering (power purchase) with their electric utility (where applicable).
- On-Site Storage model – combines solar, variable speed drive with soft-start technology, and on-site power retention that lowers energy cost by capturing and temporarily storing the energy created by the solar array along with the regenerative energy from the down stroke of the pump jack.

Visit www.solar-jack.com or contact us at **888.562.1005** to learn more.

Overview

In July of 2014 Solar Jack set up our Site Evaluation Trailer (SET) equipped with one of our Energy Management Systems (EMS) on a 50 HP Pump Jack in Lea County, NM and collected pre- and post- EMS data. The well was equipped with an across-the-line starter and a Lufkin Well Manager™. Data was collected using an Accuenergy Acuvim II Series Power Meter (ANSI rated, utility grade and verified by Lea County Electric Cooperative.

Results

- 1) **ENERGY USE REDUCTION:** In addition to the baseline energy use reduction achieved with our system, using our system to reduce the pump jack speed results in increased energy savings, while maintaining production levels:
 - a) 100% speed = 35% energy use reduction
 - b) 85% speed = 40% energy use reduction
 - c) 80% speed = 54% energy use reduction
 - d) 75% speed = 61% energy use reduction

- 2) **PEAK POWER:** Peak power is the energy used on start-up. The data collected in our sample shows this site to have a peak in rush of 330.25 amps on the existing across-the-line starter. The existing starter is operated using a Lufkin Well Manager™ on a 10 minutes off and average of 8-10 minutes on run time. With the Solar Jack Energy Management System, the peak power or in-rush current was reduced by 75% to a peak power of 78.25 amps, thereby eliminating any potential peak demand penalties accessed by the utilities. In addition most utilities use the peak power to set rate schedule therefore, by reducing the peak demand, the rate or energy charge is reduced adding to the energy reduction. (See **Energy Management 10-Minute Sample Comparison - EXHIBIT A.**)

- 3) **POWER FACTOR:** The data collected in our sample shows this site to have a power factor of .50. After the Solar Jack Energy Management System was installed the data showed a power factor of 1.00, thereby eliminating any potential power factor penalties accessed by the utilities. (See **Energy Management 10-Minute Sample Comparison - EXHIBIT B.**) Power Factor is a ratio of the capacity of a circuit to the required load. In the case of pump jacks, power factor is an efficiency index of the pump jack motor. Many utilities charge a penalty for low (inefficient) power factors.

- 4) **VIOLENT ACROSS-THE-LINE STARTS:** Significant maintenance savings will be realized by eliminating the violent starts caused by the across-the-line starter being used at this well site. Resulting in premature belt failure and vibration down hole. Based on Well Manager™ data, this site has an average of 42% runtime in a 24-hour period. Given this, the Solar Jack EMS will eliminate:
 - a) 3.5+ hard starts per hour
 - b) 84 hard starts per day
 - c) 30,660 hard starts per year

- 5) **STROKES PER MINUTE REDUCTION:** Another source of maintenance savings will be the reduction in strokes that can be easily achieved with our systems (fewer strokes = less wear and tear on the pump jack). "Dialing in" on the optimal number of strokes per minute will result in a substantial reduction of overall strokes, with no loss in production. For example:
 - a) A 15% speed reduction = elimination of 630 strokes/day and 229,950 strokes/year
 - b) A 20% speed reduction = elimination of 840 strokes/day and 306,600 strokes/year
 - c) A 25% speed reduction = elimination of 1,050 strokes/day and 383,250 strokes/year

The EMS gives operators the ability to change pump jack speed with the turn of a dial vs. expensive sheave changes.

Conclusion

The harnessing of energy inefficiencies in the operation of pump jacks in the oil & gas industry will yield substantial cost savings to pump jack operators. With each stroke of a pump jack, operators are losing energy that could otherwise be used to offset energy costs. Solar Jack offers the industry a cost effective answer in the form of a solar enhanced, zero-waste energy solution that allows the regenerative energy and solar energy captured by the Solar Jack system to accrue to the benefit of the pump jack operator.

By combining the benefits of variable speed “soft start” technology, regenerative energy, solar power, and custom energy management the Solar Jack EMS reduces the overall lifting cost for the pump jack operator. This is achieved by reducing energy use, reducing peak power, improving energy efficiency, eliminating violent starts, and reducing strokes per minute. Solar Jack’s patent pending solar enhanced variable speed system allows pump jack operators to reduce power usage and maintenance costs using a clean, renewable solution.

Solar Jack is a solar enhanced, variable speed energy management system that gives oil producers the ability to capture the regenerated energy from their pump jacks, combined with solar energy, to offer a solution for reducing energy consumption and energy cost, as well as reducing maintenance downtime and cost. Solar Jack is a joint venture formed by North Creek Energy, LLC and P&J Energy Services, LLC.

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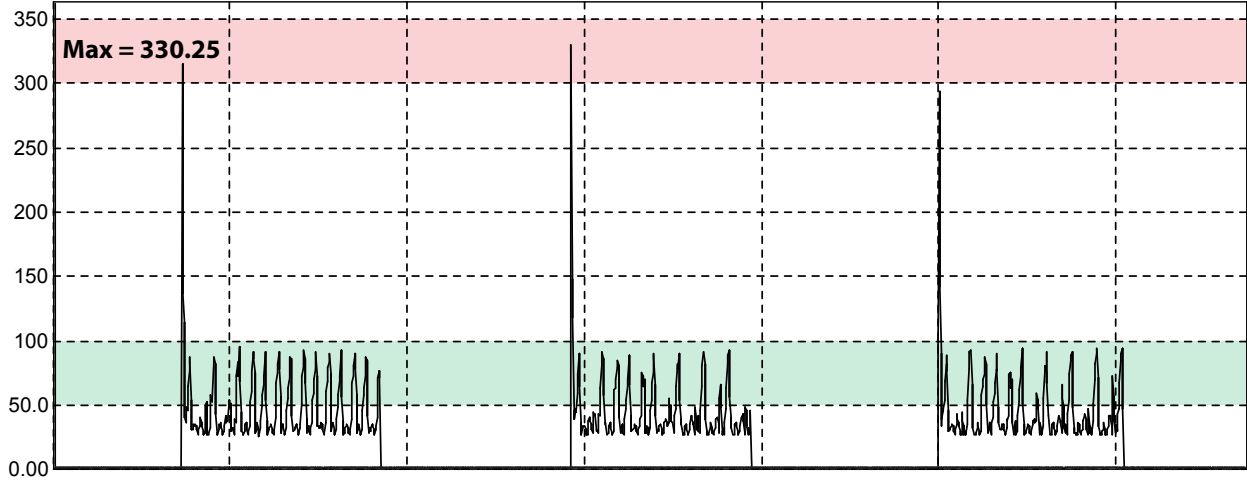
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EXHIBIT A

Trend Summary Reports

50 HP Pump Jack in Lea County, NM

With Across-The-Line Starter

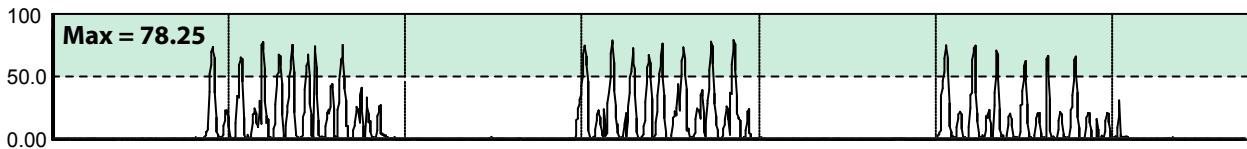


Across the line starter operated one minute on and one minute off for three cycles. Spikes at the beginning of each cycle are in-rush currents required to energize the motor fields and start the motor in motion.

Note: only one leg of the 3-phase supply was monitored for the purpose of making charts easier to read.

Trend AC

With Solar Jack Energy Management System



Solar Jack Energy Management System operated one minute on and one minute off for three cycles.

Note: only one leg of the 3-phase supply was monitored for the purpose of making charts easier to read.



Energy Management 10 Minute Sample Comparison

50 HP Motor on Pump Jack

	KWH			PF	Net Metering KWH		KWH Real	
	P	S	Q		Export (Regen)	P (net)	10 Hrs Calc	source
Solar Jack EMS	2	2	0.3	1.0	0	2	120	P (net)
Across-The-Line Starter	3.2	6.1	4.2	0.5	0.4	2.8	192	P

Readings from AccuEnergy AcuVim II meter

P = True Power

S = Apparent Power

Q = Reactive Power

PF = Power Factor