



# A62 ENGINE TRAINING INDONESIA VISIT

Arrow A62 Engine field service training led by David Johnson provides Indonesian technical crew with advanced knowledge for engine operation and maintenance.

As part of an expansion and installation of nine new Arrow A62 Power Units, field service training for the Pertamina Aldera field mechanics was required. This was a unique system, "not like your usual A62 Engines," as these systems are equipped with explosion-proof Class 1, Group D Hazardous Location equipment. Arrow Engine was happy to travel to Indonesia to provide the training for those mechanics.



*"Overall this was a very successful field school."*

Pertamina mechanics were trained on proper operation and maintenance of the EEG 6500 Series enhanced elec-

tronic governor control module and throttle body, Altronic CD200 explosion proof ignition system along with routine maintenance practices. The engines were also equipped with an enhanced battery protection system to prevent battery theft.

As you can see in the pictures of the great field mechanics Arrow had the pleasure of working with, the engines are enclosed in a

steel cage to prevent theft that is common in the very remote Indonesian field locations.

"Overall this was a very successful field school. It allowed me to witness firsthand the installation of the Arrow A62 Pumping Unit engines and provided valuable training for the Pertamina service technicians," says trainer, David Johnson.

Pertamina is an Indonesian state-owned oil and natural gas corporation based in Jakarta, Indonesia. It was created in 1968 by the merger of Pertamina and Permina. The firm is currently the second largest crude oil producer in Indonesia producing 343,000 b/d of crude oil. Pertamina is listed in the Fortune Global 500 list of companies with revenues totaling to \$70.9 billion dollars. ■

# ARROW NATURAL GAS ENGINES VS ELECTRIC MOTORS



## GAS VS ELECTRIC COMPARISON DETERMINE YOUR RETURN ON INVESTMENT FOR GAS VS ELECTRIC

*Gas vs Electric. Which one would you choose as your prime mover?*

With oil prices at an all-time low and electric rates that continue to increase year after year, now is the time to re-evaluate your old way of thinking.

The current oil economy suggests a change is in the air. Oil wells are pumping continuously and electric rates continue to skyrocket. Both small and large oil companies are looking for long-term economics over short-term savings. That's where Arrow Single Cylinder Natural Gas engines come in to save the day. Arrow engines have developed into very dependable and economical prime movers of choice.

With the glut of natural gas in the market, natural gas prices have dropped to an all-time low. This low cost makes natural gas the cheap economical fuel of choice. As an example, the average fuel consumption of an Arrow C-101 engine is 9,500 Btu/hp/hr based on 1,000 cu ft/day (LHV).

For example, an Arrow model C-101 engine produces 24.5 HP. Therefore,  $9,500 \times 24.5 \times 24 = 5,586,000$  Cubic Ft/day or 5.586 Mcf/day. Using a price of \$2.00 per/Mcf the average monthly fuel cost to operate a C-101 engine at maximum horse power and RPM is \$386.90.

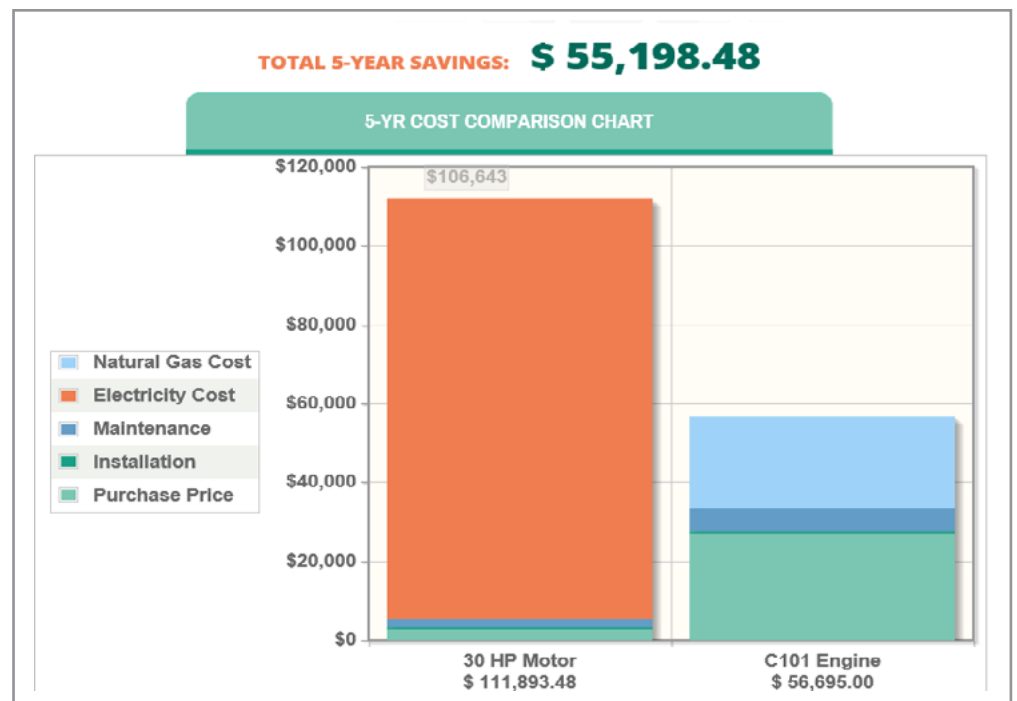
A 30 HP electric motor will consume 58.43 kWh/day. At \$0.10 /kWh the operating cost per month adds up to \$1,777.39.

As an added bonus, if the gas is not saleable, the value of the gas can be removed, reducing the monthly fuel cost to zero.

As you can see from the chart, using an Arrow C-101 Single Cylinder engine instead of an electric motor will save

All Arrow Single Cylinder engines rated at 25 HP or less meet U.S. EPA exhaust regulations for the 2017 model year using pipeline quality (NG) natural gas. Refer to the Operation and Maintenance Manual for emissions and fuel set-up instructions.

To see how we calculated this comparison, visit [www.arrowengine.com](http://www.arrowengine.com). Select the Toolbox tab, then select Gas vs Electric Program. Follow the easy



you \$55,198.48 over five years or a savings of \$15,985.90 per year and will break-even in 1.3 years.

**Note:** Fuel consumption is based on full-rated horsepower at operating RPM used.

step-by-step questions and compare for yourself. You may be surprised how economical an Arrow Single Cylinder Natural Gas powered engine can be as your prime power choice. ■

# CERTIFIED VS CERTIFIABLE

## WHAT IS THE DIFFERENCE?

### *Certified Engines*

Certified engines come from the manufacturer and are proven to have passed the EPA emissions protocol, documented with the EPA, and accompanied by a certificate of conformity to confirm it. This usually involves sending the engine to a third party to confirm the manufacturer's test results. Once the engine is certified, it is exempt from initial performance testing to demonstrate compliance (if under 25hp).

### *Certifiable Engines*

A certifiable engine has been tested by the manufacturer with confirmation that it will meet the EPA requirements. This may have been with a catalyst and air fuel ratio controller, or simply fuel adjustments. However, as it has not been documented with the EPA, the unit will need to be performance tested in the field to demonstrate compliance with EPA regulations.

#### **NOTE:**

Local regulations may require stricter standards, especially if the engine is located in a non-attainment area. Check with your local agency to determine actual requirements for your location. ■

## EPA EMISSION CONTROL COMPLIANCE ARROW EMISSIONS STANDARDS

Arrow's A-32, K-6, C-46, C-66, C-96, and C-101 engines manufactured after July 2008 are certified with the EPA to meet emissions standards requirements and do not require an expensive catalyst and AFR to be in compliance.

The C-101 was added due to demand for a unit just under the 25hp threshold that would allow larger pump jacks to run without the cost of a catalyst or air fuel ratio controller. This engine is exempt from the EPA initial performance testing.

The EPA emission laws require all owner/operators, both certified and non-certified, to maintain records of proper maintenance and emissions compliance. This means they must have a maintenance plan and retain these records should the EPA request confirmation of proper maintenance and compliance. Arrow

supplies a maintenance guideline in the back of the operation and maintenance manual. However, these are only guidelines. Each site needs to be addressed based on its unique operating conditions.

There are also requirements for engines that are modified or reconstructed.

### *Modified Engines*

Generally, modifications are defined as any physical or operational changes to an existing facility which results in an increase in the emissions rate to the atmosphere of any pollutant to which a standard applies.

### *Reconstructed Engines*

When the cost of a repair exceeds 50% of what it would cost to install a new emissions unit, then it is defined as a reconstruction. If the facility has had an extensive and expensive repair, it may count as a reconstruction regardless of any change in the emissions rate.



Emissions are an ever-changing issue that affects us all, and we can only expect standards to become more stringent in the future. Arrow Engine Company looks forward to assisting our customers in meeting those demands. ■

## TECH TIP

### **HOW OFTEN DO I NEED TO ADJUST THE VALVES ON MY ARROW ENGINE?**

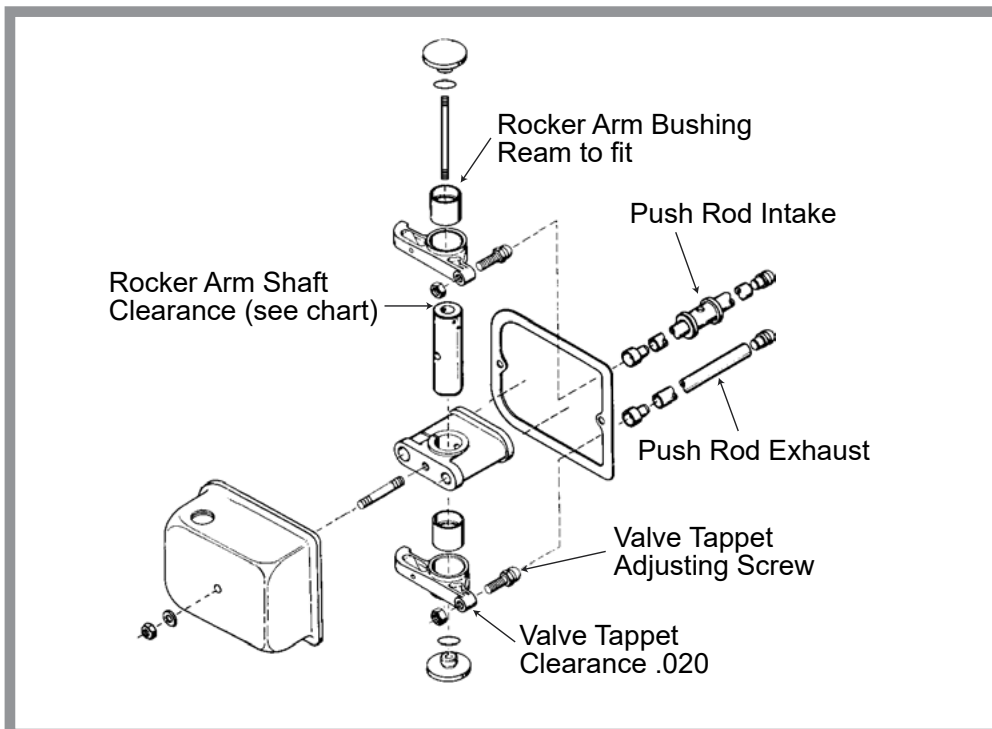
Valve adjustment is a critical part of any good preventative maintenance program. The valves play a key role in the combustion process. The intake valve controls the flow of cool air entering the cylinder, while the exhaust valve controls the flow of hot exhaust gases exiting the cylinder. Both inlet and exhaust valves must close and seal completely during the combustion process.

When adjusting the valves, keep in mind that you are not only adjusting the rocker arm assembly itself, but also making adjustments to the lifter, push rod and camshaft during the process. The condition of these components does have a direct effect on valve adjustment as well.

The rocker arm is adjusted to provide the specific clearance necessary to regulate the opening and closing of the valves. If the valve lash is too loose, the

opening and closing of the valve will be very fast and sudden which will eventually damage the valve, valve seat or valve mechanism. If the lash is too tight, the valve cannot close and seal properly and exhaust gases will leak past the valve. Incorrect adjustment will cause the engine not to operate at full power, fuel consumption may be high and the exhaust temperatures may be excessive. If left uncorrected for an extended period of time a catastrophic engine failure could occur.

Engine valve lash should be adjusted on a new start up within the first 1-2 weeks and then at every oil change after that. The first oil change on any Arrow engine is recommended at 750 hours or monthly. ■



## C-SERIES ENGINES BOUND FOR COLORADO



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A truckload of C-Series engines and volume tanks ships out from Arrow Engine Company in Tulsa, Oklahoma in July, 2017. The engines will be used on pump jacks in the Colorado oil fields.