Engine Modifications and Maximized Maintenance

Explore EPOD system enhancements aiming to minimize maintenance and boost efficiency

AUSTIN BARRIE
CONVRG INNOVATIONS INC.

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The following paper explores the strategies in place for reducing generator maintenance through various engineering modifications. The primary topics of focus are load control, power output, lubricant longevity, and temperature optimization.

Fluctuations in load often challenge the stability of internal combustion, therefore, vital methods in load management have been implemented. Furthermore, through an enhancement of the 12-volt power system, both an increase in battery capacity and an advancement in cooling equipment has been achieved.

This paper will also explore the techniques through which extended lubrication life has been accomplished, while an engine oil analysis will also validate the system's effectiveness. Lastly, this paper will discuss the main temperature control systems in place which allow for effective EPOD operation in diverse climates. These engineering advancements collectively result in reduced maintenance needs, increased longevity, and extended maintenance intervals—all contributing to enhanced EPOD efficiency.

ENGINE LOADING

As generator units often experience fluctuations in load, maintaining an efficient and stable internal combustion process frequently presents a challenge. While overloading an engine often results in symptoms such as premature wear and fluid degradation, underloading an engine also results in unburnt fuel, poor emissions, and even diminished compression.

Through the effects of unburnt fuel, engine internals often develop glazing, scoring, and an abnormal buildup of carbon. As a result, carbon-soot has the potential to compromise seals, contaminate lubricants, and block vital passages. In order to prevent these symptoms and maintain peak generator health, a hybrid system with optimized load management is applied to the EPOD design.

Through the implementation of this technology, the ability to not only monitor, but to consistently maintain correct engine load is achieved. This modification not only results in benefits such as decreased spark plug wear, but also provides for a 60% decrease in occurrence of valve adjustment intervals. More information on our hybrid system and its advantages can be found in the “Advantages of a Generator in Hybrid vs Load Following Systems” article.

OPTIMIZED POWER

By increasing alternator size, a higher amperage output is achieved. This modification not only serves to reduce alternator wear, but has enabled further modifications. In turn, certain units utilize an increased size in cooling fans, along with an upgraded radiator.

Another improvement made possible through this is an increase in amperage rating of the 12-volt DC battery. These enhancements contribute to more effective engine cooling, decreased coolant breakdown, and optimized engine performance.

In addition, the accommodation of a larger starter battery not only decreases the frequency of its replacement, but also mitigates the severity of charge cycles. This ultimately leads to smoother stop/start operations and an increase in starter motor lifespan.

EXTENDED LUBRICATION LIFE

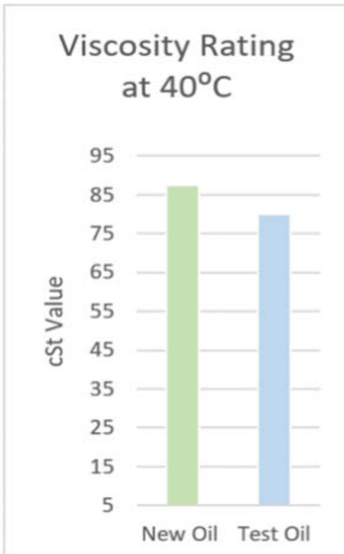
As engine oil circulates the engine, it not only lubricates components, but also plays a vital role in the collection of small debris and contaminants. Although well-gas is predominantly composed of methane, condensates and other deposits are often present in the gas. Once having entered the engine's internal chambers, these contaminants and their byproducts pose a great threat to engine oil properties and ultimately engine longevity.

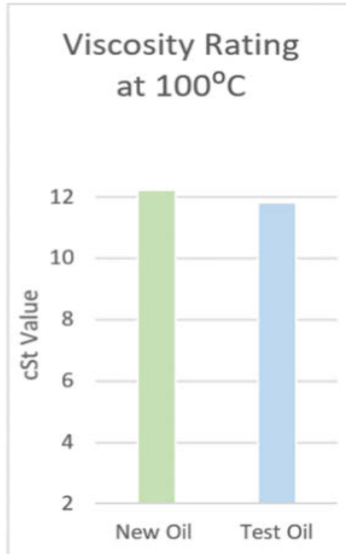
In order to provide extended maintenance intervals while also ensuring that lubrication requirements are consistently met, EPOD generator engines are equipped with a long run oil system. Through the implementation of additional filtration processes and a significant increase in oil capacity, the long run oil system accommodates harsh fuel conditions, higher operating temperatures, and extended run cycles.

As viscosity is considered one of the most fundamental properties of engine oil, limiting its degradation is of the utmost importance. An engine oil analysis completed by AGAT laboratories in 2021 compared the viscosities of two oil samples: un-used 10w30 non synthetic engine oil and the same used oil from an active EPOD unit. The test concluded that at 2,100 hours over the manufacturer's standard 400-hour service interval, the average decrease in viscosity across both cold running and hot running temperatures was only 5.8%. In comparison, a viscosity deviation ranging between 15-20% is traditionally considered critical.

In summary, the long run oil system allows for an extension in oil change interval of up to 2,100 hours, resulting in the synchronization of oil change and valve adjustment intervals, and therefore minimizing the frequency of maintenance and ultimately downtime.

PHYSICAL PROPERTIES					
Sample#	Glycol	H2O	% Fuel	Viscosity 40°C	100°C
New Oil				87.4	12.2
310569	N	N		80.0	11.8





AGAT Laboratories

TEMPERATURE CONTROL

As EPOD's operate in environments of both high heat and severe cold, the phenomenon of thermal cycling poses a significant concern. Through the effects of thermal expansion and contraction, both a decrease in ductility and an increase in clearances can occur. This can lead to brittle components, diminished material properties, and loosened connections. In an effort to mitigate these effects, innovative temperature control systems play a vital role.

As temperatures fluctuate inside the EPOD, both the enclosures components and generators equipment work in conjunction to maintain a stable operating temperature. Through various HVAC modifications and unique radiator air flow methods, both heat from the engine and air from the unit's exterior are utilized. This way, EPOD equipment not only dissipates heat externally, but when required, re-locates it internally. This feature proves equally effective in both cold and hot climates, helps maintain optimum engine temperatures, and plays a key role in maximizing component longevity.

CONCLUSION

In synthesis, these engineering advancements translate into reduced maintenance demands, increased equipment lifespan, and extended maintenance intervals. The combination of these outcomes directly contributes to the overall efficiency of EPOD systems, ultimately leading to improved operational performance and cost-effective maintenance practices.

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Corporate Head Office
700–333 7 Avenue SW
Calgary AB, T2P 2Z1

Manufacturing Facility
1-261106 Wagon Wheel Cres.
Rocky View County, AB, T4A 0E21

1-888-609-3763 (EPOD)

convrginnovations.com