Energy Efficiency from Industrial Lubricants

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Energy Efficient (EE) Hydraulic and Gear Oil potential to reduce 32,980 MW•Hr per year in Illinois

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Manufacturing in Illinois: \$108B

How's it made: applications of industrial lubricants in manufacturing Show me the savings How is energy efficiency achieved with lubricants? Additional questions

Manufacturing in Illinois: \$108B

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https://www.nam.org/state-manufacturing-data/2019-illinois-manufacturing-facts/

Top Manufacturers in IL prioritize EE

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- Caterpillar –"Contribute to fewer Green house gas emissions"
- Berry Plastics "Reduce our energy footprint"
- Alcoa "Reduce energy intensity for 4.2%"
- Kiewit "\$1B in LEED® certified construction"

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Manufacturing in Illinois: 588,000 Employed

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How It's Made

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Manufacturing in Illinois: Plastics





Manufacturing in IL: Plastics

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Potential to Reduce 27,634 MW-Hrs per year

- Cost to change is price difference in lubricant*
- Energy efficiency provided from the hydraulic lubricant does not diminish over time. If properly maintained, energy efficiency is achieved during the life of the equipment

*Note that the EE Hydraulic Oil yields several additional operational benefits

Energy efficiency relates solely to the fluid performance when compared with ExxonMobil's standard hydraulic fluids. The technology used allows up to 6 percent increase in hydraulic pump efficiency compared with Mobil DTE 20 Series when tested in standard hydraulic applications. The energy efficiency claim for this product is based on test results on the use of the fluid conducted in accordance with applicable industry standards and protocols. Efficiency improvements will vary based on operating conditions and applications.

Manufacturing in Illinois: Rubber, Protein Mfg

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383 type companies in Illinois Each has two (2) 100-HP gear reducers 3% EE yields 13,960 kW-Hr per year per site Many have larger and more gear reducers or pumps* Potential to reduce 5,346 MW-Hr per year in Illinois

*See example in subsequent slides

Manufacturing in IL (Rubber, Protein Mfg)

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Potential to Reduce 5,346 MW-Hr per year

- Cost to change is price difference in oil*
- Energy efficiency provided from the gear lubricant does not diminish over time. If properly maintained, energy efficiency is achieved during the life of the equipment

*Note that the EE Hydraulic Oil yields several additional operational benefits

Energy efficiency relates solely to the fluid performance when compared to conventional (mineral) reference oils of the same viscosity grade in circulating and gear applications. The technology used allows up to 3.6% efficiency compared to the reference when tested in a worm gearbox under controlled conditions. Efficiency improvements will vary based on operating conditions and application.

Case Study in IL: Rubber Manufacturer



Potential to reduce 769.5 MW-Hr per year

- (4) 2,150 HP Gearboxes to mix rubber
- Each 3-reduction gear box saved 192.4 MW-Hr/Year
- Custom application through Ameren IL

Compare to assumption of (2) 100 HP gearboxes per site made previously

Manufacturing in IL: other applicable sectors

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Other sectors where this has been successful:

- Cement manufacturing
- Automotive manufacturing
- Food processing
- General Manufacturing
- Paper manufacturing
- Mining Equipment

Wisconsin Focus on Energy - Results



- Captured and presented by 3rd Party Cleantechpartners.org
- The kWh use per cycle over a one hour period had a small standard deviation (< 2% of the measured value)
- Mobil energy-efficiency hydraulic oil used 3.3% less energy than the baseline oil.
- Similar results from other studies (2.2 5.1%).
- Focus on Energy[®] will use 3.3% savings
- Typical simple payback 2 to 5 years on energy alone before Focus on Energy[®] incentives

Proofs of Performance

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Mobil DTE 10 Excel[®] 46 hydraulic oil helps U.S. plastics manufacturer reduce energy consumption



Energy lives here'

Plastic injection molding machine | EVCO Plastics manufacturer | DeForest, Wisconsin, United States

Situation

EVCO Plastics is a global plastics manufacturer that operates plastic injection molding machines in its DeForest, Wisconsin plant, all of which were lubricated using a conventional mineral-based lubricant. Because of its long-standing commitment to sustainability in manufacturing, the company is continuously seeking opportunities to minimize energy and resource consumption throughout its operation. For this reason, the company partnered with ExxonMobil to identify a solution that could help improve the energy efficiency of its injection molding machines.

Recommendation

ExxonMobil engineers recommended switching to Mobil DTE 10 EXCel[®] 46 hydraulic oil. Formulated with robust anti-wear properties, lower traction coefficient, and shear stable high viscosity index improver (VII). Mobil DTE 10 Excel 46 is designed to help improve overall hydraulic efficiency. ExxonMobil engineers also recommended implementing routine Mobil Serv^{*} Lubricant Analysis to monitor fluid and equipment health.

Impact

After transitioning to Mobil DTE 10 Excel 46, detailed assessments conducted by both EVCO Plastics and ExxonMobil confirmed a 3.3% reduction in energy consumption in the company's molding machines. As a result, the company was able to reduce overall oil need, energy consumption and overall operating costs.

Benefit

EVCO Plastics reports that Mobil DTE 10 Excel 46 hydraulic oil helped reduce energy consumption by 3.3%, generating company-estimated annual savings of US \$1,353 per plastic molding machine.

Reduced energy consumption by **3.3%**

Mobil SHC Gear 220 helps improve gearbox reliability and efficiency*



Energy lives here"

Falk helical gear double reduction gearbox | Mining operation | Minnesota, United States

Situation

A Minnesota-based mining company operates a conveyor driven by Falk double reduction gearboxes. These gearboxes, which were lubricated with a mineral-based gear oil, are critically important to the customer's operation, but have a high energy demand. Seeking to improve the reliability and efficiency of these drives, the company approached ExxonMobil engineers for an alternative lubricant solution.

Recommendation

ExconMobil engineers recommended the company use Mobil SHC[™] Gear 220 synthetic gear oil. Formulated with synthetic base fluids and an advanced proprietary additive system, Mobil SHC Gear 220 is specifically designed to provide excellent wear protection and extended oil life even under extreme conditions. In addition, ExxonMobil engineers worked closely with the company to develop an energy efficiency test protocol to evaluate the synthetic gear oil's performance.

Benefit

Mobil SHC Gear 220 synthetic gear oil has helped this mining company increase gearbox efficiency and extend oil drain intervals to deliver a company-estimated annual savings of US \$7,400 in energy, labor and lubricant expenses.

Impact

After switching to Mobil SHC Gear 220 synthetic gear oil and completing a thorough energy efficiency test protocol with ExxonMobil engineering support, the company reports that it has increased gearbox efficiency by an average of 3.6 percent. In addition to expected improvements in gear and bearing protection provided by Mobil SHC Gear 220, the company expects to triple current oil drain intervals. Collectively, these benefits have helped the company save US \$7,400 annually in energy, labor and lubricant expenses.

3.6% Increase in gearbox efficiency

Additional Benefits of EE Lubricants

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Because it contributes to less than 1% of operating costs, hydraulic oil is often overlooked. But it can help deliver:



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Energy Efficiency Measurement Test Steps

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Measurement Process: Equipment to Capture Data Mobil Serv*



Dewetron 3210 E Data Acquisition System



Strain gauges and telemetric units to capture torque



Kral OME 20 Fuel Flow Meter



Kral BEM 500 Fuel Flow Meter Display







Fluke 1760 Power Meter Voltage & Current

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What makes hydraulic oils efficient?



Hydraulic Energy Efficiency

Energy Savings 3.6% — Mobil DTE 10 Excel 46[™] (3) 200000 🗕 ISO 46, 100 VI fluid Ρ 180000 Ο **Energy Savings** W 160000 4.1% Е R (8) 140000 (2)W А 120000 (1)Т (1)Т (7) 100000 S 80000 (6)60000 (5) Screw Recovery (4) Injection Velocity 40000 20000 Cycle Sequence = 37.4 Seconds 0

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2.2% Full Cycle Energy Savings*



Energy Efficiency in Gearbox applications



Rig tests and field experience

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have shown typical efficiency

gains of 0.5% per gear mesh after

converting from mineral to Mobil

Energy Efficient Gear lubricants

Estimate is for gear mesh loss only and does not include potential benefits from improved lubrication conditions and improvements in bearing losses

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Improving Overall Equipment Effectiveness (OEE) **Mobil Serv**^{**}

PT Online Dec 2019: Cut Operating Costs—and Headaches with the Right Hydraulic Oil

Energy Efficiency – White Paper



From left: Adam McMurtrey, Mobil Serv field engineer; Brandon Barton, territory sales manager for Morgan Distributing; Scott Abernathy, TG Missouri maintenance senior manager. Behind them is a 1450-ton press that went from 32 hr/yr of unscheduled downtime for hydraulic issues to zero problems in the year since switching to the new hydraulic oil.