

***THE LOWEST  
TOTAL COST  
OF OWNERSHIP***



***ROYAL***  
 ***PURPLE***<sup>®</sup>  
***SYNTHETIC OIL***

# LUBRICATIONS IN PERSPECTIVE

## LUBRICANTS ARE NOT COMMODITIES

Lubricant performance can vary greatly between competing mineral and competing synthetic oils. Because these quality differences directly and significantly impact the ultimate cost of operating and maintaining the rotating equipment, lubricant purchases cannot be effectively managed as a commodity. Lubricant excellence must always be purchased, for even the most effective lubricant management practices cannot impart properties to a lubricant that it doesn't possess.

## JUST THE FACTS

Royal Purple lubricants consistently deliver a higher level of performance across a broader group of equipment than other industrial oils, including the synthetic oils offered by our largest competitors. No other lubricant offers a lower Total Cost of Ownership for the majority of your plant equipment. The cost reductions consistently exceed the total cost of the product, often within a few weeks as illustrated by the examples below.

## TOTAL ROYAL PURPLE SAVINGS IN PERSPECTIVE

### THE BIG PICTURE

**\$3,000,000 maintenance costs**  
**\$90,000 lubrication expense is part of this \$3M**  
**\$12,000,000 energy costs**

- example is based on 36,000 HP (electrically driven) operating 8,000 hours per year at \$0.05 kwh power cost
- lubricant purchases are 3% of the maintenance costs
- lubricant purchases are 3/4% of the energy costs
- although conceptually accurate, expense ratios will vary from plant to plant



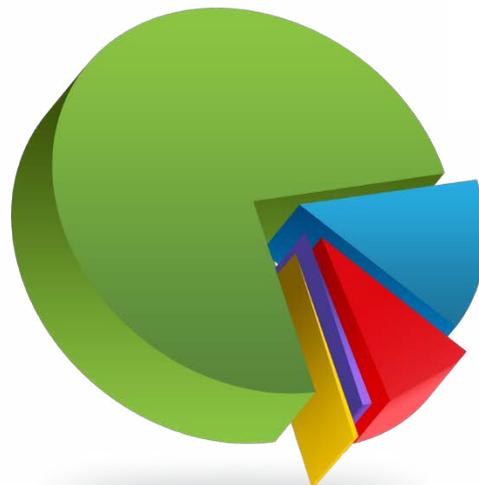
● ENERGY COST  
● LUBRICATION COST  
● MAINTENANCE COST

## ROTATING EQUIPMENT COST SAVINGS USING ROYAL PURPLE

The following pie chart illustrates the savings attainable across a broad population of equipment from upgrading to Royal Purple lubricants.

- energy savings are typically greater than 3%
- need for equipment repair reduced by at least 30%
- though Royal Purple lubricants may cost more per gallon, the annual cost for lubricants changes little due to greatly extended drain intervals and the elimination of oil changes associated with equipment repairs

## SAVINGS IN PERSPECTIVE



● ENERGY COST  
● 3% ENERGY SAVINGS  
● LUBRICATION COST  
● 30% MAINTENANCE SAVINGS  
● MAINTENANCE COST

- Total savings - \$1,260,000
  - annual return on oil investment is 1400%
  - 90 day ROI based on energy savings
  - 37 day ROI based on maintenance savings
  - 26 day ROI based on combined energy and maintenance savings
  - annual Energy Savings is \$10.00 per HP
  - annual Maintenance Savings is \$25.00 per HP
- even a total elimination of current lubricant costs would produce insignificant savings compared to the savings routinely attained from upgrading to Royal Purple lubricants.
- a Rohm & Hass Operational Excellence model estimates that for each dollar saved in maintenance, \$3.00 to \$7.00 in economic benefits accrue to other areas via improved quality, inventory reductions, energy savings, safety and increased uptime (\$2.7M to \$6.3M for this example).

## PURCHASING YOUR WAY TO IMPROVED PROFITABILITY

Most cost savings initiatives intended to reduce maintenance costs and improve rotating equipment reliability are very time and people intensive. Royal Purple offers significant improvements and cost savings by simply replacing a product you already buy and use. It doesn't get any easier than this.

## THE CONUNDRUM

Your current supplier is delivering the message you want to hear ... that the best value is attained by maintaining tradition and purchasing major brand quality at competitive prices, often with the opportunity to further reduce purchase costs by consolidating your purchases. Royal Purple is delivering the message that our lubricants produce savings that dwarf your total expenditure for lubricants. Both of us can't be right. And while a part of you would like to believe these savings are possible, it just doesn't seem plausible that they can be achieved by just changing lubricants.

## BELIEVE IT

The primary job of a lubricant is to reduce friction and protect lubricated components (energy and wear). Most rotating equipment repairs are due to the failure of lubricated components, mainly bearings. Therefore, it makes perfect sense that truly superior lubrication will deliver energy and maintenance savings.

## BE PREPARED

When your current supplier learns that you are considering any use of Royal Purple lubricants, expect them to reinforce your doubts. You will hear how large their research departments are and that a smaller company couldn't possibly offer better products. You will be shown carefully selected laboratory tests intended to clearly show their products to be technologically superior. Every means will be exerted to prevent a head-to-head comparison with Royal Purple at the equipment level, where the outcome is already known to them. They would have you continue to make, without all of the facts, a decision that falls within your comfort zone. Case study synopses that follow clearly illustrate why this is not in your best interests.

## RESULTS ORIENTED DECISION MAKING

Royal Purple encourages you to make an informed decision based on actual results in your own equipment. Ask your maintenance and operations departments to select candidate equipment for your own evaluation of what Royal Purple lubricants can do for you. After all, it is your money.

## CASE STUDIES

The following case studies have been assembled according to whether the primary benefit reported from using Royal Purple lubricants was energy savings, maintenance savings or improved production. In virtually every instance, Royal Purple lubricants replaced major brand lubricants that met all of the equipment manufacturer's requirements. In multiple examples, Royal Purple replaced another synthetic oil. It is important to note that in most of the case studies, the equipment involved did not suffer from mechanical defects nor did the equipment lack proper maintenance. Improved performance resulted because Royal Purple lubricants were able to mitigate the effects of the operating conditions in which the equipment was required to operate. All of the reported energy studies are inclusive of every piece of equipment selected for evaluation so as to be representative of what might be expected across a broad population of equipment.

## ENERGY SAVINGS

### OKLAHOMA PAPER MILL

- 3 pumps and 2 gear boxes changed to Royal Purple
- 4.1% energy savings valued at \$4,725 per year

### TAKEDA CHEMICAL COMPANY

- 2 mixers and 7 pumps
- 2.52% energy savings valued at \$3,462
- 19 day payout on increased cost of oil

### DAKOTA GASIFICATION COMPANY

- 3 - 20,000 HP CO<sub>2</sub> Compressors
- change R&O ISO 32 oil to Royal Purple Synfilm GT 32
- 2.7% power savings
- more than \$350,000 annual energy savings

### GIANT INDUSTRIES REFINERY

- 7 API pumps
- 8.5% energy savings valued at \$72,302 per year

### CAMPBELL SOUP

- 3 ammonia refrigeration compressors
- \$43,600/yr energy savings from less than \$3,000 of Royal Purple Oil
- 25 day payout on total cost of oil

### MICHELIN TIRE COMPANY

- 14 pieces of equipment (pumps, conveyors, compressors)
- 3% energy savings valued at \$36,936 per year

### FRITO LAY

- 4 pieces of equipment
- 2%, 4.5%, 5% and 5.4% energy savings
- \$1.56 savings per HP per every 1,000 hours of operation





### AHMSA STEEL MILL

- 1 rotary screw air compressor (500 HP)
- four 4-stage centrifugal air compressors (32,000 HP)
- includes digital and analog air flow measurements
- Royal Purple Synfilm 46 replaced major brand ISO 46
- Energy Savings:
  - 10.5%, 3.75%, 2.98%, 3.17%, and 3.33%
  - 6,074,385 kw/yr = \$547,000 per year

### INDUSTRIA DEL ALKALI SA DE C.V. – ENERGY SAVINGS PROJECT

- 13 pieces of equipment (vacuum pump, cooling tower fans & dryer/mixer)
- 11.8% energy savings (ranged from 5.99% to 21.86%)
- \$32,765 estimated annual value of savings at \$0.06 per kwh

### SUN CHEMICALS

- I-R Centac compressor – 3,000 HP
- 4.1% power savings valued at \$42,315 per year

### PINELLAS COUNTY WATER

- 9 gear reducers
- 7.8% power reduction valued at \$17,520 over 2 years
- 63-day payout on total cost of oil

### COFFEYVILLE RESOURCES REFINERY

- 3 API pumps on oil mist (200, 100 & 60 HP)
- oil changed to Royal Purple Synmist
- 8.34% average energy savings
- \$49,018 estimated annual savings projected for all 1,322 active pumps

### DOFASCO STEEL

- 2,000 HP bay water pump (cooling water)
- cooler erosion caused unavoidable water contamination
- mineral oil drained weekly due to emulsification with water
- have run 3 continuous years on same oil since changing to Royal Purple Synfilm (simply drain off water)
- temperature down 15°F and vibrations down 50%
- \$55,000 annual savings in parasitic steam loss

### FORD MOTOR COMPANY

- 3 Atlas Copco GA90C 125 HP rotary screw compressors
- oil changed to Royal Purple Synfilm 46
  - 1) 5.8% energy savings at \$3,625 per year
  - 2) 4.8% energy savings at \$3,315 per year
  - 3) 6.7% energy savings at \$4,973 per year

### CHICAGO COKE

- 6 Sullair rotary screw air compressors
- Royal Purple Synfilm 32 replaced OEM's synthetic fluid
- 6% average energy savings and 10°F reduction in temps
- \$10,176 per year reduced cost of lubricants
- \$35,662 per year energy savings

### ALBRIGHT & WILSON AMERICAS

- 3 pieces of equipment (cooling tower, pump & agitator)
- 3.2% combined energy savings

### ALTURA ENERGY

- American split case pump, 9 stage w/1,250 HP motor and Lufkin gear box
- 16.26% energy savings w/ Royal Purple Synfilm 68 valued at \$77,619 per year

### HOECHST CELANESE

- Riley-Stoker 150 HP coal pulverizer
- 4.1% energy savings
- \$107 cost of Royal Purple Oil
- \$1,879 annual energy savings
- 21-day payout on total cost of oil

### PHELPS – DODGE

- Blower in SO<sub>2</sub> service (5,000 HP / 4:1 speed increaser)
- Royal Purple Synfilm GT 32 replaced major brand turbine oil
- \$18,000 per year energy savings w/4.5 Amp drop
- Bearing temperature down 25°F

### SONOCO PRODUCTS PAPER MILL

- Feed water pump, 200 HP, 3600 RPM
- 18.2% energy savings (16 AMPS)
- \$5,131 per year savings for less than \$10.00 of oil
- 17-hour payout on total cost of oil

## NEXFOR FRASER PAPERS

- Control crown roll on paper machine
- Changed major brand PM 220 to Royal Purple Synfilm GT 220
- 11% machine speed increase (production)
- 34% increase in PLI (machine load)
- 32°F reduction in oil temperature
- \$27,945 per year energy savings

- 
- Calendar stack roll
  - Change major brand PM 220 to Royal Purple Para-Syn PM 220
  - \$19,248 per year energy savings

- 
- Supercalendar bottom control roll (3,000 ft/min)
  - Temperature controlled cooling water system
  - Changed major brand synthetic 220 to Royal Purple Para-Syn PM 220
  - 70% reduction on cooling water usage (50,000 gallon/day average)

## MAINTENANCE SAVINGS

### COFFEYVILLE RESOURCES REFINERY

- Major annual rebuilds on I/R Centac compressor at \$240,000 each
- Replaced PAG synthetic oil with Royal Purple Synfilm GT
- Only one minor repair after 4 1/2 years

### ENTERPRISE PRODUCTS GAS PLANT

- 15 York Centrifugal Compressors in DIB (ISO butane) service
- 7 to 10 failures each year @ \$60k-150k each
- Changed to Royal Purple Synfilm NGL
- \$800,000 per year estimated annual savings

- 
- 40 horizontal split-case pipeline pumps
  - One babbitted sleeve bearing failure every 6 weeks
  - Only 1 failure every 6 months with Royal Purple Synfilm 32

- 
- 200 fin fans
  - 2-3 failures per week
  - One failure per month with Royal Purple grease

- 
- Cooling tower gear boxes
  - Annual bearing replacements
  - Exceeding 5 years with no replacements with Royal Purple

- 
- Solar genset turbine
  - Two oil pump failures and subsequent coast downs on same turbine
  - Royal Purple Synfilm prevented potential \$325,000 damage per incident

### MAJOR OIL REFINERY

- 77 bad actor pumps changed to Royal Purple Synfilm & Synfilm GT
- 74 pumps removed from bad actor list 1 year later

### TESCO SERVICES

- Linde BPV130 positive displacement hydraulic pumps in top-drive service
- 60 pump failures per year at a cost of \$2,240 each
- 20 pump motor failures per year at \$8,100 each
- Changed to Royal Purple Marine Hydraulic Oil
- Temperatures dropped 50°F (from 180-190°F to 130-140°F)
- No pump failures during the next 18 months
- No hydraulic pump motor failures during the next 18 months

## DOW CHEMICAL

- 30 oil misted ANSI hot water pumps
- 18 bearing failures per year
- changed major brand 68 to Royal Purple Synmist 68
- one bearing failure over next 3 1/2 years (vs. 68 historically over same period)

### PREMARC CORP.

- two 18,000 lbs fork trucks w/Allison TRT2001 transmissions
- 1 to 2 transmission failures per year each at \$6,000 per incident
- changed oil to Royal Purple CMT 30
- temperatures dropped from 230°F to 180°F
- no failures in 6 years
- 6 year savings valued at over \$50,000

### KING FISHER MARINE

- 8-9 engine replacements per year historically with major brand marine engine oil - only 7 engine replacements in the last three years with Royal Purple Motor Oil
- 6 month life on turbochargers at \$1,000 each
- no turbocharger replacements in over two years with Royal Purple
- annual clutch replacements at \$10,000 to \$30,000 each depending on damage
- no clutch replacements in 2 years with Royal Purple on 3 boats where this was a problem
- oil drain intervals extended 6 fold (from 350 hrs to 2,100 hrs) with Royal Purple

### CLEAR LAKE COGENERATION

- 450 HP vertical 3600 RPM motors driving 14 stage condensate pumps
- bearing life 4 to 7 months – failure severely damaged motor and pump (\$14,000 per occurrence)
- changing oil to Royal Purple reduced temps. from 400°F to 160°F and increased bearing life to over 2 years

### DOLARSTAN BAYER SPANDEX

- 18 Klaus Union magnetically driven Dowtherm pumps
- pumps began to fail 90 days into plant start-up due to short oil life
- changed major brand synthetic oil to Royal Purple Synfilm GT
- failures stopped and oil change intervals extended to 1 year

### CLARK REFINING

- 8 hydrogen gas compressors (2 year reporting period)
- 0 failures on 6 compressors using Royal Purple Synfilm Recip. 100
- 4 failures on 2 compressors using another oil

## UNION CARBIDE

- centrifuges and gear boxes
- 8 to 10 gear box failures per year at more than \$10,000 each
- 1 failure in following year using Royal Purple Synfilm GT 150

## NEXFOR FRASER PAPERS

- greased bearings in #7 and #8 paper machine wet end
- changed major brand synthetic grease to Royal Purple Paper Mill Grease
- 30°F average bearing temp reduction
- every 4 week relubrication cycle extended to 12 weeks
- 5 unscheduled outages due to bearing failures previous year
- \$129,250 value of lost production
- 0 bearing failures next 19 months with Royal Purple
- \$10,000 annual savings from reduced grease purchases

## PRODUCTION IMPROVEMENTS

### J-POWER - WIND TURBINES

- Large Mitsubishi and 1.75 MW Vestas wind turbines
- Changed from major EP 320 mineral gear oil and major synthetic 320 gear oil to Royal Purple Synfilm GT 320
- Turbine output increased by 5% and 5.1% at year-over-year average wind speed
- Increased turbine output valued at over \$200,000 (USD) per year

## ENTERPRISE PRODUCTS GAS PLANT

- production cutbacks due to hi-temps in 10,000 HP Demag Delaval compressor in summer months
- Royal Purple Synfilm GT reduced temps from 225° to 170 - 175°F (a 50°F reduction) eliminating the need to reduce production in summer months

## COFFEYVILLE RESOURCES

- two I/R HHE reciprocating compressors in hydrogen gas service
- maintenance error loaded crank cases with water
- Synfilm protected crank shaft – avoided failures
- \$100,000 maintenance savings for each compressor
- two days minimum lost production avoided - valued at \$4.5 million per day

## DEEP MARINE TECHNOLOGY

- R.O.V. (deep subs) operate in cold water (7,000-8,000ft)
- tool calibrations must be done on deck before each job
- calibration takes 2-3 hours due to overheating hydraulics (on deck run times limited to 90 seconds)
- requires only a single 8-9 minute run since changing to Royal Purple Syndraulic (no overheating)
- \$10,000 savings in vessel time

## ESITIMATE YOUR OWN ENERGY SAVINGS POTENTIAL

### VALUE OF 3% ENERGY SAVINGS PER 1,000 Hp

ENERGY COST Kwh	OPERATION HOURS				
	1,000	2,000	4,000	6,000	8,000
\$0.10	\$2,486.70	\$4,973.40	\$9,946.80	\$14,920.20	\$19,893.60
\$0.09	\$2,238.03	\$4,476.06	\$8,952.12	\$13,428.18	\$17,904.24
\$0.08	\$1,989.36	\$3,978.72	\$7,957.44	\$11,936.16	\$15,914.88
\$0.07	\$1,740.69	\$3,481.38	\$6,962.76	\$10,444.14	\$13,925.52
\$0.06	\$1,492.02	\$2,984.04	\$5,968.08	\$8,952.12	\$11,936.16
\$0.05	\$1,243.35	\$2,486.70	\$4,973.40	\$7,460.10	\$9,946.80
\$0.04	\$949.62	\$1,989.36	\$3,978.72	\$5,968.08	\$9,957.44
	<b>1,000</b>	<b>2,000</b>	<b>4,000</b>	<b>6,000</b>	<b>8,000</b>

### OPERATION HOURS

Note: Base Rates do not reflect "Peak Load Charges" and may not fairly represent the actual cost of service.



## MAJOR OIL REFINERY

Ultraformer pump failing and would shut down unit production. Major brand Synthetic 32 changed to Royal Purple Synfilm 32 while operating (1 quart of oil). Vibrations, temperatures and noise reduced to a level where repair was no longer deemed necessary and pump remained in service for 2 more years.

- \$50,000 savings on pump repair
- downtime avoided savings (more than \$100,000 per day)

## AMOCO CHEMICAL

- high pressure reciprocating ethylene compressors
- changed from competing synthetic oil to Royal Purple NGL-NS 460 in cylinders, packing and crankcase
- machine utilization went from mid 60% to high 90% range
- maintenance cost reduced by 50%
- increased production valued at millions of dollars

## DOW CHEMICAL

- 12,700 HP electric motor driving polypropylene extruder gear box
- journal bearing temperature would exceed critical level (85°C) on high density product runs necessitating production rate cutbacks to remain operational
- major brand synthetic oil 68 changed to Royal Purple Synfilm GT 68
- bearing temperature decreased 6-8°C and never exceeded 78°C
- production was increased by 18,000 lbs per hour
- subsequently major brand EP gear oil in extruder gear box was changed to Royal Purple Synergy
- 3.1% energy savings valued at \$22,105 per each 1000 hours operation

## BASF CHEMICAL

- 10,000 HP A-C Acetylene Compressor
- operating for over 4 years on common lube console with the same 3,500 gallons of RP Synfilm 32
- frequent upsets introduce large volumes of water into system, which is regularly drained from the sump
- after an upset caused the compressor to run in reverse, it was taken down for maintenance
- the oil drained from the sleeve bearing had over 25% water in it – yet neither the bearing or shaft showed any damage

## CHINA STAR BULLET TRAIN

- project design called for average speeds of 200 kph (125 mph)
- Zhuzhou Electric Locomotive's 1,250 kw traction motors
- greased NSK motor bearings would overheat at 160 kph
- 26 greases were tested prior to grease selection
- 200 kph speeds easily reached after changing to Royal Purple UPG #2 Grease
- NSK elected to test RP Synfilm GT vs. recommended gear oil in the drive gear
- Royal Purple Synfilm GT ran cooler by 20°C while reducing bearing vibrations by 50%
- all lubes were changed to Royal Purple
- train set new China speed record of 321.5 kph (200 mph) and functioned well for over 80,000 km of high speed testing

## KING FISHER MARINE

- pump shaft bearing failing on dredging job
- oil changed to Royal Purple Synfilm 100
- high temps and noise abated
- pump operated for 91 more days to complete two jobs
- upon disassembly – the 8" bearing fell in two

## WEATHERFORD (CASPIAN SEA PIGGING JOB)

- 2000 mile 36" oil pipeline
- 58-1500cfm Sullair screw compressors / Cummins diesel driven
- high ambient temps caused repeated high-temperature trip-outs in compressors
- unable to maintain contract schedule
- changed major brand 68 synthetic oil to Royal Purple Synfilm 68
- 15°F temp. reduction in compressor ended trip-outs
- 6,000 hour oil changes

## LEADING ALUMINUM ROLLING MILL

- aluminum foil production computer controlled at optimum 4,000 ft/min
- production on 15-20 hottest days of year would slow to 2,500 ft/min due to elevated bearing temperatures & vibrations
- constant 4,000 ft/min year round w/ Royal Purple Synmist 320 – including 12 hour period when bearings inadvertently operated without cooling water

### ADDITIONAL BENEFITS:

- oil feed rates reduced 50%
- bearing failures reduced from 2 per year to 0 in 5 years (5 year savings \$430,000)

## MAJOR OIL REFINERY

- Howden vapor recovery compressor
- lubricant repeatedly contaminated with vapors from headspace from ships
- frequent lube oil changes w/ filter changes up to 8 times per day
- lube viscosity loss and blinding of filters often made compressor inoperable (cost up to \$250,000 per missed ship)
- Royal Purple Synfilm NLG totally eliminated problem



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**HISTORY:**

*Royal Purple produces a wide range of high performance synthetic lubricants for nearly every consumer and industrial application. Its founder, John Williams, was a pioneer in the development of high performance synthetic lubricants and collectively, Royal Purple's formulators have more than 200 years of expertise in developing state-of-the-art lubricants. Unlike companies that primarily focus on fuel and other petroleum byproducts, Royal Purple's sole mission is to develop products that significantly outperform other synthetic and mineral based oils. Today, Royal Purple is widely recognized as both a super-premium line of consumer automotive products and as a leading primary lubricants supplier to industrial end markets competing head-to-head with the largest oil companies. Royal Purple is distributed in countries around the world including the United States, Canada, Mexico, Australia, China, Italy, Japan and the United Kingdom. Royal Purple was acquired in 2012 by Calumet Specialty Products Partners (CLMT), a leading refiner and processor of specialty hydrocarbon products headquartered in Indianapolis, IN.*

