



PERFORMANCE WITH A PAYBACK:

“Obviously, it is a very good payback. It's less than \$1000 worth of oil annually versus \$50,000. The economics are there!”

Gary Papalia, Assistant Zone Maintenance Superintendent for United Refining Company of Warren, Pennsylvania, U.S.A.



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Turning Ideas Into Engineering Solutions

KAYDON
RING & SEAL, INC.



■ Gary Papalia, Assistant Zone Maintenance Superintendent for United Refining Company, stands behind what used to be a day's supply of seal oil. Now, with Kaydon seals, one barrel lasts 5 months.

How United Refining Kicked Their 3-barrel-a-day Habit.

Kaydon Quickly Solves Vexing Problems.

Not that there was ever a problem with production! United Refining Company of Warren, PA refines approximately 65,000 barrels of crude per day. However, Assistant Zone Maintenance Superintendent Gary Papalia had been wrestling with a problem in the alkylation unit refrigerant system that was costing United Refining thousands of

dollars in seal oil. At one point, seal oil consumption reached 165 gallons (625 L) per day! Plus, there were the costs associated with shutting down for seal repair, the cost of the repair itself, and the lack-luster performance of the repaired seal. At last, the solution to Gary's problem came in the form of a repair performed by a veteran seal manufacturer

who could test the repaired seal under simulated conditions and guarantee its performance. The result: only 55 gallons (208 L) of seal oil consumed in a five-month time period an average of about one-third gallon (379 ml) per day.

United Refining's alkylation unit is a giant reactor that mixes 97%

or 98% sulfuric acid with a hydrocarbon feed to make gasoline. Butane — the off-gas that comes off this reactor — is what gets compressed. The system has two screw compressors. One is steam driven, which runs at 5000 rpm, and the other is electric driven, running at 3500 rpm. Both have a suction pressure of 7 psi (48.26 kPa) and a discharge pressure of 72 psi (4.96 bar). The two screw compressors have four 6 1/8" (155.58 mm) face and bushing seals each. The standard maintenance routine is to shut down one system or the other each year a two-year cycle for each machine. The troubled system triggered more frequent shutdowns, however.

Papalia reports that during the nineties, United Refining was experiencing a continuous seal leak problem and high oil consumption. Oil use was as high as 165 gallons per day. In the summer months, consumption was even higher, probably associated with warmer cooling water at higher climate temperatures.

To solve the problem, Papalia addressed his concerns first with the compressor OEM. The OEM shared his concerns, stating that even 8 gallons (30 L) of seal oil consumption per day was considered excessive! To identify the root of the problem, they

went over every system and control on the machines. Gary even went so far as to pump out all of the oil from the lube tanks to check for possible contamination. He found nothing.

he was expecting 5 to 8 years of service life from the seals and he was getting only 2 months.

Papalia's next course of action was to contact Kaydon, the original seal



United Refining's Alkylation Unit ■



Electric Driven Screw Compressor w/ Kaydon Face Bushing Seals ■

Convinced it was a seal problem, the seals were sent out for repair, but performance did not improve. In one situation, the unit had to be shut down for maintenance after only two months of service, and on restart, the seals returned to extremely high oil consumption. This was frustrating to Gary because

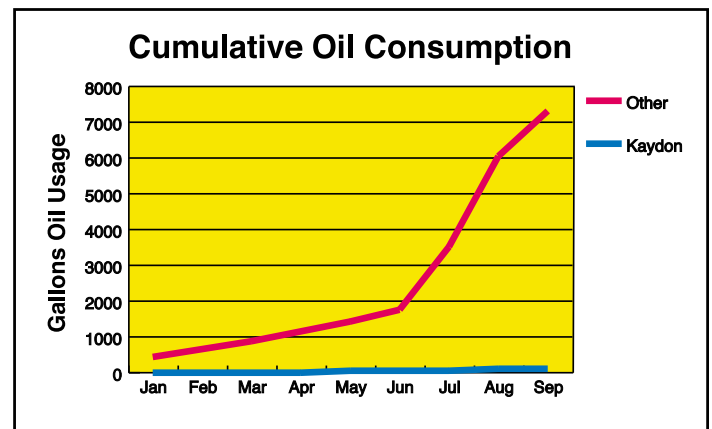
arrangements were made to repair the seals during scheduled maintenance. Kaydon returned the performance to original specifications, which was verified by testing under simulated operating conditions. Kaydon supplied test documentation with the rebuilt seals, along with

a new seal guarantee. The documentation was important to Papalia, saying, "That documentation is a significant factor. That's something we didn't have on our other seals. We never got any documentation [from the previous seal repair company]. With Kaydon, you can look at the seals and see the results of the seal test. That gives you great confidence knowing that you are putting in a product that's going to perform." Gary also felt that the failure on restart conditions he faced earlier was not likely to occur with these seals because they have already been run under simulation. The install, itself, was a restart.

This proved to be true. The Kaydon Certified Rebuilt seals were installed into the electric driven screw compressor on December 10, 1999. The seals in the steam driven compressor were not repaired at that time. Papalia documented the performance of both

the steam and electric compressors. Because of low production demand, the electric driven system was intentionally shut down four times to save energy. Each startup of this system was normal and uneventful, with no excess oil leakage.

Gary reported that in late summer, the steam driven compressor was using 110 gallons (416 L) per day! "The reason we will run a compressor with high oil consumption through the summer is because it is actually cheaper to add oil to the system than to cut back the charge on the cat cracker. The aggravating thing about our situation is that I can remember when we were rebuilding a compressor in-house using Kaydon rebuilt seals, and those seals would last in those machines for 8 years. And that was the factor that was driving me—more than the oil usage—was the shutdowns the inconvenience of having to repair these



■ Graph shows differences in oil consumption on a nine month scale. Kaydon clearly out-performs the competition.

things every year and a half or two years, rather than an eight-year run. And of course, my boss wasn't real happy either! He was always saying 'How come you can't fix this?'"

Kaydon's Certified Seals solved other costly problems, as well. Gary explains, "Preserving the life of the compressor is the biggest savings, along with the savings in oil consumed. And there's a cost associated with people delivering the oil. They have to handle these 55-gallon (208 L) drums, so there's a safety aspect. Also, when you are putting in 110 gallons (416 L) of oil a day, you can imagine that some of it is going to get spilled. So we've got clean up costs associated with it. Another factor is when the operators are monkeying around adding oil, they are obviously not watching the unit, and you've got a factor there. There is a tremendous time savings from the warehouse people right to the operators."

Owing to the increase in the steam driven compressor's oil consumption,

United Refining's scheduled shutdown for maintenance in December 2000 has been moved up to October. Kaydon has been working closely with United to respond. Papalia comments, "The other set has already been remanufactured and they are sitting in our warehouse ready to install. Kaydon's turnaround time was timely."

Papalia is, above all, impressed by performance. "Obviously, it is a very good payback. It's \$1000 worth of oil versus \$50,000 annually. The economics are there! But the biggest factor of all is the performance of the seal. It's great to have a product perform as good or better than advertised, but having the problem behind me and solved is a good thing, because I have other problems to solve. Especially in this refinery atmosphere, because if something goes wrong at the wrong time, you're sitting up here in meetings answering questions for an hour or two instead of being down there trying to figure out what's going on."



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