MOLYKOTE®
FROM DOW CORNING
TM

Molykote® Synthetic Oil Helps Solve Vacuum Pump Failure

Saves $90,000 Yearly In Maintenance Costs By Extending Mean Time Between Failure

Value Proposition

Technical know-how and proper lubricant recommendation from Dow Corning lubrication engineers help reducemaintenance costs by extending mean time between failures.

Application

Lubrication of rotary vane vacuum pump in chemical processing plant.

Problem

Oil additives in convention mineral oil reacted with process gases causing oil sludging, corrosion and pitting inside the vacuum casing resulting in mean time between failure of 42 days. Each failure resulted in costs of $8,000 to $9,000 dollars for parts and labor.

Solution

Synthetic process gas oil formulated with additives suitable for use with harsh process chemical gas streams.

Product Selected

Molykote® *L-1510 Process Gas Oil*

Results

Extended mean time between failure from 42 days to 87 days. Saving $90,000 annually in plant maintenance costs.

Molykote Lubrication Engineers helped a chemical manufacturer drive costs down by solving vacuum pump failure, saving $90,000 in yearly maintenance costs.

Dow Corning installed a new, rotary vane vacuum pump in a processing building in its chemical manufacturing complex in Midland, MI, where the pump was needed to draw process gases from a reactor vessel. The pump was put into operation using conventional mineral oil that was specified by the original equipment manufacturer (OEM). During the first nine months of operation there was a catastrophic failure every four to six weeks.

"There was so much corrosion that it caused the casing to pit, and we couldn't just make repairs," says Lisa Honaman, building engineer. "We had to order a new pump casing and other major parts every time, then spend one to two days rebuilding the pump. We estimated the breakdown cost $8,000 to $9,000 each time. The repair parts cost $6,400 and labor averaged $2,000, if the work could be scheduled during regular hours," she explains. This particular pump was one of three pumps in the processing building that were all experiencing similar issues.

High Temperature Additive Reaction

The pump drew hydrochloric acid (HCl) vapors from a reactor vessel used to manufacturer chemical intermediate products. During the vacuum process, some acidic vapor condensed into liquid form and mixed with oil inside the vacuum chamber. As the oil stream hit the inside of the vacuum chamber casing, the anti-wear additives in the conventional oil mixed with hydrochloric vapors and reacted with process gas. The reaction produced small solid particle deposits on the casing.


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These highly acidic deposits resulted in pitting of the casing. Additionally, the corrosion by products reacted with HCl to produce abrasive ferric chloride particles. "The result was devastating," says Honaman. The pitting corrupted the vacuum chamber wall thus reducing the vacuum capacity. The ferric chloride particles abraded the vane tips and wall further reducing vacuum capacity. These imperfections prevented formation of a reliable oil film that was needed to maintain vacuum seal while preventing surface contact and frictional wear and heat generation between vanes' tips and wall.

Oil and process chemical interaction also led to sludge formation that when combined with corrosion and abrasion, contributed to breakdown of the phenolic/fiber composition of the rotor vanes. As the rotor turned, particles chipped off the trailing edge of the vanes and damaged the tips of the following vanes, which compounded the damage through increased friction, vacuum leaks, pitting, and over-heating – leading to total vane breakdown, extensive case wall damage, and finally catastrophic failure. Everything pointed to high-temperature additive reaction as part of the problem.

Specific Additive Formulation Chemistry Is Key To Success

Dow Corning's *Molykote*® Technical Services staff believed that specially formulated lubricant would result in better performance by helping to reduce or eliminate effects of additive reaction with chemical process gasses, and resulting corrosion and abrasion of metal pump components. As a result, they recommended synthetic oil formulated specifically for the harsh operating environment the equipment was operating in and Honaman was pleasantly surprised to discover that Dow Corning, her own employer, had the solution in hand. The company had just introduced a new line of industrial lubricants under the *Molykote*® brand name, and L-1510 Process Gas Oil fit the ticket.

L-1510 Process Gas Oil is polyalphaolefin-based oil fortified with specially selected additive technology that minimizes opportunity for additives and base oil to react to harsh process gases. "The additives are so well-suited that the formulation behaves as though it was totally additive-free," explains Honaman. It is the additive package that gives the oil its capability to reduce corrosion and sludge formation caused by process conditions and temperatures that can result in premature lubricant breakdown and equipment failure.

Traditional solvent-refined oils with zinc-based additive chemistry typically have a higher initial TAN (Total Acid Number). "Add water and hydrogen," says Honaman, "and you could make sulfuric acid."

By comparison, the *Molykote*® brand Process Gas Oils with zinc-free chemistry have lower initial TAN. And, its corrosion, rust and oxidation preventative additives and base oil are free of sulfur so the oil is essentially a benign product that seemed to be a good fit.

In addition, the "engineered" chemistry makes *Molykote*® oils inherently more inert and resistant to oxidation and emulsification which helps enable them to last up to five times longer than conventional oils.

Smooth Operation with Molykote® *Lubricant*

After plant maintenance professionals switched to *Molykote*® L-1510 with proper additive technology and installed a larger oil pump, there was a 30% drop in surface operating temperature. While the exact cause of the temperature reduction was not known, both steps were contributing factors. The key problem solved, however, was elimination of failure caused by corrosive pitting and oil additive and process gas interactions. "Since switching over to *Molykote*® brand oil the vacuum pump has been operating smoothly, without incident and we've had no breakdowns," says Honaman. "In fact, we are so happy with the results that we decided to switch all of our vacuum pumps to *Molykote*®."

"In addition, with help from the Molykote Engineering Team, we reduced the number of lubricants used in our building by almost 50 percent, from 13 competitive products to 6 *Molykote*® oils!" Reducing the number of competitive lubricants provides additional efficiency improvement by simplifying the purchasing process and reducing the potential for applying the wrong lubricants.

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