

MagnaDrive Canada Distributor POWER PLANT SUPPLY CO

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Magna C O R P O R A T I O N **Drive**TM

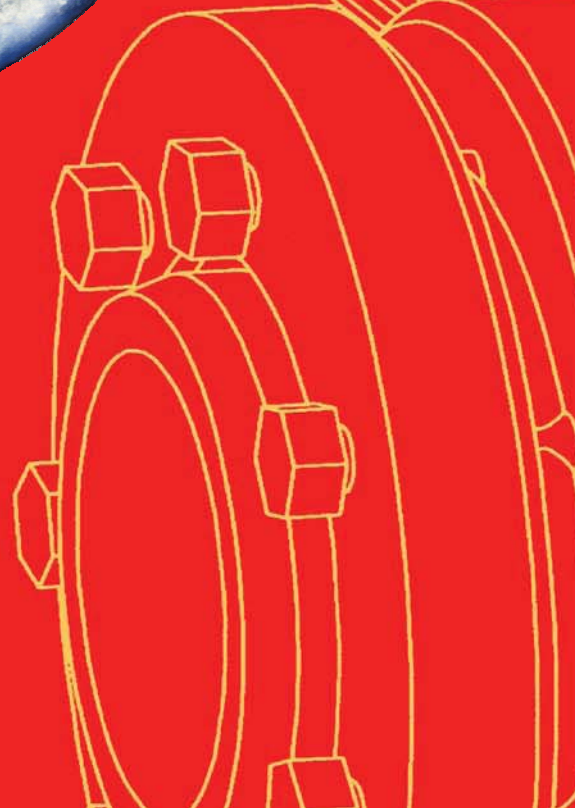
Saving Energy Globally

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***The Next
Industrial
Revolution
is Here!!!***

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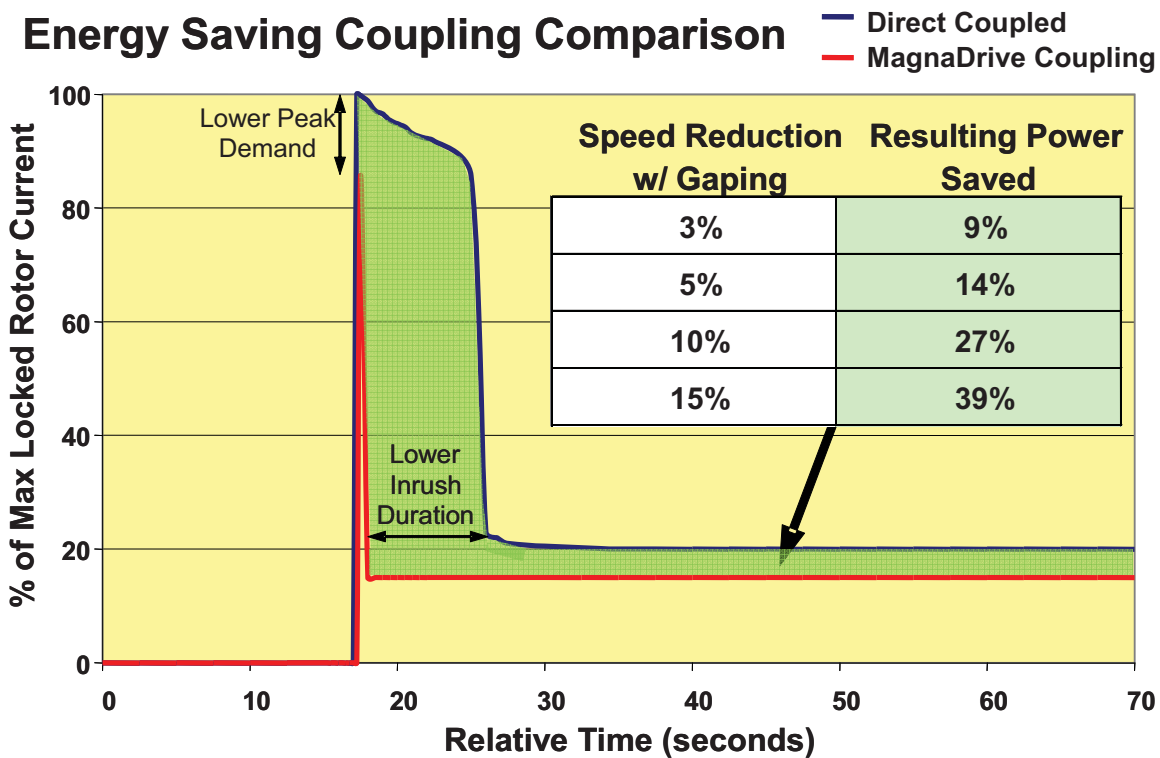


MagnaDrive Products Save Energy!!!

With the Affinity Laws

ASDs save energy on pumps, fans, and other centrifugal equipment by controlling process speed by automatically increasing the drive's air gap, and drawing from the motor the reduced power required by the centrifugal application. The speed of MagnaDrive constant speed couplings can be adjusted ("fine tuned") with gapping to achieve a limited range of process control, thus providing the same energy savings on pumps and fans.

It is known that most pumps, fans, blowers, and other similar centrifugal equipment installed worldwide are commonly oversized by 10%-15% or higher. No engineer wants to run the risk of under-sizing equipment. That's why most valves and dampers on a pump or fan are always partially closed. In effect, this is like running your car with one foot on the gas pedal and the other on the brake. A great deal of energy is wasted!!! If a system is oversized, flow must be reduced to reach the optimum operating capacity. In addition to closing a valve or damper, some operators create a bypass system where the excess flow is returned to circulation. This is inefficient and consumes more energy than necessary. Another way to reduce flow is to trim the impeller on the pump or fan, which is expensive and is a permanent change to the system. VFDs (Variable Frequency Drives) are yet another option to reduce speed. This is also an expensive proposition especially if the system is run at a constant speed most of the time.

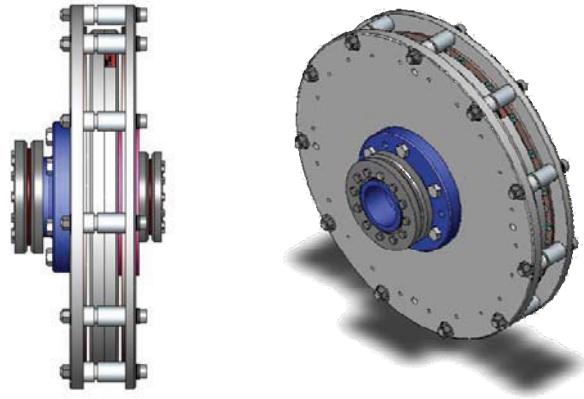
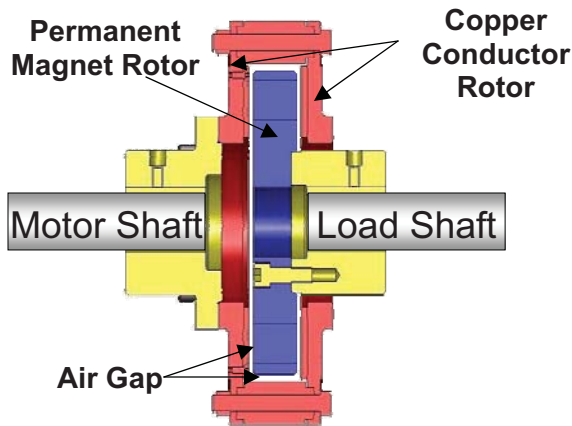


MagnaDrive couplings can be adjusted (depending on the application) to reduce costly power wasted by an oversized system, thus maximizing system efficiency. The resulting savings in power can be substantial. As the above graph illustrates, a 3% reduction in speed by adjusting the gap can result in a reduction in power consumption of approximately 9%. A 5% reduction in speed can result in 14% savings in power and so forth. Consult MagnaDrive for proper gap adjustment settings based on your application.

MagnaDrive couplings are the only couplings that can be adjusted to meet the exact performance demands of a system and give customers energy savings as a byproduct. Additionally, the air gap can be returned to the minimum position if additional flow is required. If desired, the air gap on a MagnaDrive coupling can be changed during certain seasons to accommodate higher flow rates required during other times of the year (i.e. winter vs. summer).

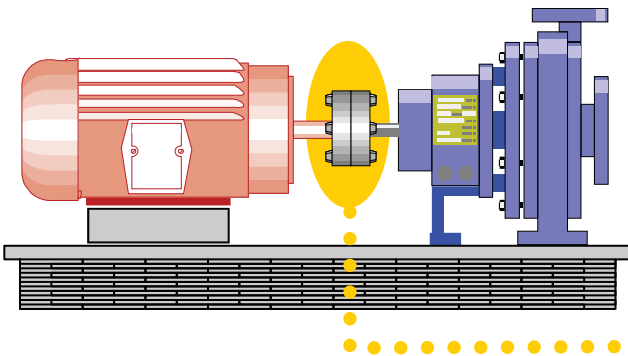
With a Cushioned Start

All MagnaDrive Product's have a "disconnected connection" and realize the benefit of a cushioned start with lower peak demand and lower inrush duration, as per the graph on the opposite page. At startup, the motor must overcome only the inertia of the motor and the MagnaDrive Conductor Rotor, but not the Magnet Rotor, the shaft or the load. With many on-off cycles this energy savings can be substantial, as well as a reduction in reduced equipment wear (which in turn helps maintain equipment efficiency). Reducing peak demand may also reduce the power usage rate assessed by the utility company.



With a Disconnected Connection

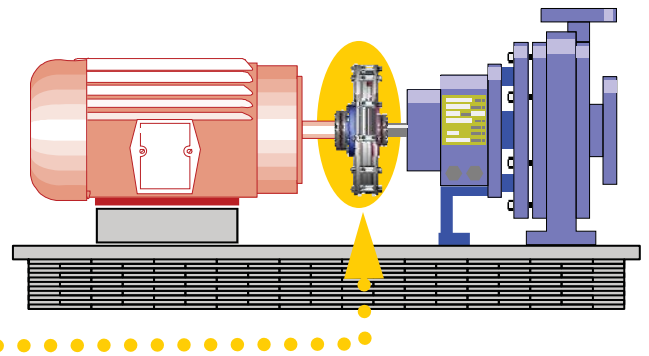
All MagnaDrive products can save energy by releasing the stress and friction in the system due to misalignment, thermal expansion and vibration. The MagnaDrive air gap accommodates some misalignment and system thermal growth. The motor wastes no energy deforming the shaft or adding load to bearings and seals. Energy lost due to friction in traditional couplings and in bearings, seals and other rotating equipment is minimized because the MagnaDrive air gap prevents vibration transfer.



Vibration and misalignment between motor and load cause bearings, seals, and other components to fail prematurely increasing energy usage.

Misalignment causes energy waste as the motor needs to work harder to overcome losses.

Thermal growth causes misalignment and energy waste due to increased friction between bearings.



Less vibration and no misalignment problems between motor and load increases bearing, seals, and other component life keeping system efficient.

Virtually no energy is wasted due to misalignment.

Thermal growth is accommodated in the system due to the air gap.



Recent Energy Savings Examples



HVAC

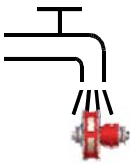


18% Energy Savings!!!*

- ◆ **End-User:** Mirage Casino, Las Vegas, NV
- ◆ **Application:** Water Pump, Chiller #3
- ◆ **Product:** MGE-11
- ◆ **Motor Data:** 25 Hp / 1200 RPM



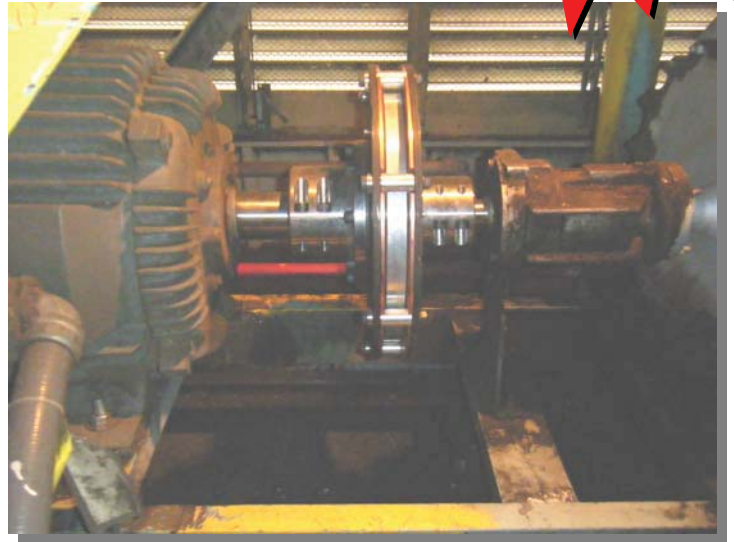
Energy savings was about 18% without affecting the process requirements. ROI Performed By Mirage. ROI Based on 5 couplings. Actual kWh Savings $24/7/240 = \$9,976$. Total cost of coupling upgrades for the Chillers = \$ 9,500. Annual ROI = 105%. Payback in years = 0.95. The ROI does not show the estimated \$5,000 bi-annual savings on pump rebuilds. *Energy savings data provided by customer and specific to each application.



Water & Wastewater

58% Energy Savings!!!*

- ◆ **End-User:** Synagro Technologies, Inc., Baltimore, MD
- ◆ **Application:** Thermal Oil Pump
- ◆ **Product:** MGE-15
- ◆ **Motor Data:** 100 Hp / 1800 RPM



MGE-15 was bought for maintenance reduction. Severe vibration and pump rebuilds were eliminated after the MGE was installed. Also, preliminary data shows significant energy savings. With the original coupling the motor current reading was 102 AMPS, and after the MGE-15 coupling was installed the reading dropped down to 43 AMPS. *Energy savings data provided by customer and specific to each application.



HVAC



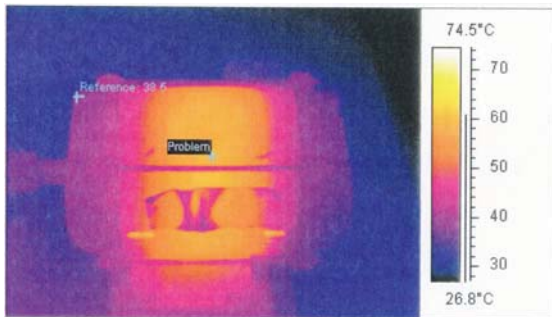
- ◆ **End-User:** US Army, Ft. Wainwright, AK
- ◆ **Application:** Heating System Pump
- ◆ **Product:** MGE-07
- ◆ **Motor Data:** 15 Hp / 1800 RPM

20-27% Energy Savings!!!*

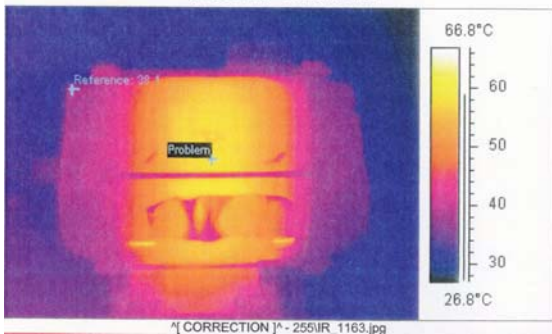


Old Coupling

27% energy savings after coupling was installed. Before Modification – 11kW energy usage on pump using flexible coupling (photo on the right). After installation – 8 kW energy usage on pump. Most of the energy savings is from eliminating misalignment and vibration. Also a small 2.2% reduction in speed accounted for additional energy savings. Coupling costs aprox. \$1,100. Pump is run 8 months out for the year. Therefore savings per year = 3 kW * 24 hrs / day * 243 days * \$0 .145 per kW/h = \$2,537 savings per year. Payback = 0.41 months or 5 month payback in energy only. Additional savings in maintenance makes payback much shorter. *Energy savings data provided by customer and specific to each application.



PROBLEM]* - 255\IR_1158.jpg



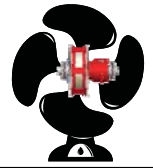
CORRECTION]* - 255\IR_1163.jpg

kW measured with Flexible Coupling			kW measured with MGE-01 Magnetic Coupling		
Flexible Coupling	App. Power	Real Power	MagnaDrive MGE	App. Power	Real Power
	kVA	kW		kVA	kW
Phase 1	1.354	1.058	Phase 1	1.208	0.836
Phase 2	1.444	1.170	Phase 2	1.311	0.948
Phase 3	1.443	1.123	Phase 3	1.310	0.900
Avg/Total	4.241	3.350	Avg/Total	3.829	2.684

A before and after electrical system analysis showed immediate reduced motor amperage and temperature upon installation. Infrared scans showed the temperature dropped by approximately 2 degrees Celsius with the MagnaDrive coupling installed, dropping the temperature out of the critical range.

In addition, vibration levels decreased by approximately 30% at four measurement points in the system.

db Readings on Pump & Motor Before & After MagnaDrive Coupling		
Reading Location	Before	After
Pump Side (readings taken on pump)	64 db	51 db
Motor Side (readings taken on motor)	56 db	32 db
Pump Side (readings taken on front bolt)	43 db	31 db
Motor Side (readings taken on front bolt)	43 db	30 db

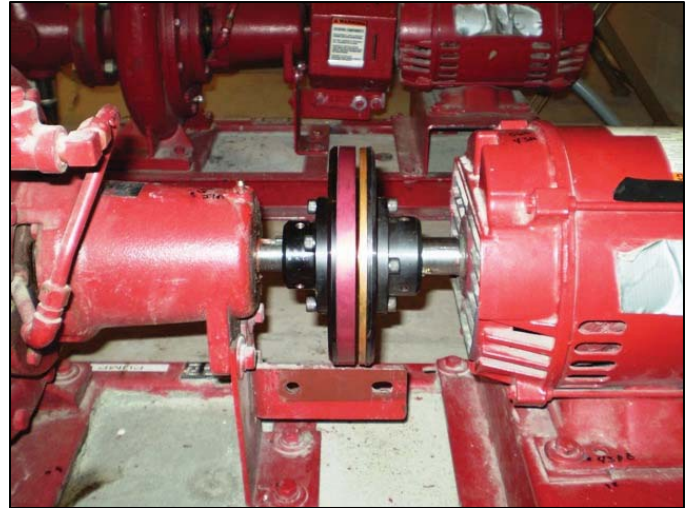


Quantified Business Results

United States Army - Fort Wainwright, AK MGE Couplings on 5 HP – 1800 RPM Centrifugal Pumps

Situation:

Fort Wainwright Army base in Alaska was replacing flexible couplings 3 to 4 times per year on their Hot Glycol Return Pump systems. The US Army was experiencing severe vibration and misalignment problems that were destroying the flexible couplings. Frequent replacement of the couplings was expensive and consumed both labor hours and operating hours while the equipment was down. Energy savings was also a goal on this system as a reason for installing MagnaDrive couplings.



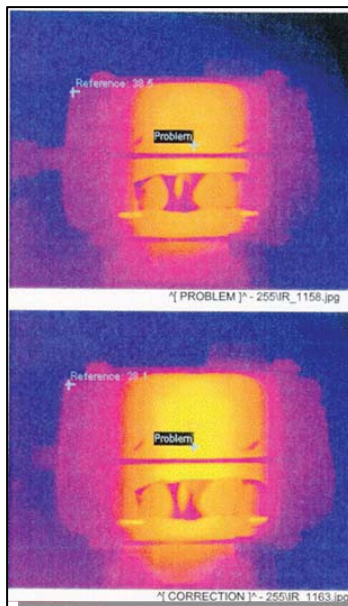
Solution:

The US Army's Contractor selected MagnaDrive MGE (MagnaGuard Economizer) couplings (see photo at right) to address the thermal growth issues as well as save energy.

Results:

Overall the MagnaDrive couplings significantly reduced vibration and misalignment issues. However, the US Army was most impressed by a major reduction in energy consumption. MagnaDrive couplings have no physical connection between the motor and the load, which not only significantly decreased vibration, misalignment and maintenance in the system, but it also contributed to energy reduction and cost savings. Total average power usage decreased by 20% on the pump system.

The before and after electrical system analysis showed immediate, reduced motor amperage and temperature upon installation. Infrared scans showed the temperature dropped by approximately 2 degrees C with the MagnaDrive coupling installed, dropping the temperature out of the critical range.



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Quantified Business Results

Results (cont.):

kW measured with Flexible Coupling			kW measured with MGE-03 Magnetic Coupling		
Flexible Coupling	App. Power	Real Power	MagnaDrive MGE	App. Power	Real Power
	kVA	kW		kVA	kW
Phase 1	1.354	1.058	Phase 1	1.208	0.836
Phase 2	1.444	1.170	Phase 2	1.311	0.948
Phase 3	1.443	1.123	Phase 3	1.310	0.900
Avg/Total	4.241	3.350	Avg/Total	3.829	2.684

In addition, sound levels decreased by approximately 30% at four measurement points in the system:

db Readings on Pump & Motor Before & After MagnaDrive Coupling		
Reading Location	Before	After
Pump Side (readings taken on pump)	64 db	51 db
Motor Side (readings taken on motor)	56 db	32 db
Pump Side (readings taken on front bolt)	43 db	31 db
Motor Side (readings taken on front bolt)	43 db	30 db

Even without taking into account the significant savings from reduced downtime and less maintenance due to lower vibration levels, the MagnaDrive couplings in this application pay for themselves in less than 9 months.

Annual energy costs using traditional coupling = \$4,255

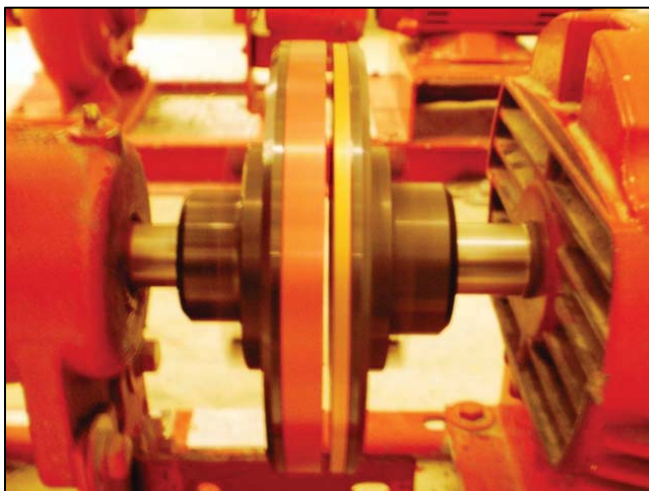
Annual costs using MagnaDrive coupling = \$3,409

Annual savings per coupling in energy ALONE = \$846

Additional up-front expense incurred = \$600 per coupling

Breakeven Point = (\$600) / (\$845/yr) = 0.71 years

The Army has already installed multiple MagnaDrive units on its pump systems and plans to purchase several more to continue the cost saving trends demonstrated.



Customer Comments:

"At the end of the test we conclude that replacing the flexible couplings with MagnaDrive MGE not only resulted in significant savings in the avoided maintenance cost but also saved us energy".

US Army, Senior Energy Management Consultant



Quantified Business Results

University of Utah Hospital MGE Coupling on Hot Water Pumps

Situation:

The University of Utah was experiencing vibration problems on their hot water pumps in the university's steam plant. The steam plant produces steam that is used throughout the university property, including the University Hospital. These vibration issues were causing premature pump seal wear. Technicians at the hospital had to replace the pump seals an average of twice yearly.

Solution:

MagnaDrive Corporation's local distributor approached steam plant superintendent, Wyatt Peterson, at the University of Utah with a proposal to install MagnaDrive MGE-11 couplings in place of the existing conventional couplings on the system's 50 hp / 1800 rpm pumps. The University agreed and a total of eleven MGE couplings were installed.



Results:

After installation of the MGE couplings, the University reports the following results:

- No maintenance has been needed after installation.
- No vibration transmitted between the systems components.
- Pump seal life has increased significantly.
- Timely response and support from MagnaDrive Corporation.

The maintenance staff at the hospital reports that, prior to the installation of the MGE couplings, they were required to change the pump seals in this system at least twice yearly at an average cost of \$2,000 per seal. The new system shows no indication of suffering from the same wear. The University now expects each seal to last at least one year due to the reduced vibration.

Even though the MagnaDrive coupling was more than four times as expensive as the traditional coupling, the University was able to achieve a payback on their investment of less than two months.

Annual savings from reduced seal purchases per coupling = \$ 2,000

Annual savings in non-energy operating costs (other than seals) = \$11,907

Total annual savings per coupling = \$13,907

Additional expense incurred = \$2,000 per coupling

Breakeven Point = (\$2,000) / (\$13,907/yr) = 0.14 years

Quantified Business Results

Northwestern U.S. Forest Products Company MGE Coupling on Clean Condensate Pumps

Situation:

A forest products company located in the Pacific Northwest was experiencing repeated failures in their clean condensate pumps due to extremely high levels of vibration in the system that were the result of thermal expansion in the system piping and the pump shaft. Vibration amplitude levels of over 0.4 in/sec (RMS velocity) were literally shaking the pump apart. According to the maintenance crew, the condensate pump was being replaced between three and four times every year as a result of the vibration.

Solution:

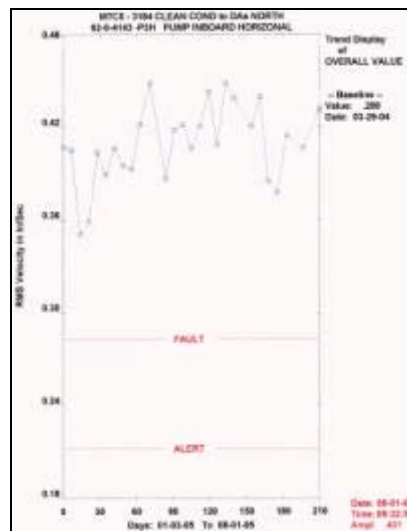
MagnaDrive Corporation proposed the installation of a MagnaGuard Economizer (MGE) coupling as a replacement for the existing rigid coupling. Because this was a 100 hp motor running at 3600 rpm, an MGE-11 coupling was selected. Removal of the original coupling and installation of the MGE-11 coupling was done without moving either the pump or the motor and only took less than an hour to complete.



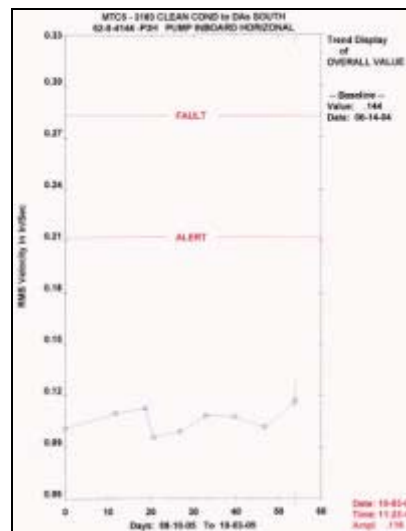
Results:

After successful installation of the MGE-11 coupling the customer reports the following results:

- Vibration levels dropped from 0.431 in/sec to 0.116 in/sec RMS velocity on the inboard side of the pump (down 73%) and from 0.286 in/sec to 0.087 in/sec RMS velocity on the outboard side (down 70%).



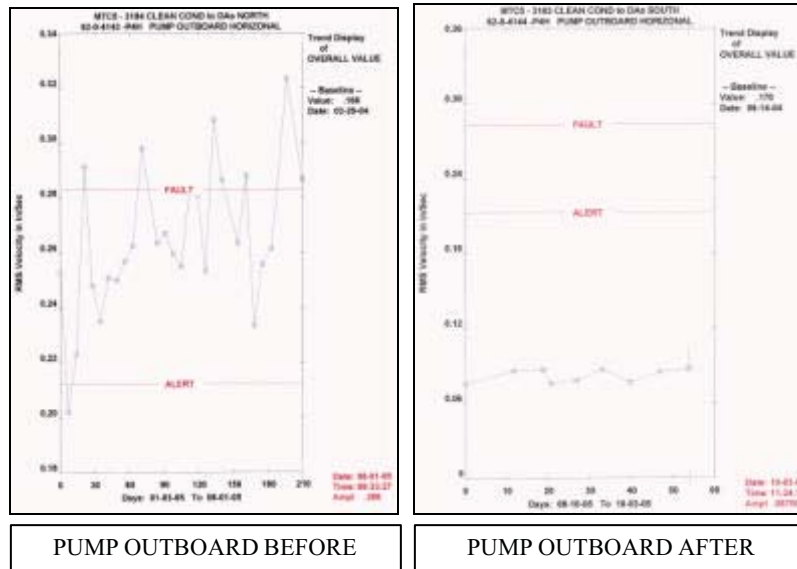
PUMP INBOARD BEFORE



PUMP INBOARD AFTER

Quantified Business Results

Results (cont.):



- Reduced maintenance due to decreased vibration.
- The pump is lasting longer. Instead of replacing the pump 3 – 4 times each year at a cost of \$5,000, the plant has operated over one year with no signs of pump damage!

Annual labor and equipment costs using traditional coupling = \$24,800 / yr

Annual labor and equipment costs using MagnaDrive Coupling = \$ 2,029 / yr

Annual savings per coupling = \$22,771 / yr

Additional expense incurred = \$2,000 per coupling

Breakeven Point = (\$2,000) / (\$22,771/yr) = 0.09 years = 1.1 months

Customer Comments:

When asked to summarize their experience with MagnaDrive Corporation, this customer expressed complete satisfaction with both the MGE Coupling and with the service they received from the MagnaDrive Applications and Sales personnel. Proof of the customer's satisfaction has been shown by additional orders for the MGE Coupling. Also, the customer is reviewing their adjustable speed applications for potential MagnaDrive ASD installation.



Quantified Business Results

Chevron Oil Tanker MagnaDrive MGE Coupling on Oil Transfer Pump

Situation:

Chevron Corporation is one of the world's largest oil producers. In the Asia-Pacific region, Chevron has interests in seven refineries and eight chemical plants, and has produced more than ten billion barrels of oil over the past 50 years. To transport their products around the globe, Chevron has a fleet of over 20 oil tankers. Recently, Chevron contacted MagnaDrive Corporation with a request to help them reduce vibration-caused problems in the oil transfer pumps on one of their Australian-based tankers, the Chevron Vega Voyager. Because the tanker structure flexes while at sea, misalignment between the pump and its motor were causing accelerated mechanical seal wear, resulting in shortened seal life.



Solution:

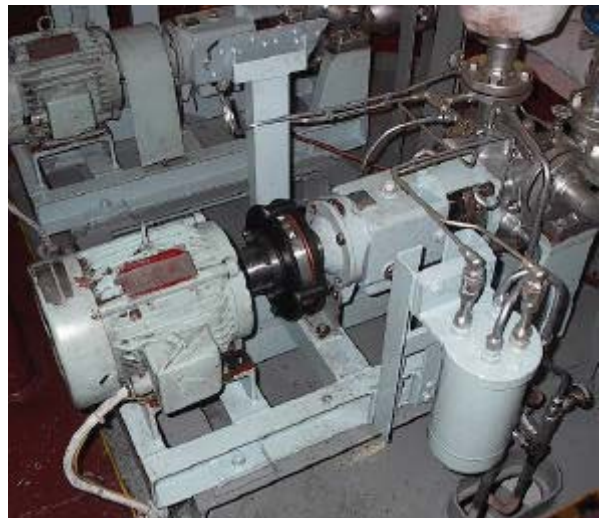
MagnaDrive's Application Engineers determined that the best solution for the 20 hp / 3600 rpm oil transfer pumps would be MagnaDrive's MGE-07 Coupling. This solution was presented to Chevron and the decision was made to fly a MagnaDrive employee and a Chevron vibration expert to the Vega Voyager's Australian port of call for an immediate installation.

Results:

The MagnaDrive MGE-07 Coupling was installed while the Vega Voyager was in port. The Chevron vibration expert measured a 75% reduction in vibration during pump operation. Also, the Vega Voyager crew noticed a significant reduction in noise while the pump was running.

Chevron estimates that prior to the installation of the MagnaDrive MGE Couplings, they were replacing the system's mechanical seals at least twice each year due to the vibration caused by misalignment. Now that the MGE Coupling has been installed, the mechanical seal life is expected to greatly increase, saving Chevron not only the cost of two seals each year per pump, but also the expense associated with the replacement labor and the downtime associated with each seal failure.

Because of the long-term savings potential, Chevron has made the decision to install MagnaDrive MGE Couplings on all oil transfer pump applications in their single hull tanker fleet. Additionally, Chevron is also looking at other tanker and land-based applications where MagnaDrive's disconnected technology can have the same economic benefit to their organization.



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Quantified Business Results

Results (cont.):

Originally, Chevron had been using semi-rigid disc couplings on the Oil Transfer Pumps. Because of the long-term savings potential, the decision to purchase MagnaDrive's MGE Couplings was made in spite of the fact that the MagnaDrive couplings had a price tag more than triple the cost of the couplings they had been using in the past. Looking at the maintenance and operating savings realized by the Vega Voyager in relationship to the additional cost, it is clear that a Cash Flow Breakeven Point of less than two months is realized.

Annual maintenance & operating costs using traditional coupling = \$16,946

Annual maintenance & operating costs using MagnaDrive Coupling = \$ 1,523

Annual savings per installation = \$15,423

Additional expense incurred = \$2,000 per coupling

Breakeven Point = (\$2,000) / (\$15,423/yr) = 0.13 years

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