

# Reliability Maintenance – How it Saves Money

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Maintenance programs, are they a costly expense or as an income opportunity? Maintenance cost is almost always treated as an expense. Utilizing reliability maintenance can turn this thinking around and our maintenance programs can begin to create opportunities to increase profits. Most current maintenance programs are typically reactive to failure and attempt to maintain equipment almost exclusively through lubrication. Few alternatives have been utilized to assist equipment in running reliably or efficiently; therefore, reducing the cost of doing business. With a few additions and alterations of maintenance practices, systems can begin to be seen as income instead of expense. Reliability maintenance is a required component of a world class maintenance program and is changing the way maintenance is viewed.

Current methods of maintenance lose money through a number of system errors. Wasted energy and losses in efficiency increase the cost of production. Reactive maintenance, repairing after a failure, is very expensive and can be up to 10 times more expensive than repairs performed proactively. This is in part due to additional damage done when a part fails. Shafts and other components can be damaged if a failure is not noticed early. Reactive failures require more personnel and often demand overtime to return the equipment to service as fast as possible. Breakdowns do not occur during slow times when equipment is idle but most often during critical busy times. The added pressure to get equipment back in service adds personnel safety concerns as well.

Unplanned downtime is one of the largest costs a facility can incur. Labor cost alone can produce staggering figures. Running 2 shifts, 340 days per year at \$19 per hour with only 5 minutes of downtime per shift equals \$26,916 / year. Reducing this downtime by only 10% will save over \$9000 each year. (Downtime) Inputs in calculating unplanned downtime include lost time, lost wages, and lost revenue. Considering demurrage will increase loss possibilities by thousands of dollars. Unplanned downtime can potentially reach \$100,000 per day with some facilities much higher.

Maintenance programs and man power tend to be the first to receive cuts in funding when trying to reduce costs. This reduces manpower and the man hours needed to perform routine maintenance tasks. According to Ron Moore, “Simple cost cutting will remove resources from your system without changing the underlying system design, and performance will deteriorate.” (Moore) Routine tasks get neglected and pressure is applied to a smaller group when emergency repairs are necessitated. There are a number of reliability tools available to increase the bottom line. The reliability tools discussed in this article are: Infrared, Vibration Analysis, Ultrasound and Precision Alignment and the savings that can be found using each tool.

Infrared inspections not only save money but will increase the reliability of equipment. Starting with an electrical infrared survey provides utility savings very quickly as repairs are made. Any electrical resistance detected with infrared technology is costly wasted energy. Heat

created from the waste of energy can damage nearby components as well as cause nuisance trips. Infrared industry standards return on investment is 4:1. Four dollar savings for every dollar spent on inspection. Electrical repairs performed will reduce risk of unplanned downtime, electrical usage and dangerous heat sources which can cause fires, explosions and other damage.

Figure 1 demonstrates the savings obtained by repairing faulty connections. Some repairs can save a substantial amount of money alone although repairing a number of smaller faults will defiantly add up to incredible savings.

\$/mth @ .07	Normal Temp F	Abnormal Temp F	\$ with resistance	Added cost/year
161.28	30	60	\$171.49	\$122.57
161.28	35	47	\$168.63	\$88.25
161.28	38	55	\$171.70	\$125.02
161.28	40	75	\$182.73	\$257.40
161.28	50	60	\$167.41	\$73.54
161.28	55	130	\$207.24	\$551.58
161.28	55	65	\$167.41	\$73.54
161.28	55	65	\$167.41	\$73.54
161.28	55	65	\$167.41	\$73.54
				\$1,439.00

Figure 1

Vibration analysis of equipment provides an indication of numerous issues adding savings to the bottom line. Misalignment of drive units will waste energy. Misalignment causes the unit to utilize horsepower. Horsepower used to overcome misalignment is therefore not transferred to the driven unit and is lost. This reduces the efficiency of the drive. Bearings that are progressing into a failure mode can be detected. Finding these bearings early provides ample time to plan repairs during slow times. Ancillary damage of bearing failure is eliminated. This allows personnel to be available for routine work during regular hours of operation. Overtime costs are reduced. This also results in a safer work environment. According to an Exxon-Mobile report, “It is 5 times more likely for injuries when performing reactive maintenance than proactive Maintenance.” And, in 66% of companies, 60% of injuries occur when doing reactive work.” (Idhammar) All the systems are interconnected and affect the performance of each other. “A reliable plant is a safe plant is a cost effective plant”. (Moore)

Ultrasound is a tool available to provide immense savings. One use is for slow speed bearing fault detection. Slow speed bearings failures are difficult to detect. Ultrasound is one of the best methods used to solve this problem. Ultrasonic fault detection provides ample warning of failures so work can be planned. Slow speed bearings typically have higher torque and will incur more ancillary damage if allowed to proceed to failure. Ultrasound is an excellent tool for lubrication as well. Ultrasound allows for less grease usage, less waste and a higher degree of accuracy in lubrication. This is especially helpful in motor lubrication where there are no visible indicators of lubrication issues. By far the most savings from ultrasound will come from performing leak detection. Ultrasound can detect leaks in compressed air systems and can save thousands of dollars per year when repairs are performed. This tool can be utilized in any system that includes pressure differential; blowers, air compressors and steam lines are a few examples. One leak in a compressed air system of 1/8” can cost \$1400 / year. Very few systems have only

one small leak. The savings increase dramatically in steam lines. Figure 2 from UE Systems Inc. indicates the savings available from finding and repairing air leaks.

1/16"	6.49	389.4	3,115.20	1,137,048	<b>\$205</b>	<b>\$364</b>
1/8"	26	1560	12,480.00	4,555,200	<b>\$820</b>	<b>\$1,458</b>
1/4"	104	6240	49,920.00	18,220,800	<b>\$3,280</b>	<b>\$5,831</b>
3/8"	234	14040	112,320.00	40,996,800	<b>\$7,379</b>	<b>\$13,119</b>
1/2"	415	24900	199,200.00	72,708,000	<b>\$13,087</b>	<b>\$23,267</b>
3/4"	934	56040	448,320.00	163,636,800	<b>\$29,455</b>	<b>\$52,364</b>
1"	1,661	99660	797,280.00	291,007,200	<b>\$52,381</b>	<b>\$93,122</b>
Source: UE Systems						

Figure 2

Precision laser alignment provides savings starting at installation. Precision alignment on drives reduces resistance and allows maximum power transfer to the driven. This ensures a more efficient system of power usage, product flow and reduced wear and tear on equipment. Any misalignment will increase wear on seals, bearings, couplers and other drive components. Increased load is also a result of misalignment. Load increases have a cubed effect on reducing the life of a bearing. Belts and sheaves must often be over tensioned to overcome alignment issues. Even correcting minor alignment issues can add up to savings. Precision alignment provides the equipment the most ROI and the best possible chance for long equipment life, efficiency and reliability.

World class maintenance programs work together to ensure the lowest life cycle costs, most reliable and highest efficiency of their programs. Using the tools available will reduce costs. Maintenance systems do not have to be the expense we are used to them being. Using the reliability tools discussed in this article, maintenance programs can begin to make money as an alternative. Change the culture and start small to grow a reliability maintenance program into a quality program that saves money. Changing the perspective in the way we view maintenance systems and procedures can move the bottom line upward.

*Downtime.* (n.d.). Retrieved August 9, 2017, from Downtime Cost Calculator:

<http://www.downtimedb.com/calculator.asp>

Idhammar, C. (n.d.). *Idcon Safety/Reactive maintenance survey.* Retrieved August 3, 2017, from Idcon, Inc. : <http://www.idcon.com/en/resource-library/articles/safety-and-maintenance/546-safety-reactive-maintenance.html>

Moore, R. (n.d.). *A Reliable Plant is a Safe Plant is a cost effective plant.* Retrieved August 3, 2017, from Life Cycle Engineering: <https://www.lce.com/A-Reliable-Plant-is-a-Safe-Plant-is-a-CostEffective-Plant-1266.html>