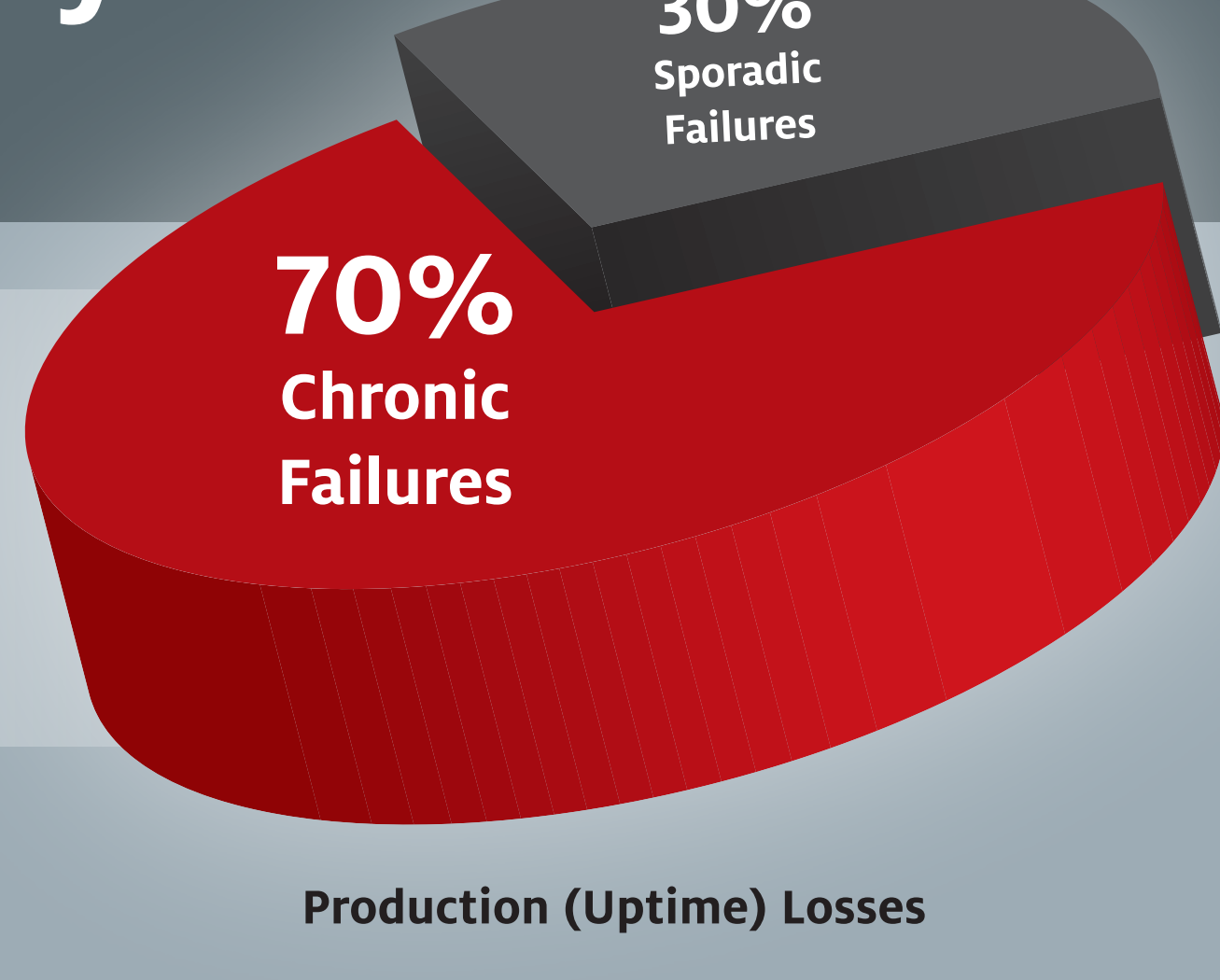


Why reliability-centered maintenance should be a top priority

Assets and Investments that Impact You

Industry Facts and Figures



Production (Uptime) Losses

<p>\$11,000 PER HOUR of downtime costs for a large natural gas power plant</p> <p><small>Source: KCF Technologies Blog, March 2013</small></p>	<p>70% of maintenance costs are on valves, pumps, compressors, exchangers, piping, vessels and fired equipment</p> <p><small>Source: Improve Reliability with Essential Asset Monitoring, Nikki Bishop, InTech, June 2012</small></p>	<p>50% HIGHER failed assets repair costs when not addressed early</p> <p><small>Source: Improve Reliability with Essential Asset Monitoring, Nikki Bishop, InTech, June 2012</small></p>
<p>70% of uptime failures are chronic</p> <p><small>Source: Doug Martin, E.I. Dupont de Nemours and Company.</small></p>	<p>25% unplanned outages are due to equipment failure</p> <p><small>Source: Improve Reliability with Essential Asset Monitoring, Nikki Bishop, InTech, June 2012</small></p>	<p>8-12% of product costs are maintenance costs in a plant</p> <p><small>Source: Constance E. Dyer, Quality Digest</small></p>

Top 9 Preventable Downtime Causes

1		Fastener Loosening #1 Cause Of Catastrophic Failure	6		Hydraulic Leaks 1 drop per second @ \$5 per gallon = \$2025 per year per leak
2		Keyway Wallow Downtime + Replacement Parts	7		Air Leaks 1/16" 100 psi @ \$0.065 per kWh = \$842 per year per leak
3		Spun Bearings Downtime + Replacement Parts	8		Gasket Leakage Downtime + Replacement Parts
4		Fretting Corrosion Downtime + Replacement Parts	9		Delayed Repairs Downtime
5		Tape Fouled Valves Downtime + System Flush			

Reliability-centered maintenance as a top priority



Advantages of Predictive Maintenance

Mining Industry

IMPACT OF UNPLANNED DOWNTIME

\$8M annually
Productivity improvement spending per concentrator

Hydraulic power and belt drive failures cause up to **47%** downtime cause in mining industry

Source: The Power of GE Predictivity™, No Unplanned Downtime 2014

PREDICTIVE MAINTENANCE

- Increased Stability
- Increased Profitability = lower energy and maintenance costs

- Poorly maintained concentrator increases energy and maintenance costs
- Lost production

Power Generation Turbine Engine

IMPACT OF UNPLANNED DOWNTIME

\$1M per day
Lost revenue per power plant

For a utility, with average spark spread of \$13.15/mwhr, the lost profit opportunity is **\$45k per day**

Source: The Power of GE Predictivity™, No Unplanned Downtime 2014

PREDICTIVE MAINTENANCE

- Identifying parts that are starting to degrade
- Lower maintenance cost and improved availability and utilization

- Lost production
- Addition maintenance cycles

Refinery Processing Technologies

IMPACT OF UNPLANNED DOWNTIME

\$800k per day
In lost profit for a refinery processing 200,000 barrels per day of crude

Source: The Power of GE Predictivity™, No Unplanned Downtime 2014

PREDICTIVE MAINTENANCE

- Extended production runs
- Minimized cost for cleaning and repairs

- Cost of repairs for unplanned events = 10 x planned maintenance costs
- Interrupted production
- Capital asset replacement

Railway Industry

IMPACT OF UNPLANNED DOWNTIME

\$400M per year
In reliability costs due to mainline failures

Source: The Power of GE Predictivity™, No Unplanned Downtime 2014

PREDICTIVE MAINTENANCE

- Improved network velocity and capacity
- Lower maintenance costs and improved availability and utilization

- Lost train availability & crew costs
- Loss per train per year
- Customer order fulfillment misses

Food Manufacturing

IMPACT OF UNPLANNED DOWNTIME

\$35 per minute
Costs once a packaging line, running a product contributing 10c each at 350PPM, is stopped

Ten minutes per day = **\$87,500 annually** in profit loss
= **40 hours annually** in production loss

Source: The Power of GE Predictivity™, No Unplanned Downtime 2014

PREDICTIVE MAINTENANCE

- Reduced Energy cost per unit
- Reduced Maintenance cost
- Reduced Labor cost
- 15% Inventory reduction
- 30% Improved overall equipment effectiveness

- Breakdown in packaging line
- Increased inventory and labor costs
- Lost production

Henkel General Industry Maintenance, Repair and Overhaul (MRO)

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REBUILD REBUILD & WEAR COMPOSITES	PROTECT COATINGS, LUBRICANTS & CLEANERS

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