The Blind Spot in Maintenance: Energy Loss You’re Not Measuring

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Nanoprecise
Prediction with Precision

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I am the Vice President of Sales at Nanoprecise Sci Corp, where I lead the expansion of advanced predictive maintenance and condition monitoring solutions across the Americas and Europe. With more than 15 years of experience driving industrial innovation at organizations including Hitachi, LTIMindtree, and OmniMetrix, I have been helping global manufacturers and energy leaders transform reliability into a strategic advantage. I work towards bridging AI, IoT, and business outcomes, enabling companies to reduce downtime, boost efficiency, and achieve measurable sustainability results.

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THE CHALLENGE

The energy industry needs to reduce their carbon footprint, but it's hard to make a willing/meaningful shift unless there's a financial reason to do so.

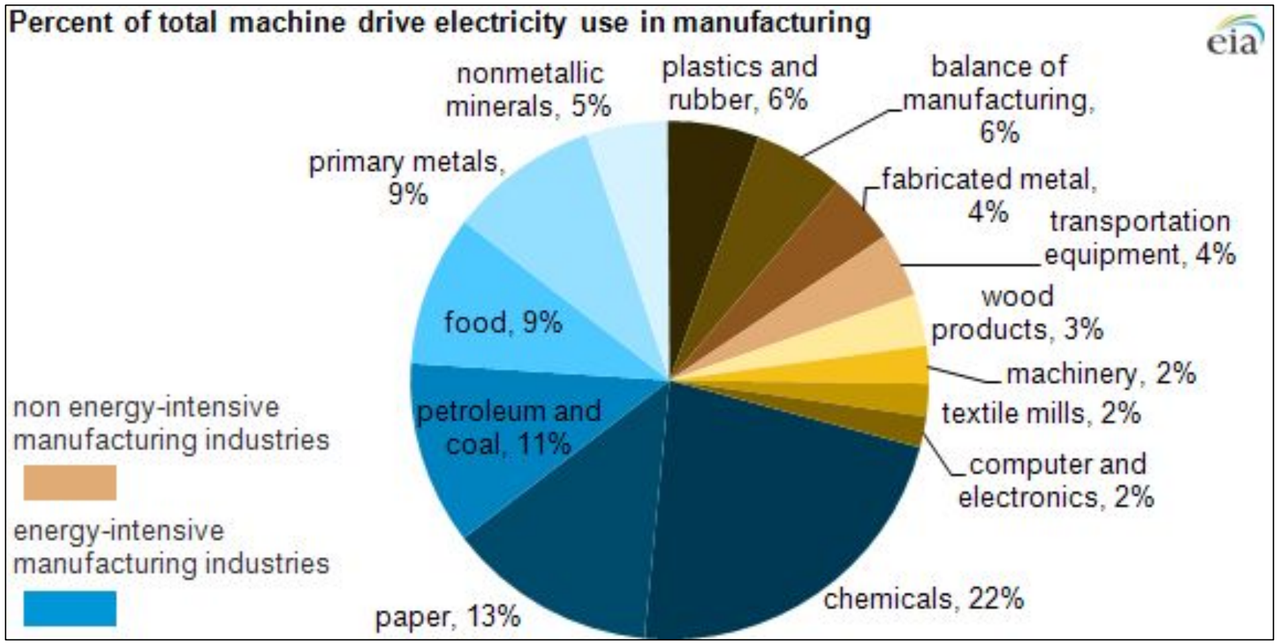
The electric motor is responsible for 65% of global electricity consumption and machines consume ~20% more electricity when they are in a fault state.

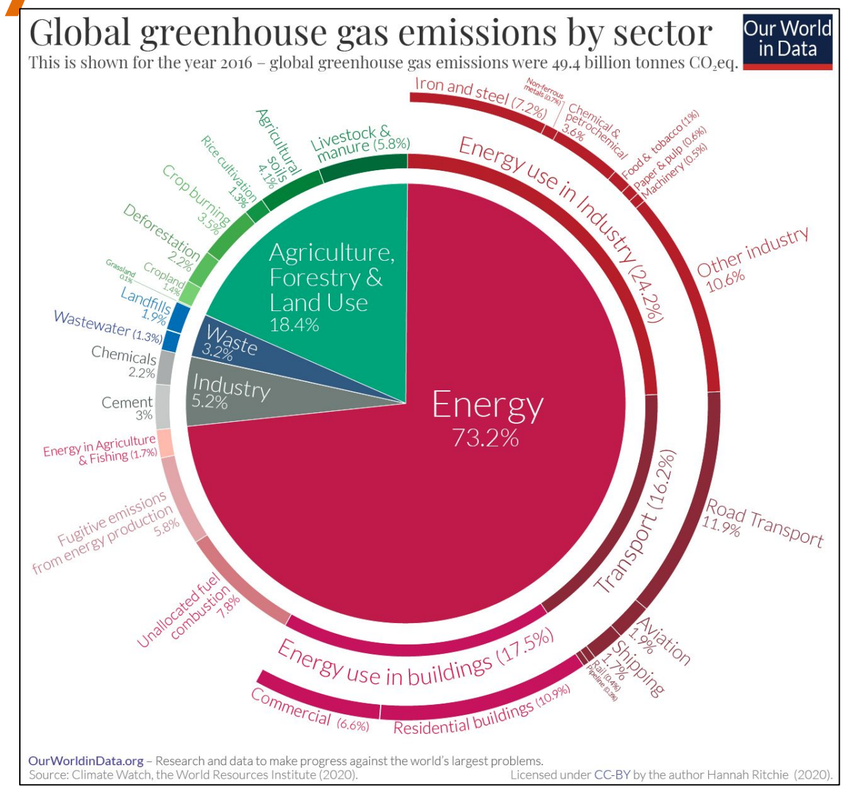
What if there was a way through technology to create a win/win scenario for businesses and the planet; by increasing operational excellence, while also reducing costs and CO_2 emissions...

Limitations of Typical Reliability Centered Maintenance (RCM)

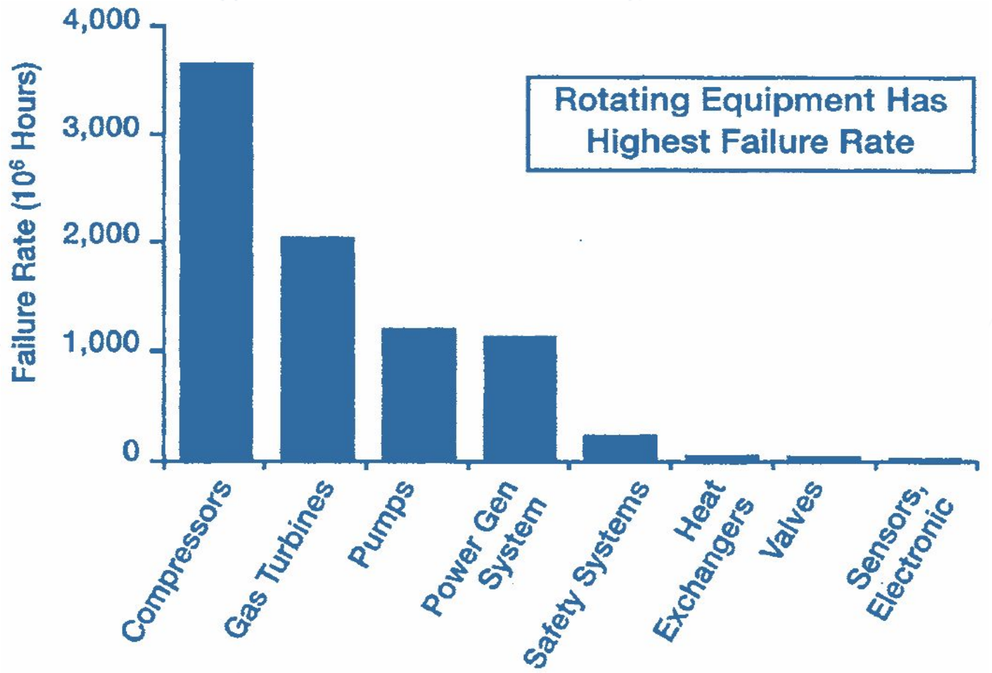
- Focuses only on ensuring uptime
- Relies on a belief that reliability and efficiency are mutually exclusive
- End users are not incentivized for keeping machines efficient
- Not accounting for energy consumption
- Incomplete reliability maintenance approach

>60% of Global Electricity Consumption due to Rotating Machinery





What do you notice very similar in both these diagrams?



~70% of the >$1 Trillion in Global Downtime Losses are due to Rotating Machinery

Around 20% of equipment in a production facility are critical for production loss, for the rest (above 20HP machine), Energy Centered Maintenance is the only way for guaranteed 2x RoI or more/annum

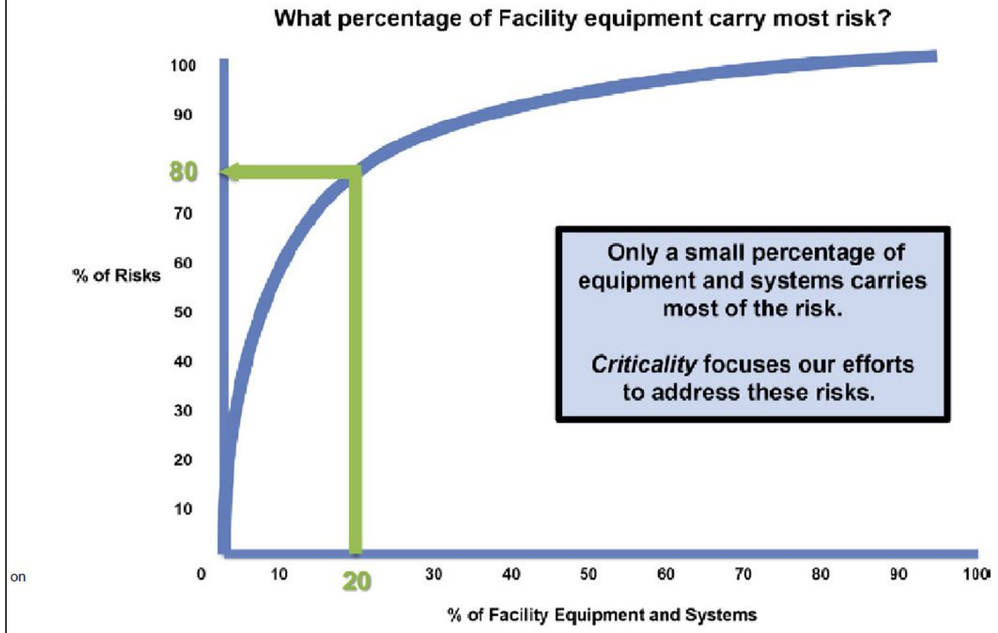


Figure 1.3 *Risk versus percentage of facility equipment.*

Faulty Equipment Can Lead To

Loss of Production

Unoptimized maintenance resources

Decreased Equipment Life

Wasted Energy

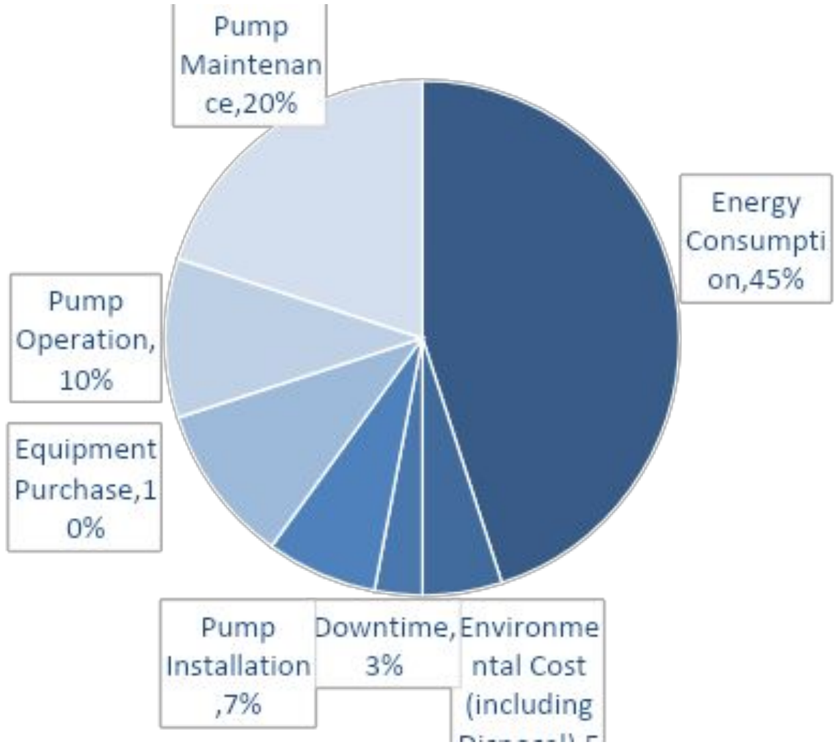
Over or Depleted Inventory

The Road To Smarter Maintenance

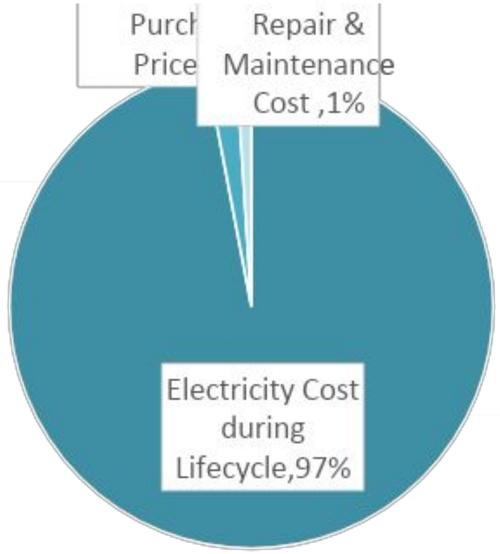
Driving to Sustainability

- 15% of Energy is Wasted in Industrial Plants
- 20 % of Energy is Wasted in Buildings

Lifecycle Costs of Motor Driven Machinery



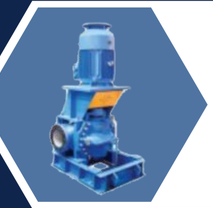
Typical Pump Life Cost Profile



Motor Operating Costs

World Pumps - Identifying life cycle cost is key for maintenance

TYPICAL EQUIPMENT & FAULTS

	MOTOR	Unbalance • Misalignment • Bearing Problem Rotor Bar Problem • Winding Problem • Phase Related Problem
	FAN	Unbalance • Misalignment Bearing Problem • Impeller Related Problem Looseness Problem
	PUMP	Unbalance • Misalignment • Cavitation Blade / Vane Failure Flow Related Problem
	COMPRESSOR	Unbalance • Misalignment Bearing Problem • Screw Mesh Problem Lobe Mesh Problem • Looseness Problem
	GEARBOX	Unbalance • Misalignment • Bearing Problem Gear Problem

8% of Machines Face Serious Issues

Immediate action is needed to prevent costly breakdowns.

93% of Machines Have Shaft Misalignment

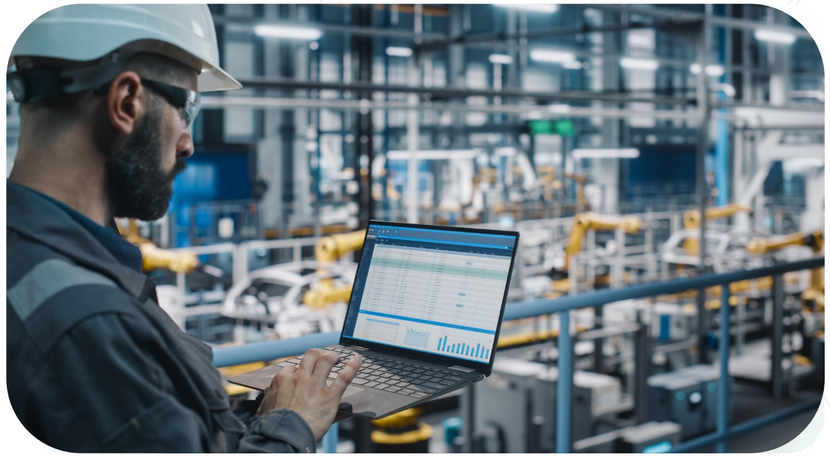
Addressing this now could drastically improve performance.

Catch Just One Issue for Instant ROI even on non-production critical machinery

Eliminating unplanned downtime and saving energy delivers fast returns.

Reliability-Centered Maintenance (RCM)

- Identifying critical assets
- Analyzing failure modes
- Prioritizing maintenance tasks based on severity of fault mode and its potential to cause production loss
- Implementing preventive measures to save unplanned downtime only



Energy-Centric Predictive Maintenance(ECPdM)

- Identifying energy-intensive & critical equipment
- Prioritize maintenance activities based on incremental energy consumption in dollars & severity of the fault & its potential to cause production loss
- This will lead to zero unplanned downtime & savings in energy consumption due to early maintenance action

ENERGY-CENTERED MAINTENANCE (ECM)

ECM = RCM (Reliability Centered Maint.) + Energy Savings

- **Reduce Operating Expenses**
- **Increased Production by Avoiding Unplanned Downtime**

While Also

- **Avoiding energy loss due to inefficient machinery (saving 5 – 15% of utility bills)**
- **Decreasing GHG Emissions**
- **Reducing Carbon Footprint (3-5% global emissions, equivalent to emissions of entire cement sector globally)**

IMPROVE BOTTOM LINE & ENVIRONMENTAL FOOTPRINT WITHOUT IMPACTING TOP LINE

“SUSTAINABILITY”

https://www.amazon.com/ENERGY-CENTERED-MAINTENANCE-GREEN-SYSTEM/dp/0881737798

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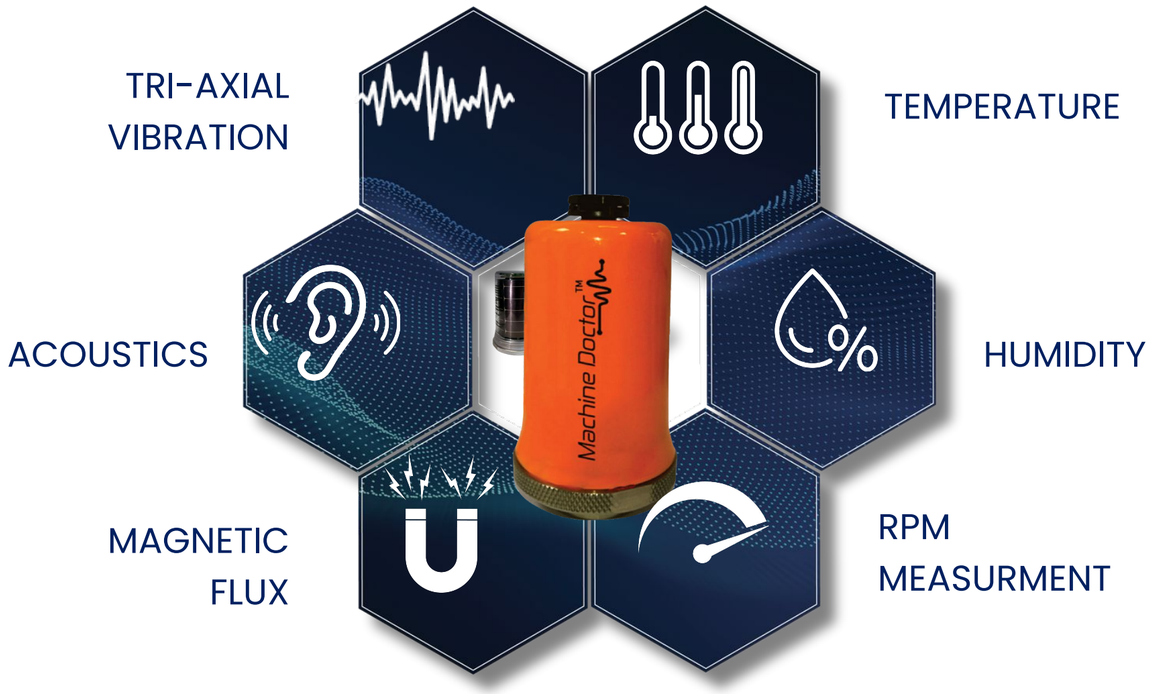
Machine health data is tracked, analyzed and shared directly to your team in field.

Smart IoT Sensor: MachineDoctor



Digitize Your Assets
In < 5 min

A Versatile, Device Agnostic Platform with 35,000 ft to 3 ft view (C suite to technician)

Plant Status

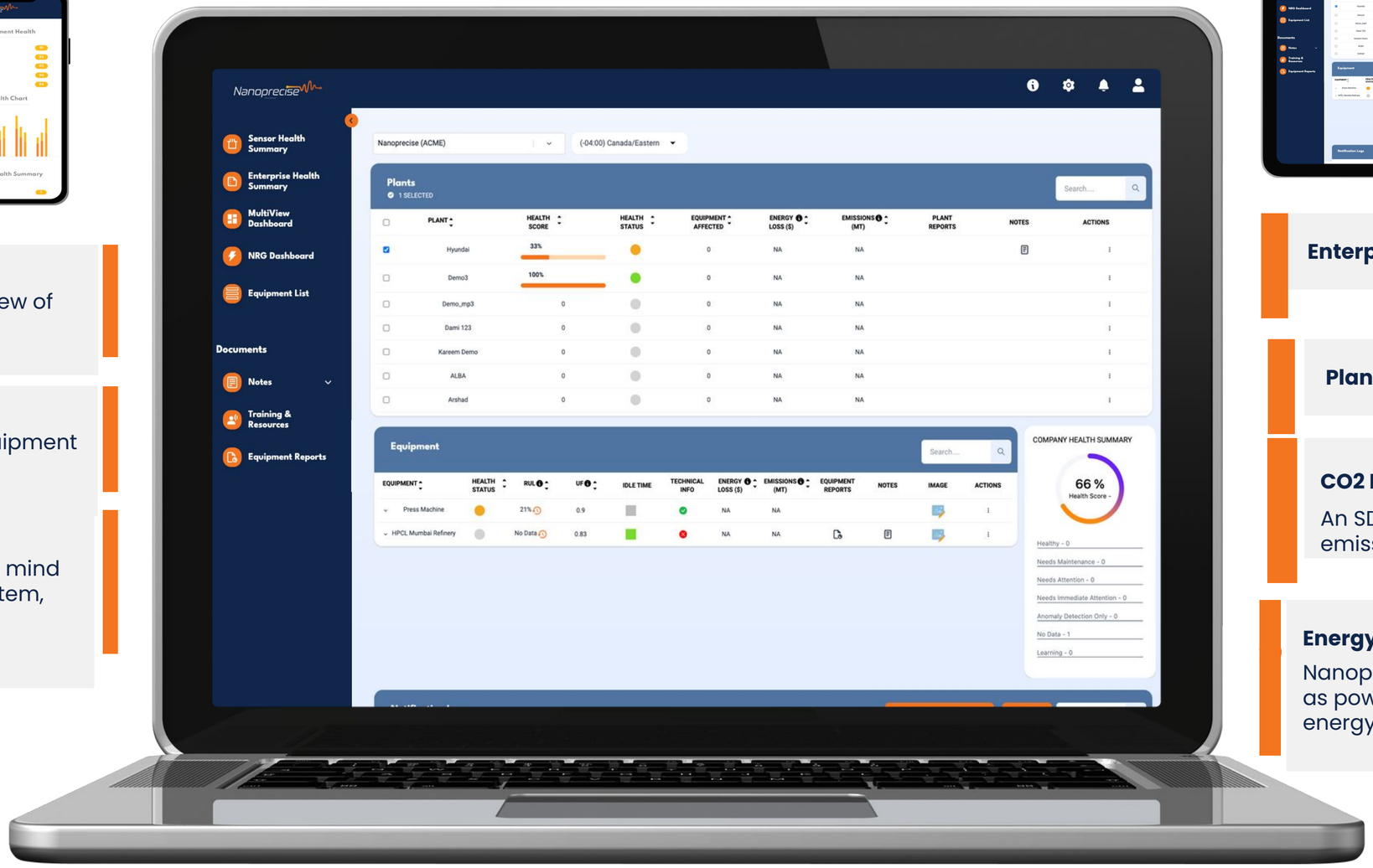
Gives a high-level overview of the customer's plants

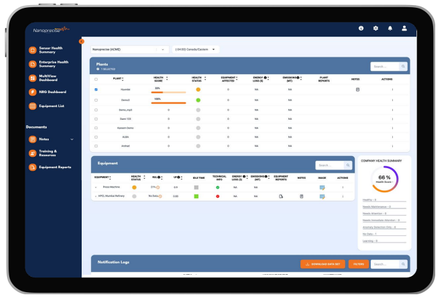
Equipment Status

Displays health of all equipment for each plant

Notification Log

Enables customer's peace of mind with sophisticated alarm system, Offers feedback function, on customer's input





Enterprise Health Summary

Plant Health Summary

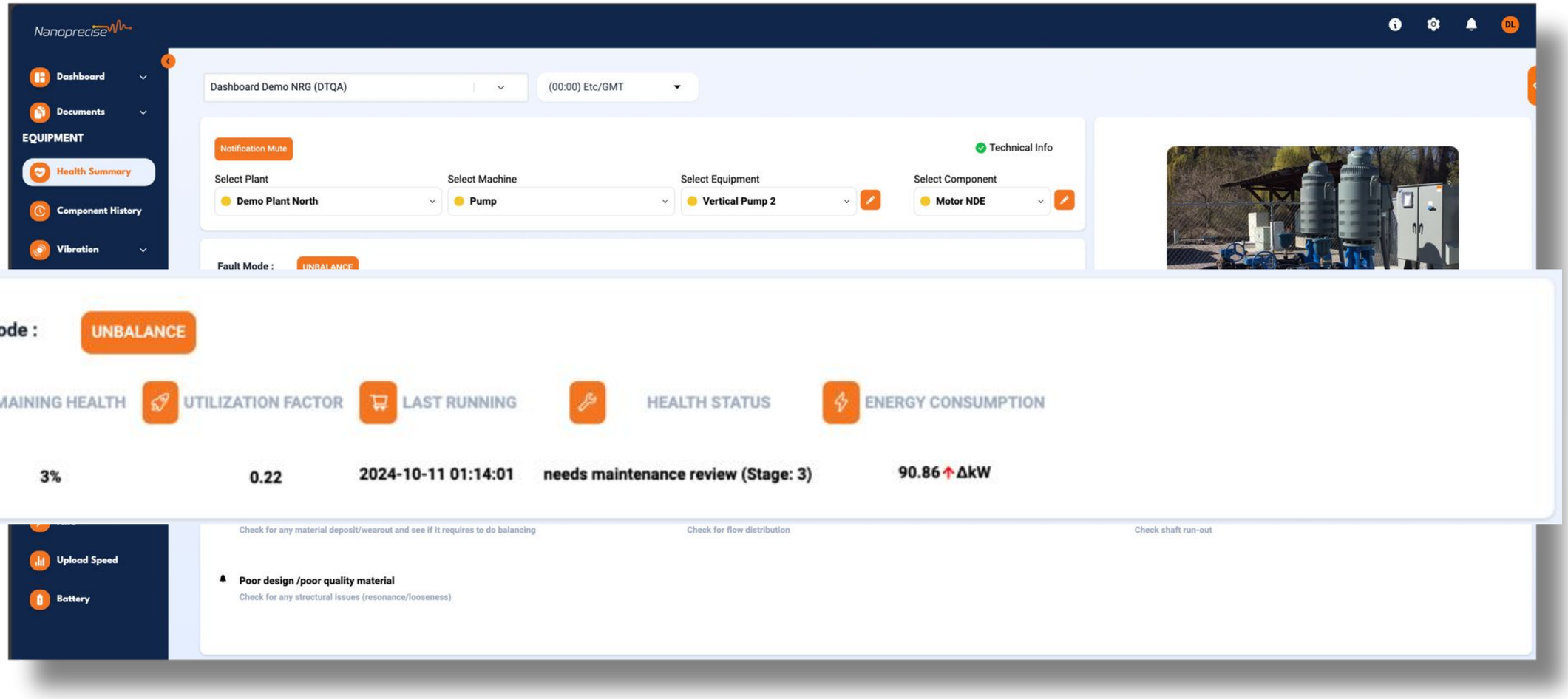
CO_2 Emission Summary

An SDG tool to track CO_2 emissions.

Energy Consumption Statistics

Nanoprecise has features such as power consumption and energy loss statistics

Actionable Insights



Prioritize actions by energy consumption and emissions

Increased Emission

Equipment

Search....

EQUIPMENT	HEALTH STATUS	RUL	UF	IDLE TIME	TECHNICAL INFO	ENERGY LOSS (USD)	EMISSIONS (MT)	EQUIPMENT REPORTS	NOTES	IMAGE	ACTIONS
Vertical Pump 2		3%	0.27			623.3	2.3				
Vertical Pump 1		65%	0.88			829.6	3.1				
Water Pump #2		69%	0.77			268.1	1				

Money Wasted

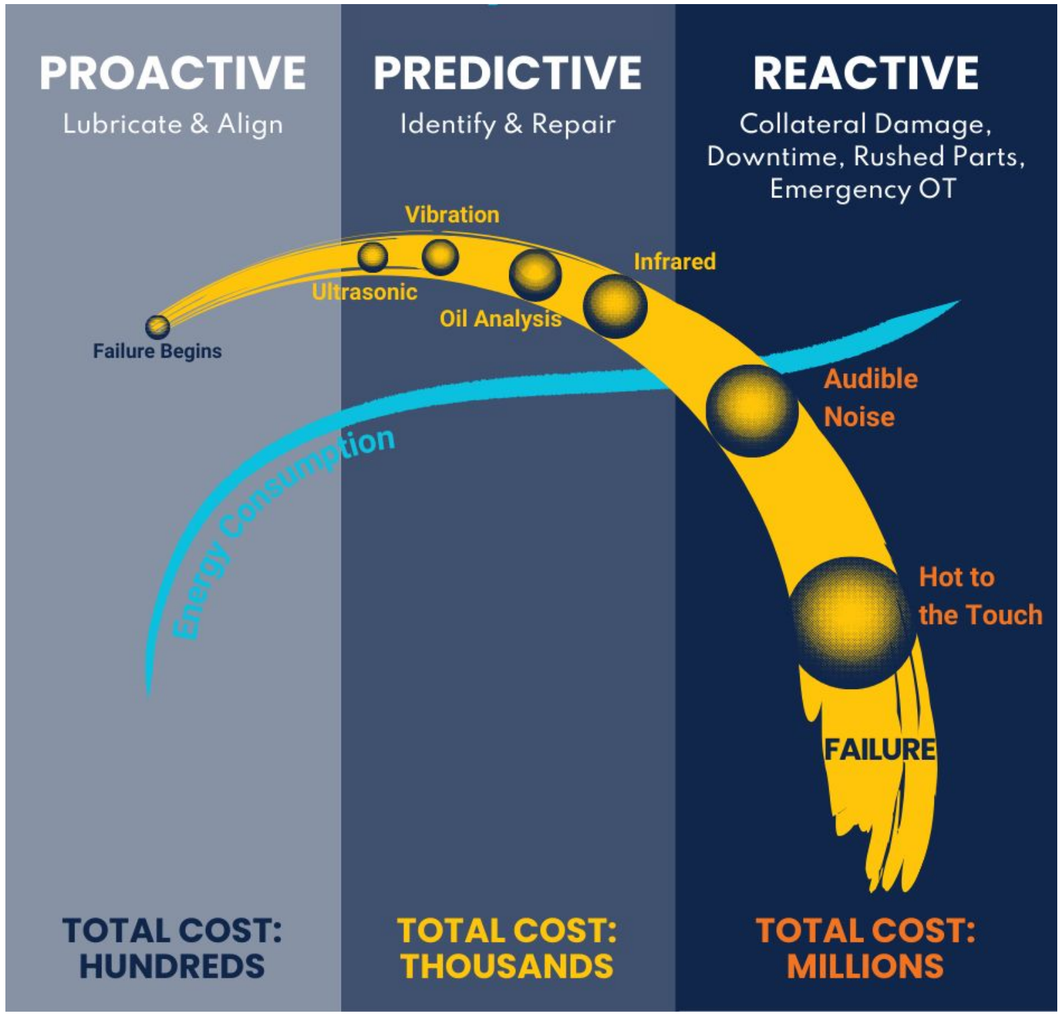
Energy-Centric Predictive Maintenance

- **Reduce** Operating Expenses
- **Increase Production** by Avoiding Unplanned Downtime

While Also

- **Avoiding Energy Loss** Due to Inefficient Machinery
- **Decreasing GHG** Emissions
- Reducing **Carbon Footprint**

Modified P-F Curve with ECM



Success Story

Scalable | Non-intrusive | Precise

Food & Beverage Manufacturer – Preventing Downtime and Energy Waste

Distillery Hammer Mill Motor

Distillery Vacuum Pump

Context

At a global distillery frequent unplanned failures in pumps, fans, and hammer mills caused production losses and energy waste.

Findings

Detected coupling misalignment, bearing wear, and lubrication issues across multiple machines; alerts validated by analysts and addressed through planned maintenance.

Solution

MachineDoctor sensors and the Condition Intelligence platform deployed on critical assets supporting key processes including bottling, milling, distillation, boiler, and fermentation. Priority given to machines without redundancies and those essential to product quality.

Outcome

Nanoprecise proved that their critical alerts and Human In the Loop CMaaS was effective in preventing issues from escalating. No unplanned downtime across monitored assets has been seen. Verified fault correction within two weeks and measurable energy improvement post-maintenance.

Global Pharmaceutical Manufacturer - Scales from 1 to 6 facilities after quick time to value at first site

Context

A global pharmaceutical manufacturer faced frequent maintenance challenges across cooling systems, pumps, and vacuum units operating under strict environmental and compliance requirements as well as staffing issues.

Findings

The system identified faults such as unbalance in cooling tower fans, bearing looseness in pumps, and lubrication issues in motor drive ends. Early alerts enabled planned interventions, preventing prolonged equipment stress and energy inefficiencies.

Solution

Nanoprecise installed MachineDoctor sensors across hundreds of assets in six facilities, monitoring vibration, temperature, acoustics, humidity, and magnetic flux. Centralized visibility through the Condition Intelligence platform enabled consistent health tracking and early fault detection.

Outcome

Success at the first facility where the project prevented 136 hours of unplanned downtime and revealed $42,800 in excess energy usage, leading to targeted maintenance improvements led to a rapid ROI. After confirming the ROI, the customer planned expansion to five other sites to reap additional benefits.

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Download Our Brochure

Download Our E-book on how ECM expands the RCM Playbook