CATERPILLAR ANALYTICS

MORGAN VAWTER

CHIEF ANALYTICS DIRECTOR

in Linkedin.com/in/MorganVawter

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MORGAN VAWTER

Born and Raised in Georgia

Started Tinkering With Computers In Middle School

Started College at 16 in a STEM Program

Taught Business Analytics Management at Columbia University

Head of Data Management and Digital Analytics in North America

Accenture Interactive
Part of Accenture Digital

Joined Cat as Chief Analytics Director

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ILLINOIS SCIENCE & TECHNOLOGY COALITION

Joined Illinois Science & Technology Coalition Board
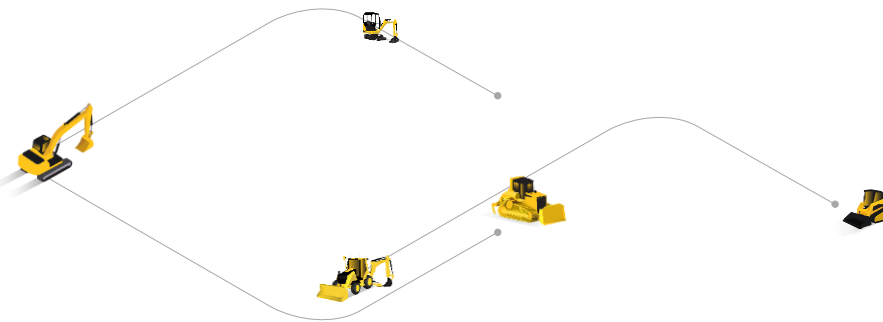
COLUMBIA UNIVERSITY

Georgia

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200 TAXICABS

BUT EVEN OUR
SMALLEST MACHINES
ARE CONNECTED

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OUR SOLUTIONS HELP OUR CUSTOMERS
BUILD A BETTER WORLD

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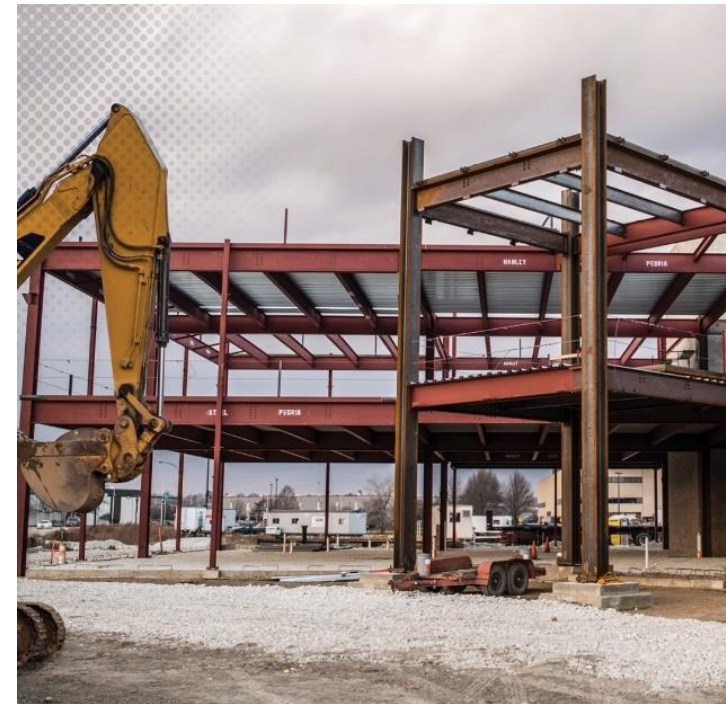
OUR ENTERPRISE OBJECTIVE

WE MUST BE CUSTOMER CENTRIC, DATA DRIVEN AND PURPOSE LED

IDENTIFY CUSTOMER NEEDS AND SERVE THEM

MAKE DATA-DRIVEN DECISIONS

IMPROVE SPEED AND AGILITY

ENGAGE PRAGMATIC, CREDIBLE LEADERSHIP

KEEP PACE WITH CUSTOMER EXPECTATIONS FOR TECHNOLOGY AND INSIGHTS

SEIZE AFTERMARKET OPPORTUNITY

DELIVER COMMITMENTS TO OUR PEOPLE, OUR PARTNERS, OUR CUSTOMERS AND OUR SHAREHOLDERS

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OUR BRAND PROMISE

CHAMPION FOR OUR CUSTOMERS' ENDURING SUCCESS

» The way our customers succeed is changing.

APPRECIATED • SECURE • EFFORTLESS

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WIN WITH DATA & ANALYTICS

DIGITAL DRIVEN VALUE

IRON DRIVEN VALUE

TELEMATICS

FINANCING

SUPPORT AGREEMENTS

MACHINE ALERTS

PARTS & SERVICE

MACHINE DATA & ANALYTICS
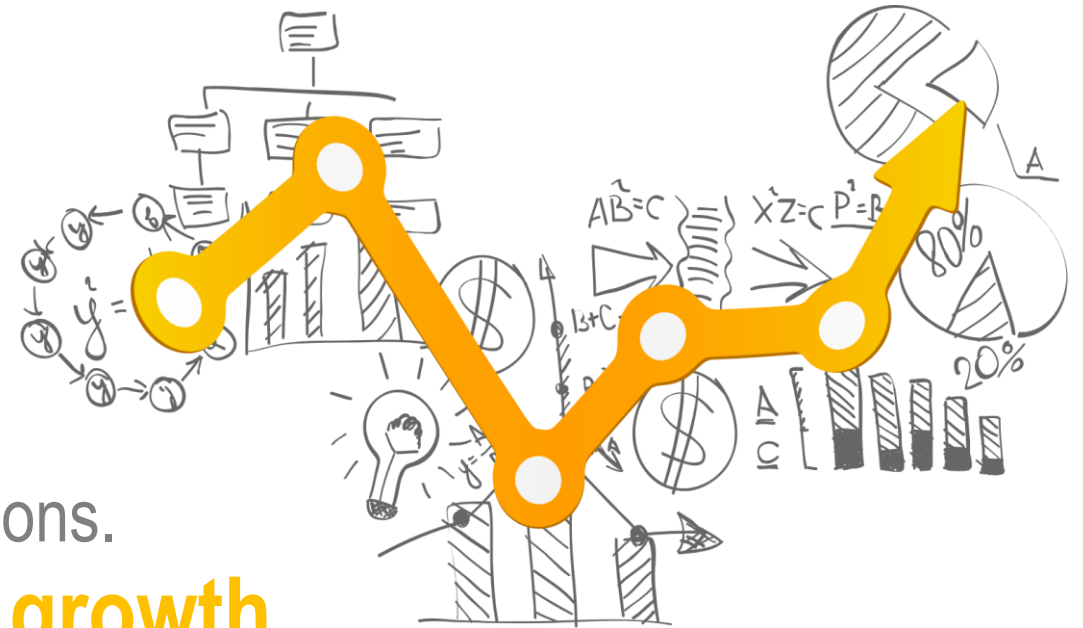
ENTERPRISE

JOBSITE

ASSET

YEARS

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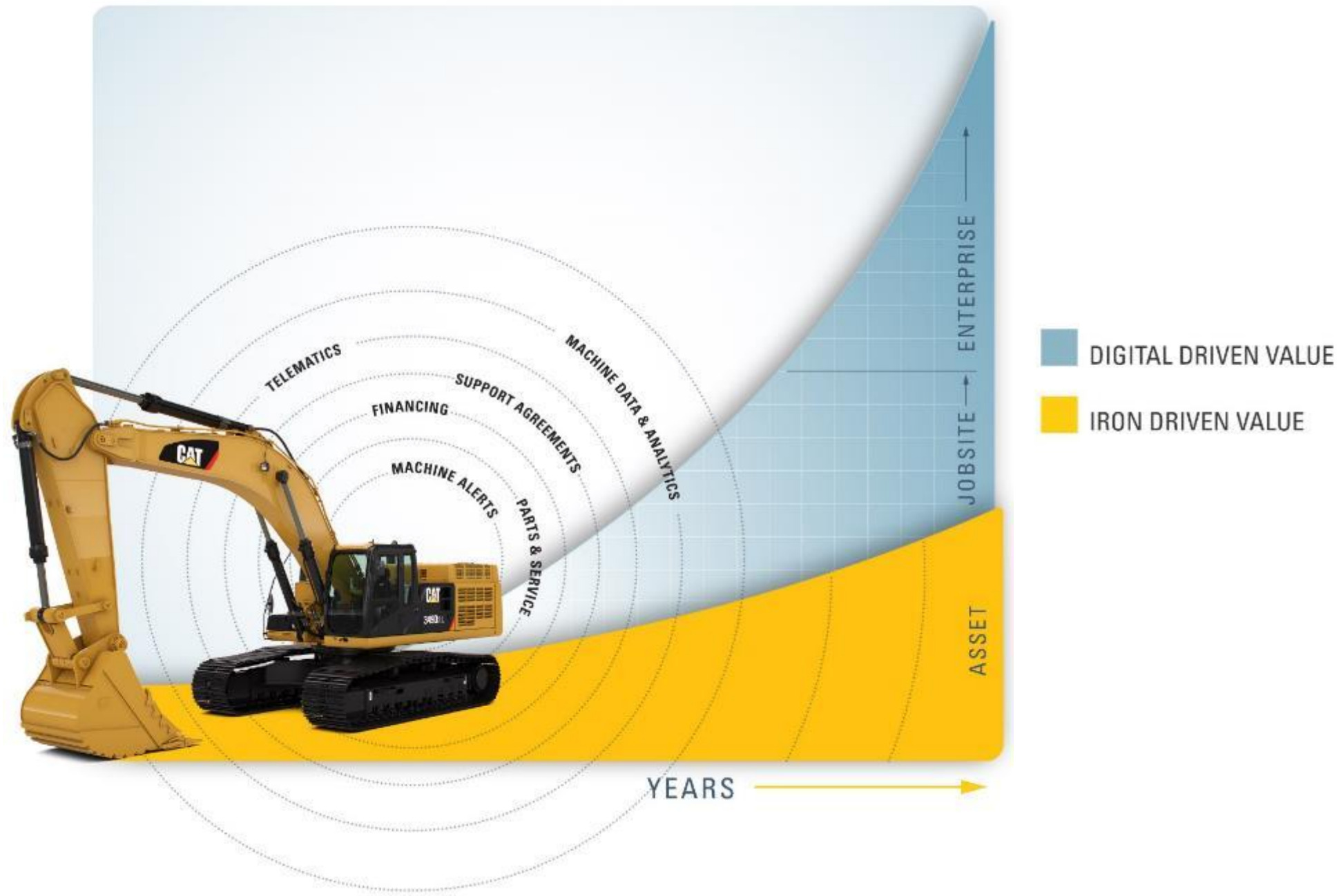
WHY ANALYTICS IS IMPORTANT

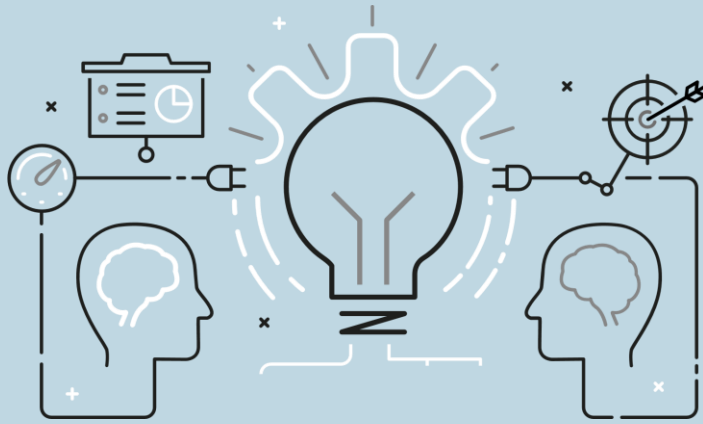Companies applying sophisticated Data Analytics regularly as part of their business enjoy **OPERATING MARGINS** that are **8% HIGHER** than lagging organizations. They also tend to show **INCREASED revenue growth** and **LOWER RISK profiles.**

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WHY ARE COMPANIES NOT CONSISTENTLY REALIZING VALUE IN ANALYTICS?

Data Analytics Skills Gap Across Industries

Many companies not leveraging advanced analytics tools or predictive analytics techniques

Cultural change needed for better utilization

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▶ **Complacency**

What are we really up against?

CULTURE

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▶ Competing Priorities

▶ Resistance to Change

▶ Skepticism

FRAMEWORK FOR SUCCESS: THE ANALYTICS DELTA

DATA — Analytics team centrally manages data access, quality and integration

ENTERPRISE — Enterprise approach for leveraging analytics and managing analytics demand

LEADERSHIP — Active, visible executive sponsorship of Analytics across the business

TARGETS — Analytics resources allocated using profitable growth targets

ANALYSTS — Analytics team centrally manages analytics talent – including university engagement, recruiting, career paths, and training across the enterprise.

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SUCCESSFUL ANALYTICS

"If you build the technical analytics too far ahead of the organization, your efforts will be wasted"
Robert Morisson – Author of "Analytics at Work"

ARTIFICIAL INTELLIGENCE FOR PRODUCT DEVELOPMENT

Opportunity

- Launching new offerings or improving existing offerings requires significant investment in product development

- Reduce product development costs by leveraging Analytics for Virtual Product Development to iterate new designs in simulation before any prototypes are built
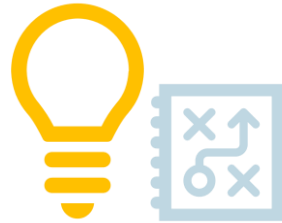
Analytics Solution

Develop Virtual Operator Models that are representative of Human Operators. Improve simulation efficiency through automated learning with realism and variability.

Leverage Artificial Intelligence (neural network reinforcement learning) to train the virtual product development program to operate a machine by itself.

Make building operator modeling something non-experts can do easily. By integrating the operator models into standardized engineering tools.
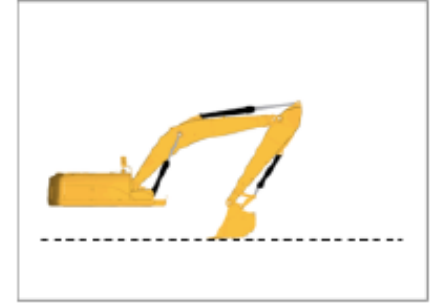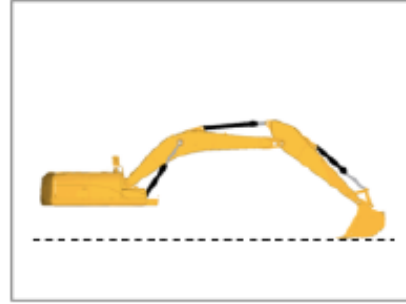
Results

✓ Significantly reduced product development costs and improved quality

✓ Building block for Operator Assist & Autonomy
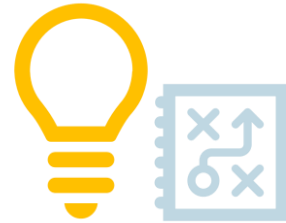
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ASSURANCE OF SUPPLY

INCREASE material availability. **REDUCE** network cost. **INCREASE** revenue recognition.

Opportunity

Complex supply & logistics ecosystem

- 11,500 supplier facilities, 130+ Caterpillar facilities
- Largest global heavy equipment shipper, managing over 50K shipping notifications daily

Analytics Solution

Developed Assurance of Supply Center to provide end-to-end Supply, Production and Logistics visibility

Predictive and prescriptive analytics to optimize performance

Supplier portal providing 100's of suppliers with real-time visibility into their performance metrics, engagement, risks, and opportunities

Results

✓ Improved supplier shipping performance
✓ Rapid root cause analysis and correction
✓ Reliable factory availability
✓ Customer centric inventory targets

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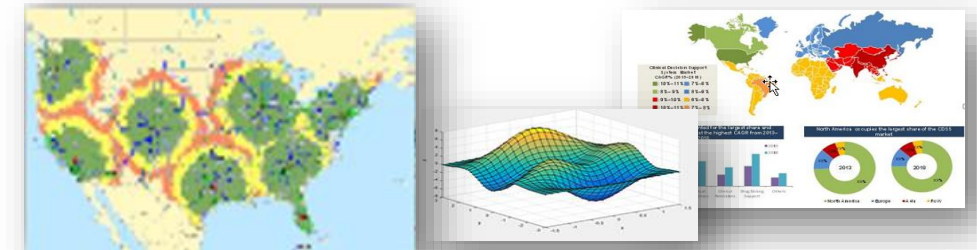
MANUFACTURING OPTIMIZATION

**MAKE** effective use of capacity to **MEET** demand.

Opportunity

- Understand global capacity and asset burden
- Increase capital requirement understanding, reduce evaluation time, aid future demand management, and manage resources with demand fluctuations
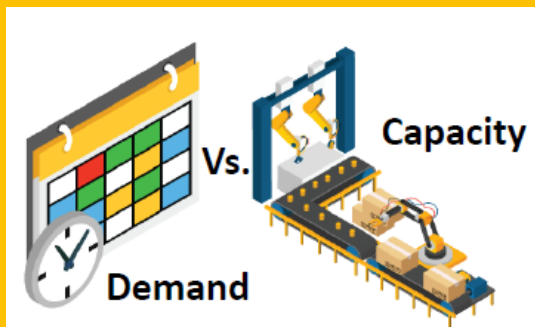
Analytics Solution

- **Build** reusable manufacturing data model
- **Simulate** predictive forecasts and test using what-if analyses
- **Link** forecast to asset utilization
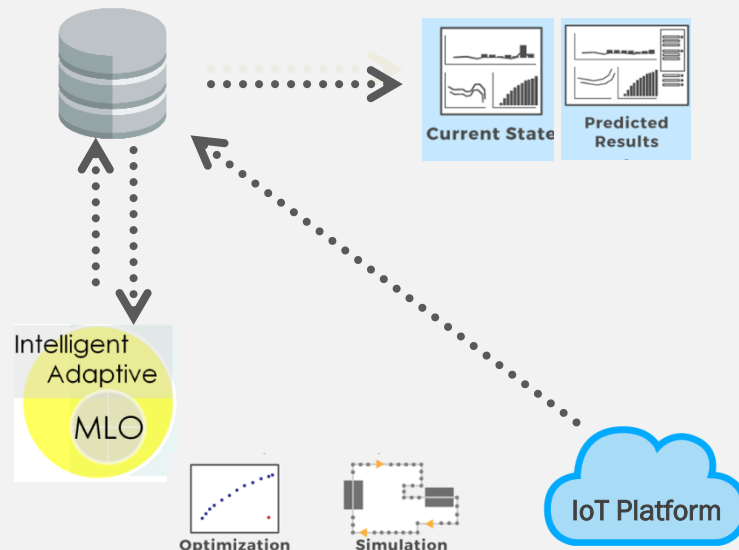
Results

- ✓ Real-time system tracking, warning and recommending changes delivered to the hands of planner and manufacturing engineer

- ✓ Optimized routing of demand, increasing asset utilization and velocity

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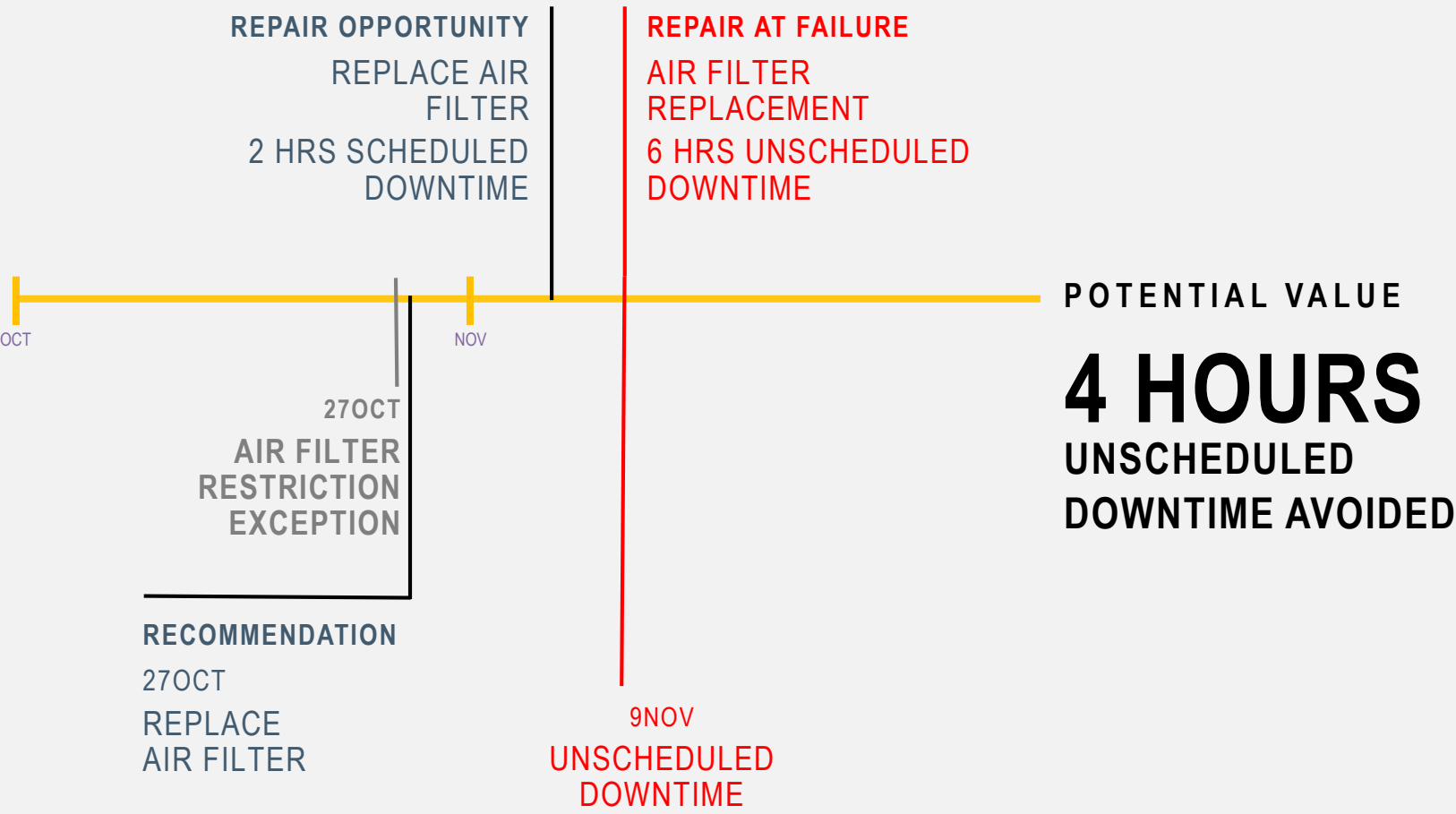# WHAT OUR CUSTOMERS ARE ASKING FOR

SAFETY

PERFORMANCE

AVAILABILITY

PRODUCTIVITY

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ASSET PERFORMANCE THROUGH PREDICTIVE MAINTENANCE

AIR FILTER EXAMPLE

REPAIR OPPORTUNITY
REPLACE AIR FILTER
2 HRS SCHEDULED DOWNTIME

REPAIR AT FAILURE
AIR FILTER REPLACEMENT
6 HRS UNSCHEDULED DOWNTIME

OCT

NOV

27OCT
AIR FILTER RESTRICTION EXCEPTION

RECOMMENDATION
27OCT
REPLACE AIR FILTER

9NOV
UNSCHEDULED DOWNTIME

POTENTIAL VALUE
4 HOURS
UNSCHEDULED DOWNTIME AVOIDED

EXPANDED POTENTIAL VALUE

120+
TOTAL INSTANCES ACROSS SITES

100 UNSCHEDULED
20 SCHEDULED

100 x 4 Hours =
400 Hours
UNSCHEDULED DOWNTIME AVOIDED

AVERAGE RECOMMENDATION
8+ DAYS IN ADVANCE

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INCREASING RELIABILITY – CAT EQUIPMENT CARE ADVISOR

» MEAN TIME BETWEEN SHUTDOWNS   (25-30% INCREASE)

» % SCHEDULED WORK   (10-15% INCREASE)

» MEAN TIME TO REPAIR   (20-25% INCREASE)

» REPAIR COST   (1/10 SAVINGS RATIO)

» COMPONENT LIVES   (10-25% INCREASE)

» PHYSICAL AVAILABILITY   (3-5% INCREASE)

» SPEED OF PROBLEM IDENTIFICATION   (75% TIME REDUCTION)
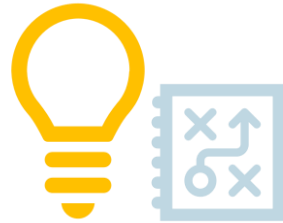
MULTIPLE ENGINE OPTIMIZATION

LESS fuel consumption. **LESS** harmful emissions. **LESS** maintenance on vessels

Opportunity

- Fuel cost in marine industries can be as high as 10% of revenue.
- There is a large demand for maximization of engine operating efficiencies and lower fuel consumption.

Analytics Solution

Utilize fuel & emission maps and optimization algorithms to dynamically determine the best power allocation among engines for every load situation

Automatically select the best combination of engines from

Integrate the technology into a fast and easy-to-use tool that can be used by dealers and integrate MEO into the power management system on board

Multi-Engine Dynamic Asymmetric Load Allocation
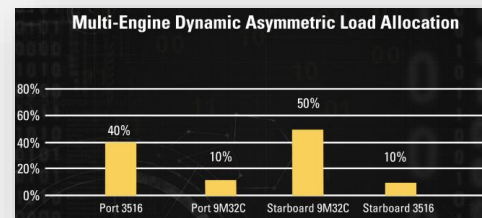
Results

✓ Reduce the number of engines operating and amount of fuel burnt (5%~20%)

✓ Cut NOx emission (5%~50%) and be environment friendly

✓ Improve performance, reliability and efficiency of CAT power system

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JOB SITE SOLUTIONS

Opportunity

- A key customer, a large aggregate producers - has a limestone quarry with a mixed fleet
- The quarry was not hitting 1300 Ton/Hr production plan and wanted to evaluate a bigger fleet, and moving a large crusher to the tune of $10M

0: 0: 0:52: 8

Speed (Km/Hr): N/A   0   15   30   45   60

What you see here is the customer job site operation modeled using predictive analytics. This simulation runs quickly, so we can simulate months of operation in a few minutes.

Results

✓ Recommendations resulted in 27% cost savings for the customer.

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3 KEY TAKEAWAYS

1. Build a strong foundation for analytics by developing **DELTA** (Data management, Enterprise operating model, Leadership alignment, Targets, Analytics talent development)

2. **Balance focus** on the **organizational** and **technical** aspects of analytics

3. **Think big, start small and optimize results**

Cost Reduction

Faster, better decision making

ANALYTICS

New products & services

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