Asset Monitoring & Predictive Maintenance
A Turnkey IoT Solution for Manufacturing
We understand maintenance operations

We will bring a multi-disciplinary team with an integrated perspective of maintenance operations

From the fundamentals…
A comprehensive maintenance program includes an integrated set of people, process, and technology elements

...to advanced enablers & accelerators
Exponential technologies can augment, rather than replace, programmatic elements, allowing more rapid and robust leveraging of information to drive step-function improvement
Unlocking value through Smart Predictive Maintenance

Smart Predictive Maintenance can deliver additional value than traditional maintenance methods

- **ASSET MONITORING & HEALTH**: Real-time data on individual assets is displayed
- **CONDITION-BASED MAINTENANCE**: Parameters are established and intelligent alerts are generated
- **PERFORMANCE-BASED MAINTENANCE**: Parameters are tweaked and optimal performance ranges are defined
- **PREDICTION-BASED MAINTENANCE**: Models predict when an asset will fail
- **SMART PREDICTIVE MAINTENANCE**: Maintenance planning is automated and execution enhanced by digital technologies
Traditional maintenance process today

I don't know what happened. It just stopped working.

Well that took all afternoon.

How long is it going to be down this time?

Even with all these extra parts, I still don't have what I need. Going to have to order one.

Three days??! Just get it to me as quickly as possible.

I'm tired of waiting for a 'new' process that never makes things better.

Being down 3 days is really going to hurt our numbers this month.

Every month we keep getting worse. Something has to change!

Three days?!! Just get it to me as quickly as possible.
Common Maintenance Issues

Every month we keep getting worse. Something has to change!

- Unplanned downtime and machine failure
- Low plant velocity and throughput (downtime-related)
- Low OEE and machine availability
- High spares inventory and maintenance costs
- Poor first-pass-yield (FPY) and quality metrics
- Rework caused by out-of-spec machine
- Missed delivery dates
- Inability to identify root causes
- Risk to employee / public safety and environmental impacts
Our approach
We utilize our Think Big, Start Small, Scale Fast approach to tackling issues such as predictive maintenance

Think big
No one ever got anywhere important without pushing the envelope.

In today’s hyper-competitive world, innovation is everything. If you’re not thinking big—like really big, the competition’s buzzing by. We know how—and where—to use IoT to create an actionable plan that can put your business ahead of the pack.

Start small
It’s important to know how much is too much, and we have this down to a science.

By pursuing maximum innovation, it’s really easy to go too fast too quickly. That’s why we design a game plan with achievable phases and just the right amount of ambition. We then apply powerful technology to real-life customers and environments. This all sums up to quick wins and big insights.

Scale fast
Our knowledge and service breadth allow us to move quickly and get results.

Going fast requires a deep and dynamic team. With our powerful blend of cross-functional capabilities, creative thinking, and pre-built assets, we can ramp up lightning-quick. Leaning on our global network, as well as an ecosystem of alliances, you can rest assured we have the people and breadth to deliver big results—and real business value—at the speed of tomorrow.
Predictive Maintenance, Why Now?

PdM has been around for years, but reduced cost and improved analytics have finally made it worth pursuing.

Collecting, storing and processing IoT-sized data used to be cost-prohibitive, but today it’s adding value.

And technology has gone far beyond traditional spreadsheets, graphs and charts.

Source: Deloitte analysis | DUPress.com
A Turnkey IoT Solution for Manufacturing

This out-of-the-box accelerated solution for high impact IoT use cases combines best-of-breed analytics, software, infrastructure, security, and professional services into a single pre-configured solution.

**Best of Breed Solution**

**Attributes**

1. 8 week proof-of-concept to drive new outcomes
2. Quick and easy setup and data analysis
3. Edge data acquisition and analytics
4. Immediate business results from analyzed data
5. Global distribution, services, and scalability
A Turnkey IoT Solution for Manufacturing

This out-of-the-box accelerated solution for high impact IoT use cases combines best-of-breed analytics, software, infrastructure, security, and professional services into a single pre-configured solution.
Maintenance re-imagined with a turnkey IoT solution

Hi Jim, it's great to be here. I'll have everything set up by the end of the day.

Great, another easy fix.

With this we can remotely monitor the machines health.

We're connected and starting to receive new data already.

With all this information, our condition-based model is really going to help.

Machine 1 will fail in the next 4 days.

With a click of a button I got the right parts and was able to fix the machine before it went down.

Wow! Every month we keep getting better!

I never thought change could be seen in such a short time.
Project scope and deliverables
The POC will deliver a working product

POC Project Scope
- Single Asset
- Single Plant Location
- Turnkey IoT Solution Maintenance Accelerator
- Maintenance Program for the POC asset
- 8 week program (discovery phase, sprint development phase, release phase)
- Agile delivery (agile training to be included)
- Not in scope for POC
  - Security requirements
  - Solution industrialization
  - Enterprise maintenance program

Key Project Deliverables
- Maintenance POC Solution, minimum viable product (MVP) including:
  - Connectivity / data ingestion (e.g., MES, OSIsoft historian, existing sensors)
  - New active sensors (or sensor array) as needed
  - Predictive analytics / algorithms
  - Dashboards / Visualizations (max 4 Personas)
- POC asset performance baseline and asset-specific maintenance assessment (including gap assessment)
- Initial (quick) recommendations for improving existing maintenance program
- Rollout phasing and scaling considerations
Utilize an Agile Methodology

Agile can deliver business value by...

- Allowing Business/IT to respond quickly to changing needs
- Reducing the time between request and delivery
- Building only the software needed
- Avoiding delivering software with quality problems
- Meeting project commitments by reprioritizing scope

Agile Process

Potential Results

- Program of frequent releases means quicker speed to solution
- Smaller batches of work can mean easier focus on quality control and risk management
- Increased user involvement provides greater visibility of progress and product
- Less process and more discipline means an organization that can be more responsive to change
- The scope of the product and its features become the variable, rather than the cost or time
- More active involvement, self-organization and autonomy increases employee engagement
Sprint Approach

A typical project has 3 phases: Discovery, Sprint/Development Cycle, and Release. Each of these phases have a specific purpose and the Agile Scrum nature is implemented in the Sprint Cycle Phase.

**Discovery Phase**
(1 WEEK)

- Assess current state and prepare for build
  - Establish project and develop charter
  - Conduct workshop sessions and agile development training
  - Collect maintenance process and asset performance data
  - Define pre-requisites, use cases, as-is technical architecture
  - Create personas, user stories, journey maps
  - Baseline asset-specific maintenance process and identity issues/challenges
  - Execute communication activities
  - Gather/define requirements
  - Define reliability criteria
  - Create component level asset tree
  - Conduct criticality assessment training
  - Conduct top-down estimate of POC MVP rollout cost across similar machines network-wide

**Sprint Cycle Phase**
(6 WEEKS)

- Design, build and iterate solution & processes
  - Conduct component criticality assessment
  - Identify failure modes
  - Conduct root cause analysis for failure modes
  - Build minimum viable product
  - Collect/detect data failures
  - Update training material after each sprint cycle
  - Work with users to gain feedback for next sprint cycle
  - Manage communication approach and ongoing communications to stakeholders

**Release Phase**
(1 WEEK)

- Maintain, release solution and assess value proposition
  - Establish KPIs to monitor progress
  - Train end users on new processes/technology
  - Conduct user acceptance testing (UAT)
  - Sprint release of incremental part of viable system
  - Updated product backlog
  - Conduct interviews to understand and document implications of broader maintenance process changes across network
Predictive Maintenance Solution - MVP

The Minimum Viable Product (MVP) is a development technique in which a new product is developed with sufficient features to satisfy early adopters. The final, complete set of features is only designed and developed after considering feedback from the product's initial users.

**MVP Objective**

The MVP should deliver an enhanced preventive/predictive maintenance program with a responsive web application that will bring insight into asset performance trends & potential failures.

**MVP Capabilities & Characteristics**

- Analyze and classify asset component criticalities
- Assess and augment (as needed) sensor array
- Collect data from sensors & PLCs
- Analyze data to predict impending failures
- Create/augment maintenance programs
- Create visualization

With all this information, our condition based model is really going to help.
Attaining Value in Scale

The initial investment lays the foundation to scale the vision by creating the platform, metrics, and predictive algorithms, which can also improve with scale as users learn from each other.

One-time costs:
- Platform / applications
- Algorithms
- KPI / Metrics
- Training materials

Week 7

Machine 1 will fail in the next 4 days.

Recommendation:
- Schedule Repair
- Order Parts

ACCEPT
The Turnkey IoT Solution Drives Value

Smart Predictive Maintenance drives real value that can be realized in weeks instead of months and years

Smart Predictive Maintenance Value*

- **Increased OEE**
  5% – 15% (availability, performance, quality)

- **Reduced Unplanned Downtime**
  15% – 30%

- **Increased Throughput and OTD**
  10% – 20%

- **Reduced Maintenance Costs**
  20% – 30%

- **Improved Quality**
  10% – 35%

Other Potential Benefits

- Increased customer satisfaction with improved ability to make deliveries on-time or to deploy smarter MRO aftermarket service
- Improved forecasting of planned shut-downs with less “fire-fighting” and increased wrench time
- Enhanced spares planning and inventory optimization
- Reduced buffer WIP due to increased reliability
- Reduced spend on expediting parts
- Reduced OEM spend
- Improved resource planning, with less unplanned overtime
- Improved safety and sustainability

*Benefit ranges based on case studies