Asset Performance Management
How Honeywell Connected Plant Delivers Better Asset Performance

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INDUSTRY CHALLENGES

Unplanned Downtime

Unexpected equipment failure and bad maintenance
- 92% of maintenance shutdowns unplanned

Sold Out Asset Capacity

Tough to find more operating efficiency
- $60B in lost opportunity in 2017

Balancing Asset Reliability with Maintenance

Too much, too little maintenance and failed maintenance
- 45% of maintenance causes new problems

Loss of Expertise

Aging workforce and new employee job tenure
- 12 months to train a new hire for 24 months in the role

* 250,000 barrel per day facility

- ISOLATED PRODUCTION, ASSET & MAINTENANCE SYSTEMS
  - $61M loss per year

- DECISIONS AND ACTIONS ARE NOT DATA DRIVEN
  - $1M miss per day

- OPERATIONS ARE OFTEN TOO REACTIVE
  - $55M cost per Year

- UNTAPPED DATA IS LEAVING MONEY ON THE TABLE
  - 10K retire per day
WHAT IS APM 4.0?

“Asset Performance Management (APM) encompasses the capabilities of data capture, integration, visualization and analytics tied together for the explicit purpose of improving the reliability and availability of physical assets. APM includes the concepts of condition monitoring, predictive forecasting and reliability-centered maintenance (RCM). “

Gartner Definition

Image source: LNS research
“All of these systems generate a lot of data making it practically impossible for site engineers to gather, correlate and analyse data to predict and prevent equipment failures”

Customer quotes, Refining

“Timely data correlation, analysis is key to us understanding process and equipment related issues in order to reduce lost production and maintenance costs”

- PRODUCTION, ASSET & MAINTENANCE SYSTEMS ARE SILOED
- UNABLE TO TURN DATA INTO ACTION IN A TIMELY MANNER DECISIONS
HCP SOLUTION: HCP ASSET PERFORMANCE

Secure, Scalable, Edge to Cloud Connectivity

Rule, and Model Based Early Event Detection and Notification

Integrated ML, Predictive, and Visual Analytics

Open Ecosystem for OEM and Knowledge Vendors

Closed Loop

Visualization, Events & Business Process

ML, Visual Analytics

OEM

Connected Historian

Calculations, Analytics

Condition Health Monitoring

Advanced Machine Diagnostic

DCS

Historians

SAP / Work Orders
Overview of the Discussion

A Connectivity Of Data Sources

B Application of Rules, Models and Analytics

C Closing The Loop with People & Workflow
HOW DO I GET THE DATA?

New ControlEdge GW
Edge to Cloud

Honeywell Connected Plant Asset Performance

SDX
Historian
Secure Data Exchange

DCS

3rd Party Cloud

CEGW
Data

Stranded Assets

SDX
DCS

Data

Data

Data

Data

DCS

LIMS
ERP
Plan
MES
CHM

SDX
OEM
HOW DO I GET THE DATA?

Cloud Applications
- Asset Analytics
- Connected Historian
- KPI Dashboard
- Visual Analysis
- Collaboration Environment
- Process Analytics

Secure Data Transport
- Plant Gateway

The Edge
- Data Aggregation
  - Edge Gateway
  - DCS Server
  - Historian
  - SCADA
- Advanced Analytics (New)
  - OEM / Third Party Software
- Basic Analytics (New)
  - Stranded-Asset Data Acquisition Edge Device
  - DCS Controller
  - PLC
  - RTU
- Data Collection
  - On / Off-Process Data Acquisition Edge Device

Full-Capability Edge Devices
- Traditional Control System
- System-to-System Data Flow (FUTURE)

Asset Data
- Valued Assets
- Smart Protocol IO
- Traditional IO
- Process Data

Low-Cost Sensors
- Lab Test Data

Ancillary/Environmental Data
HOW WHAT HAPPENS TO THE DATA?

Data Ingestion → Data & Event Streaming → Self-Serve Analytics

- Graphics & Trends
- Event Management
- Notifications
- Manufacturing Intelligence
- Cloud Historian
- High Performance Storage
- Data Lake
- Data Lake Big Data Storage
- Batch Analytics / Machine Learning

- Data Cleansing & Preprocessing
- Calculations / Digital Twins
- Real-Time Analytics
- Fault Monitoring & Event Detection
- Real-Time Analytics
- Digital Twins
- Fault Monitoring
ANALYTICAL APPROACH

RUN TIME ANALYTICS

Real-time model execution engine to ‘operationalize insights’

Condition & Performance Monitoring:
- First Principle Models
- Calculations
- Empirical / Data Driven
- ML Models

CONNECTED ANALYTICS TOOLS

Analytic tools using a variety of methods used to refine model creation

Packaged 3rd Party Tools & Developed Applications

Data Ingestion

Data & Event Streaming

Cloud Historian
**EVENT MANAGEMENT & VISUALIZATION**

### EVENT MANAGEMENT

- **Real-time early event detection and management**
  - Event, Deviation Detection, Fault Modelling
    - Heuristic
    - Rule Based
    - Model Trained
  - Fault Prioritization
    - Fault Severity *
    - Asset Criticality

### VISUALIZATION

- **Data & Event Streaming**
- **Data Ingestion**
- **Cloud Historian**
- **Data Lake**
- **Big Data Storage**
- **High Performance Storage**
EXPANDING INSIGHT BEYOND YOUR ENTERPRISE

Customer and partner collaborate on the same asset, using the same data and analytics.

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<th>Rot_A</th>
<th>Recips_A</th>
<th>Pumps_A</th>
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Ecosystem Partners

Ecosystem partners can only see those assets for which they are providing service.

Honeywell Connected Plant
Asset Performance

Honeywell Connected Plants

A B C D

Onsite

OEM
CLOSING THE LOOP WITH MAINTENANCE

Data → Analyze → Predict → Event Detection → Notify → REVIEW

DO → ADJUST → PLAN
CLOSING THE LOOP WITH MAINTENANCE

Identified Lubrication May Be Required within next 5 days

NEXT PLANNED LUBRICATION IS IN 10 DAYS

Do I slow down or do I adjust or modify the plan?

Planned Work Order is now modified to a Corrective and planned to take place in the next 3 days
CLOSING THE APM LOOP - A HOLISTIC USE CASE

Honeywell Sentience

**EAM/ERP Integration**

**Connected Plant | Honeywell Sentience**

**HCP Asset Performance Insight**

**HCP Skills Insight**

**HCP Connected Historian**

**Orange, TX**

**Operator Rounds**

**Work Instructions**

**AR/VR Training Simulations**

**Remote Expert**

**AR/VR Training Simulator for Critical Work Processes**

**Remote Expert & Work Instructions**

**Asset Data**

**Process Data**

**DCS**

**Orange Training / HSSE / Field Ops**

**Operator Rounds**

**Work Instructions**

**AR/VR Training Simulations**

**Remote Expert**

**Remote Expert & Work Instructions**

**Orange Maintenance & Reliability**

**Early Event Detection**

**Root Cause**

**Decision Support**

**Maint. Planning**

**PMT Maintenance CoE**

**Train Models**

**What if Analysis**

**Visual Analytics**

**KPI Reporting**

**Remote Expert**

**Monitor model quality, and benchmark performance**

**Identify Rules / Models to Improve, Train Models, Add New Sensors**

**Validate in real time data stream before deploying**

**OEM / Vendor**
Asset Performance Insight allows you to increase asset reliability and process performance, reducing unnecessary maintenance. We connect disparate data sources and use advanced analytics to turn that data into actionable insights, and collaboration with internal and external expertise.

1. **ASSET & PROCESS PERFORMANCE**
   - Identify critical assets & processes
   - Begin with existing data sources
   - Continuous surveillance & early event detection

2. **EXPAND YOUR INSIGHTS & EXPERTISE**
   - Connect to a wider set of assets
   - Add OEM edge, analytics and expertise
   - Add Premium Analytics and Collaborate with Visualization and KPIs

3. **CLOSE THE APM LOOP - DECISION SUPPORT**
   - Integrated workflows
   - Collaborative Decision Support
   - Integration to EAM

START TODAY. GET RESULTS FAST.
STOP REACTING... START PREDICTING

Connect, collaborate and proactively manage asset and process performance to optimize your operations and maintenance.

HONEYWELL CONNECTED PLANT
Address the dynamic relationships between the performance of people, assets, and processes.