An equipment health journey

Connecting the AVEVA™ PI System with AVEVA™ Predictive Analytics

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International Paper

Who We Are

- Founded in 1898
- 39,000 employees worldwide
- 250 facilities (35 U.S. states & 10 countries)
- 21,000 customers in 150 countries
- $21.2 billion net sales in 2022
- Our businesses - Industrial Packaging, Global Cellulose Fibers

Core Values

Recognition

Source: International Paper – Corporate Communications
Pulp & paper – continuous industrial manufacturing

Typical pulp mill

• 4 main unit operations
• ~30,000 total equipment assets
  • ~5% designated critical
  • ~1% high priority critical assets
• ~1,500 control loops
• ~30,000 to 100,000 process data tags

International Paper – by the numbers

• Facilities: 29
• PI Servers: 46
• PI Tags: 1.5 Million
• Equipment: 120,000 Rotating Equipment

Source: International Paper – Corporate Communications
What is a Mill of the Future?

Automated Processes

Evolving Workforce

Connected Data

Reliable Equipment

MILL OF THE FUTURE

Source: International Paper – Corporate Communications
Our equipment health analytics journey

Full vision is to reach Level 4 COLM of Critical rotating equipment to reach maximum value of expected equipment life.

- **Level 4**
  Prognostic analytics to estimate remaining useful life.

- **Level 3**
  Apply failure modes effects and expert logic to enable auto-diagnosis.

- **Level 2**
  Continuous sensor (e.g. vibration, MCSA) scalar data with advanced APR models to improve anomaly detection.

- **Level 1**
  Advanced Pattern Recognition (APR) technology applied to existing data. Early detection of anomalies.

Source: International Paper – Corporate Communications
Cutsforth _ ERPI Monitoring & Diagnostics
Pulp & paper - reliability opportunity

Reliability events over four (4) years

Annual potential continuous on-line monitoring finds for the enterprise

Future projects will go after other failure modes until all failures are eliminated.

Source: International Paper – Corporate Communications
Equipment health - continuous on-line monitoring

An investment in disruptive technology including advanced sensors and data analytics for critical rotating equipment to eliminate unplanned failures and extend equipment life.

- Advanced sensors, both wired and wireless sensors for critical rotating equipment
- Advanced pattern recognition (APR) for continuous monitoring and diagnostics – predicting failures and providing early warning of equipment issues days, weeks, or months prior to pending failure
- AVEVA™ PI System, PI Asset Framework, and AVEVA™ Predictive Analytics are foundational tools for this project.

Source: International Paper – Corporate Communications
Centralized Analytics Team – A2C

Advanced Analytics Center (A2C): An investment in a centralized cross-functional team that is strategically focused on value generation from manufacturing data

• Concept initiated March 2018
• Located in Atlanta’s Technology Square
• A “flashlight” into our mill processes
• Early warning of drifts
• Continuous audit process
• Operational data and equipment status
• Delivering data to the right people at the right time

Source: International Paper – Corporate Communications
Solution architecture

Mills

Sensor data

AVEVA PI System

Sensor data

Model results

AVEVA Predictive Analytics

Early warning alerts

Advanced Analytics Center Monitoring Team

Site personnel

Investigation results

Notification reports

Maintenance Actions
Path to success with AVEVA™ Predictive Analytics

Implementing AVEVA™ Predictive Analytics within your organization

• People – Process – Technology
  • You need all three!
• Avoid the temptation to focus only on one aspect
  • Common risk is for engineers to focus mainly on the technology
  • The world’s best, most optimized, finely-tuned model will mean nothing if you don’t have the people to use it or the processes to integrate it with the rest of the business
• Establishing a **monitoring center** whose focus is on detecting early signs of equipment failure, and communicating that out to individual sites, makes overall success much more likely
## The people

### Roles & responsibilities

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<th>Role</th>
<th>Responsibilities</th>
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| **Analyst**           | - Performs regular reviews of early warning alerts  
                         - Provides initial diagnoses and create reports                                 |
| **Model Building Engineer** | - Builds new models and templates  
                              - Updates models based on real-world feedback                                    |
| **Subject Matter Expert** | - Provides technical expertise to model builders and analysts  
                           - Confers with sites                                                            |
| **Program Champion**  | - Manages the monitoring team  
                         - Gathers and reports on successes to the wider org                             |
| **IT Admin**          | - Manages data infrastructure and access rights  
                         - Keeps software running                                                         |
| **Site Contact**      | - Receives reports from monitoring center  
                         - Determines appropriate action at site-level                                   |
The process

Making it all work

Internal processes

- Model design
- Model building & updating
- Alert & case management

External processes

- Communication with the sites
- Software updates
- Reporting on catches & avoided cost savings

Monitoring Center

Site A

Site B

Site C

Site D

Determine scope
Create project & link to template
Import & clean historical data
Test model & refine
Deploy model

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The technology

Using the tool

• AVEVA™ Predictive Analytics is designed to enable the monitoring center to work efficiently
  • Templates establish consistency between models for similar equipment
  • Bulk model building speeds up deploying lots of models at once
  • Alert & case management helps keep track of which alerts have been evaluated
  • Sensor quality management helps identify bad sensors and dynamically removes them from the models
  • Fault diagnostics provide likely causes of alerts, and prescriptive actions to take
  • Reports provide high-level summary of the active models
  • Forecasting estimates urgency and time remaining of each issue
• To be effective, all of those functions require the right people following good processes!
Typical diagnostic model catch

Paper Machine roll – AVEVA™ Predictive Analytics deviation alarm

Source: International Paper – Corporate Communications
Typical diagnostic model catch

Paper Machine roll – AVEVA™ Predictive Analytics deviation alarm

Drive side fault confirmed in the field.
Continuous on-line monitoring

Challenge:

- Dramatically reduce / virtually eliminate unplanned failures of critical rotating equipment at our pulp & paper manufacturing sites.

Solution:

- Our COLM project combines equipment criticality, reliability incident data, advanced sensors data, and real-time operating data using the AVEVA™ PI System archive and AVEVA™ Predictive Analytics platforms

- Results
  - Reliability incidents were reduced by 70%
  - Downtime hours were reduced by 77%

*For monitored equipment: (2 year baseline vs 2 year results)*

Source: International Paper – Corporate Communications
More information

Mill of the Future
Advanced Analytics Center

Scan below to learn more!
Questions?
Please wait for the microphone.
State your name and company.

Please remember to...
Navigate to this session in the mobile app to complete the survey.

Thank you!