STRATEGIC MAINTENANCE

IIOT for R&M: The Real Struggle

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Reliability Leadership

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Aladon
The Risk & Reliability
GLOBAL NETWORK

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IIOT – Not new

- Vibration monitoring for process control
  - Consistancy indication
  - Valve position

  - IIOT is not new it has been around as long has we have had process control and equipment condition indicators (vibration, speed, load, temperature)

IIOT – What is new

- The process integration of all the on-line systems along with the biological inputs
- **The proper use of data**
- We can’t wait for the equipment to fail in order for the machines to learn when our equipment is failing.

IIOT – The proper use of data

- The distrust of technologies and “black boxes”
- Stack Monitors
- ClO2 Monitors
- Confined space entry monitors
- Berkley Access Machine (BAM)
- Amazing Maintenance Supervision

IIOT - DATA

- Even in the presence of overwhelming data and logical explanation we can not overcome the desire to blame the things we cannot control.

- We subordinate information to our own biases, tribal knowledge, and culture

IIOT – How to over come the distrust of data & “backboxes”

1st there must be an organizational wide understanding of the soft side foundational principles

1. 80% of all failures occur randomly
2. Equip failures follow the P-F degradation curve.
3. Human sense
4. Who the SME are
5. We don’t need failure data
6. Frequency of inspection has nothing to do with criticality
7. Must define risk tolerance
8. Cans vs Wants
9. Failure occurs suddenly, OAPOT, or hidden

Common Software for multi-point data analytics

- SeeQ
- Process Book
- Bentley Asset Wise
- Excel

Common method for algorithm identification

Reliability Centered Maintenance (RCM)

Operation Context

1. Functions
2. Functional Failures
3. Failure Modes
4. Failure Effects
5. Failure Consequences
6. Strategy Development (Algorithm ID)
7. Default Actions

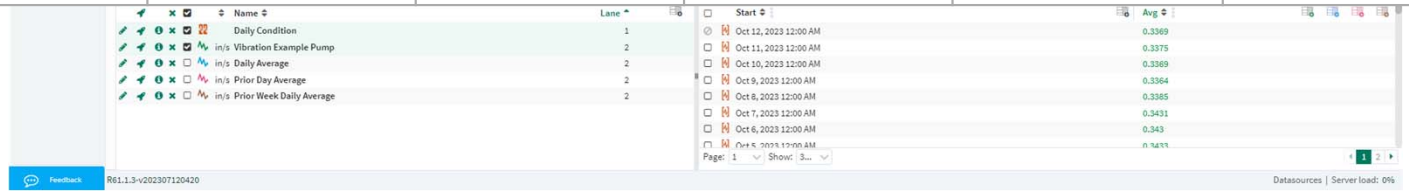
Case Study – Vacuum Pump Drive Train

- Problem – Vacuum pump drive train coupling fatigue. The P-F interval was too short (2-weeks) for standard vibration route analysis. On-line continuous monitoring was available, but biased by vacuum pump pressure.
- Solution - Sample both vacuum pump pressure and vibration level at ½ the P-F interval. Null all vibration readings if the vacuum pump pressure was “high”. Generate alerts if the pressure was in normal to low range with a vibration reading that was above threshold.
- Outcome – Avoid 16 hours of downtime.

Case Study – Vacuum Pump Drive Train

Gearbox vibration velocity

		Critical (5+ X N) (>0.5 in/sec)	Alarm (5 X N) (0.4 - 0.5)	Warning (4 X N) (0.2 - 0.4)	Normal (1 X N) (<0.2 in/sec)
Vacuum Pressure (psi)	High	N/A	N/A	N/A	N/A
	Normal	Critical	Alarm	Warning	Normal
	Low	High Critical	Critical	Alarm	Normal



IIOT – Additional 2 Hurdles

1. Trust and permission to failure or permission to learn
2. Cost of implementation
3. Understanding of the business process of maintenance
4. Allow for open communications from employees
5. Trust employees will do the right things
6. Provide leadership / coaching /mentoring / training when and where needed.

IIOT – Aging Mills

- We must have an entrepreneurial spirt
- Willingness to experiment
- Be tolerant that sometime we will fail
- There must be a culture that pre-forgives mistakes
- Mills must learn to overcome the biases, tribal knowledge, and culture that causes workers to mistrust the data these systems provide.
- Without all of these elements in place, the M&R IIOT will struggle to take root.