Closing the Loop...
with the PI System

Presented by Marc Richard
Chief Engineer
Symbolicware
## Closing the Loop... with the PI System

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Traditional

MINE MANAGEMENT  ↔  PLANNERS / ENGINEERS  ↔  SHIFT SUPERVISOR  ↔  OPERATORS
Traditional

SHIFT SUPERVISOR

New Tasks

Daily

OPERATORS
Traditional

New Plans
Weekly
Progress Report

New Tasks
Daily
Shift Reports

PLANNERS / ENGINEERS

SHIFT SUPERVISOR

OPERATORS
Traditional

MINE MANAGEMENT

New Instructions

Monthly

Progress Reports

PLANNERS / ENGINEERS

New Plans

Weekly

Progress Reports

SHIFT SUPERVISOR

New Tasks

Daily

Shift Reports

OPERATORS

New Plans

Weekly

Progress Reports

New Instructions

Monthly

Progress Reports

New Tasks

Daily

Shift Reports
What if we were to digitalize these loops?
Digitalizing These Loops

MINE MANAGEMENT ➔ PLANNERS / ENGINEERS ➔ CONTROL ROOM ➔ VEHICLES
Digitalizing These Loops

New Tasks

Near Real-Time

CONTROL ROOM

VEHICLES
Digitalizing These Loops

New Plans → Near Real-Time
Automated Reports

New Tasks → Near Real-Time
Automated Reports

PLANNERS / ENGINEERS
CONTROL ROOM
VEHICLES
Digitalizing These Loops

MINE MANAGEMENT

New Tasks
Daily or Ad-hoc
Report Progress

PLANNERS / ENGINEERS

New Tasks
Near Real-Time
Automated Reports

CONTROL ROOM

New Tasks
Near Real-Time
Automated Reports

VEHICLES

New Tasks
Automated Reports
Digitalized loops are connected with a smaller loop allowing for quicker task assignment.
How are these digitalized loops connected?
How are these digitalized loops connected?

MINE MANAGEMENT → PLANNERS / ENGINEERS → CONTROL ROOM → VEHICLES

Wired

Wireless
Wired Infrastructure
(with dashboards, reports and notifications)
Wireless Underground Infrastructure*
(LTE underground, WiFi, etc...)

* = SUBJECT TO AVAILABILITY
Wireless Underground Infrastructure

Not always available, why?

Infrastructure not extended to the face, or only in strategic areas

Changing map (advancing/abandoning drifts) means dynamic and challenging propagation characteristics, on a macro scale

Maintenance & upkeep of infrastructure: collisions or damage due to rock movement
Addressing with a physical solution?

Ad hoc network extenders (mobile repeaters)

Ruggedized enclosures

Redundant network elements
Wireless Underground Infrastructure

**Address with a software solution?**

Offload as much data as possible in a small window

Recent advances in Symbioticware technology have yielded an order of magnitude improvement in offload rate while under coverage

Typically retrieve 8000 datapoints per minute, offload rate over 100 times that
How does the PI System help close the loop?
How does the PI System help close the loop?

VEHICLE + FIXED ASSET (PLC, VoD, etc…)

Data is collected and sent into PI System

PI SYSTEM

Data is compiled, historized and displayed

PRESENTABLE DATA
How does the PI System help close the loop?

This previously used the PI Interface for UFL

PI SYSTEM

COMPILED DATA

CSVs take too long to be parsed

VEHICLE + FIXED ASSET (PLC, VoD, etc...)
How does the PI System help close the loop?

Moved to PI JDBC which made insertion into PI System fast... too fast.
How does the PI System help close the loop?

PI JDBC allows for real-time alerts and dashboards in cabs.
Digital Loop Examples
Underground Hard Rock Mine

Heavy vehicle fleet needed health monitoring for **maintenance and safety**, with near real-time notifications and reports.

**BUSINESS CHALLENGES**
- WiFi is not available everywhere
- Operator safety is paramount
- Maintenance queues need to be monitored

**SOLUTION**
- **PI DataLink Reports**
  - Seatbelt infractions and maintenance alarms
- **KPI Dashboards**
  - Excessive idle, seatbelt infractions
- **Notifications**
  - Tire pressure, engine coolant

**RESULTS AND BENEFITS**
- Seatbelt policy monitored through SymBot reports
- Dashboard review part of daily routine
- 30% annual savings from tire monitoring alone
Surface Smelting Operations

Ladle haulers retrieving molten smelted material and dumping in appropriate storage area looking to improve **repeatability and timeliness** of their process, as well as **automatically populate** their inventory system.

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<th>BUSINESS CHALLENGES</th>
<th>SOLUTION</th>
<th>RESULTS AND BENEFITS</th>
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<tr>
<td>WiFi only near converter</td>
<td><strong>PI DataLink</strong> &gt; LUT identifying origin and destination</td>
<td>All goals achieved</td>
</tr>
<tr>
<td>High heat in aisle, extreme cold outside</td>
<td>Payload weight retrieved without operator interaction</td>
<td>Process improvement imminent</td>
</tr>
<tr>
<td>GPS obstructed</td>
<td>Operator input of payload type retrieved upon loading of ladle</td>
<td>Expansion of functionality forthcoming</td>
</tr>
<tr>
<td>Reverse tracking through choke points</td>
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Interior aluminum processing plant with anode and crucible haulers running 24/7, seeking an opportunity to improve manual process of entering process markers and of retrieving vehicle data while providing feedback to the operator in near real-time.

### BUSINESS CHALLENGES
- Short interval control
- Constant uptime of WiFi (high reliability)
- Huge data retrieval with near real-time review

### SOLUTION
- Reverse tracking leads to automated process interval indication
- Data collected sent to PI System for immediate dashboard replay
- In-cab display powered by PI System

### RESULTS AND BENEFITS
- Operator no longer records transactions manually
- Transaction processing sped up fivefold, with less likelihood for errors
Questions

Please wait for the microphone before asking your questions

State your name & company

Please remember to...

Complete the Online Survey for this session

Download the ConfOSIsoft Users search OSISOFT in the app store

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