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Canary User Conference
August 11- 14 State College, Pennsylvania
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Delivering Operational Visibility at Milliken

James Wise

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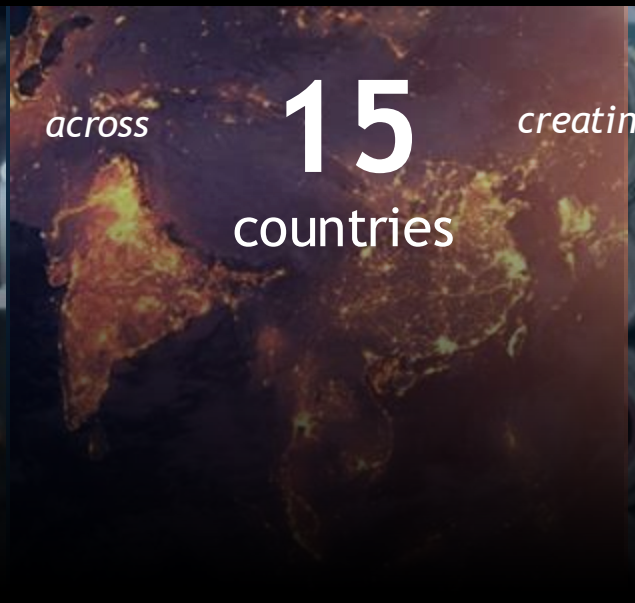
Milliken™

ectobox

MILLIKEN AT A GLANCE

we have **70+** locations

and **7000+** associates

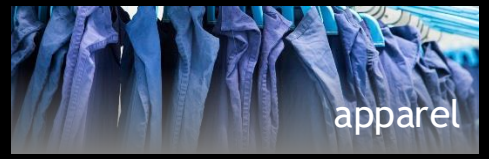


across **15** countries

creating **11,000+** products

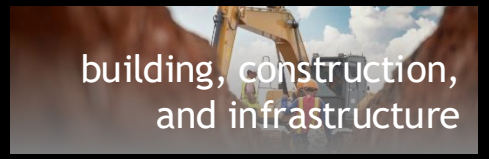
for use in...

agriculture

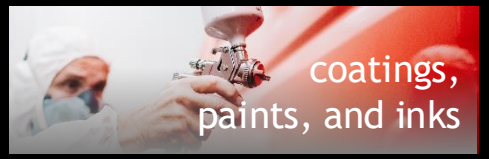


apparel

automotive and transportation



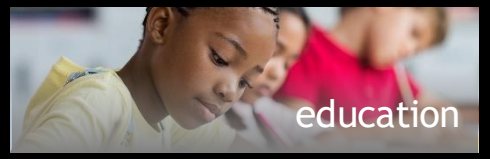
building, construction, and infrastructure



coatings, paints, and inks

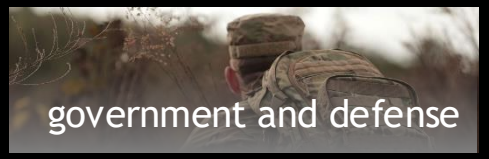
commercial spaces

consumer goods

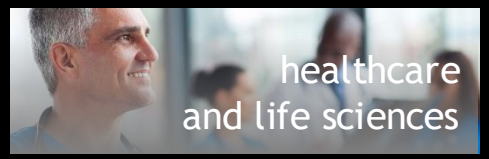


education

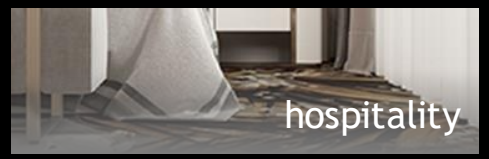
energy and utilities



government and defense



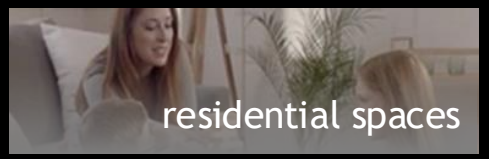
healthcare and life sciences



hospitality

manufacturing

packaging and print



residential spaces

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Milliken – Smart Factory Initiative

In 2019 Milliken set out to develop their strategy for the development of Smart Factories with the goal of providing employees with real-time and historical operational intelligence.

2019 – Smart Factory Goals

- Support Historical Data Analysis
- Require minimal local IT support.
- Accessible to all users
- Provide open connectivity to work well with other Millken Smart Factory solution platforms.

2025 – Wave 3 Implementations

- Scale and roll out platforms and solutions to other facilities.

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The Canary System is a Milliken Standard

Milliken knew they needed a platform that could collect, store, contextualize, analyze and deliver data to users in an easy to access and use visualization tool. After completing a formal assessment, the team chose the Canary System.

- **Favorable Licensing and Cost**
  - **(P**erpetual)
- **Features**
  - Axiom
  - Powerful (virtual views, calculations, events)
  - Easy setup and Admin
  - Easy to Use (Intuitive)
- **Performance**
  - Scalable
  - High Performance
- **Open Access**
  - API, MQTT, ODBC, OPC
  - Nice fit for our “Modular” architecture
- **Full Service & Support**

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Basic Solution Architecture

Milliken selected a full suite of platforms that are secure, open, flexible and scalable and work seamlessly together to create a modern digital solution stack.

Ignition Edge

- Connect to Equipment, OPC UA
- Publish MQTT SpB

Ignition

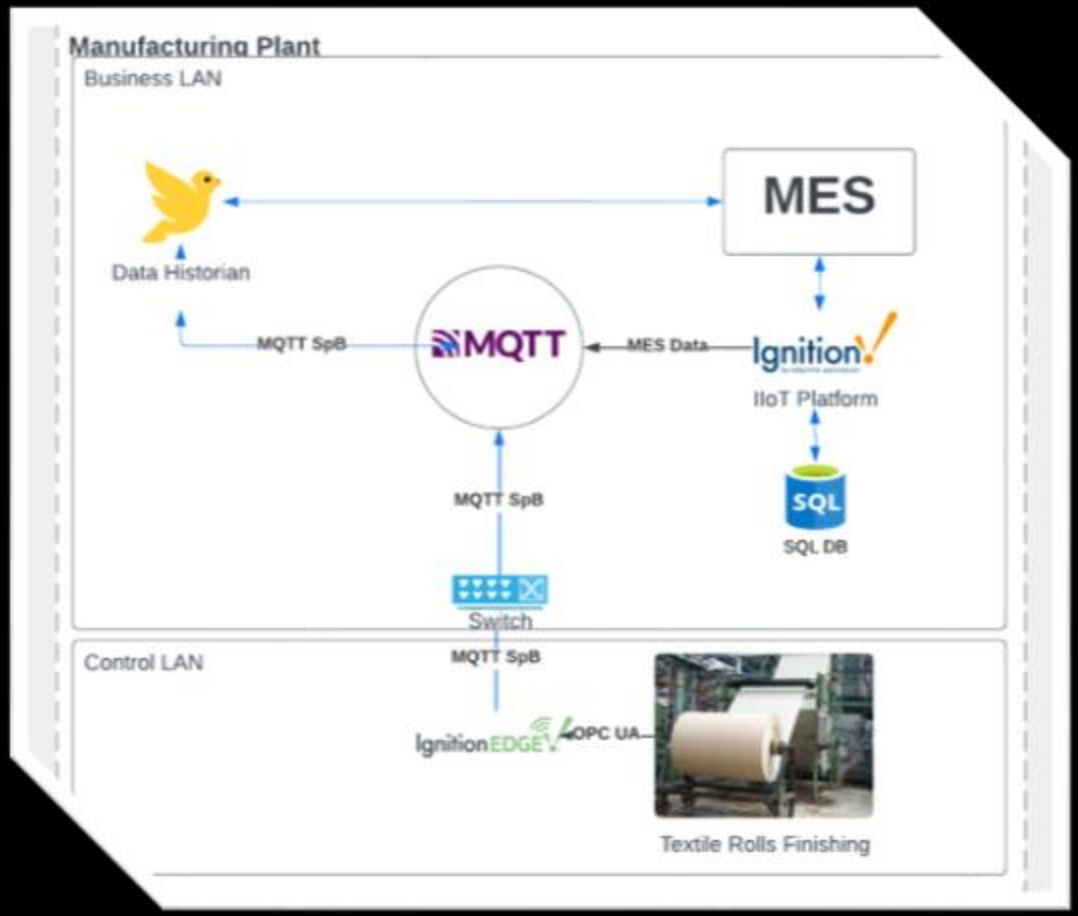
- Screens monitoring, analysis
- Easy integration with Canary Labs
- Integrate with MES…SQL Server database

Canary System

- Consumes MQTT SpB automagically
- Axiom for in situ analysis

MQTT Data Broker

- Central hub for sharing data across the plan



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Goal- Provide Operational Performance Visibility

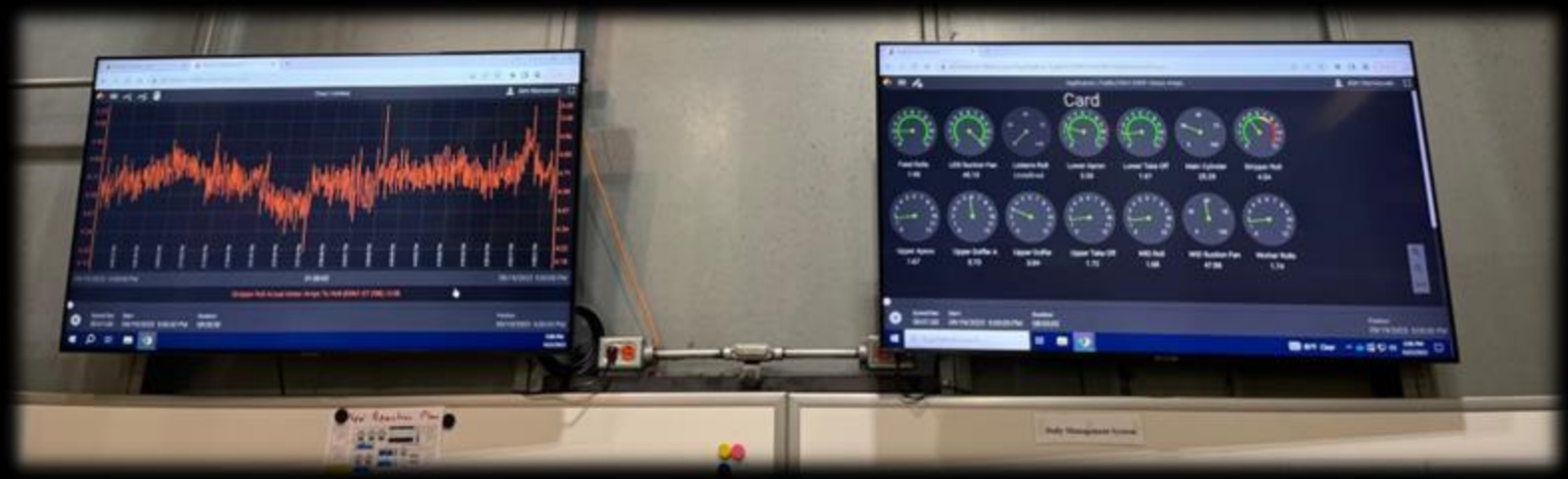
The project team has created operational performance dashboards and displays that are hosted on large screen displays on the shop floor to keep associates apprised of plant performance.

Overview Displays

- Performance Dashboard
- Machine Stop Log

Detail Displays

- Motor Amp load and Stripper motor amp load over time
- Any tag that we feel needs monitoring can be put on the screen and dashboards can be created where needed.



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Line Performance Dashboards

Line performance overview dashboards equip associates with a bird's eye view of the overall performance of critical process parameters and the production for each line.

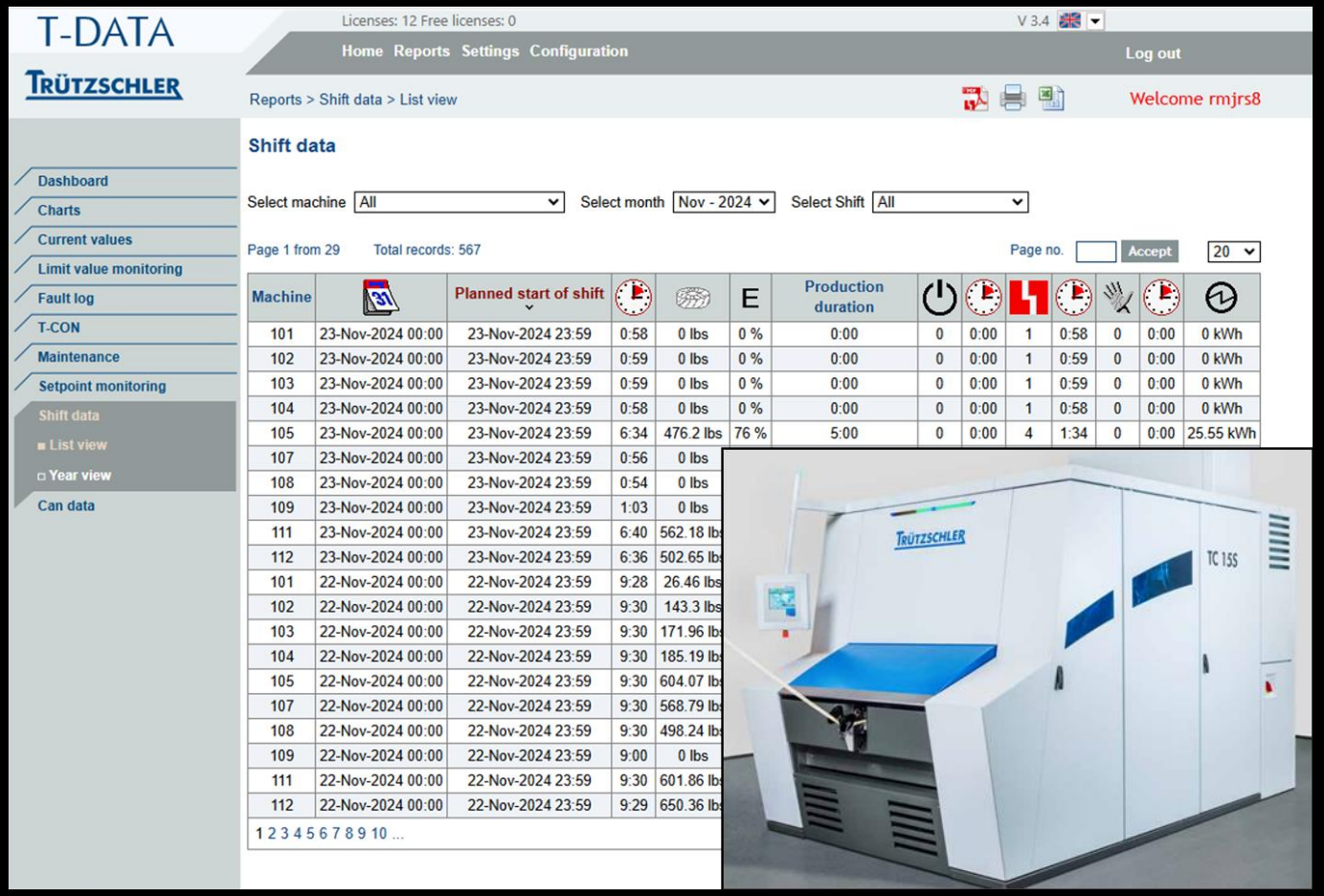
Pendleton
Tenter Line

Carding Machine Data Collection Challenge

OEM Card Equipment is delivered with predefined HMI charts and reports that do not meet all of the analytical and operational visibility requirements.

Data Source

- The T-Data system collects and stores the data in a relational data base local to the machine.
- The default visualizations limit the ability for customizations, flexibility for analysis and client access.

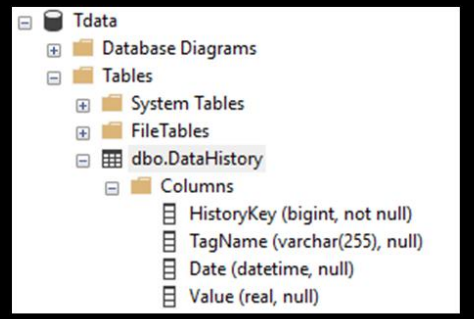


Solution: Using the Canary SQL Data Collector

With the Canary SQL Data collector we were able to connect to each Carder and query data from the local SQL data store and write the data as tags to the Canary Historian.

Configuration Steps

1. Create queue Table
2. Create Trigger to generate (get some help from CoPilot)
3. Configure SQL Collector
4. Data Collector will collect data records from table and then clear the table




```
USE [Tdata]
GO
/****** Object:  Trigger [dbo].[trg_UpdateDataHistory]    Script Date: 12/3/2024 10:09:16 PM ******/
SET ANSI_NULLS ON
GO
SET QUOTED_IDENTIFIER ON
GO
ALTER TRIGGER [dbo].[trg_UpdateDataHistory]
ON [dbo].[tbllastCurrentValues]
AFTER UPDATE
AS
BEGIN
    SET NOCOUNT ON;

    INSERT INTO dbo.DataHistory (TagName, Date, Value)
    SELECT DISTINCT
        RTRIM(LTRIM(s.strMachAlias)) + '_' + v.subcategory AS TagName,
        -- Subtract 3 hours from the timestamp
        DATEADD(HOUR, -4, a.strtimestamp) AS Date,
        CASE
            WHEN a.strvalue IN ('True', 'False') THEN a.strvalue
            ELSE
                CASE
                    WHEN ISNUMERIC(a.strvalue) = 1 THEN a.strvalue
                    ELSE CAST(a.strvalue AS varchar(255))
                END
        END AS Value
    FROM dbo.tbllastCurrentValues AS a
    INNER JOIN dbo.tblSource AS s ON a.strMachId = s.strMachId
    INNER JOIN dbo.FN_GetCategoryData(1) AS v
        ON a.intcategoryId = v.categoryid
        AND a.intsubcategoryId = v.dscsubcategoryid
    WHERE a.intdataid IN (SELECT DISTINCT i.intdataid FROM Inserted i)
END
```

	HistoryKey	TagName	Date	
1	2	108_Power line frequency	2024-0	
2	3	108_Phase difference angle Phi	2024-0	
3	4	108_Current RMS phase A	2024-0	
4	5	108_Current RMS phase B	2024-0	
5	6	108_Current RMS phase C	2024-0	
6	7	108_Voltage RMS phase A	2024-09-09 19:19:36.000	401.7
7	8	108_Voltage RMS phase B	2024-09-09 19:19:36.000	401.5
8	9	108_Voltage RMS phase C	2024-09-09 19:19:36.000	401.3
9	10	108_Power	2024-09-09 19:19:36.000	4.9
10	11	108_Idle power	2024-09-09 19:19:36.000	3
11	12	108_Apparent power	2024-09-09 19:19:36.000	6.2
12	13	101_Power line frequency		
13	14	101_Phase difference angle		
14	15	101_Current RMS phase A		
15	16	101_Current RMS phase B		
16	17	101_Current RMS phase C		
17	18	101_Voltage RMS phase A		
18	19	101_Voltage RMS phase B		
19	20	101_Voltage RMS phase C		

<u>Lesson Learned:</u>
Make sure to include the machine number so that Assets can be created and data is not over-written.

Carding Machine Performance Dashboards

Similar assets are defined in Canary Views and displayed in Axiom using the same graphical display by configuring Asset Relative Displays in Axiom.

Carding Machines

Automated Carding Machine Performance Report

With Axiom you can configure a report layout just like a dashboard and then schedule it to run on a schedule and then distribute the reports via email.

Schedule Type: Weekly, Monthly, Quarterly, Yearly

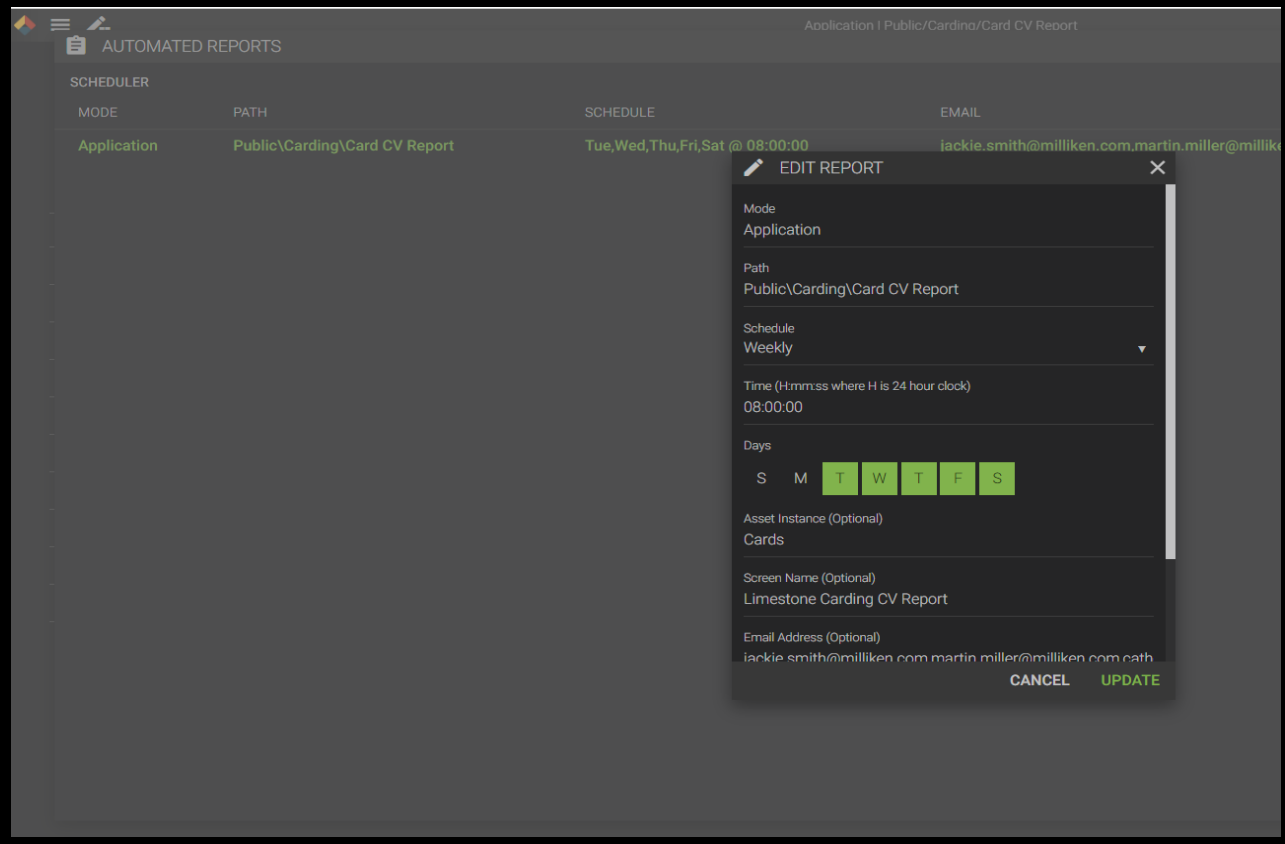
Schedule Time: Time of day for the report to execute.

Scheduled Day(s): Select on which days you want the report to execute.

Asset Instance: Indicate if the report is asset dependent.

Screen Name: The name of the Report Display

Email List: List the email group or names you wish to send the report(s) to.



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Use Case – Cooling Tower Header Failure

Plant Associates have leveraged the Canary System to troubleshoot and identify root causes of multiple process excursions and failures and to develop Canary applications to prevent reoccurrence.

Issue

- Excessively high cooling water return temperatures from reactors can cause a collapse of the header.

Need

- Quickly identify, alert and notify when any of the 20 reactors are approaching temperatures that can cause a failure.

Solution

- Developed an event to trigger when return water temperature are abnormally high and send Notifications

STARTED AT	ENDED AT	DURATION	PROPERTIES
8/8/2024 10:02:09.662 AM	8/8/2024 10:10:39.325 AM	0:08:29.663	MaxRtnTemp: 200 MaxComTemp: 107.9125 RJX01JktCooling: 0 RJX01HECooling: 0 RMG01Cooling: 100 RSX01JktCooling: 0 RSX01HECooling: 0 RSX02JktCooling: 0 RSX02HECooling: 0
8/8/2024 10:12:42.456 AM	8/8/2024 10:20:54.348 AM	0:08:11.892	MaxRtnTemp: 200 MaxComTemp: 95.65 RJX01JktCooling: 0 RJX01HECooling: 0 RMG01Cooling: 100 RSX01JktCooling: 0 RSX01HECooling: 0 RSX02JktCooling: 0 RSX02HECooling: 0

Reactor Performance Dashboards

The new Asset Relative Reactor Performance Dashboard provides users with a common view for each asset.

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Use Case – Backing Line Speed & Availability Improvement

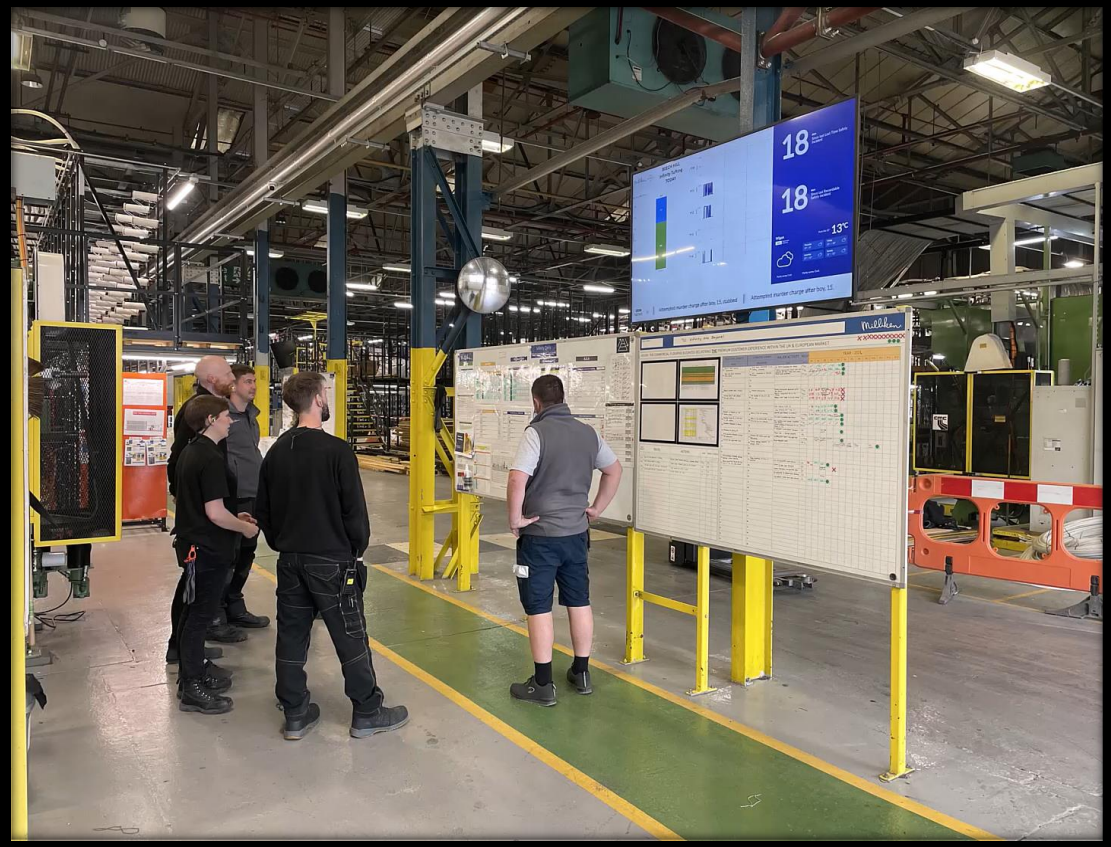
The Beech Hill Plant backing line was routinely running with 10% unaccounted for time, and the team had no visibility of the causes.

SOLUTION PROVIDED

After the installation of canary, the operations team could see the line speed live and review data daily, allowing them to investigate and resolve root causes of the line being run at a slower speed.

BENEFITS AND OUTCOME

With live visibility of line speed and other machine data they were able to resolve issues as they occurred. This increased throughput on the machine and removed 9% of unaccounted for time.



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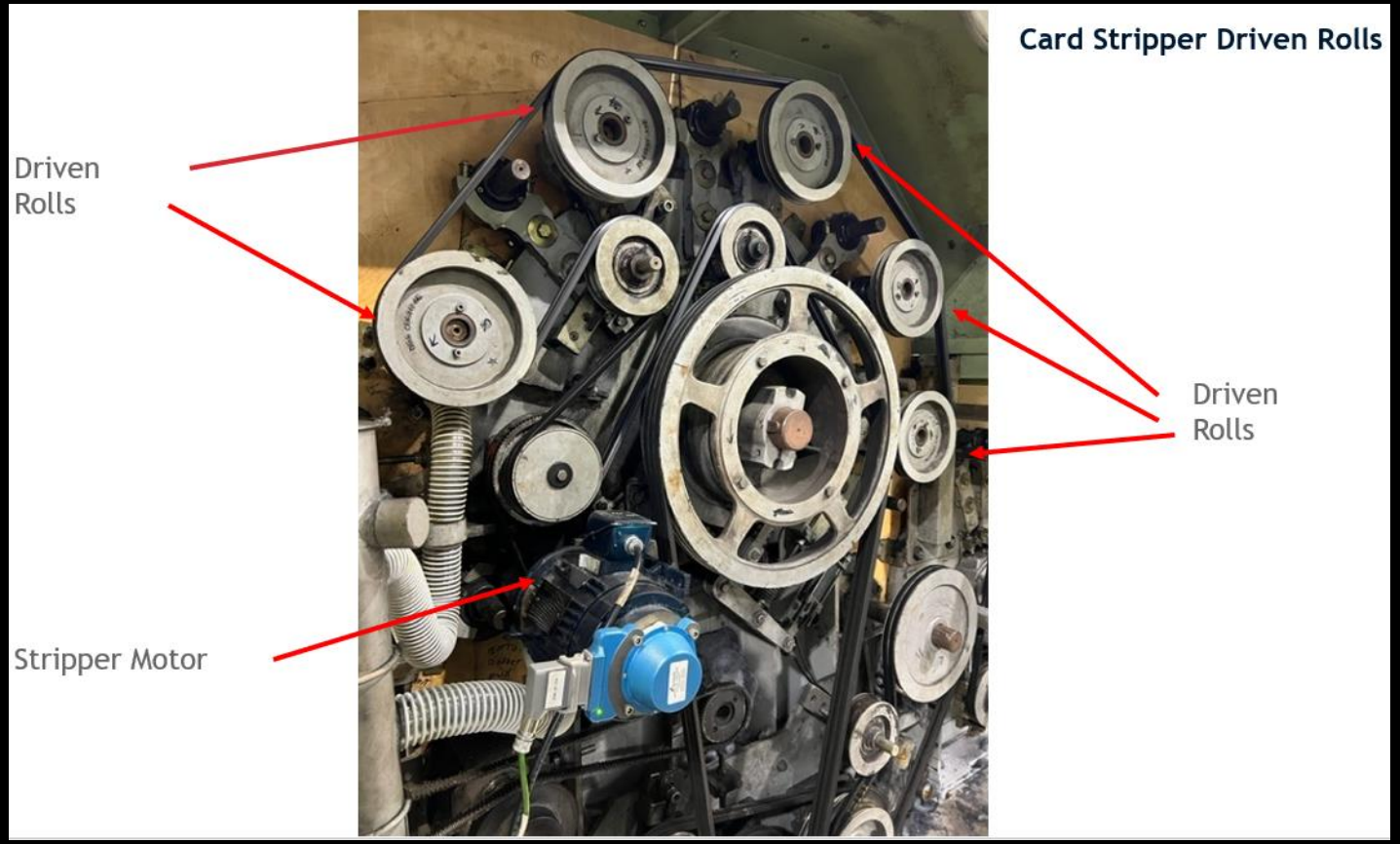
Use Case - Alma Plan Non-Woven Line Downtime Reduction

On the non-woven line at Alma the stripper roll motor on the card continually faulted causing line stops. Prior to Canary the plant team could not determine the root cause.

SOLUTION PROVIDED

Analysis in Canary showed the motor was pulling excessive current. After creating a Canary graphic to monitor motor amperage they were able to determine the root cause was the anti-lap discs wrapping.



BENEFITS AND OUTCOME

Machine downtime reduced and off quality reduced by eliminating the motor fault and line stop.

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Open Data - Using Canary with Ignition

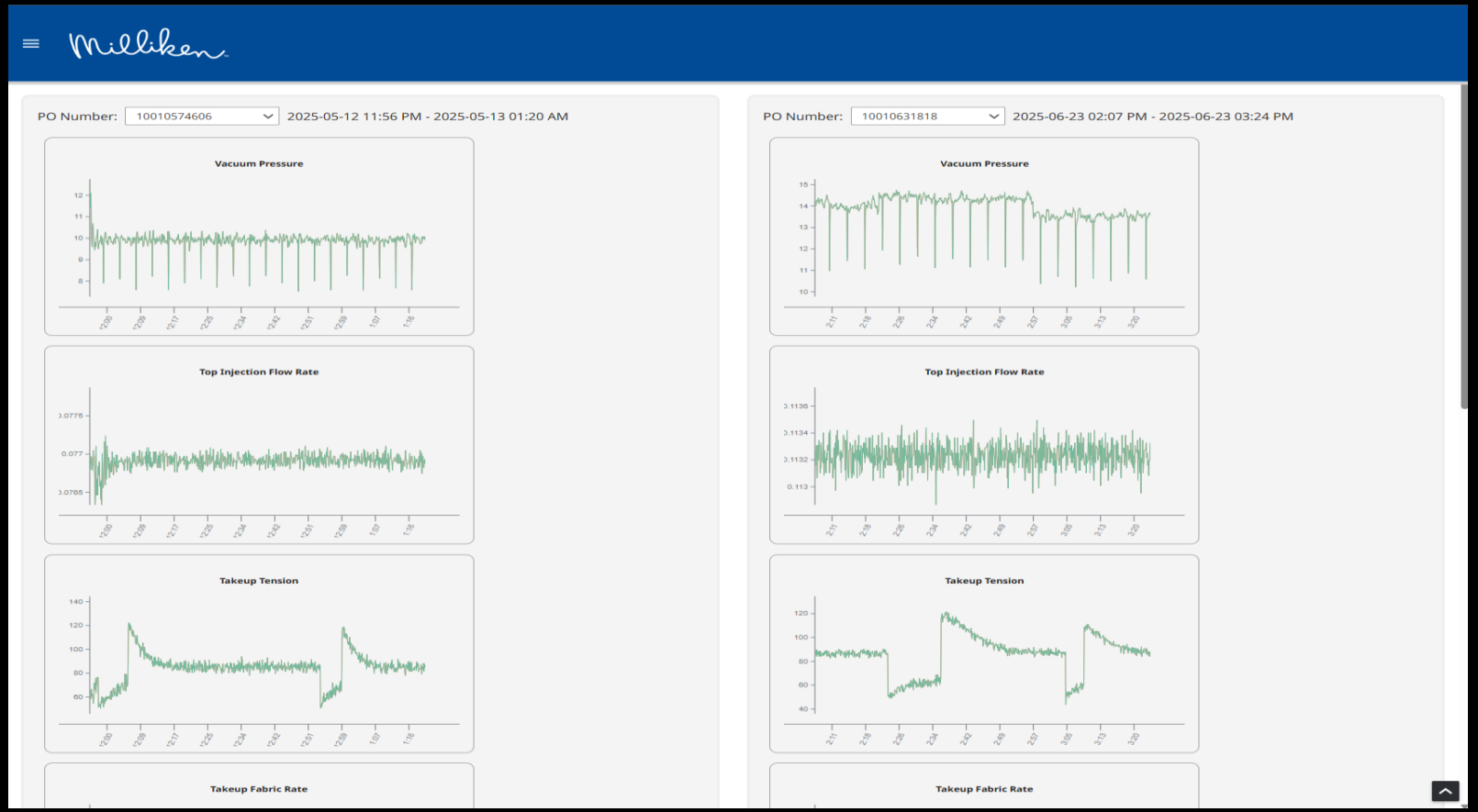
In addition to the great features of Axiom, we can access Canary Data for use in other systems like Ignition to display data from Canary with the Canary Read API.

Example

- Line Process Report
- PO Comparison Report of key process variables.

Benefits

- Expected 15% reduction of scrap and rework
- Actual results TBD pending review by Process Improvement team



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Recommendation - Organize for Success!

Corporate IT/OT Team Goals

- **Listen** to Key Stakeholders.
- **Collaborate** by establishing Canary User Forums and sharing information on Microsoft Teams.
- **Question** to understand needs.
- **Enable** improvements by providing tools to collect, join, visualize and act on data.
- **Empower** users to act while balancing scalability, governance and long-term supportability

Accelerate Progress

After the success of your first implementation the word will get out and company leadership and plant staffs will be requesting for the team to accelerate deployments across the organization.

- **Address Plant Connectivity**
  - Sensors and Instrumentation
  - Connectivity to PLCs & SCADA
  - Plant Asset Networking
- **Establish a Playbook**
  - Standard Training Materials
  - Written installation procedures
  - Tag and Asset naming conventions
- **Select a Partner**
  - Select a Canary Partner to get started and accelerate deployments.

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Realized Benefits

Plants are realizing benefits from the availability of all process and machine data and both real-time and historical operational visibility to support rapid detection and response.

Expansive Data Collection

- **Every** BPCS (Basic Process Control System) & SIS (Safety-Instrumented-System) **tag is now historized**
- Increased tag count by ***62%***

High Data Visibility

- Associates at all levels are looking at both real-time and historical data.
- Engineers are now making data driven decisions (Corrective Action Requests & Process Improvement)
- Operators are now able to see their process run and are suggesting optimizations

Rapid Response

- Plant associates can now respond quickly to various process upsets and identify and address root causes.

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Thankyou

- James Wise

- Kevin Jones

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