

# Conference Theme and Keywords





# Breaking New Ground With Enterprise PI System

Presented by **Dan Moore**  
**Billy O'Connor**



# Agenda

- About DePuy Synthes
- Business Challenge/Use Cases
- J&J Regional PI Instance
- DePuy Automation System Control Tower
- Key OSIsoft Products Used
- Results Obtained and Business Impact
- Next Steps
- Conclusion

# DePuy Synthes Background



## Company of Johnson & Johnson - Global Presence

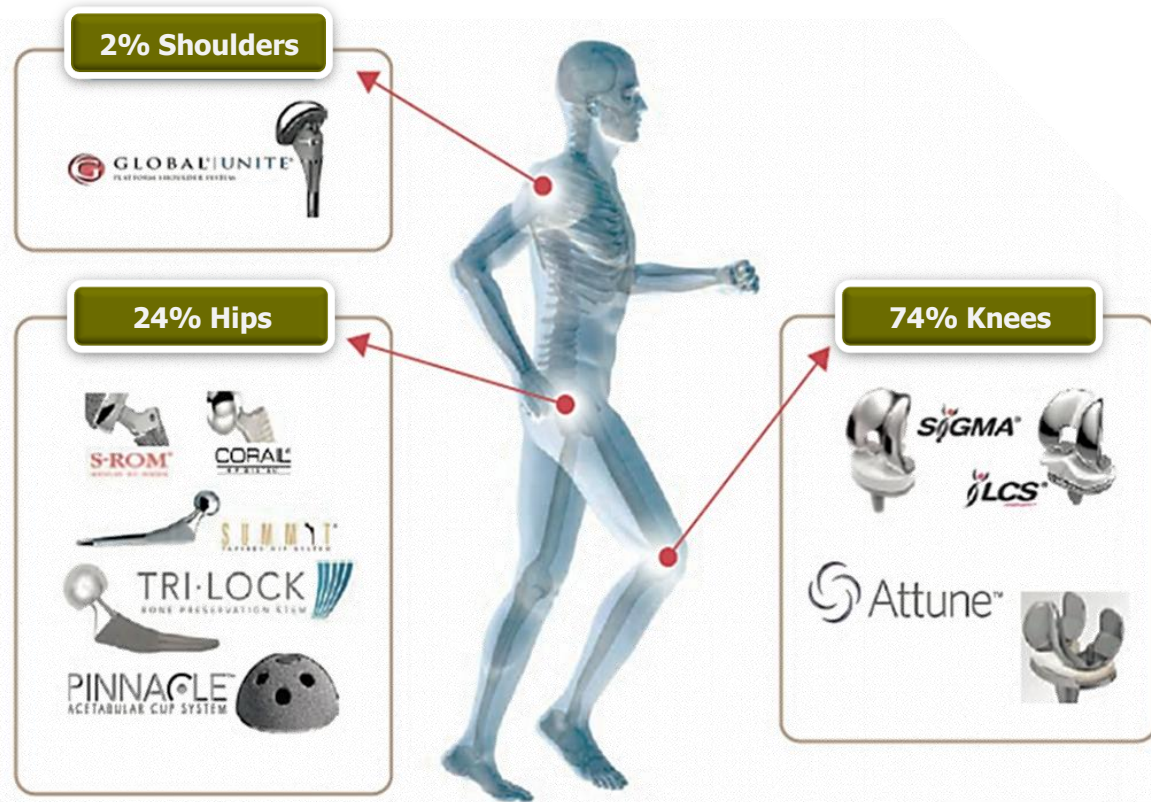
- ❑ World's Largest Health Care Company
- ❑ 119,000 Employees
- ❑ 250 Operating Companies In 57 Countries
- ❑ Selling Products in More Than 175 Countries

# DePuy Synthes Cork Site



Manufacturing - Global Supply Chain - Innovation Centre

# DePuy Synthes Product Portfolio



# DePuy Synthes Core Technologies



Investment Casting



Surface Coating



CNC Machining

Clean & Passivation



Robotic Polishing



X-Ray / FPI Inspection



# Business Challenge

- Lack of data to make informed decisions
- Lack of visibility into manufacturing and process data
- Numerous data sources, no central repository
  - Manually recorded excel sheets
  - Chart recorders
  - SCADA's
  - Utilities Applications
  - Etc.
- Restricted access to data

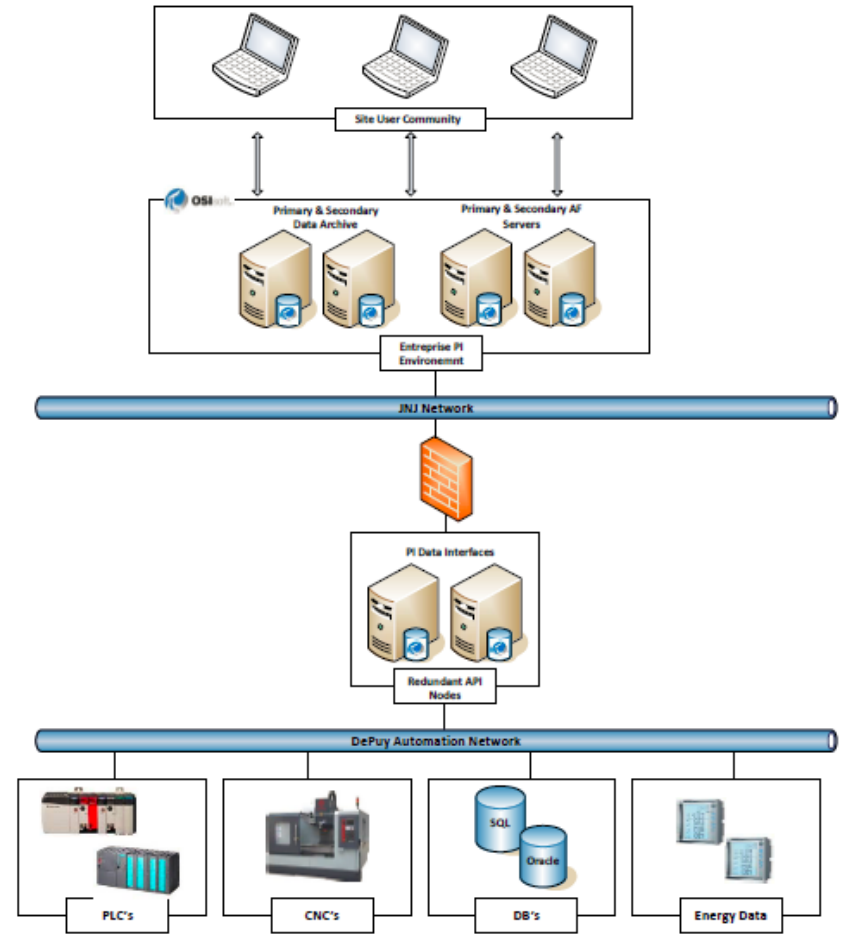


# Uses Cases

- Asset Utilization
- Downtime tracking
- Process Data Collection
- Environmental & Facilities Data Collection

# System Architecture

- Regional J&J PI Instance Hosted in J&J Data Center
- Local API Nodes Per Site (Redundant Pair)
- Multiple Sources
  - Separate VLAN's
  - PLC's
  - CNC Controllers
  - Databases
- Unrestricted Access to PI Client Tools for J&J Users

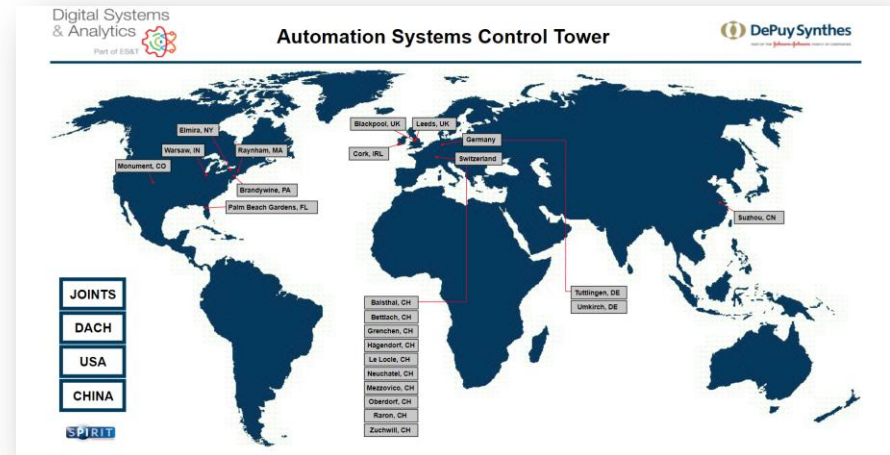


# Leveraging J&J PI System Standards

- Standard Naming Convention
  - Universal S88 based tag naming across J&J
- Content Standard
  - PI AF Templates & S88 Enterprise Structure
- Visualization Standards
  - Content driven visualization templates
- Global Adoption and Utilization Framework
  - Formal Process for driving training, usage and value realization
- Standard Qualification Documents & Protocols

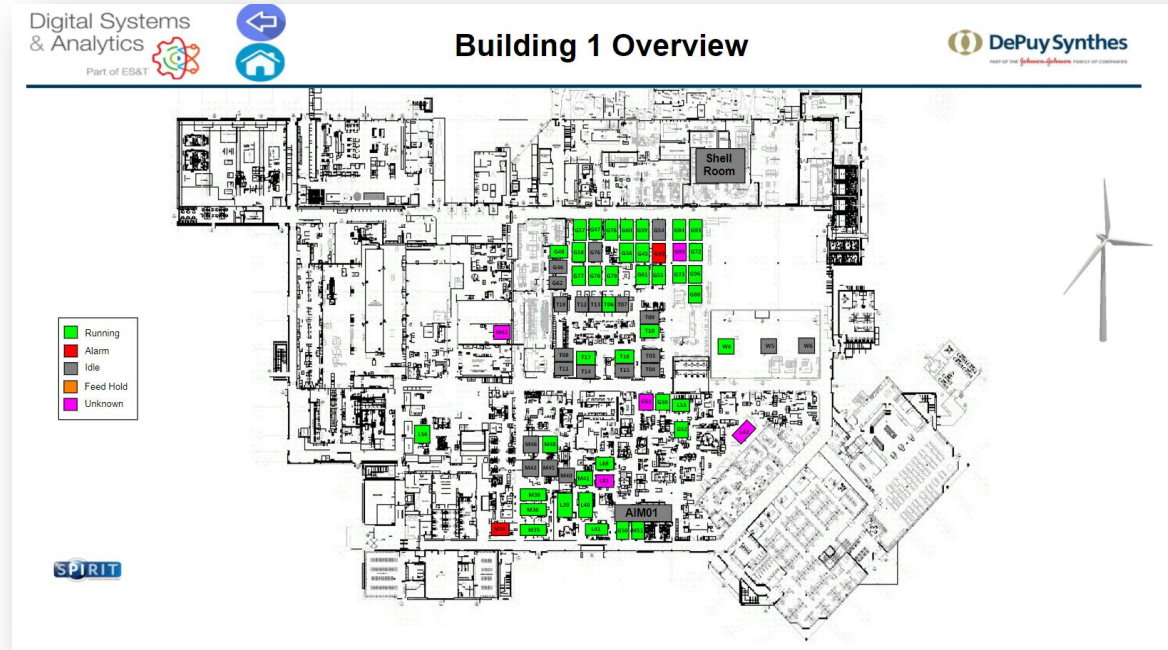
# Automation Systems Control Tower

- PI ProcessBook Displays Published in PI Coresight
- Home Screen – DePuy Synthes Global Orthopaedics Overview
- Currently have Cork Site Qualified
- Warsaw & Raynham POC on-going



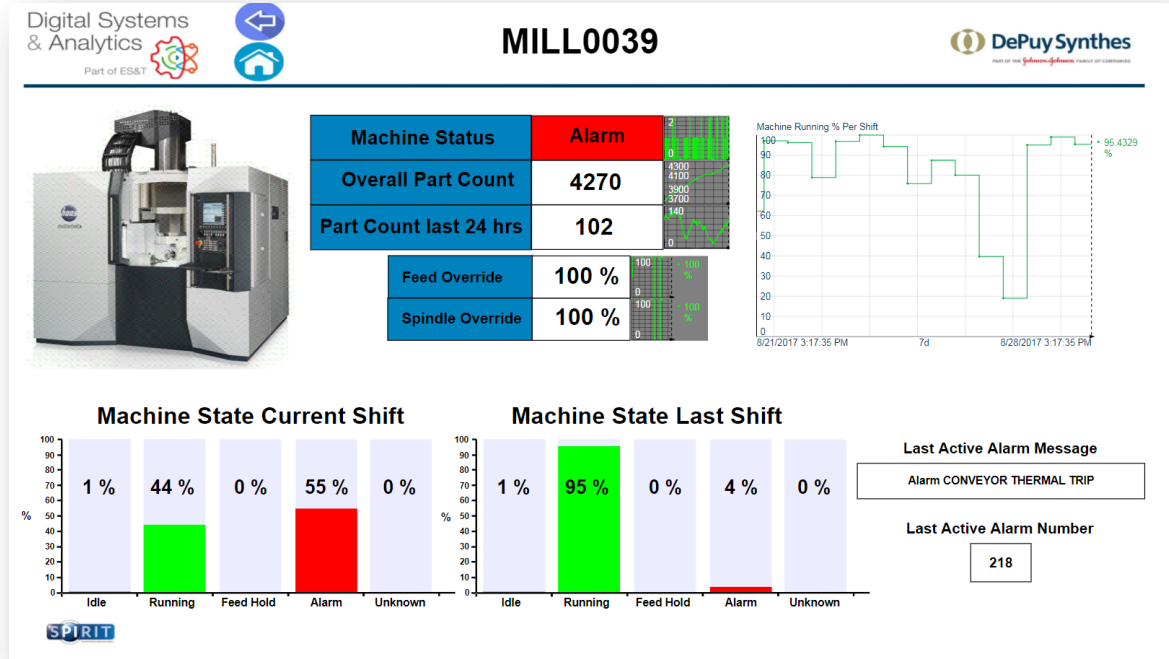
# Automation Systems Control Tower

- Building Overview Screens - Machine Status Colour Coded



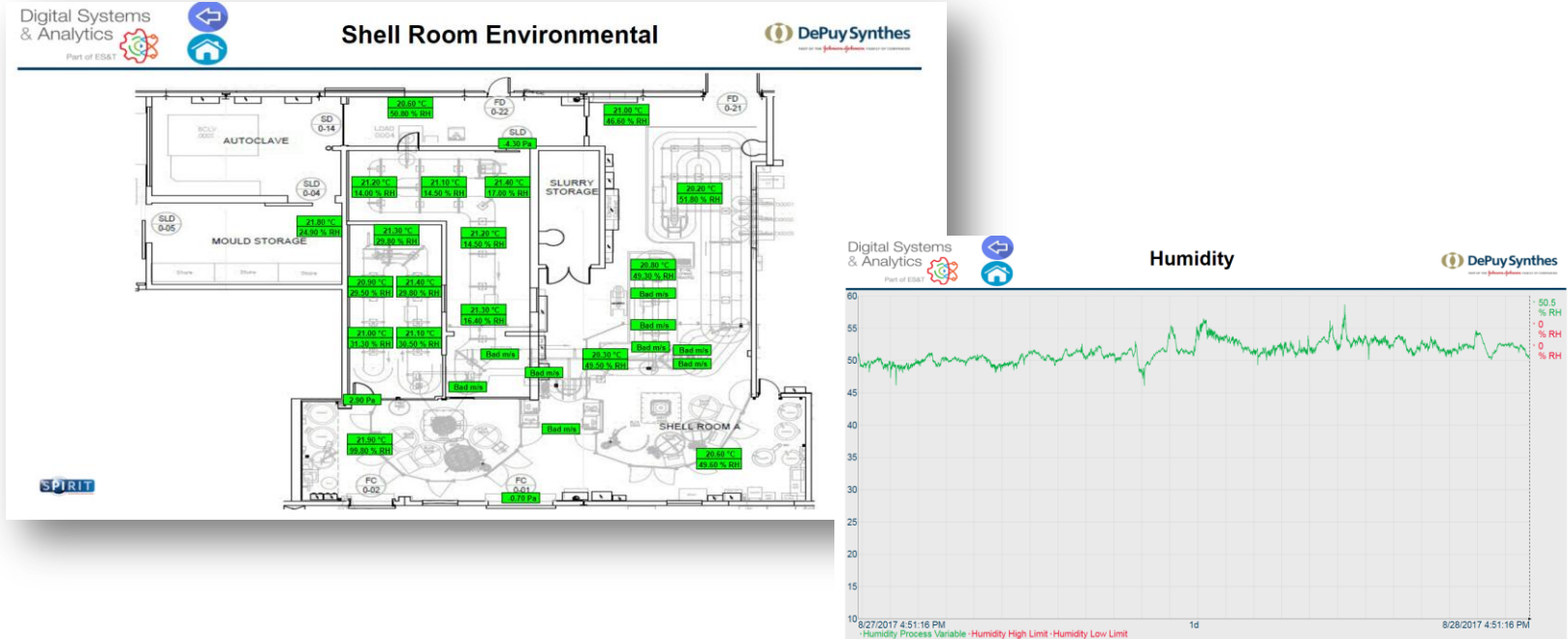
# Automation Systems Control Tower

- Drill Down to Individual Asset Display. Asset Utilization Data.



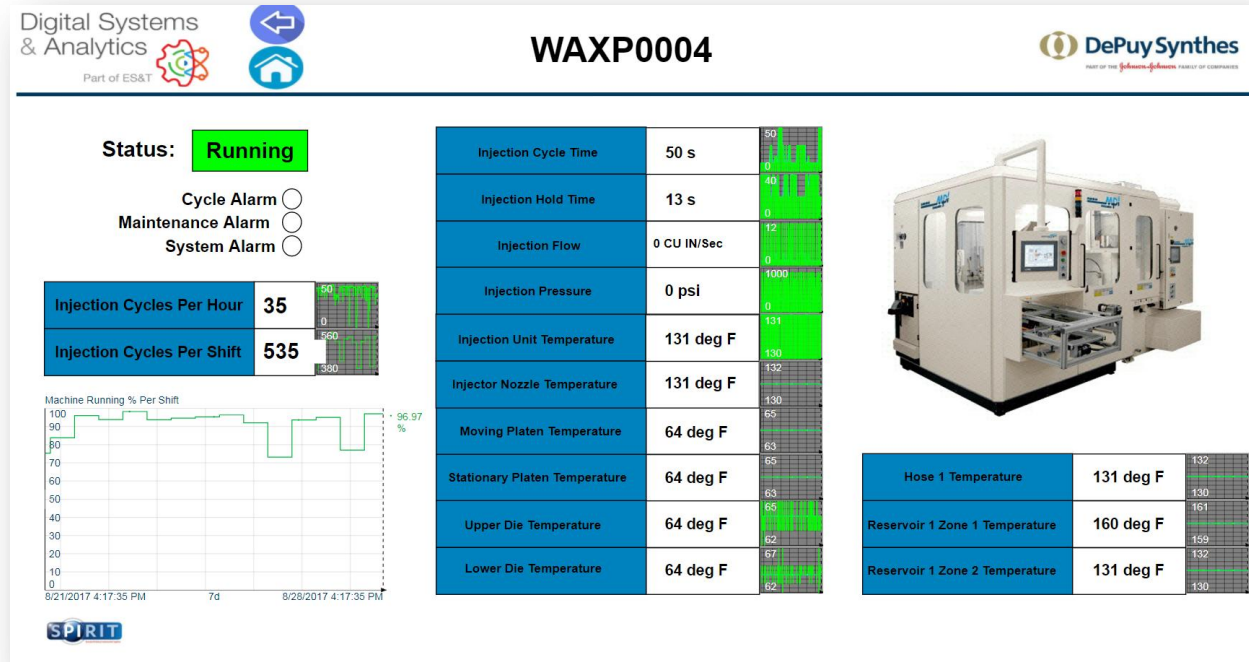
# Automation Systems Control Tower

- Environmental Data Monitoring. Critical to Quality Parameters.



# Automation Systems Control Tower

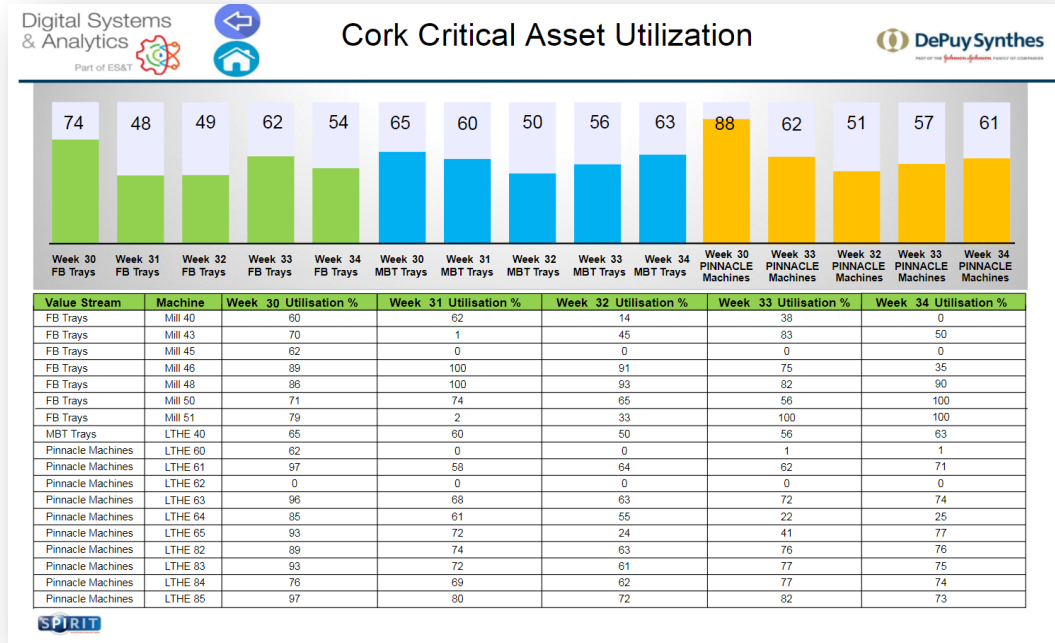
- Machine Process Parameters Monitoring for Engineering Analysis





# Automation Systems Control Tower

- Critical Assets Identified and Highlighted for Review in Weekly Management Review Meeting



# Automation Systems Control Tower

- Dashboards used with Mobility



# AF Template Structure

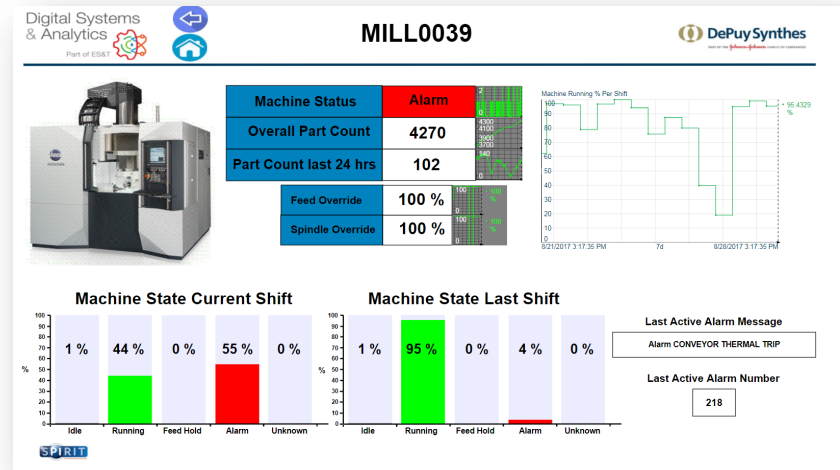
- Rapid Development Time Due to template Approach
- Analysis and Event Frames Built Into All Templates
- Templates Built to Leverage Across All Sites

The screenshot displays a software interface for managing templates. On the left, a tree view shows a list of templates under the 'Elements' folder. Two groups are highlighted with brackets and labels: 'Grinder Template' (GRIND0045 to GRIND0096) and 'Tumbler Template' (TUMB0001 to TUMB0018). The main window shows the details for the 'GRIND0045' template. The 'Attributes' tab is active, displaying a table of attributes with columns for Name, Value, and Unit of Measure.

Name	Value	Unit of Measure
Asset Name	GRIND0045	<none>
Controller Type	Haas	<none>
Active Program Name	JL_MPF_1008_MPF	<none>
Active Program Number	220	<none>
Active Tool	No Data	<none>
Feed Override	100 %	percent
Last Active Alarm Message		<none>
Last Active Alarm Number	0	<none>
Machine Status	Running	<none>
Machine Status - INT	1	<none>
Part Count	300	<none>
Part Count Control	1752	<none>
Part Count Last 24hrs	30	<none>
Planned Downtime	0 s	second
Spindle Override	100 %	percent
Day Running Percentage	86.87962962962963	<none>
Rolling Shift Alarm Percentage	0.0325814536340552 %	percent
Rolling Shift Feed Hold Percentage	0 %	percent
Rolling Shift Idle Percentage	3.20050125313383 %	percent
Rolling Shift Running Percentage	96.76691729322311 %	percent
Rolling Shift Unknown Percentage	0 %	percent
Shift Alarm Percentage	0 %	percent
Shift Feed Hold Percentage	0 %	percent
Shift Idle Percentage	9.13888888888889 %	percent
Shift Running Percentage	90.86111111111111 %	percent
Shift Unknown Percentage	0 %	percent
Week Running Percentage 00:00	76.518518518518519	<none>
Weekly Idle Percentage	19.5814814814815 %	percent
Weekly Running Percentage	78.628092592393 %	percent

# Element Relative Displays

- Dashboards Built Element Relative, One Dashboard Developed for >90 Assets



- Template Display With *?CurrentElement* Appended to the URL
- <https://YourCoresightmachine/Coresight/#/PBDDisplays/13044?CurrentElement=\\AFServer1\DePuy Synthes GO\DePuy Cork\Poly\MILL0039>

# Downtime Tracking in Event Frames & PI DataLink

- All equipment templates include downtime event frames
- Downtime events used to capture start time, stops time, duration, machine state & alarm code/message.
- PI DataLink used to empower engineers to investigate unplanned downtime events

The screenshot displays the PI DataLink interface. On the left, a list of 'Event Frames' is shown, with 'MILL0038 Downtime 2017-09-25 18:32:50' selected. The main window shows the details for this event, including a table of attributes and a right-hand panel for configuration.

Name	Value	Unit Of Measure
Category	<None>	
Alarm Message	Alarm MLOUTOFSPEC	<None>
Alarm Number	3022	<None>
Duration	12.7693333943685 min	minute
Machine Status	Alarm	<None>

Right-hand panel configuration:

- Name: Alarm Message
- Description: CNC Alarm Message
- Properties: <None>
- Categories: <None>
- Default UOM: <None>
- Value Type: String
- Value: Alarm MLOUTOFSPEC
- Data Reference: PI Point

Settings...  
[Elements[]].Last Active Alarm Message;TimeRangeMethod=StartTime

# Downtime Tracking in Event Frames & PI DataLink

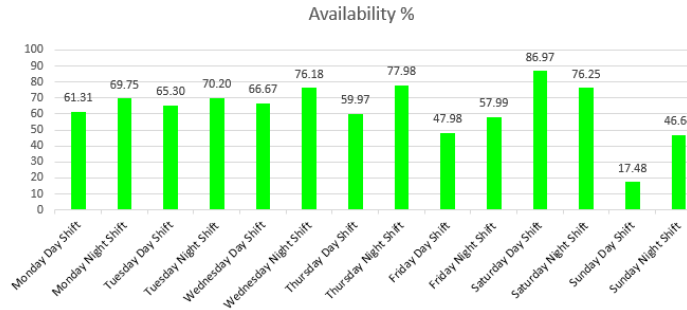
Digital Systems & Analytics Part of ES&T		CNC Downtime Report			DePuySynthes COMPANIES OF Johnson & Johnson
<b>Report Start Time</b>	21-Sep-17 00:00:00				
<b>Report End time</b>	26-Sep-17 00:00:00				
<b>Asset</b>	MILL0038				
Start time	End time	Duration	Alarm Message	Machine Status	
21-Sep-17 00:05:18	21-Sep-17 00:08:28	0 0:03:10		Idle	
21-Sep-17 00:11:59	21-Sep-17 00:20:14	0 0:08:16	PALLET CHANGER DOOR INTERLOCK	Idle	
21-Sep-17 00:20:19	21-Sep-17 00:31:41	0 0:11:21		Idle	
21-Sep-17 00:32:01	21-Sep-17 00:35:06	0 0:03:05	Alarm SCATTERTOLERANCE	Alarm	
21-Sep-17 00:39:31	21-Sep-17 00:50:22	0 0:10:51	Alarm MAGAZINE DOOR INTERLOCK	Alarm	
21-Sep-17 01:33:06	21-Sep-17 01:43:52	0 0:10:46	Alarm SHORTBROKENTOOL	Alarm	
21-Sep-17 02:15:30	21-Sep-17 02:25:36	0 0:10:06	PALLET CHANGER DOOR INTERLOCK	Idle	
21-Sep-17 02:32:52	21-Sep-17 02:37:12	0 0:04:20		Idle	
21-Sep-17 03:36:58	21-Sep-17 04:06:06	0 0:29:08	Alarm MLOUTOFSPEC	Alarm	
21-Sep-17 04:22:22	21-Sep-17 04:27:08	0 0:04:45		Idle	
21-Sep-17 04:27:13	21-Sep-17 04:28:58	0 0:01:45		Idle	
21-Sep-17 05:08:26	21-Sep-17 05:18:27	0 0:10:01		Idle	
21-Sep-17 05:28:43	21-Sep-17 05:48:20	0 0:19:37	Alarm SHORTBROKENTOOL	Alarm	
21-Sep-17 06:21:18	21-Sep-17 06:22:18	0 0:01:00	Alarm EMERGENCY STOP	Alarm	
21-Sep-17 06:22:23	21-Sep-17 06:25:59	0 0:03:35		Idle	
21-Sep-17 06:37:55	21-Sep-17 06:39:20	0 0:01:25	PALLET CHANGER DOOR INTERLOCK	Idle	

# Asset Availability Data PI DataLink

## CNC Weekly OEE Availability

<b>Report Start Date</b>	02 October 2017
<b>Value Stream</b>	Trays
<b>Asset</b>	MILL0049

Date	Shift	Shift Running Percentage
02 October 2017	Monday Day Shift	61.31
02 October 2017	Monday Night Shift	69.75
03 October 2017	Tuesday Day Shift	65.30
03 October 2017	Tuesday Night Shift	70.20
04 October 2017	Wednesday Day Shift	66.67
04 October 2017	Wednesday Night Shift	76.18
05 October 2017	Thursday Day Shift	59.97
05 October 2017	Thursday Night Shift	77.98
06 October 2017	Friday Day Shift	47.98
06 October 2017	Friday Night Shift	57.99
07 October 2017	Saturday Day Shift	86.97
07 October 2017	Saturday Night Shift	76.25
08 October 2017	Sunday Day Shift	17.48
08 October 2017	Sunday Night Shift	46.64



# Business Impact

- Asset Utilization

- 11% Increase.
- Decrease in unplanned downtime.

- Data Access & Retrieval

- 80% reduction in data retrieval time.
- Provided managers, engineers and operators increased visibility in machine data.

- Environmental Data Monitoring

- Variations in relative humidity in dip room linked to increase in upstream scrap.

- Behaviour Impact

- Empowered engineers to understand and investigate the manufacturing process in more depth.

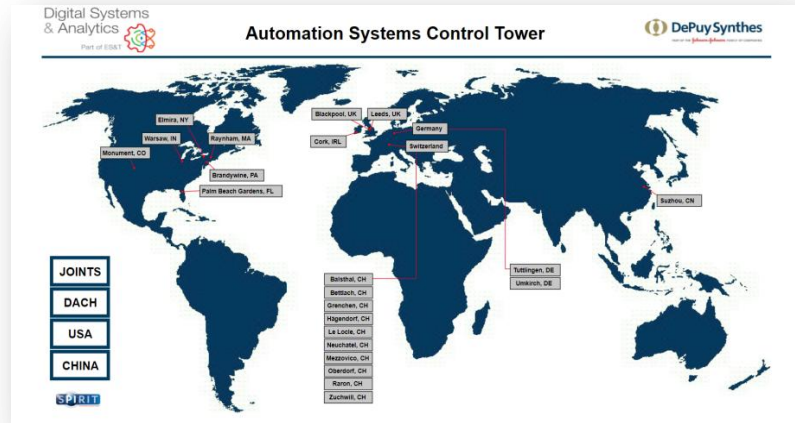


## Next Steps



- OSIsoft MTConnect Connector Development
- Trend SPC Measurement Data
- Collect facilities energy monitoring data
- Trial Started on two more DePuy Sites
- Merge With MES Data To Calculate Full OEE Metrics
- Expose Data to Data Lake for More Advanced Analytics Using PI Integrator
- Roll Out Automation System Control Tower to all DePuy Synthes Sites in Global Orthopaedics

# Breaking New Ground With Enterprise PI System



## COMPANY and GOAL

DePuy Synthes is a global leader in orthopaedic medical device products, and wanted to **improve asset utilization**

## CHALLENGE

No central repository for machine data. Lack of visibility into asset utilization

- Numerous data silos
- No standard for data collection

## SOLUTION

Used an enterprise PI System as a standard method to access real time data and to analysis asset utilization

- Rapid deployment due to use of PI AF templates & element relative displays
- Unrestricted access for J&J users to all data

## RESULTS

Data can now be accessed by operators, utilities and management from any location and any device

- Improvement in asset utilization
- Increased visibility into machine & process data
- Standard data collection approach developed for all sites

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## Questions

Please wait for the **microphone** before asking your questions

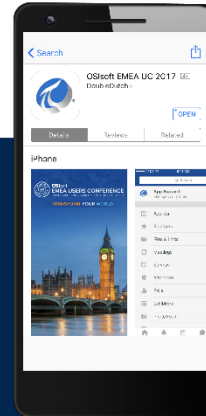


State your **name & company**

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Danke

谢谢

Merci

Gracias

**Thank You**

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Спасибо

Obrigado