

OCTOBER 24, 2023

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# How Shift Teams at BASF use AVEVA™ PI System™ Data to Collaborate and Boost Asset Utilization

Michael Eckardt

Andreas Eschbach

**AVEVA**

# BASF – We create chemistry

- Our chemistry is used in almost all industries
- We combine economic success, social responsibility and environmental protection
- Sales 2022: €87.3 billion
- EBIT before special items 2022: €6.9 billion
- Employees (as of Dec. 31st, 2022): 111,481
- 6 Verbund sites and 239 other production sites
- Around 82,000 customers from various sectors in almost every country in the world



# BASF production and Verbund sites



# BASF's segments



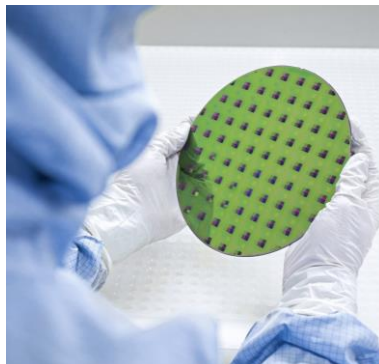
## Chemicals

Petrochemicals  
Intermediates



## Materials

Performance Materials  
Monomers



## Industrial Solutions

Dispersions & Pigments  
Performance Chemicals



## Surface Technologies

Catalysts  
Coatings



## Nutrition & Care

Nutrition & Health  
Care Chemicals



## Agricultural Solutions



# The biggest job on earth is getting bigger

**+2 billion**

increase of world  
population  
by 2050

**50% higher**

productivity in farming  
required  
in 2030<sup>2</sup>

**Limitations**

on arable land<sup>1</sup>

<sup>1</sup> World Bank hectares per person 1994-2016: -23%

<sup>2</sup> FAO



# BASF Agricultural Solutions



## Seeds & traits

- Field crop seeds
- Vegetable seeds



## Solutions beyond crop protection

- Seed solutions
- Soil management
- Biologicals
- Pest control solutions
- Public health



## Crop protection

- Herbicides
- Fungicides
- Insecticides



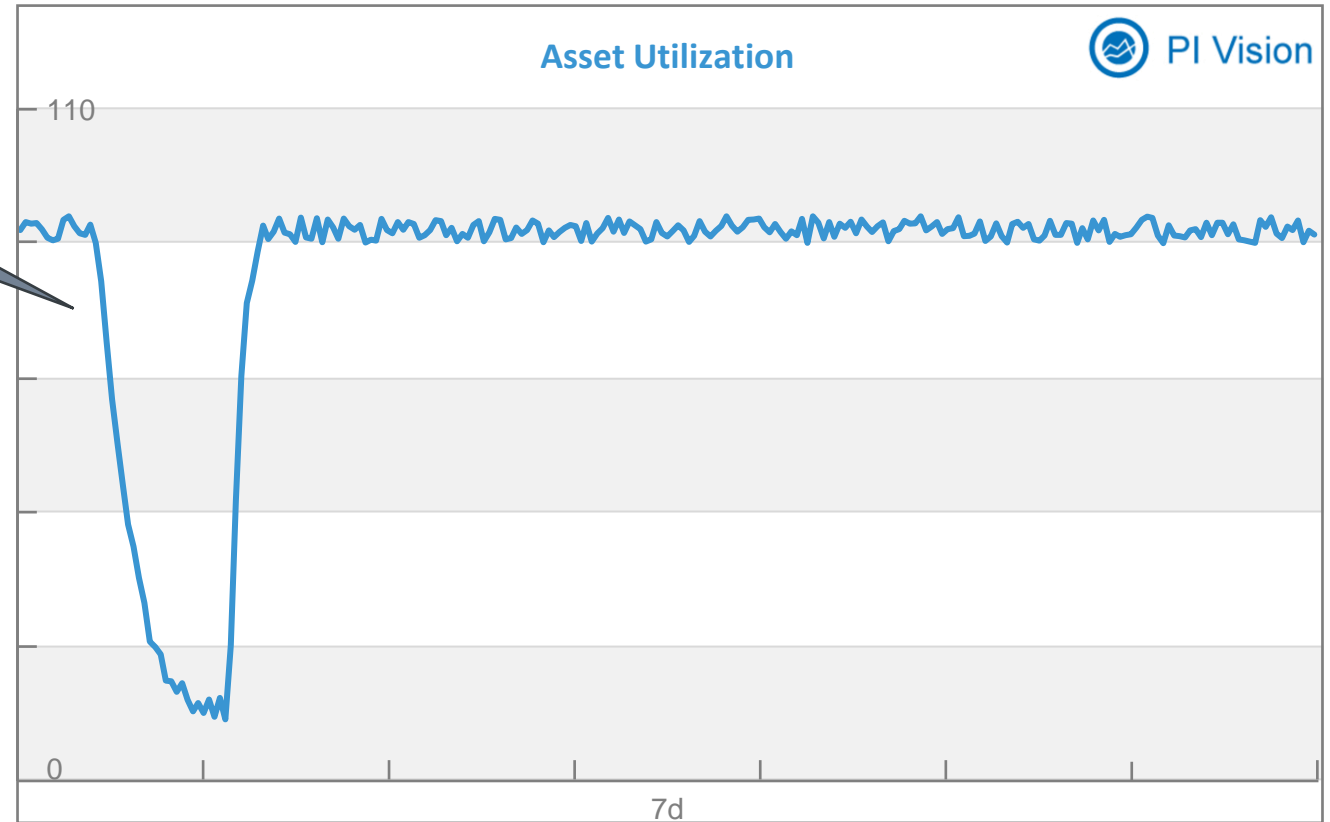
## Digital farming

- Digital farming solutions
- Sales and marketing excellence

# Our business and process challenge

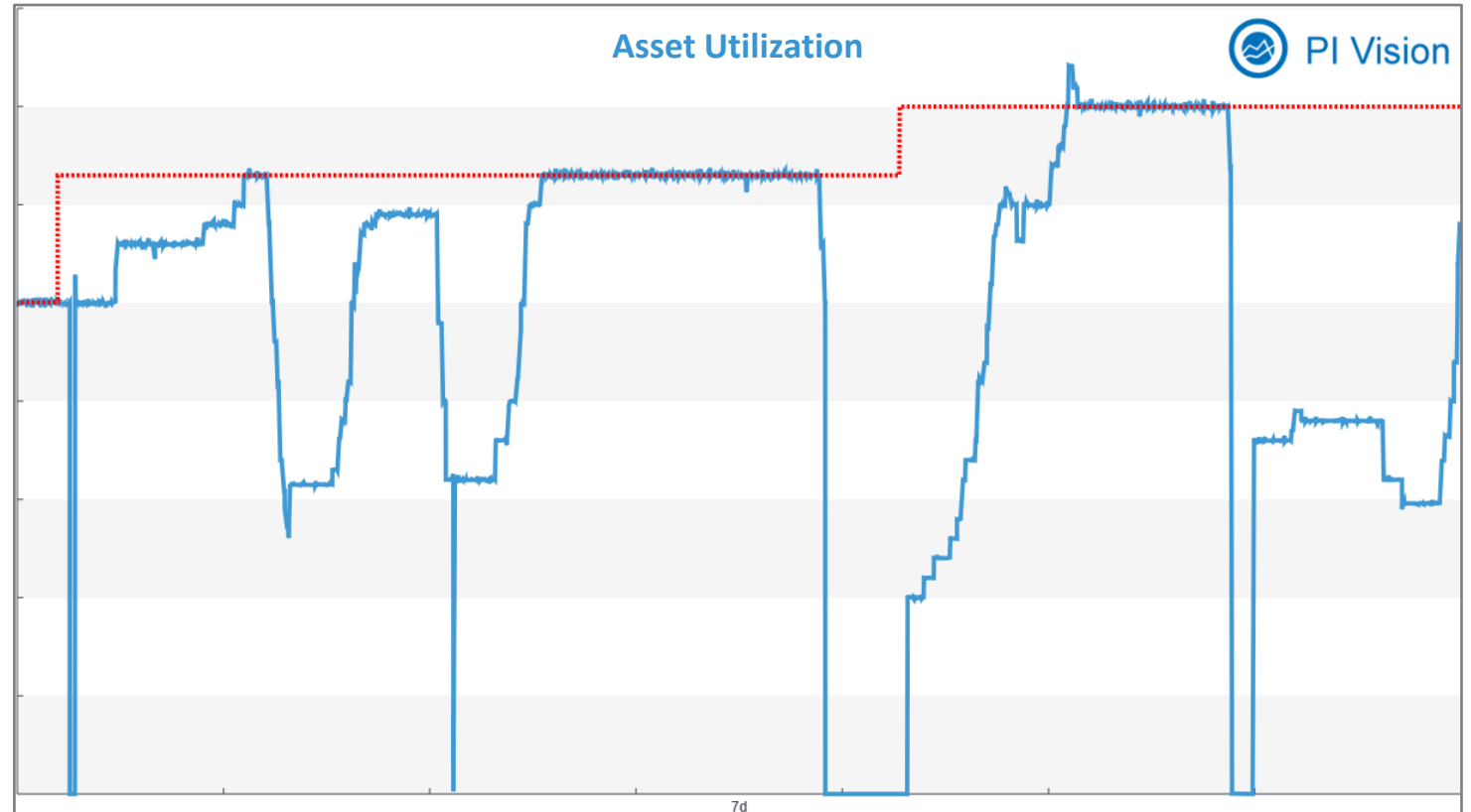
Reason?  
Improvement?

- Link AVEVA™ PI System data and **contextualize** it
- Provide a managed asset performance process
- Full VI: from sensor data to the global AE database



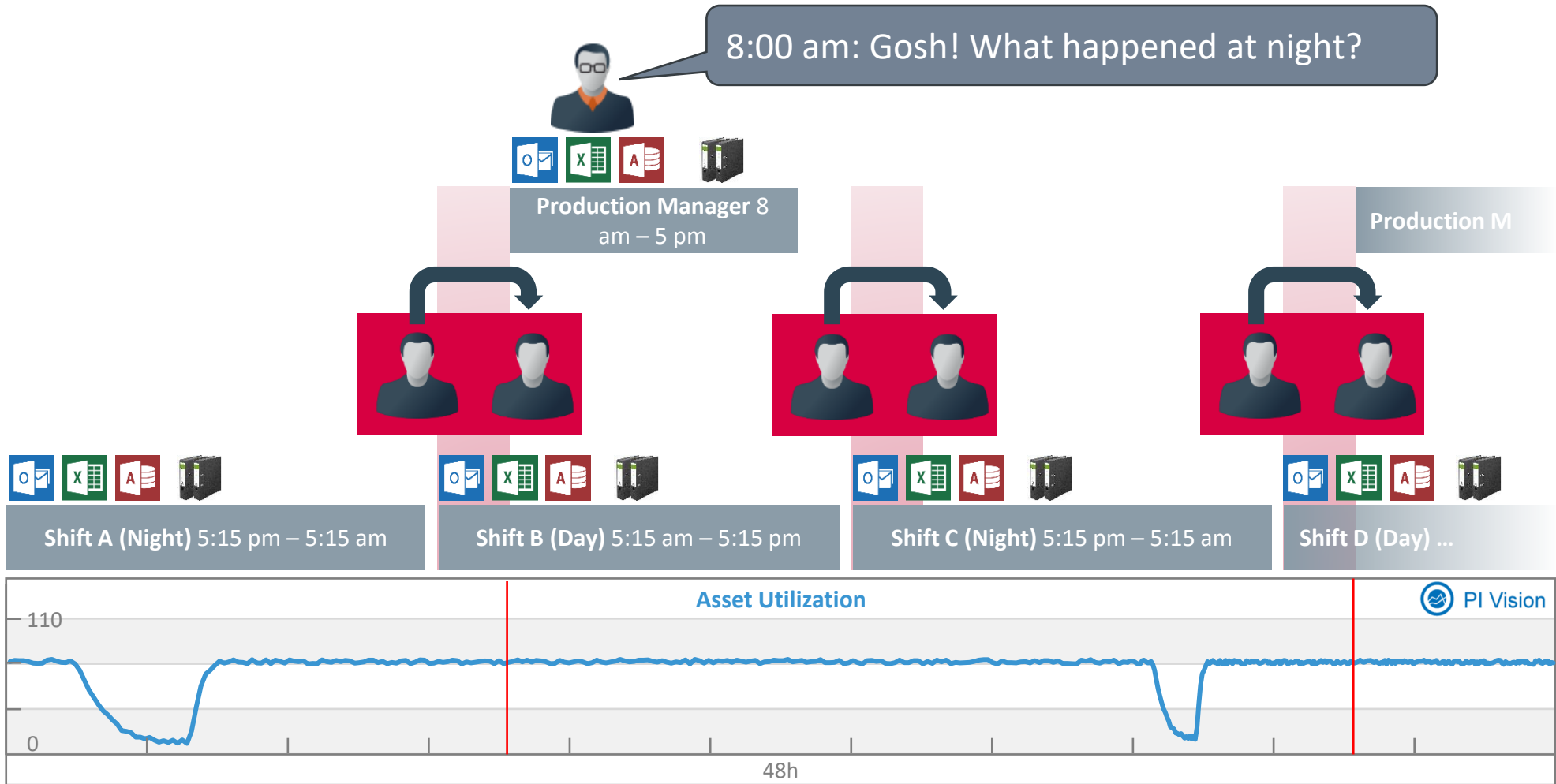
# A real-life example on optimization

- We observed:
  - Process upsets
  - Reliability issues
  - Shift dependent rates
- Why was it so hard to get a **smooth** output?
- Who has all the relevant information?

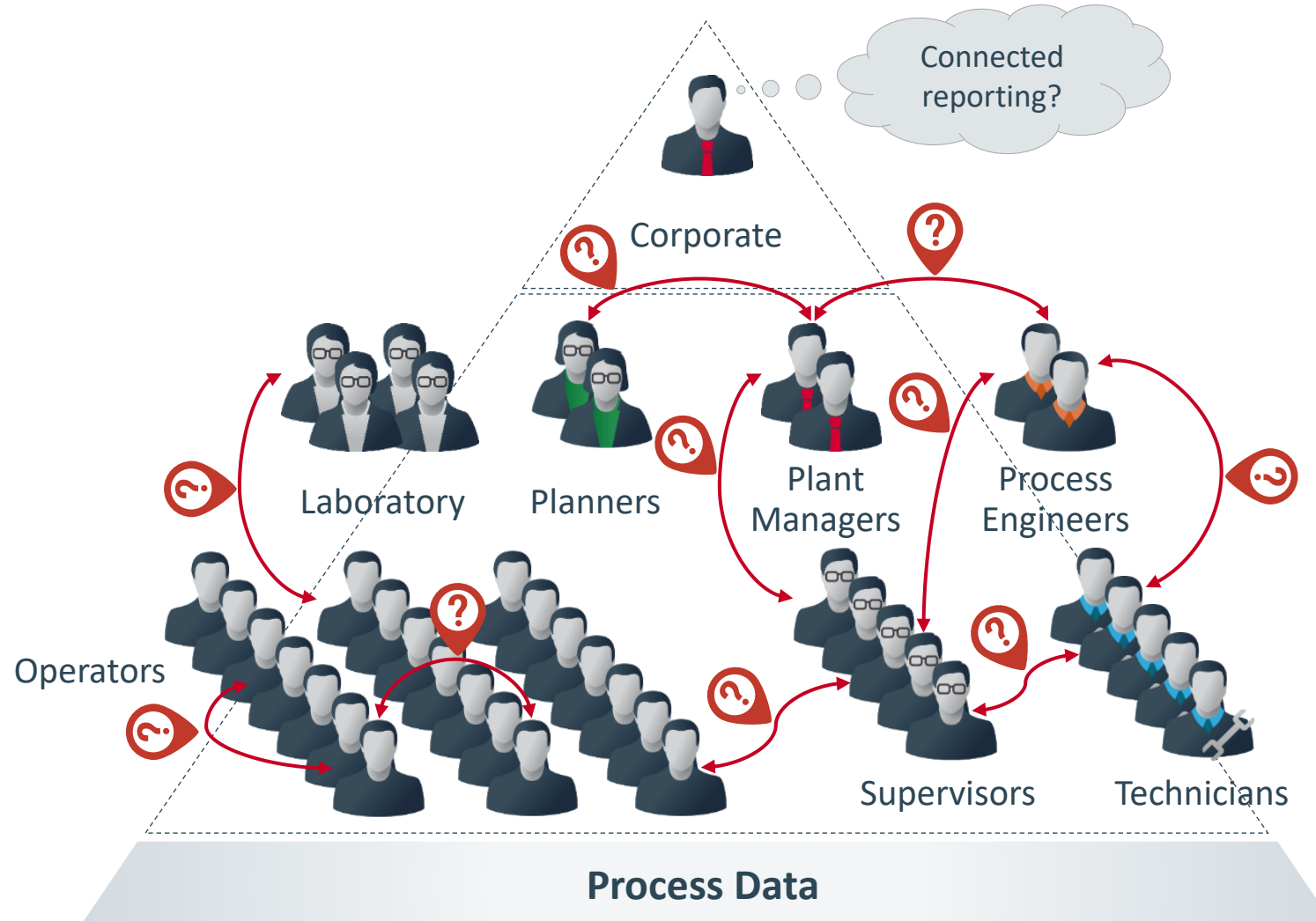




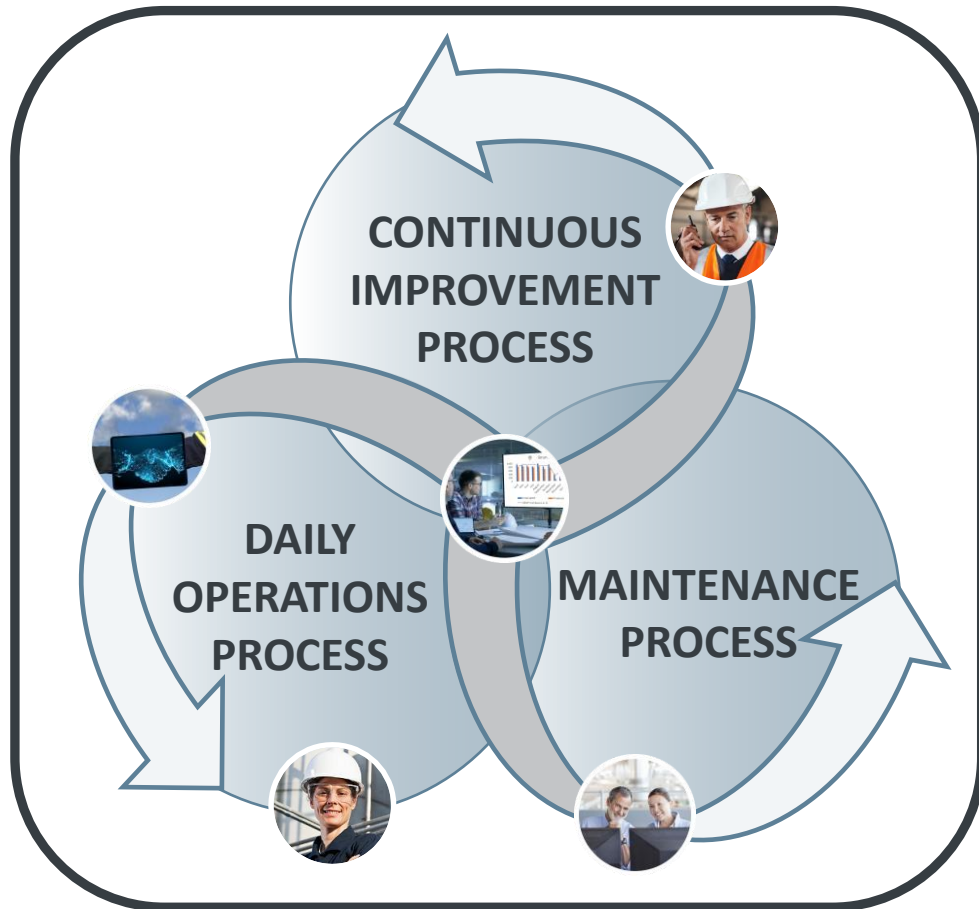
# A typical situation in a 24/7 plant



# Information flow isn't a piece of cake



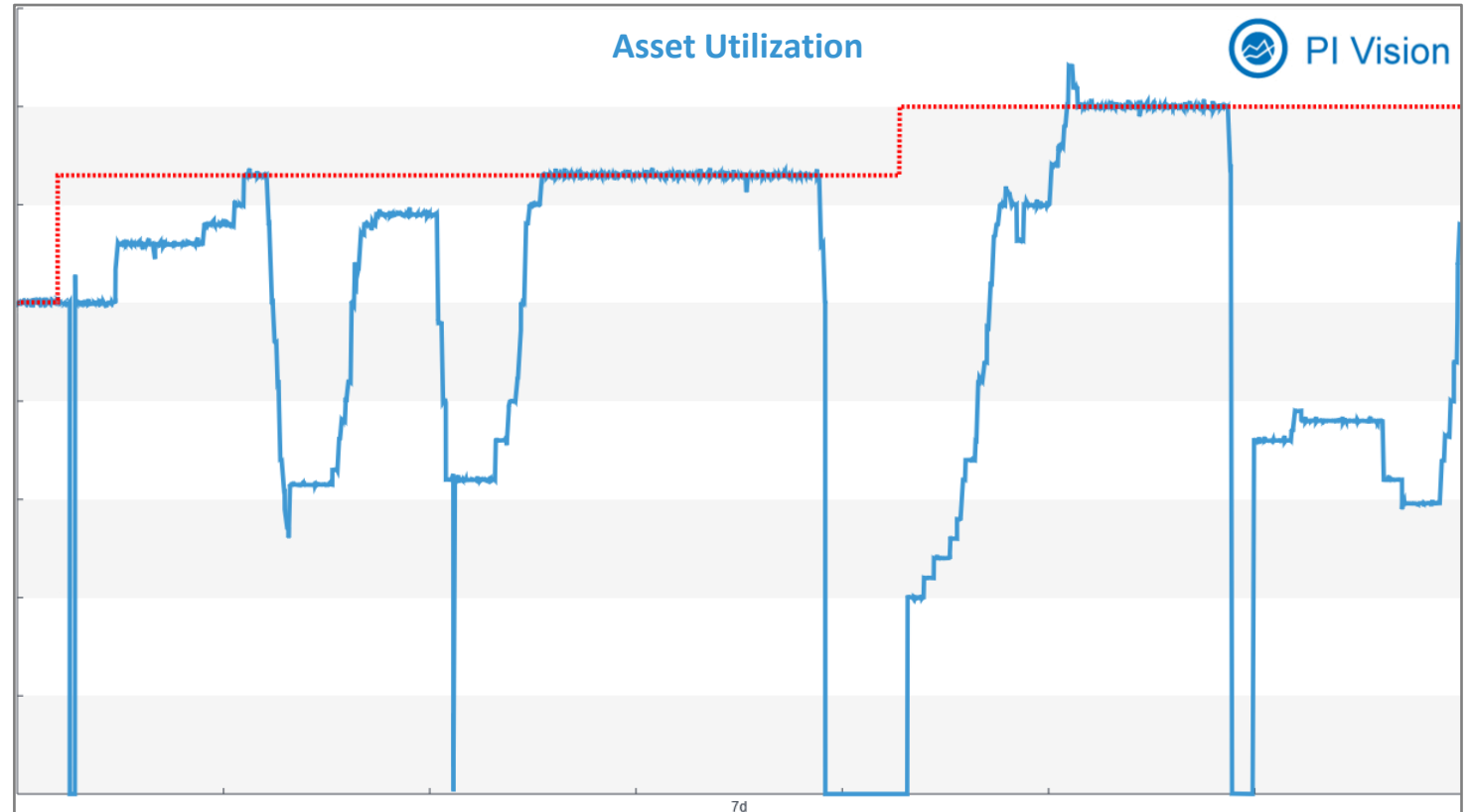
# Getting the whole process picture





# Pain points of our optimization approach

- Managed by one person or a small team
- Sustainability issues due to **short term** maximization
- Difficult getting a clear picture w/o functional locations



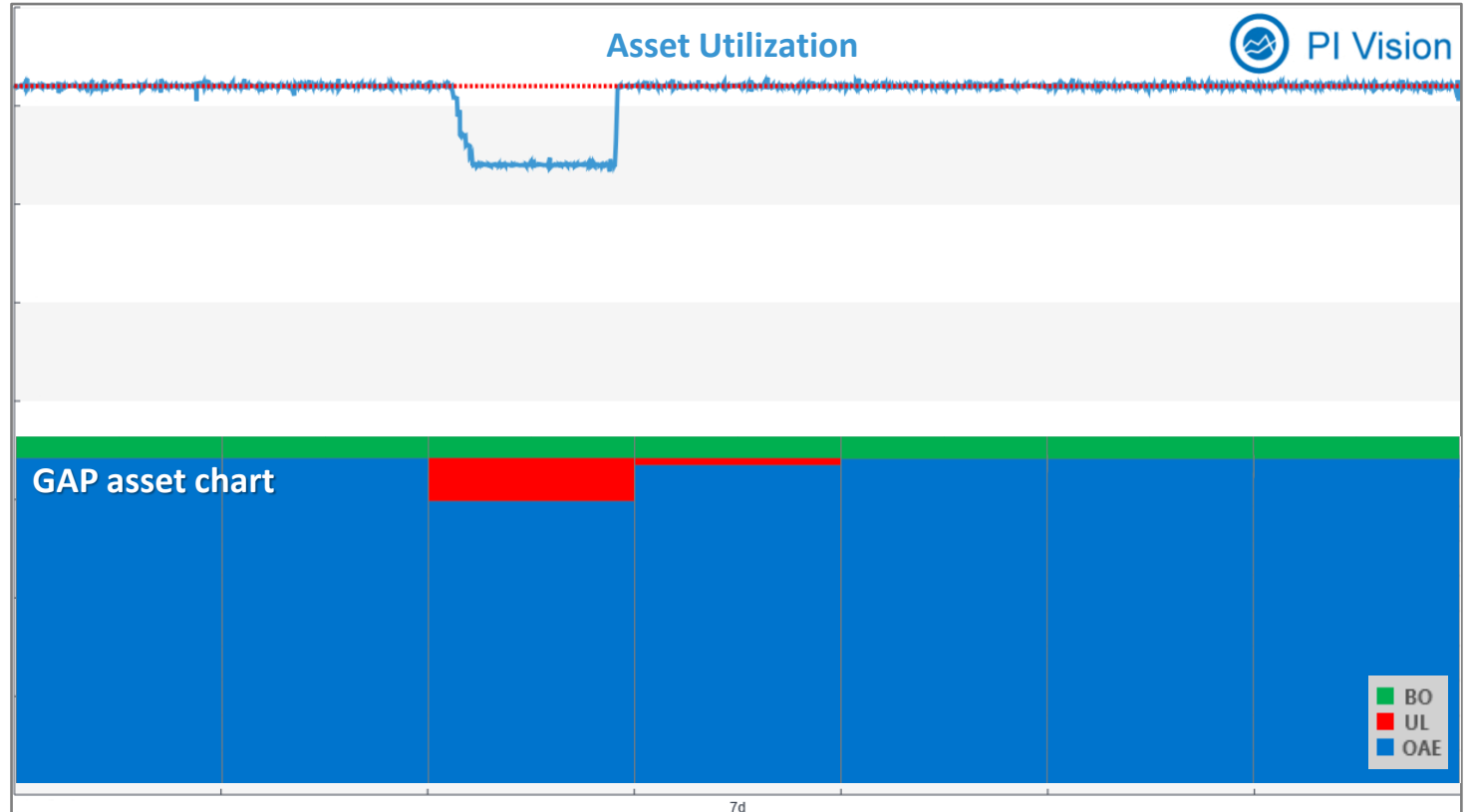
# Solution: asset utilization as a team sport

- We got an increased:

- Process stability
- Employee **alignment**

- Finally, we have:

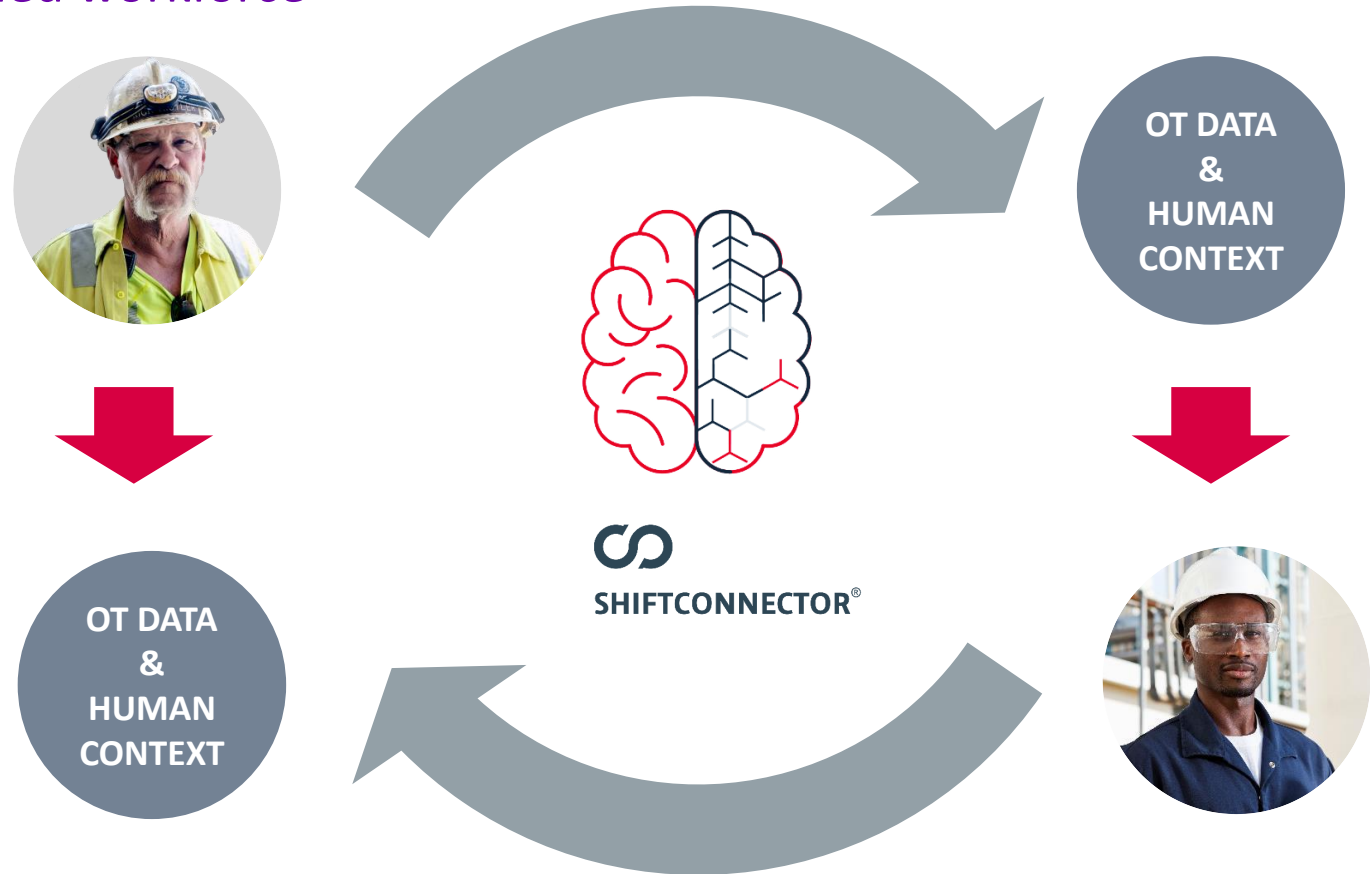
- Common understanding
- Shift **independent rates**
- Interface to AE database



# Bridging the skill gap – Circle of knowledge

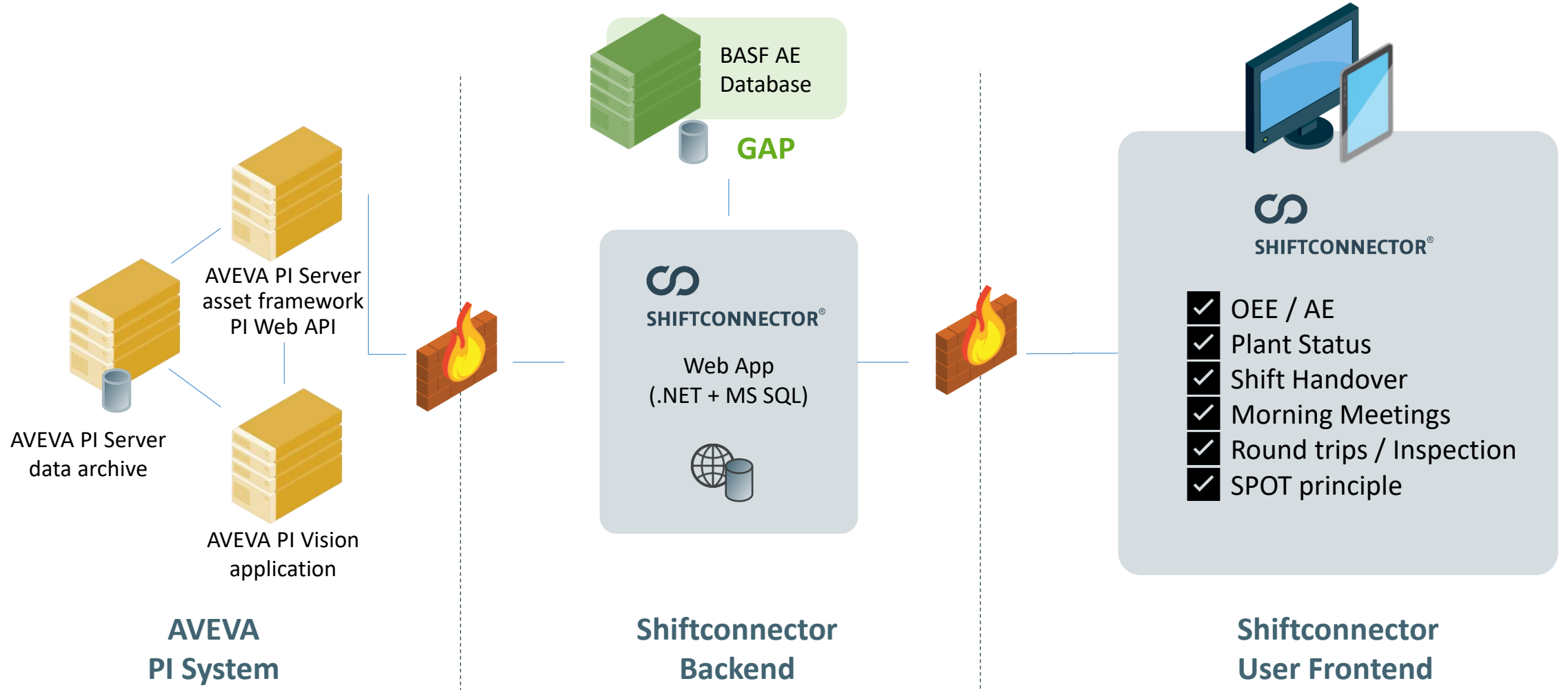
Mitigating the shortage of qualified workforce

- Know-how across different generations
- Conservating implicit knowledge
- AI-assisted knowledge-sharing





# AVEVA PI System, Shiftconnector and GAP



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# DEMO

How Shift Teams at BASF use data from AVEVA PI System to Collaborate and Boost Asset Utilization – BASF Project Demo

AVEVA

Show: Active Items

- Infoboard
- Shiftlead
- Precursor Synthesis
- Saponification
- Downstream Processing
- Purification
- Dayshift Supervisor
- Tankfarm 1
- Tankfarm 2
- Filling and Packaging
- Production Specialists
- Maintenance
- Laboratory
- Moring Meeting
- SAP PM
- Search

- MY MAILBOX
- nothing to sign
  - no tasks

## Information for Infoboard



Tue, 10-17-2023 19:27  
Michael Eckardt

### Welcome to AVEVA World 2023

How Shift Teams at BASF use PI Data to Collaborate and Boost Asset Utilization.  
Empowering Chemical Manufacturing Teams with the PI System and Human Intelligence.



Mon, 10-16-2023 19:47  
Michael Eckardt

### New Production Record in September

Our team achieved a new production record  
With this, we can all look forward to a successfull year 2023!



Mon, 10-16-2023 19:47  
Michael Eckardt

### Shiftconnector Training Sessions

Training sessions will continue in October for our new hires  
Please book a suitable time in our global training portal.  
Any questions? Please touch base with our on-site training team.



Mon, 10-16-2023 19:47  
Michael Eckardt

### Vacation and Events Planner available

New Planner for 2024 out now  
The new vacation and events planner for each team is available.

Vacation and Events Plan...024.xlsx





+ Add Entry

Show: Active Items

## Information for Infoboard


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Update

XLSX Vacation and Events Plan...024.xlsx



Show: last 24 hours



Grouping: - None - Shiftbook Category Functional Location Shift

- Infoboard
- Shiftlead
- Precursor Synthesis
- Saponification
- Downstream Processing
- Purification
- Dayshift Supervisor
- Tankfarm 1
- Tankfarm 2
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> Shiftlead 0

▼ Precursor Synthesis 1

Start/End or Open	Shiftbook	Category	Functional Location	Description	Created/Modifie...	Atta...	Priority
Tue, 10-17-2023 17:23	Precursor Synthesis	Quality	BE10 - KAT-Aufgabe	Catalyst from last delivery has hard-to-read labels.	Jane Doe		

▼ Saponification 3

Start/End or Open	Shiftbook	Category	Functional Location	Description	Created/Modifie...	Atta...	Priority
Tue, 10-17-2023 18:28	Saponification	SAP PM Notification M1	C512 - Reaktor Verseifer	Lighting in area of vessel C512 insufficient.	Jane Doe		
Tue, 10-17-2023 18:25	Saponification	Safety	C512 - Reaktor Verseifer	Lighting in area of vessel C512 insufficient.	Jane Doe		
Tue, 10-17-2023 15:21	Saponification	Safety	C564 - Reaktor Verseifer	Reaction was paused due to maintenance work in this area.	John Doe		

▼ Purification 2

Start/End or Open	Shiftbook	Category	Functional Location	Description	Created/Modifie...	Atta...	Priority
Tue, 10-17-2023 21:18	Purification	Failure	P441A - Pumpe von B441	Flow rate dropped to 0 kg/h Action/Solution: Checked in the field, motor not moving, pump stuck.	Jane Doe / Michael Eckardt		
Tue, 10-17-2023 14:20	Purification	Quality	R470 - Rührwerksbehälter Wisto/H2O	Batch 20231017: AI concentration out of specification @ DSC. ==> Lab analysis running...	Richard Miller		

> Dayshift Supervisor 0

> Production Specialists 0

> Maintenance 0

> Laboratory 0

# Standardized deployment templates

## Batch process deployment template



- Batch cycle time tracking
- Line clearance and changeover
- Based on ISA-88 PI System event frames



## Discrete production deployment template



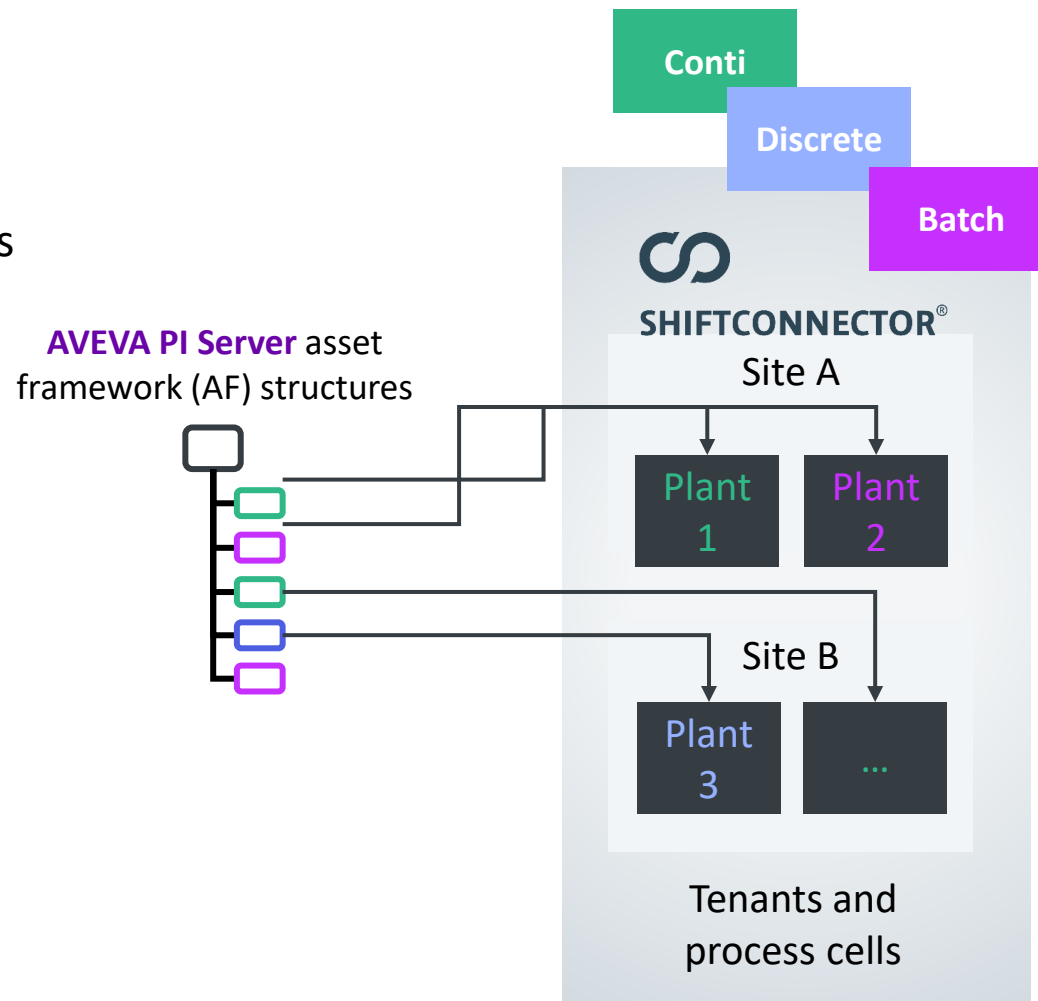
- Accounting for number of pieces
- Micro stops accounting
- Based on totalizer in PI Server's AF



## Continuous process deployment template



- Timeboxing (drumbeat)
- Flow rate vs. target
- Based on totalizer in PI Server's AF



# Scaling and standardizing with PI Server's asset framework structures

The image shows two screenshots side-by-side. The left screenshot is from 'PI System Explorer (Administrator)' showing a tree view of elements under 'Houston' and 'Cracking Process'. The right screenshot is from the 'SHIFTCONNECTOR' OEE dashboard showing a calendar and a list of bottleneck events.

Annotations with red arrows point from the PI System Explorer to the SHIFTCONNECTOR interface:

- Tenant:** Points to the 'Houston' element in the tree view.
- Process Cell:** Points to the 'Cracking Process' element in the tree view.
- Bottleneck Equipment:** Points to the 'B-210' element in the tree view.
- Tag for Uptime / Downtime (optional):** Points to the 'Fuel Gas Flow' tag in the table.
- Totalizer Tag for Amounts:** Points to the 'Fuel Gas Volume' tag in the table.

Name	Value
Asset Name	High F
Burner	TZ-14
Fuel Gas Flow	17.02
Fuel Gas Flow Tag	cdt15
Fuel Gas Volume	36.90
Fuel Ratio	1000
Installation Date	5/15/
Make-Up Water Flow	30.11
Make-Up Water Tag	SINUS
Manufacturer	Borne
Model	BX-41
Plant	Houst
Process	Crack
Water	629.6

SHIFTCONNECTOR OEE Dashboard Data:

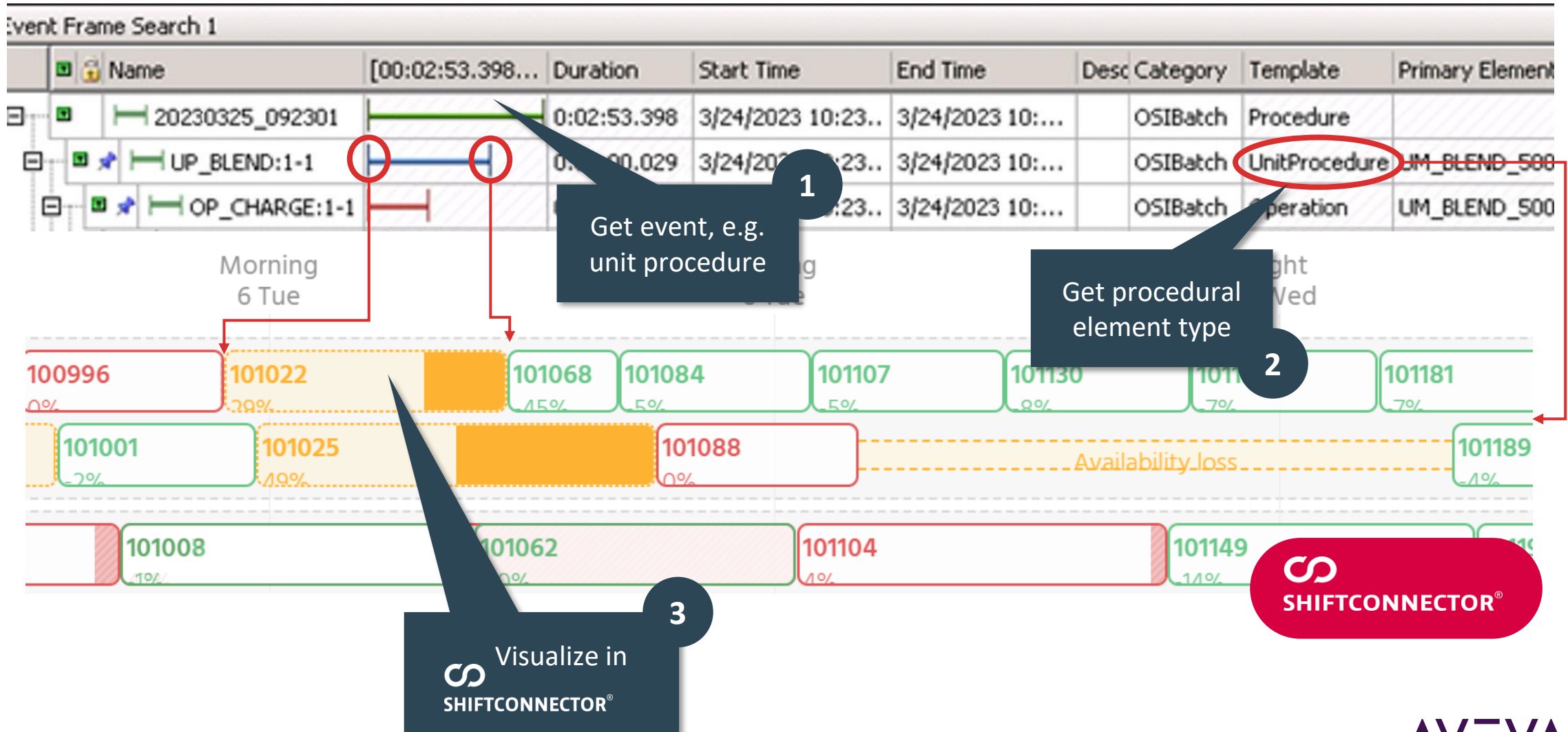
Event	Duration	Time	Batch
OEE bottleneck events	12 h 0 min	-	-
Downtime - Missed operation 2 start	2 h 41 min	11:07 AM - 05:48 PM	9346
Changeover	30 min	10:37 AM - 11:07 AM	9346
Rate Loss - Faulty gasket at compressor	4 h 7 min	06:30 AM - 10:37 AM	9345
01 - Production	6 h 0 min	12:30 AM - 06:30 AM	9345

Amounts (85.12 klbs / - / 24.00 klbs)

80.04 klbs 04:00 AM - 04:00 PM

Actual production: Amount (klbs): 85.17, Product: Product A, CurrentProductionRate: 7,352,449

# Standardization with AVEVA PI System's event frames





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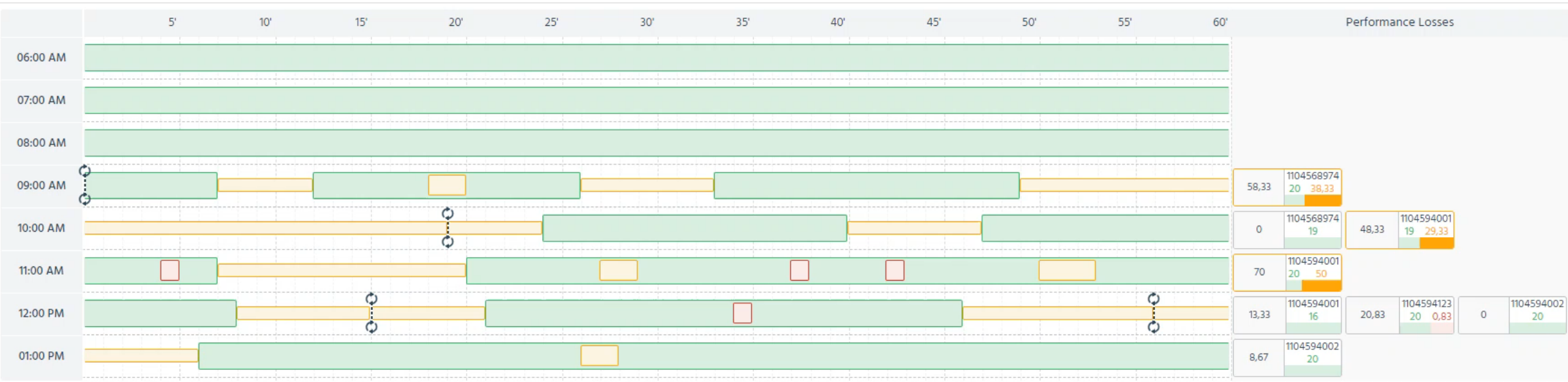
# DEMO

How Shift Teams at BASF use data from AVEVA PI System to Collaborate and Boost Asset Utilization – Multi Unit and Batch Plants





- Infoboard
- Shift Supervisor
- API Manufacturing
- Packaging**
- Morning Meeting
- Search
- Tool improvements
- MY MAILBOX
- nothing to sign
- no tasks
- Configuration



> Operations Staff

> Area A

> Area B (SC GO)

> Area C (OEE)

Overview Shift Supervi...

Line 1

Line 2

Morning Meeting

Search

> Special Apps

Search

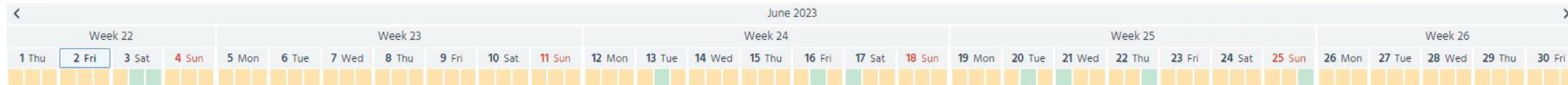
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no tasks

Workflow Tasks 4

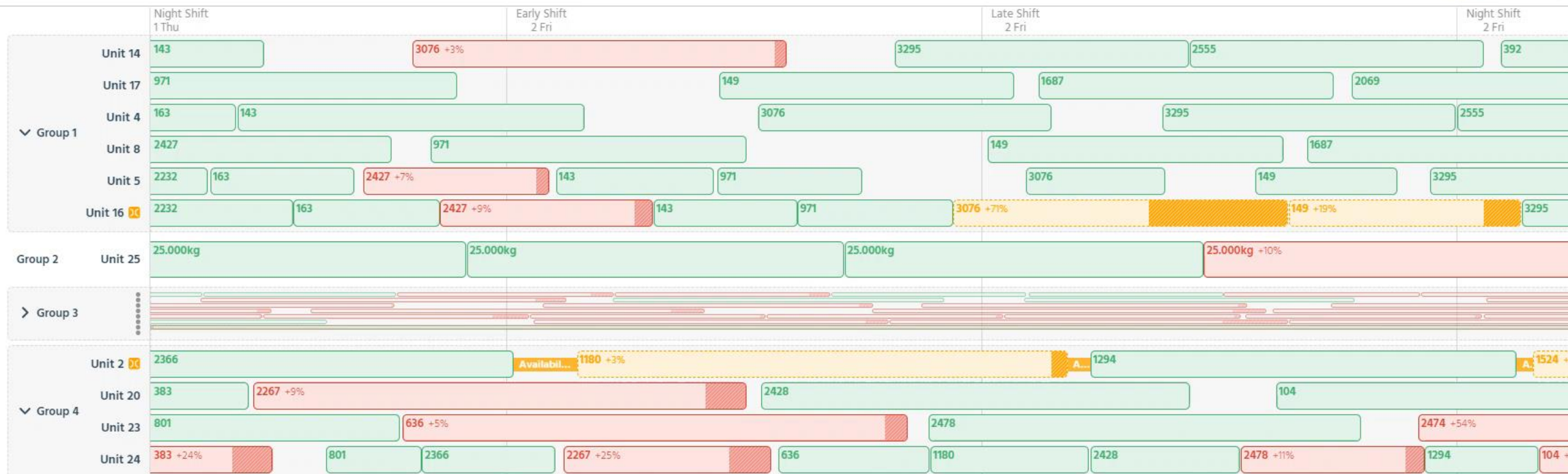
Configuration



Product  
4 products selected

Deviation type

Gantt List PCC



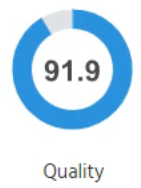
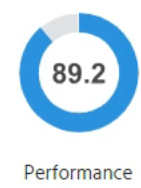
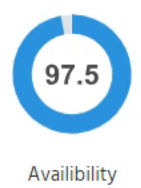
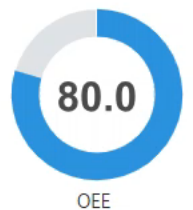


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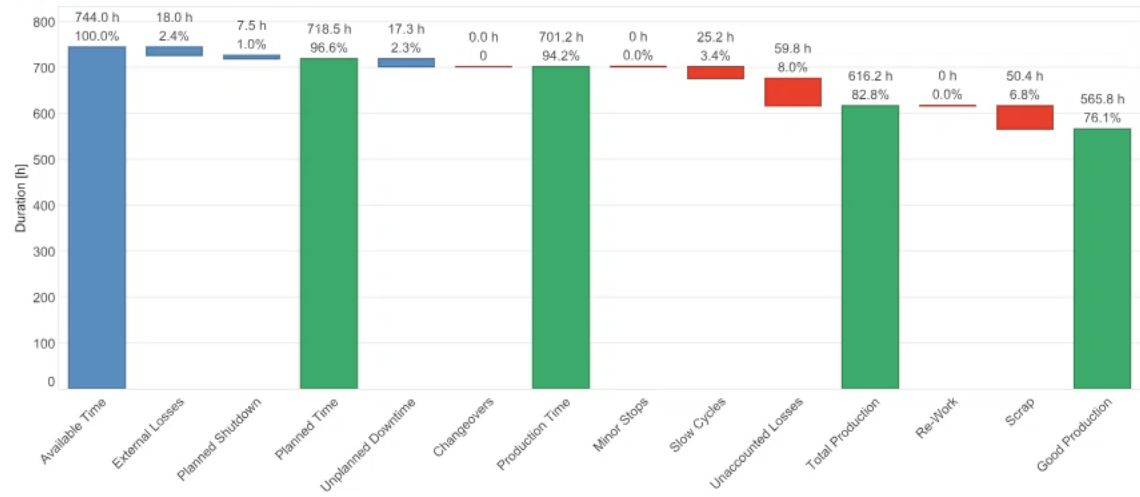


Start Date: 2023-8-1    End Date: 2023-8-31    Submit

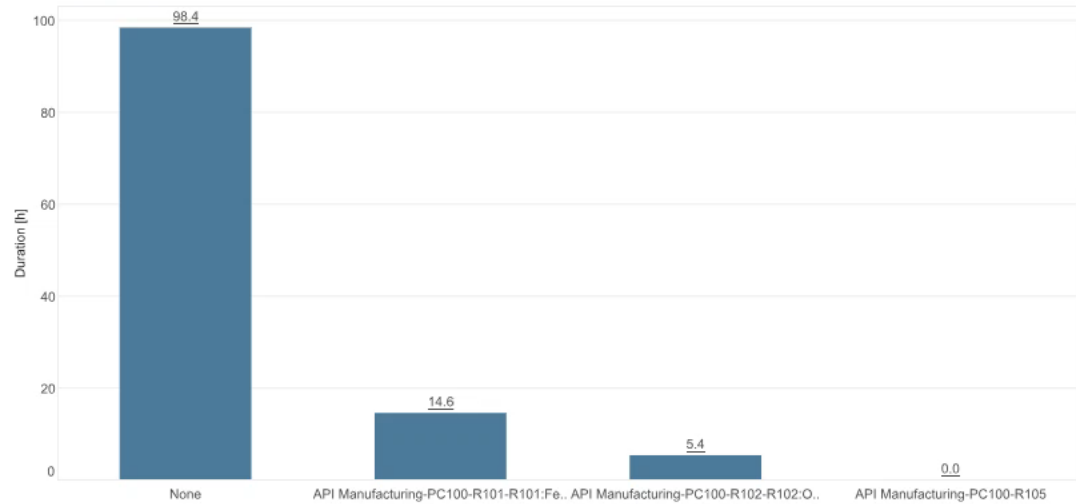
### Key Performance Indicators [%]



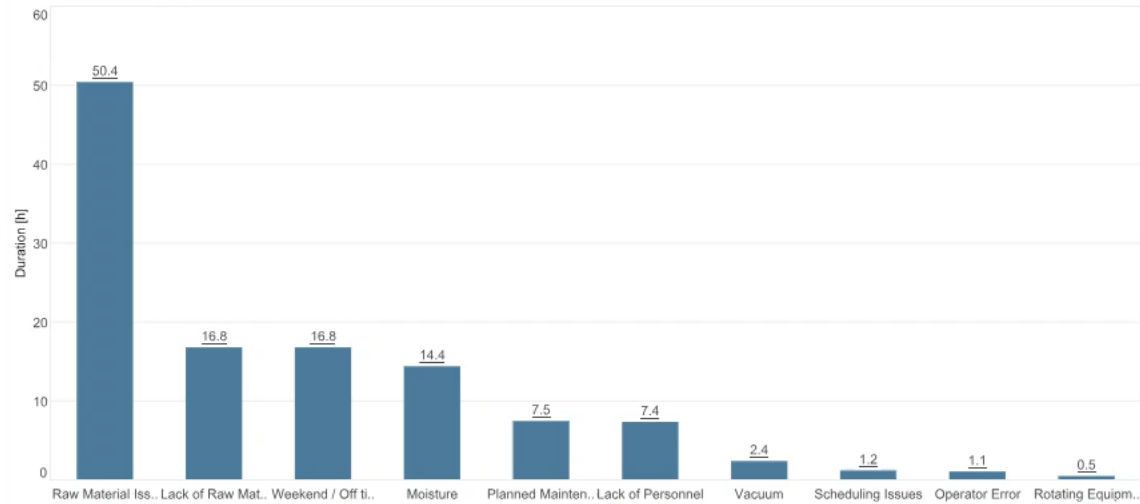
### Waterfall



### Top Bad Actors



### Top Reason Codes





# BASF increases the time at the desired production rate from 30 % to > 85 %

## Challenge

- Shift dependent driving styles, process upsets and short-term maximization of the output led to less reliability and limited the time at the desired production rate
- Loss accounting into the global database was difficult due to a lack of information
- Most employees were not involved in asset effectiveness efforts

## Solution

- Implementation of Shiftconnector™ as middleware with interfaces to AVEVA™ PI System™ for reliable process data and BASF's global AE reporting database

## Results

- Increase of the time at the desired production rate from approx. 30% to >85 %
- Synchronized process flow across all teams: engaged employees, reduced friction, reduced upsets and sustainable output at  $M_{max}$
- Hands-on data for decision-making







## Michael Eckardt, PhD

Project Lead Technical Process Optimization

- BASF Agricultural Solutions
- michael.eckardt@basf.com



## Andreas Eschbach

Founder & CEO

- **eschbach**
- andreas.eschbach@eschbach.com

**Visit** us at the **eschbach**  
**booth #21**

**AVEVA**

# 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!



Our path is digital.



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The Company shall not be obliged to disclose any revision to these forward-looking statements to reflect events or circumstances occurring after the date on which they are made or to reflect the occurrence of future events.

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AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

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