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PARIS

OCTOBER 2024

## Novartis Manufacturing Cockpit

Using AVEVA PI System

Andre Muller, Principal Automation Engineer Uros Pudgar, Principal Automation Engineer



## Novartis Manufacturing Cockpit

**Using AVEVA PI System** 

**U**NOVARTIS | Reimagining Medicine

# Reimagining medicine

#### **Andre Muller**

Principal Automation Engineer Novartis Global ITOT

October 15, 2024

**UNOVARTIS** Reimagining Medicine

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#### About the presenter

#### **Andre Muller**



André is part of the Global Novartis ITOT organization working in Automation and collaborating with all sites to enable relevant use cases to best benefit in the production of medicines.

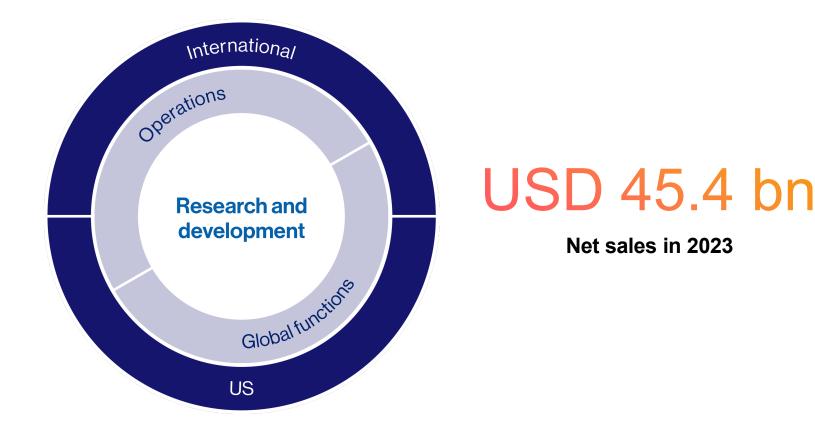
André joined Novartis in 2002 at a manufacturing site and joined the Global Novartis Organization in 2006.

## Novartis is an innovative medicines company

Novartis consistently ranks among the world's top companies investing in R&D.<sup>1</sup>

## USD 8.6 bn

Core R&D spend in 2023<sup>2</sup>



<sup>1</sup> All figures refer to continuing operations (i.e. excluding Sandoz).

<sup>2</sup> This presentation includes non-IFRS financial measures such as constant currencies and core R&D spend. A definition of non-IFRS measures used by Novartis, and further details, including reconciliation tables, can be found in "Item 5. Operating and Financial Review and Prospects" of the Novartis Annual Report 2023.

## **Our transformation**

Over the years we have transformed from a healthcare conglomerate to an innovative medicines company, culminating in the spin-off of our Sandoz generics and biosimilars business in October 2023.

1996 Sandoz and Ciba-Geigy merged			Acquired GSK oncology portfolio; created GSK consumer healthcare Accelerator Applications,			)20 uired Medicines npany	2023 Acquired Chinook Therapeutics	Focused on innovative medicines	
	CREATED	> DIVERSIFIED HEALTHCARE CO	MPANY		ERA				E MEDICINES COMPANY
		2002 Divested Health and Functional Foods business	2007 Divested Medical Nutrition and Gerber businesses	2015 Divested animal health and vaccines businesses	2018 Divested GSK consumer joint venture	2019 Spun off Alcon	2021 Sold Roche stake	2023 Spun off Sandoz	



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## Our purpose and vision are supported by a strong culture with clear values



#### **Purpose**

Reimagine medicine to improve and extend people's lives



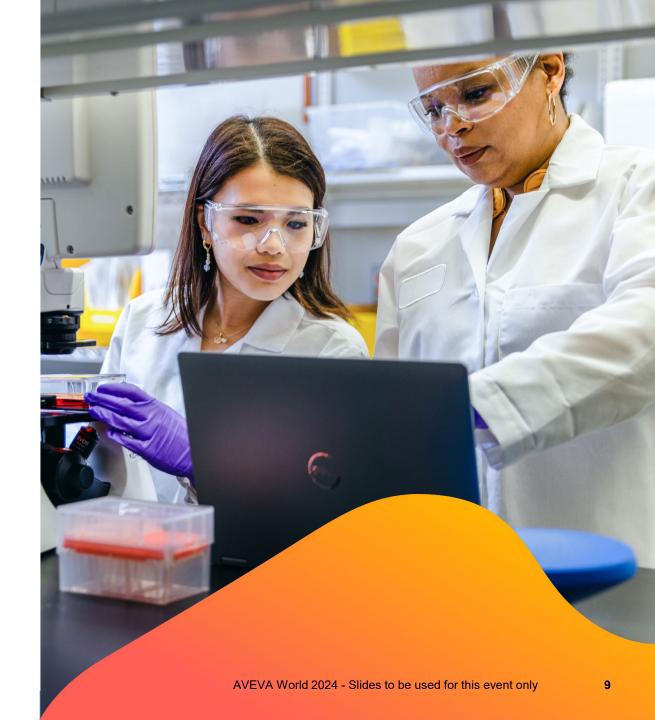
#### Vision

To become the most valued and trusted medicines company in the world

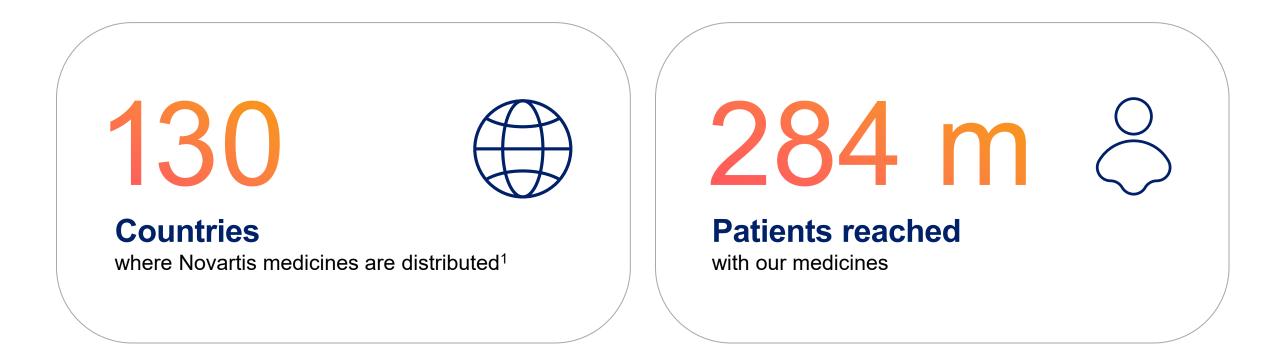


#### Values and behaviors

Inspired. Curious. Unbossed. Integrity



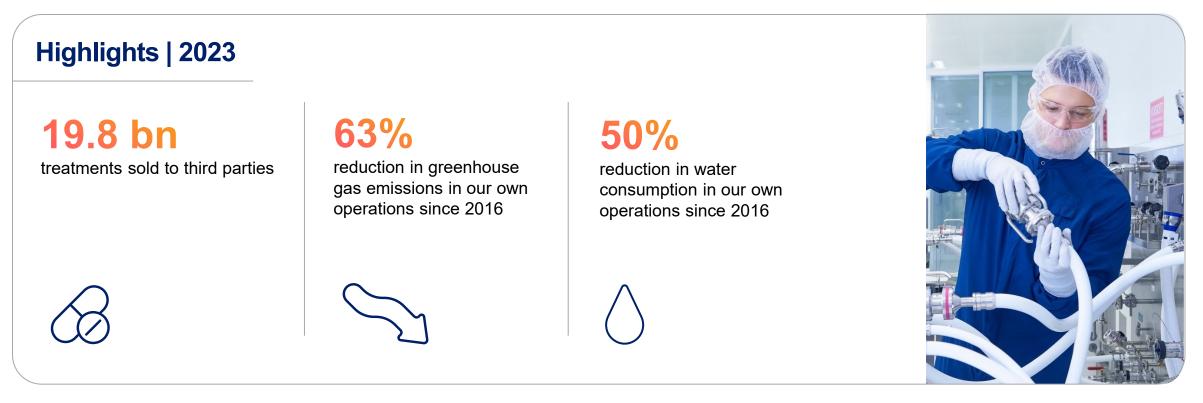
## Millions of people worldwide benefit from our medicines



All figures refer to continuing operations (i.e. excluding Sandoz).

### **Embed operational excellence**

We aim to drive efficiency and free up resources to invest in innovation for patients. In everything we do, we maintain high standards of patient safety, while also working to reduce our environmental footprint



All figures the refer to continuing operations (i.e. excluding Sandoz).

### **Our achievements are gaining recognition**

#### Access to Medicine Index

Novartis has ranked in the leadership group for more than 10 years

#### CDP

Novartis achieved Double A List status in Climate Change and Water Security (based on latest available results from 2022)

#### **Bloomberg Gender Equality Index**

Novartis was included in 2023 for the fourth year in a row

#### MSCI

Novartis maintained its AA rating in the 2023 MSCI ESG Ratings assessment.

1. All information based on 2023 data.



## MANUFACTURING COCKPIT 2

**Pudgar, Uros** Principal Automation Engineer Novartis Global ITOT

October 15, 2024

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#### About the presenter

#### **Uros Pudgar**



Uros is part of Global Novartis ITOT Organization working on different use cases across several manufacturing sites.

He joined Novartis in 2017 at a manufacturing site and transitioned to the global Novartis organization in 2020.

He holds a Bachelor's degree in Computer Science and Electrical Engineering from University of Maribor, Slovenia.

## Novartis lays a foundation to help improve equipment efficiency by at least 5%

#### Challenge

- Standardization: adopt global standards across all sites
- Transparency: siloed and locally managed data

#### **Solution**

 Use AVEVA<sup>™</sup> PI System<sup>™</sup> to centralize data and apply global standard guidelines for analytical calculations

#### **Results**

- End to end link between shopfloor and Business Intelligence platform
- Strong foundation for improvement actions / continuously improving knowledge database
- Expected outcome to improve equipment efficiency by at least 5 %

## Agenda



#### **1. About Manufacturing Cockpit** MACO in a nutshell



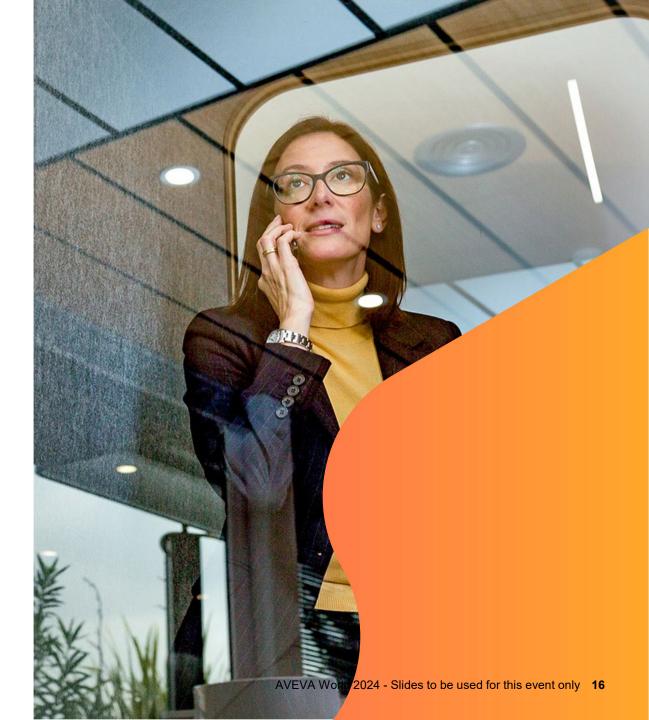
**2. How it was done** Architecture design



**3. How it looks like** MACO OT & BI

#### 4. Benefits

What are the expected benefits



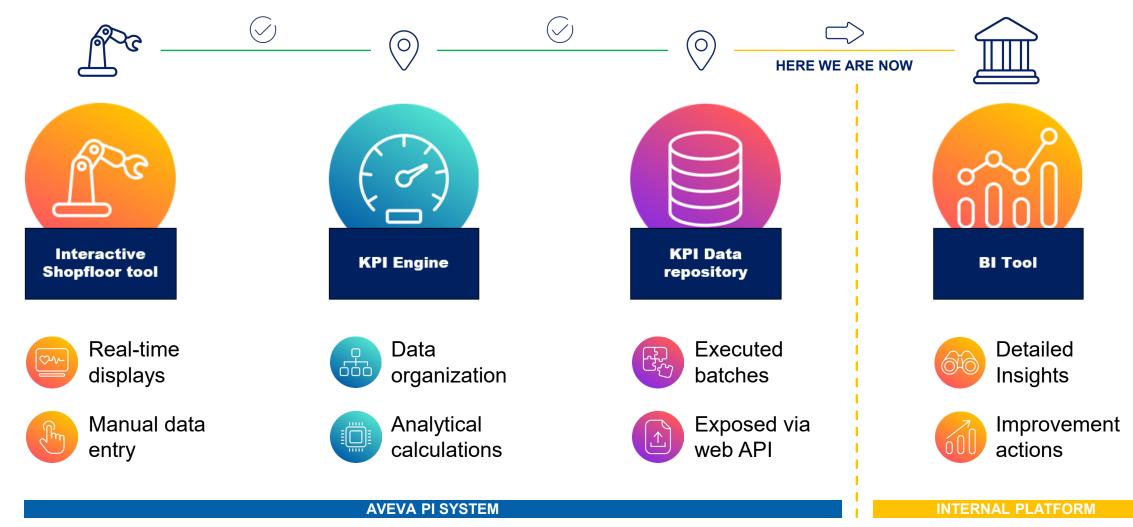
## About Manufacturing Cockpit

MACO in a nutshell

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#### **About MACO**

FROM THE SHOP FLOOR TO THE TOP FLOOR

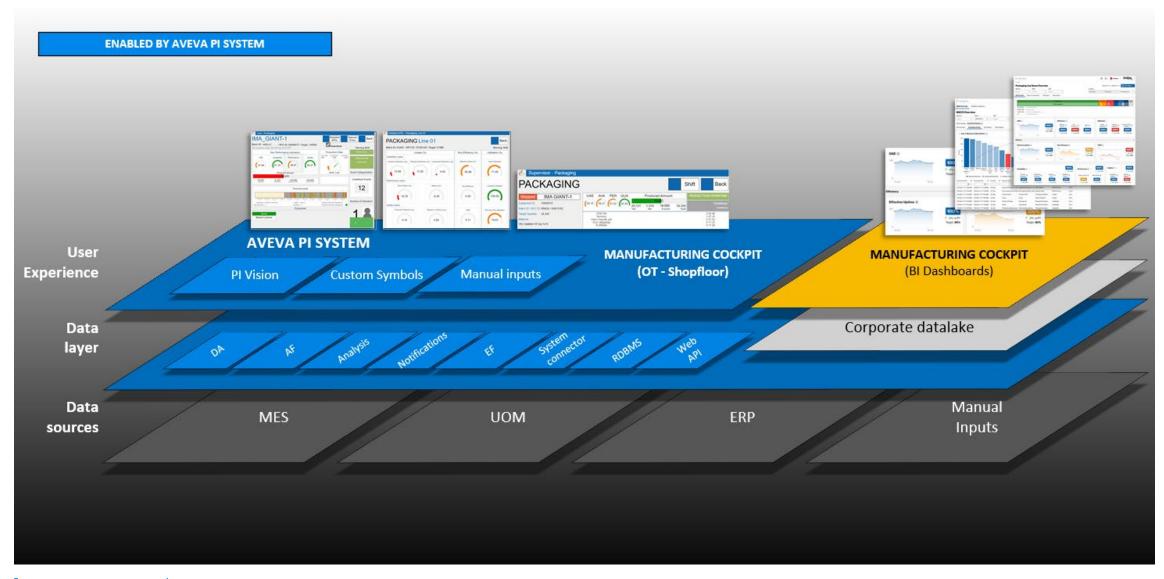


## **Architecture Design**

#### **2.1 Datasources and PI Components**

2.2 Interfaces / gathering data2.3 Organizing and using the data

#### **Datasources & PI Components**



## **Architecture Design**

2.1 Datasources and PI Components2.2 Interfaces / gathering data2.3 Organizing and using the data

//

## Interface 1 of 5: MES System

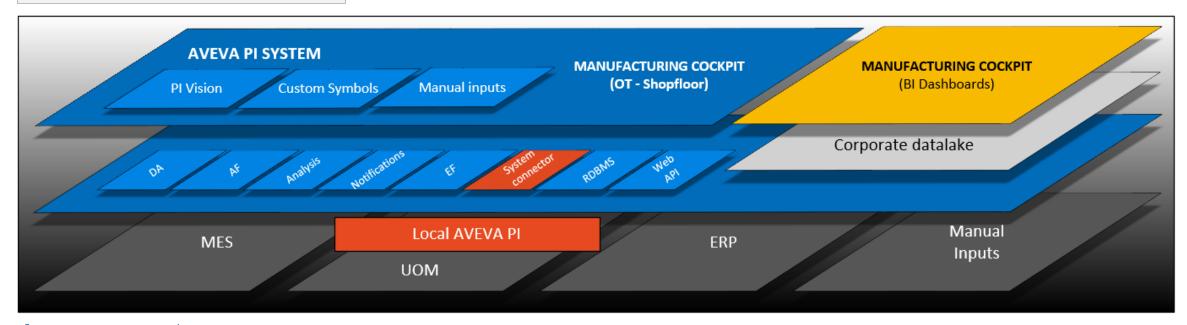
		Name: TR10.PCK.Ambalaj.IMAG1.MACO.MES.ActualAmount
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<ul> <li>Direction: One way</li> </ul>	Location3: 1 Square Root Code: 0 UserReal1: 0	Exdesc: P1="10002810" P2=TS
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		P1 P2
AVEVA PI SYSTEM PI Vision Custom Symbols DA AF Analysis Hotificat	Manual inputs Manual inputs Ma	MANUFACTURING COCKPIT (BI Dashboards) Corporate datalake
MES	UOM ERP	Manual Inputs

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General Archive Classic Security System

### **Interface 2 of 5: Local PI System**

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						Filter				- م	Name:	Parsing Alarms
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## Interface 3 of 5: ERP System / inbound

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## Interface 3 of 5 ERP System / outbound

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		Name: Notification Rule:Name	▶ ISM02
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		Database: Database:Name	⇒ ISM04

ISM05
 ISM06

⊳ LEK01

> LEKO2

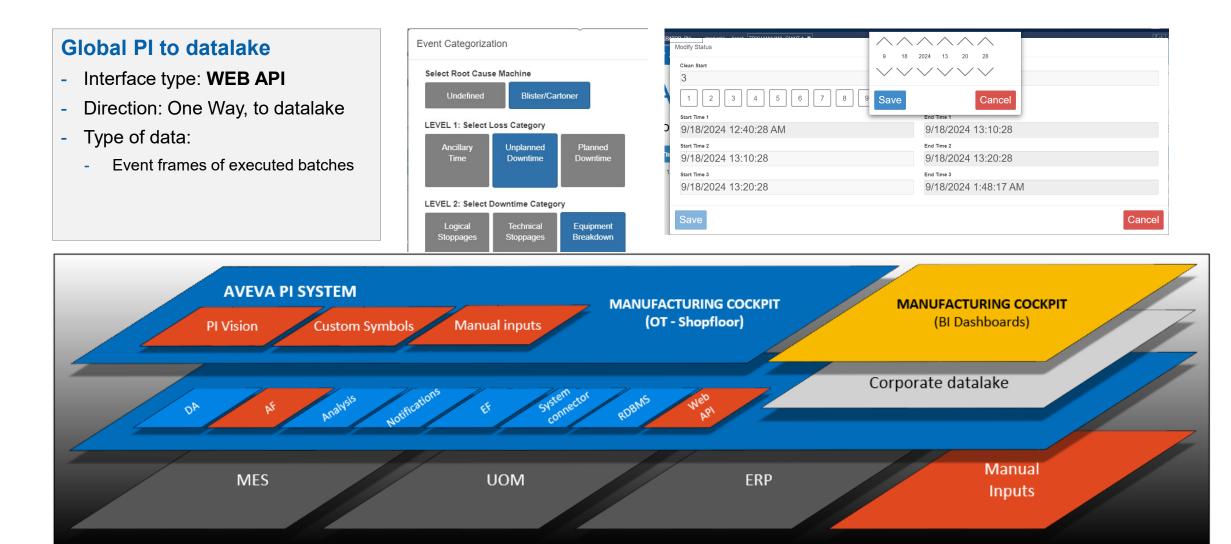
Start Time: Event Frame:Start Time

Send Time: Notification Rule:Send Time

Severity: Event Frame:Severity

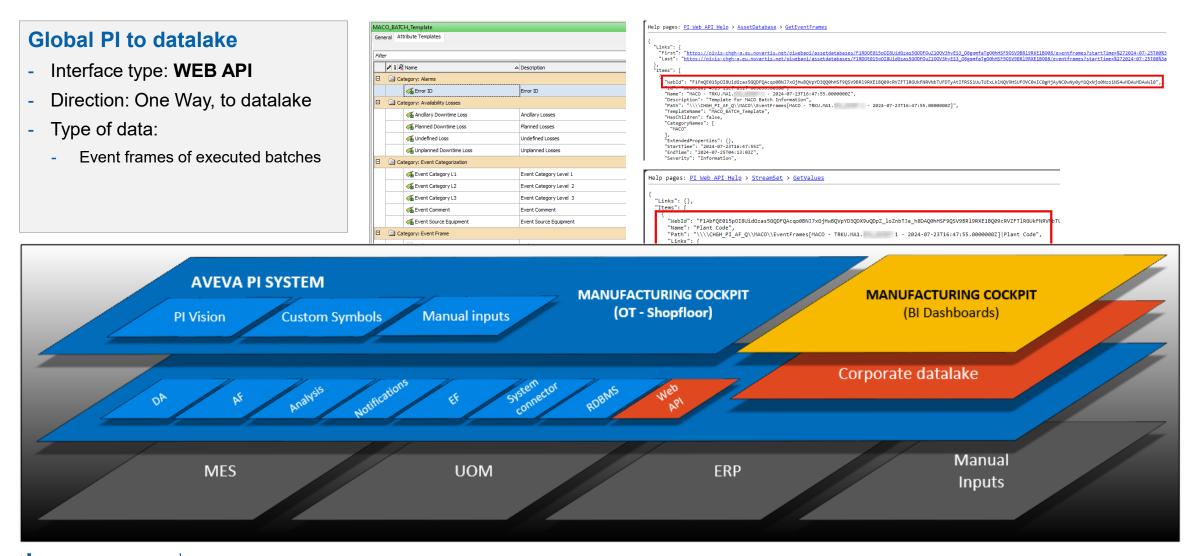
Target: Target:Path

## **Interface 4 of 5: Manual inputs**



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#### **Interface 5 of 5: Corporate datalake**



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## **Architecture Design**

2.1 Datasources and PI Components2.2 Interfaces / gathering data2.3 Organizing and using the data

2.3

## **MACO Hierarchy in Asset Framework**

#### Organizing the data & contextualizing

Elements	ISA-88: Physical model
Elements	Level 1: Platform
	Level 2: Site
	Level 3: Manufacturing Area
🖃 🗇 TRKU.MA1 -1	Level 4: Manufacturing Line
-1.EQ01	Level 5: Manufacturing Unit
🗇 TRKU.MA12	Set of attributes
🗇 TRKU.MA12	TRKU1.E General Child Elements Attributes Ports Analyses Notification Rules Version
Em TRKU.MA2	Filter       ▶ ! Imi ♦ № Name     Name   Time Stamp Description
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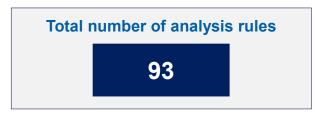
## **MACO KPI Calculations**

#### **Calculation Example**

#### Step 1: Take real-time input values / machine or MES signals / from PI Point

#### TRKU.MA1 -1 General Child Elements Attributes Ports Analyses Notification Rules Version TRKU.MA1 General Child Elements Attributes Ports Analyses Notification Rules Version EQ good\* Nam Desc 🥒 🐮 🗉 🔶 🤬 Name △ Value Time Stamp Description Name Backfilling T 12 0 Cate Ø OAE 洋 EQ Good Counter 10. 08. 2024 10:34:34.379 Good Counter Items (blisters) Anal OAE Day fixì EQ Good Counter Available OAE Shift 0 True 1.01.197000:00:00 Set True If EQ Good Counter is coming from Production Unit Ø fi⊗ Add a new variable Name Expression Step 2: Pass the signal as input and calculate next level of information, e.g. "Quality". Not(BadVal('SF0 Status')) Then If Not(Compare('SFO Status', 'SFO Status No Workorder')) Then If Not(BadVal('Availability')) And Not(BadVal('Performance')) And Not(BadVal('Quality')) Add a new variable Evaluate OAE Then Name Output Attribute Expression (('Availability' / 100) \* ('Performance' / 100) \* ('Quality' / 100)) \* 100 Else If NoOutput() Not(BadVal('Current Produced Quantity')) And Not(BadVal('SFO Good Production Counter')) And Not(BadVal('SFO Status')) Else Then If 'Current ced Quantity' 'SFO Status No NoOutput() Quality Then Quality Else ('SFO Good Production Counter' / 'Current Produced Quantity') \* 100 Step 4: Bring final value to the visualization layer. Else NoOutput()





Step 3: Keep building up dependency chain until final calc., e.g. "OAE"

## MACO OT & BI

#### 3.1 How it looks like on the shopfloor (OT)

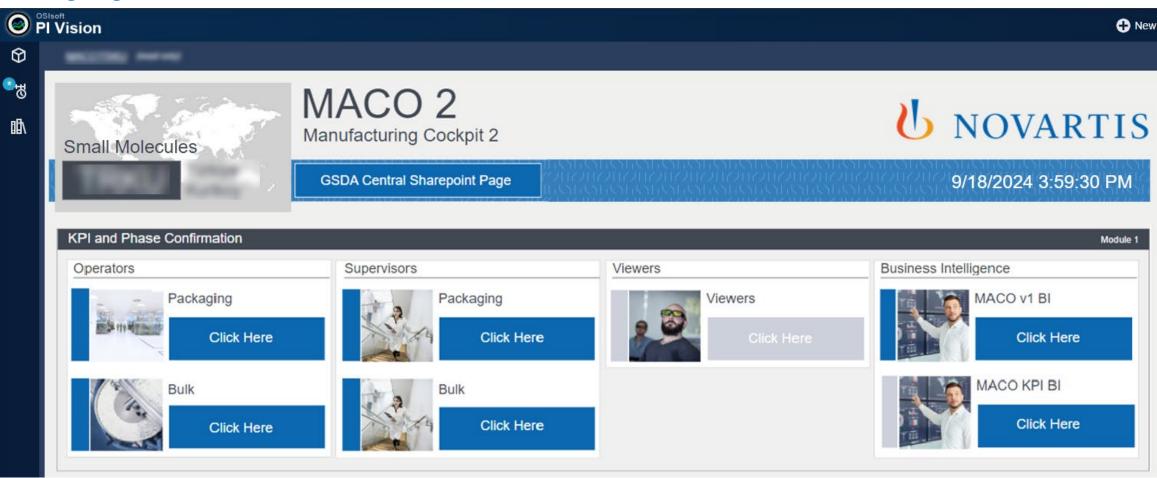
**3.2 How it looks like on the top floor (BI)** 

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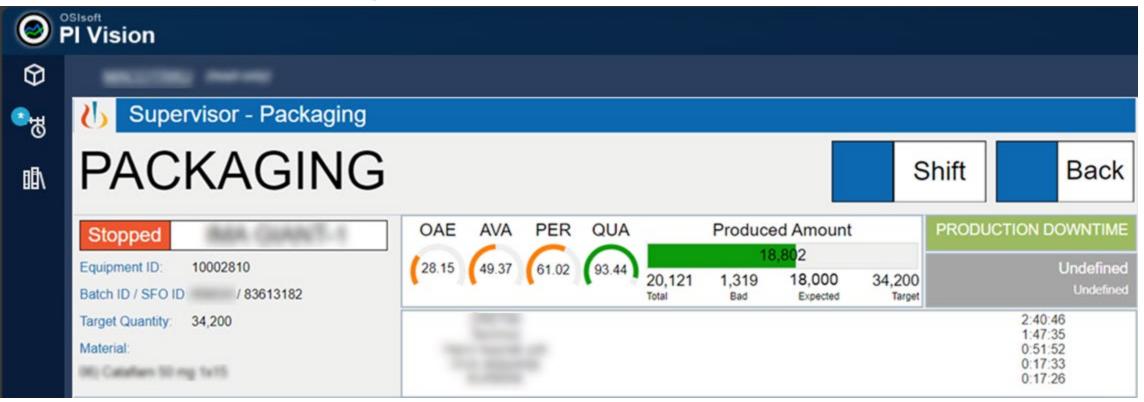
## MACO Landing page (AVEVA PI Vision)

#### **Landing Page**

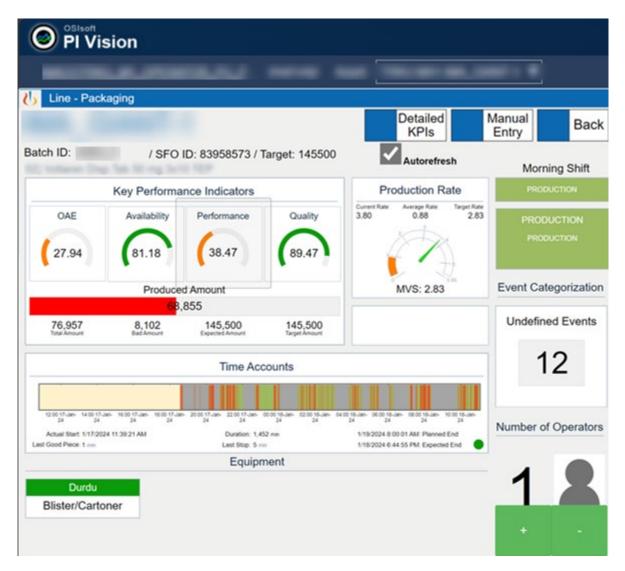


## MACO Lines overview (AVEVA PI Vision)

#### List of lines in selected manufacturing area



## MACO Main line display (AVEVA PI Vision)

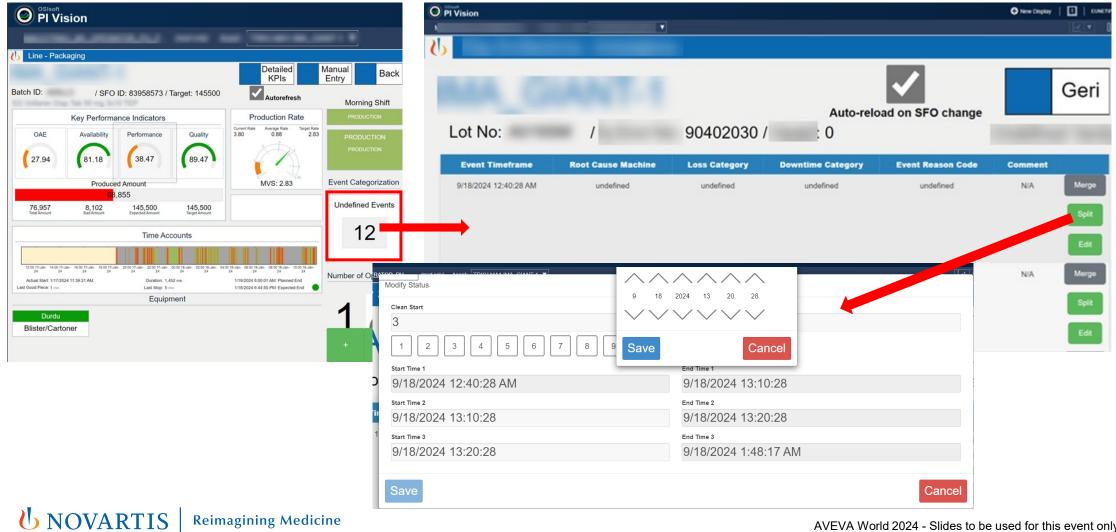


#### Main line display as seen by the operator

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## MACO Main line display (AVEVA PI Vision)

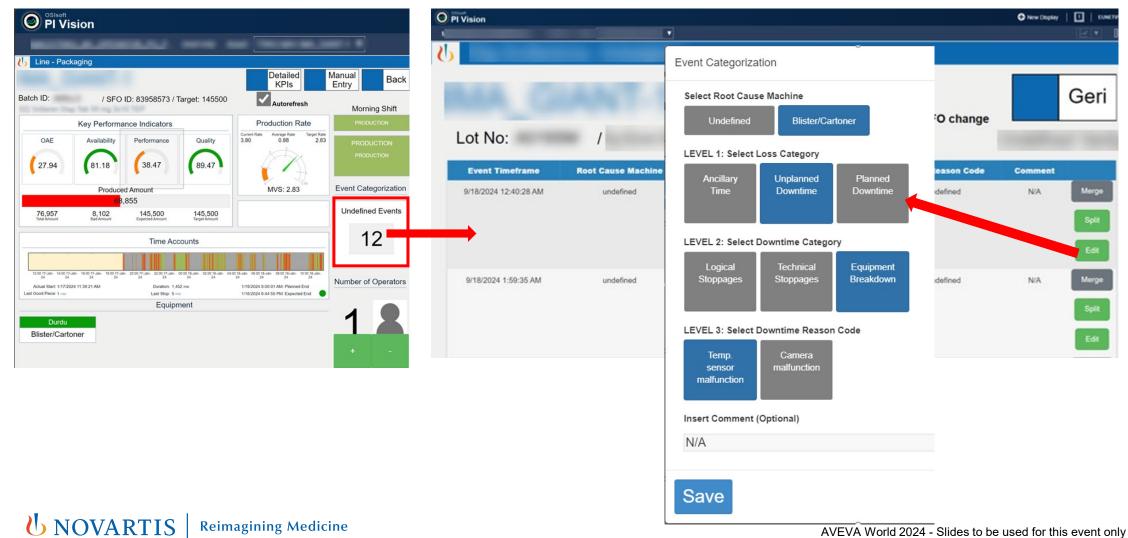
#### Spliting one large event into multiple smaller chunks



AVEVA World 2024 - Slides to be used for this event only

## MACO Main line display (AVEVA PI Vision)

#### Categorizing downtime using 3 levels



AVEVA World 2024 - Slides to be used for this event only 36

## MACO OT & BI

## 3.1 How it looks like on the shopfloor (OT)3.2 How it looks like on the top floor (BI)

3.2

## MACO BI (Test data)

#### **KPI Dashboard / Line performance**

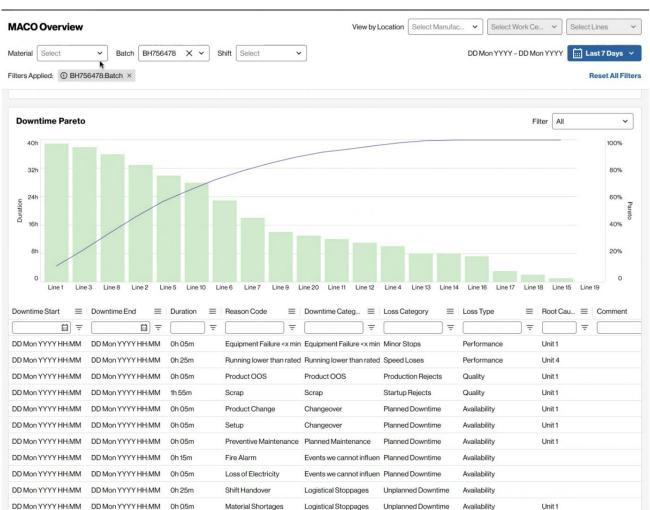
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4d20h20m Running								
6d 07h 12m Schedul	ed Available Time							
7d Total Ave	ailable Time							
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#### **KPI Dashboard / Shift performance**

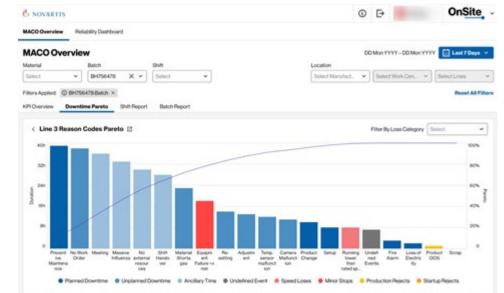
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## MACO BI (Test data)

#### Paretto / Top & worst performers



#### Paretto / Top reason codes for low performance



Downtime Start III	Downtime End III	Duration III	Resson Code	Downtime Categ.	=	Loss Category	=	Loss Type	=	Root Calu.	=	Conment
( D) 7	( D) =		· ·	Ψ.	) 🔻	C 2	] 🔻		7		Ŧ	
DD Mon YYYYY HHIMM	DD Mon YYYYYHHMMM	0h:05m	Equipment Failure <x< td=""><td>min Equipment/Failure</td><td><s.min< td=""><td>Minor Stops</td><td></td><td>Performance</td><td></td><td>Unit 1</td><td></td><td></td></s.min<></td></x<>	min Equipment/Failure	<s.min< td=""><td>Minor Stops</td><td></td><td>Performance</td><td></td><td>Unit 1</td><td></td><td></td></s.min<>	Minor Stops		Performance		Unit 1		
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DD Mon YYYYY HH MM	DD Mon YYYYYHHMMM	0h-05m	Product OOS	Product OOS		Production Rejects	÷ .	Quelity		Unit 1		
DD Mon YYYYY HHAMM	DD Mon YYYYYHHMM	11.55m	Scrap	Scrap		Startup Rejects		Quality		Unit1		
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Preventive Maintenance Planned Maintenance

DD Mon YYYYY HHMM DD Mon YYYYY HHMM On 05m

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## **Benefits**

What are the expected benefits?

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3.2

Implementing MACO for capturing process data, categorizing downtimes and measuring KPI's according to Novartis time model, will enable us to improve efficiency by at least 5%. Pudgar, Uros uros.pudgar@novartis.com

## Thank you

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## **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.





