



18 MAY 2022

Operationalizing advanced industrial data projects

From PoC to practice - Mondi AG

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Agenda

- Who are we? - About Mondi AG
- What is this talk about? – Summary
- What happened so far? – The pilot challenge
- Operationalization & actual projects
- What have we learned? – Success factors
- More questions?

Who are we?

About Mondi AG

AVEVA

Mondi unpacked

- A leading global packaging and paper company, employing around 26,500 people in 30 countries
- Integrated across the value chain, leveraging our cost-advantaged asset base
- Clear and consistent strategy, delivering industry-leading returns
- Taking action to maximize our positive impact with MAP2030, our 10 year sustainability plan
- Innovative and sustainable solutions
 - Leveraging global industry trends of sustainability, e-commerce, digitalization and customer brand value
- Supporting customers to develop sustainable packaging and paper solutions with EcoSolutions, our customer-centric approach
- Premium listing on the London Stock Exchange and a secondary listing on the JSE Limited



Operating across the value chain

We have an integrated business that leverages our distinct competitive advantages and key relationships and resources



Driving innovation and excellence across the globe



Production sites per business unit

Corrugated Packaging	Mill (5)
Flexible Packaging	Converting plant (21)
Engineered Materials	Mill (5)
Uncoated Fine Paper	Converting plant (57)
	Converting plant (14)
	Mill (6)

Group offices

London	Côte d'Ivoire	Jordan	Serbia
Vienna	Czech Republic	Lebanon	Slovakia
	Egypt	Malaysia	South Africa
	Finland	Mexico	Spain
	France	Morocco	Sweden
Austria	Germany	Netherlands	Thailand
Belgium	Hungary	Oman	Turkey
Bulgaria	Italy	Russia	Ukraine
China			USA
Colombia			

Employing around 26,500 people at 100 production sites across more than 30 countries, with key operations located in Europe, North America and Africa

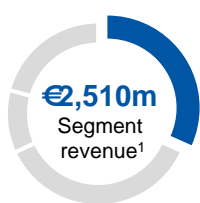
A market leader in sustainable packaging and paper

PACKAGING

Corrugated packaging



We produce containerboard, which we use to make a broad range of solutions designed to keep our customers' products safe and differentiated in-store and online

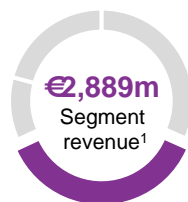


- #1** virgin containerboard producer in Europe
- #1** containerboard producer in Emerging Europe (EE)
- #2** corrugated solutions producer in EE

Flexible packaging



We produce kraft paper for strong paper-based packaging, such as paper bags, and plastic-based flexible solutions for extra functionality and protection



- #1** kraft paper producer globally
- #1** paper bag maker in Europe/global leader
- #3** consumer flexible packaging maker Europe

OUR AWARD-WINNING SOLUTIONS
ARE UNDERPINNED BY CLOSE
COLLABORATION ACROSS
OUR VALUE CHAIN

Engineered materials²

Our functional papers and films protect adhesive surfaces or provide barriers for protecting papers, packaging and other items

- #1** commercial release liner producer in Europe
- #2** extrusion coatings producer in Europe

€876m Segment revenue¹

Uncoated fine paper

We produce sustainable home, office, professional and converting printing papers, tailored to the latest digital and offset technologies

- #1** uncoated fine paper supplier in Europe
- #1** uncoated fine paper producer in South Africa

€1,652m Segment revenue¹

Functional paper and films

Release liners



Silicone-coated and speciality release liners, specifically designed for the pressure-sensitive adhesives industry

Extrusion solutions



We protect against wind, water, fire and earth

Personal care components



Siliconized films for individual sanitary napkin packaging, diaper components, elastic films, frontal tapes, nonwovens and wipes

Our applications

We customize our release liners to address your individual requirements. We provide solutions for graphic arts, tapes, fiber composites, medical, hygiene and labels.



Graphic Arts



Labels



Medical



Industrial



Fibre Composites



Hygiene



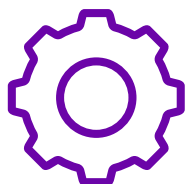
Envelopes

What is this talk about?

Summary



From PoC to practice



Challenge

- Pilot has proven benefits of advanced predictive quality and prescriptive operator instructions
- Significant implementation & adoption efforts
- How to harvest benefits & keep efforts in balance



Solution

- Offer standardized light version of pilot
- Integrate initiatives from practioners (e.g., Shop floor)
- Keep learning



Benefits

- Increased quality accuracy (e.g., 40% less claims, 50% less waste)
- Further advancement in sustainability
- Improved customer relationship
- Leverage operator commitment
- Higher operational efficiency

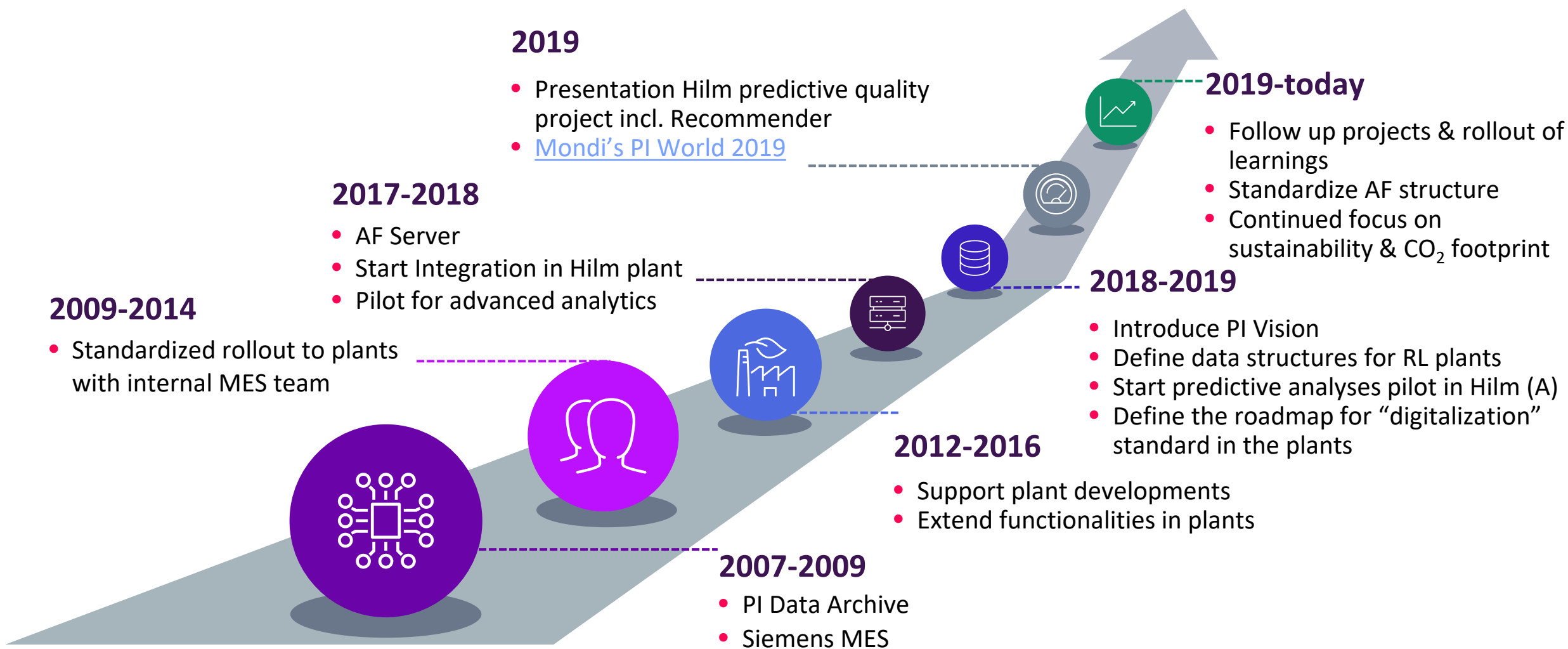
What happened so far?

The pilot challenge

Our journey so far & the challenge we faced

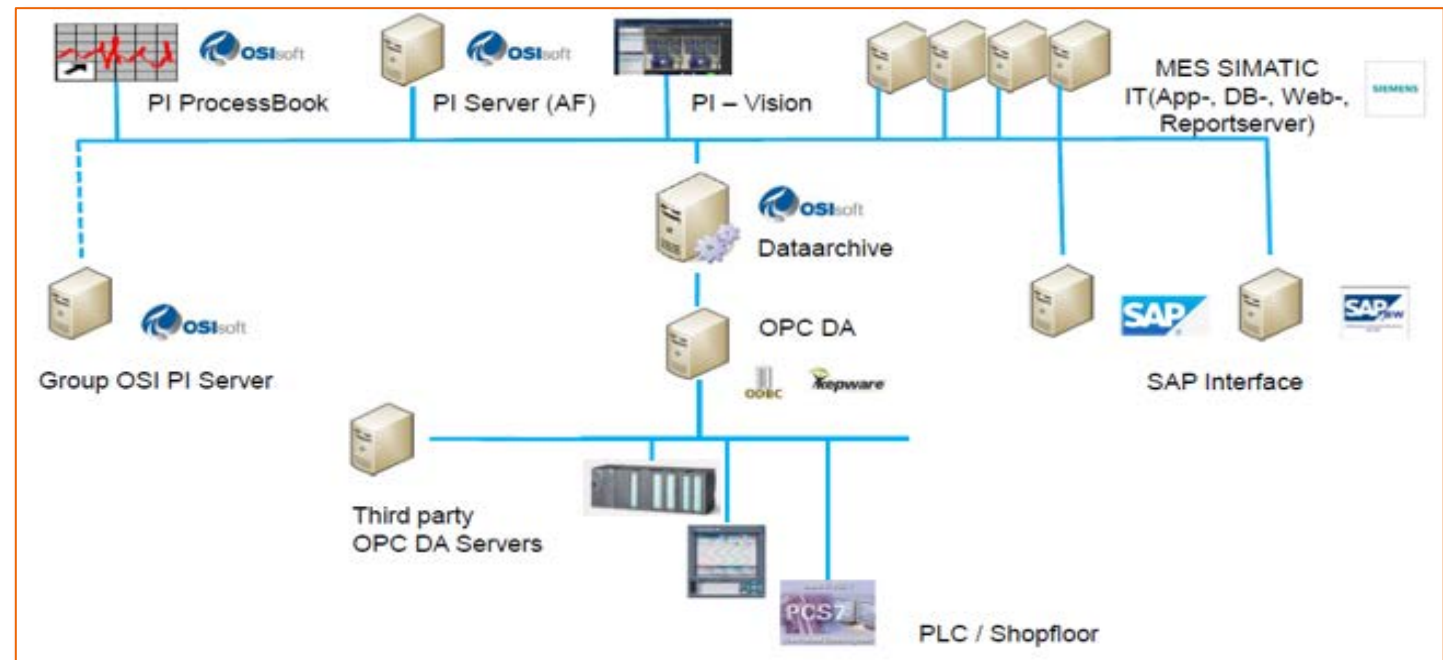


Our history with the PI system



A similar infrastructure across sites eases scalability

- Cost advantage for solutions in conception, maintenance, development
- Limited resources in plants and central functions
- Enables pilots and roll outs for digitalization projects
- Sharing across BU and segments

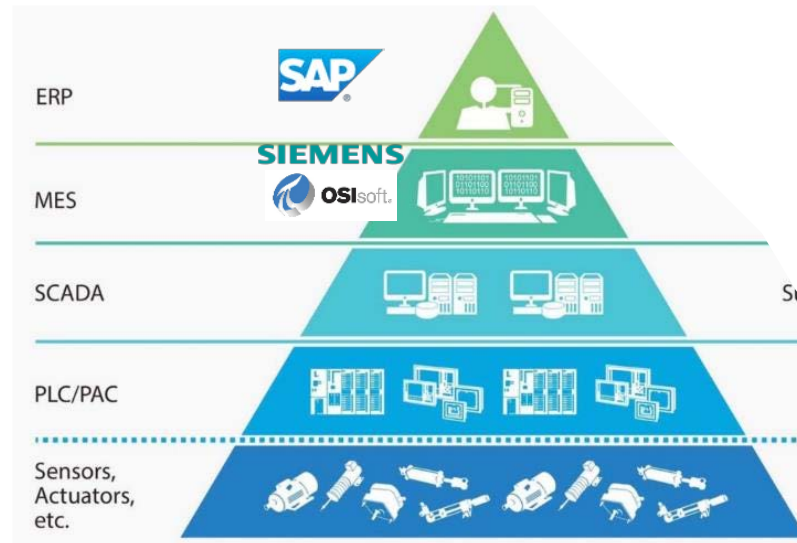


Solid foundation in FPF operations

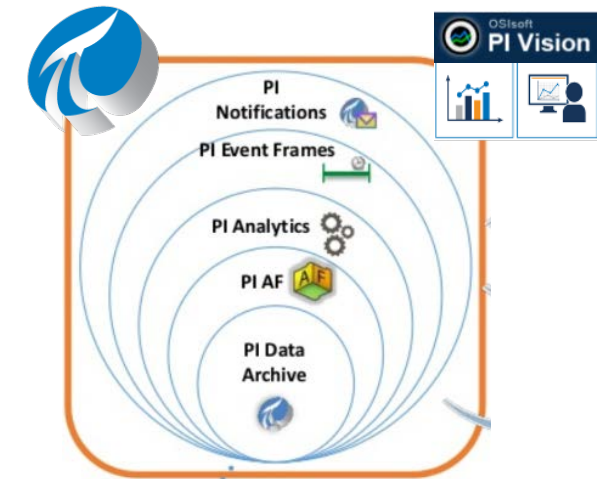
Full MES integration to SAP & OSI PI
 All processes shadowed in MES & OSI PI
 Full track and trace possibilities
 Automated reporting with SAP BW/real time monitoring

**Solid
Foundation**

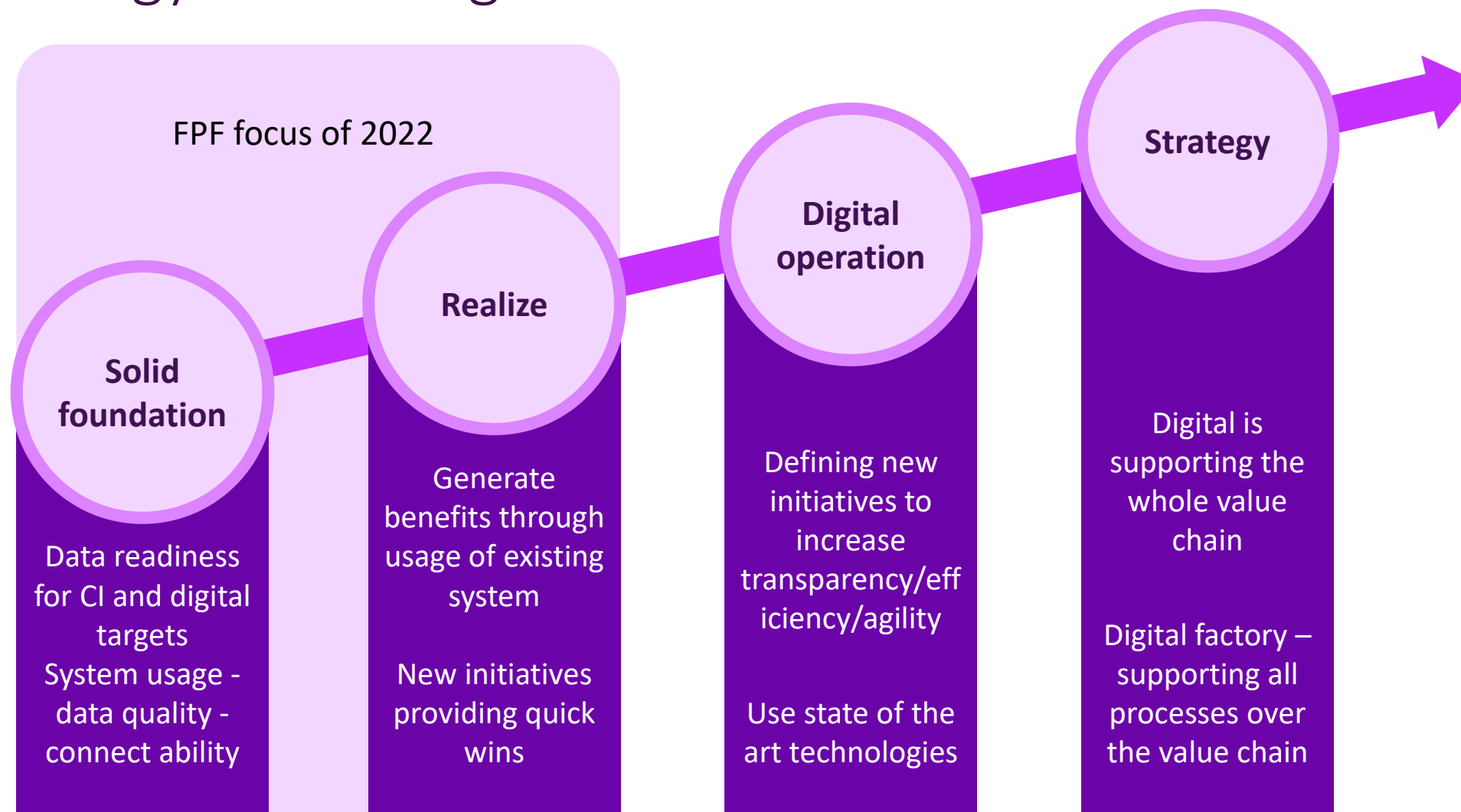
10 years of operations and machine process data
 Focus on standardization & data quality
 Connectible to new machines/devices
 Data readiness for CI and digital journey



19 May 2022

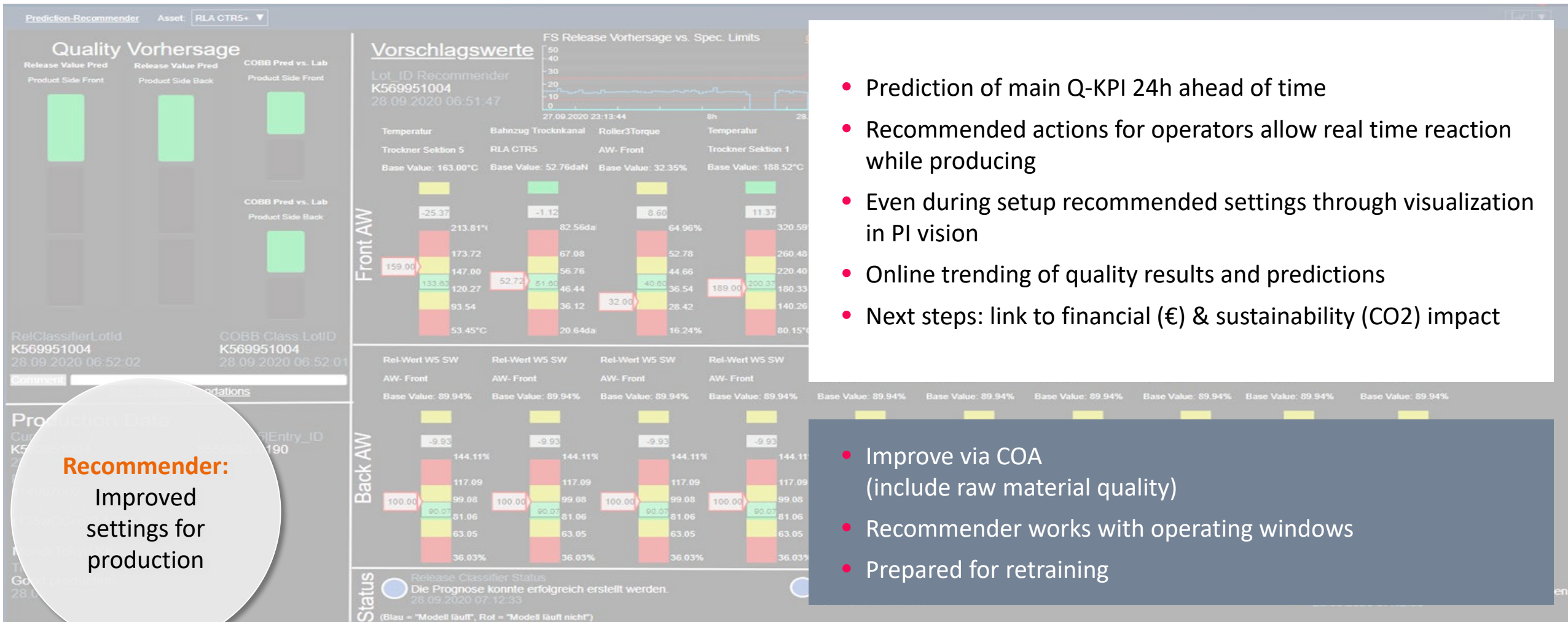


Strategy for our digital transformation



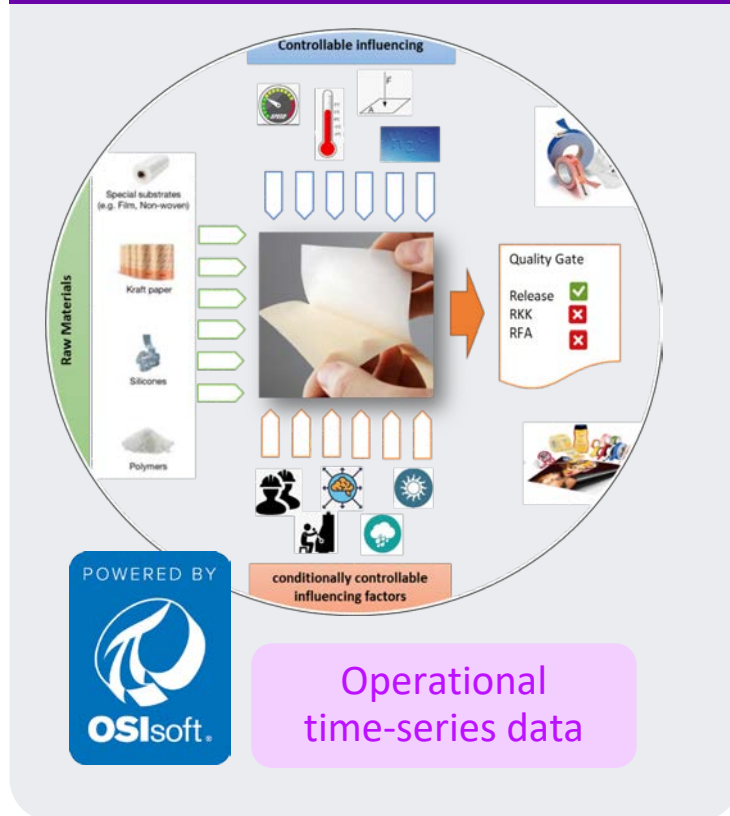
HMI adv. analytics for predictive process control

[Mondi's PI World 2019](#)

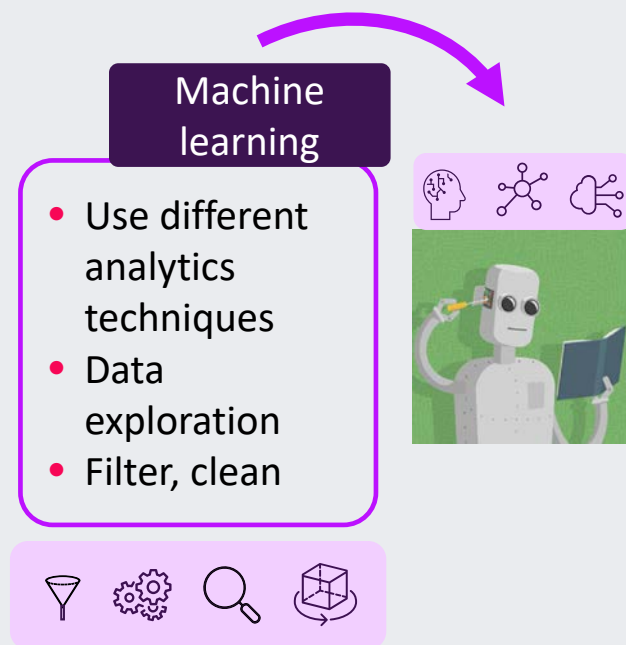


The project steps leading to our objective

1 Ensuring the data base



2 Model identification



3 Deployment & operationalization



Value realization

- Further improved quality
- Sustainability impact
- Less rework
- Knowledge capturing

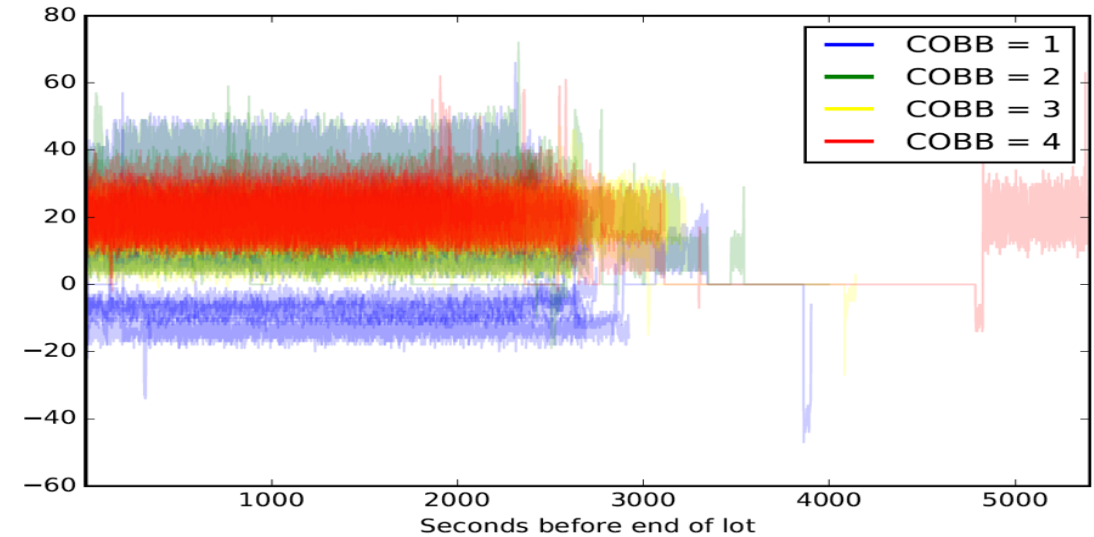
How to identify influencing parameters?

Goal

- Find (process & environment) parameters with an influence on quality indicators

RLA CTR4	General	Child Elements	Attributes	Ports	Analyses	Notification Rules	V
RLA CTR5							
HelperFunctions							
RLA CTR5 ANILOX ROLLER							
RLA CTR5 CORONA A							
RLA CTR5 CORONA B							
RLA CTR5 CS1							
RLA CTR5 CS2							
RLA CTR5 CS3							
RLA CTR5 CS4							
RLA CTR5 CS5							
RLA CTR5 CS6							
RLA CTR5 DRYER1							
RLA CTR5 DRYER2							
RLA CTR5 DRYER3							
RLA CTR5 DRYER4							
RLA CTR5 DRYER5							
RLA CTR5 REWINDER							
RLA CTR5 ROLLER BACK							
RLA CTR5 ROLLER FRONT							
RLA CTR5 SILICONMIXING BACK							
RLA CTR5 SILICONMIXING FRONT							
RLA CTR5 STEAMBOX1							

Name	Value
Entry_ID	8543774-0190
Lot_ID	K437741008
Order_ID	8543774
Product_ID	125304002
Category: KPIs	
LengthPerAttendedMinute	0 m/min
Category: MES Data	
AttendTime	0,2835185185
GoodProductionTime	0,2176620370
Grammage	0 g/m ²
TotalLength	186969,33 m
Category: Production	
Category: Quality	



Methodology

- Domain know-how by Mondi
- Data science-based data screening

Results

- Started with ~500 AF attributes
- Concluded with ~60 AF attributes

HMI adv. analytics for predictive process control

- Published in big data insider
- Requests from several companies for webinars on prediction project e.g., Takeda
- <https://www.Bigdata-insider.De/per-parameter-recommender-zu-weniger-produktionsausschuss-a-1040884/>



The screenshot shows a web article from Big Data Insider. The navigation bar includes links for Start, Infrastruktur, Data Sourcing, Analytics, Best Practices, **Industrie 4.0**, IT Awards, Recht & Sicherheit, Künstliche Intelligenz, and Definiert. The article title is 'Optimal beschichtet Per Parameter Recommender zu weniger Produktionsausschuss'. The date is 05.08.2021 and the authors are Sascha Henzgen und Johannes Strobel, with Nico Litzel as a contributor. The text describes how Mondi Release Liner Austria used data science to reduce production waste by analyzing historical machine data and developing a predictive model.



Produktionsanlage von Mondi Release Liner Austria (MRLA) zur Beschichtung und Veredelung von Papieren und Folien.
(Bild: Mondi Release Liner Austria)

HMI adv. analytics for predictive process control



Successes

- 50% reduction of rework & waste versus 2018
- 25% reduced technically accepted customer complaints
- Cross departmental collaboration
- First real time prediction for Q—KPI in RL with 24h ahead
- Direct recommendation to operators
- Knowledge capturing



Challenges

- Create awareness and understanding
- Breaking data silos
- Identifying relevant process information for advanced analytics
- Developing an infrastructure framework for advanced analytics projects that allows real-time processing & data export for 3 years every second
- Getting support for analytics projects on the technical side




Learnings

- Steep experience curve leading to standards for FPF sites
- FPF's AVEVA PI-based system landscape being implemented for all FPF sites
- Need to work on integrated concepts for data collection beyond operations
- Utilizing existing data & systems to address Sustainability challenges
- Further step: include quality data of supplied raw materials



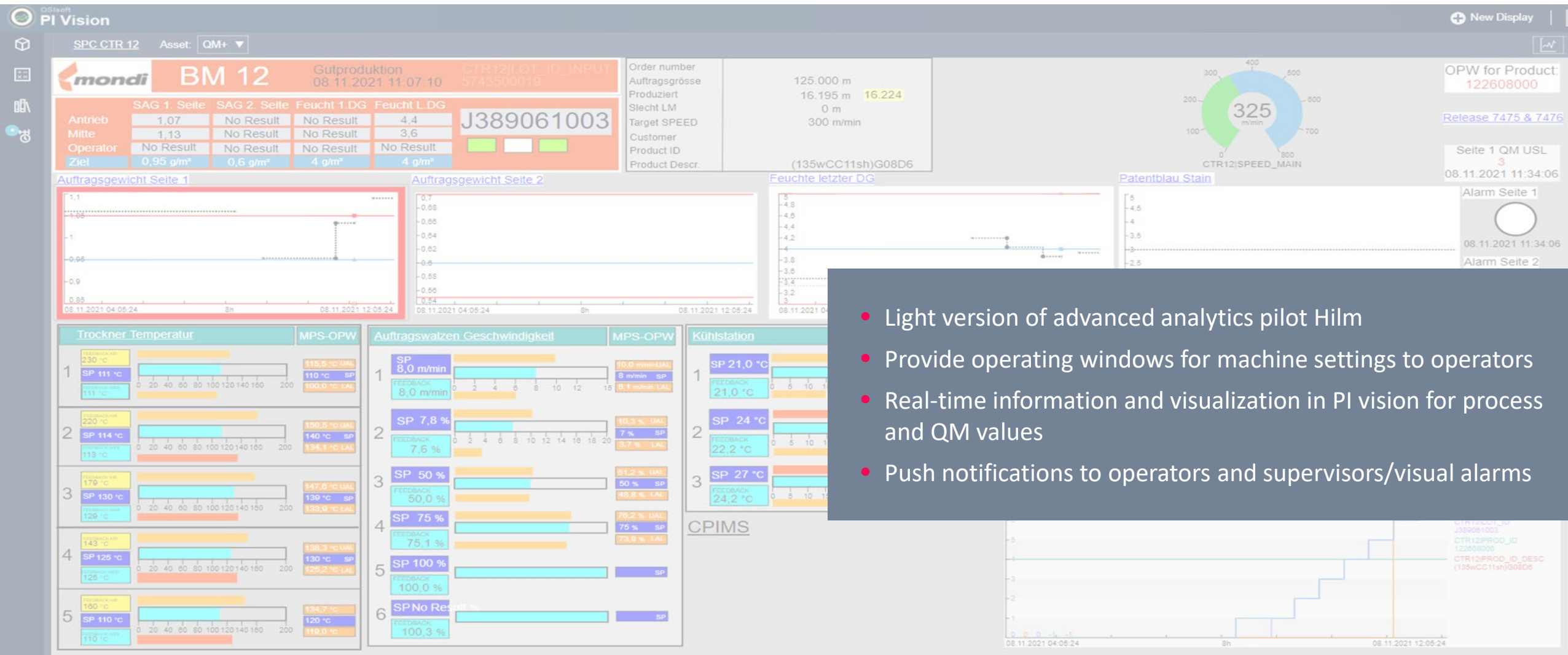
Follow up projects

Advanced SPC Heerlen & Juelich



SPC maturity levels (according to Mondi SPC project)	
4	<ul style="list-style-type: none"> • Warning systems in place • Closed loop system
3	<ul style="list-style-type: none"> • Product consistency is measured (long term capability) and data analysis tools in place • Monitoring of SPC system and active responses on deviations
2	<ul style="list-style-type: none"> • Correlation between (CTQ) product characteristics and process parameters tested and quantified • Optimum setup conditions, centrelines, control limits, etc. for (CTQ) process parameters determined
1	<ul style="list-style-type: none"> • Overview of (CTQ) product characteristics and mapping to process parameters in place

Advanced SPC Juelich & Heerlen



- Light version of advanced analytics pilot Hilm
- Provide operating windows for machine settings to operators
- Real-time information and visualization in PI vision for process and QM values
- Push notifications to operators and supervisors/visual alarms

Advanced SPC Juelich & Heerlen



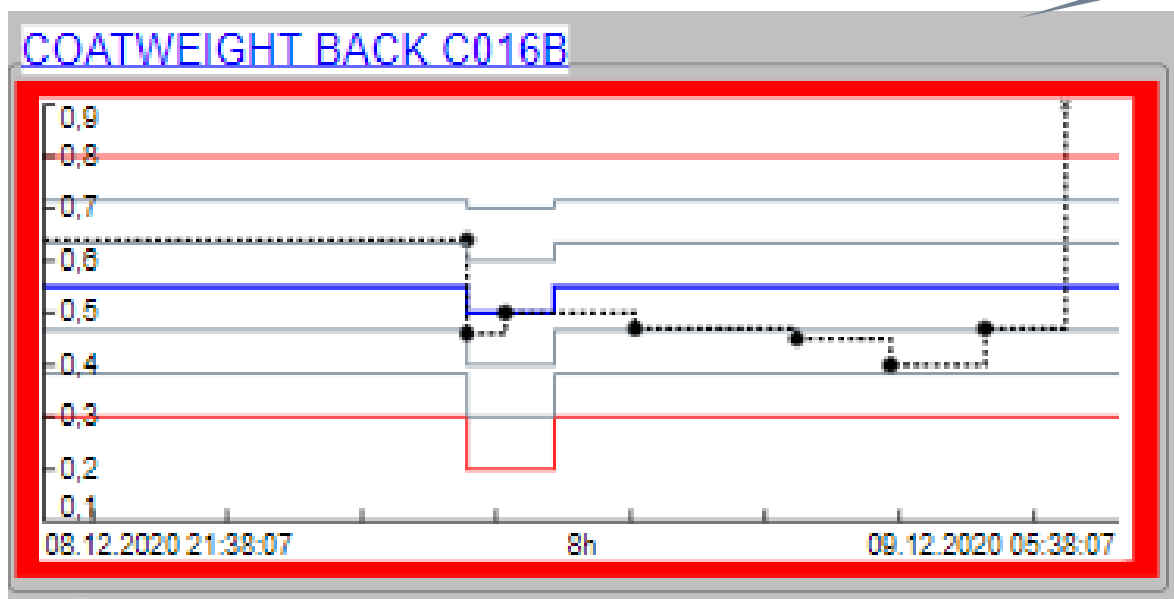
- Configuration of SPC parameters through PI Vision
- Embedded and connected to Digi DB and the Operating Window screens

QM KPI monitoring & dynamic information of right people

Monitoring ensures immediate alarming

- Push notifications for quality KPI to supervisors & quality department
- Defined SPC operating windows of main machine parameters


Immediate alarm visual
& email notification



Mo 07.12.2020 01:40

Heerlen PiNotifications (NL, Heerlen)

QM C071ICPB SQC Alarm 2020-12-07 00:29:06.000

An  Strobel Johannes (DE, Raubling)

The following SQC Analysis triggered the Alarm: C071ICPB SQC Alarm

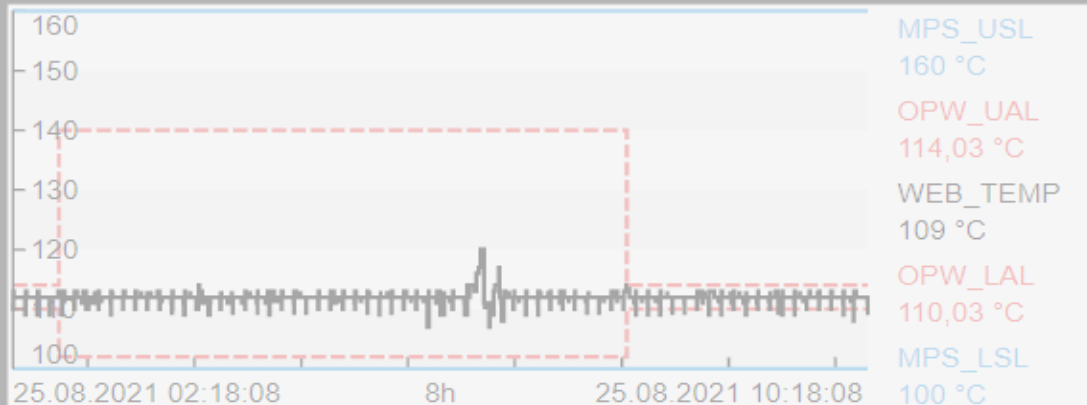
C016B : Normal
 C016F : Normal
 C071ICB : Normal
 C071ICF : Normal
C071ICPB : OutsideControl
 C071ICPF : Normal

Advanced SPC Heerlen

CTR22_Dryer_Temperatures

Asset: SEC 2+ ▼

Dryer1 Section1



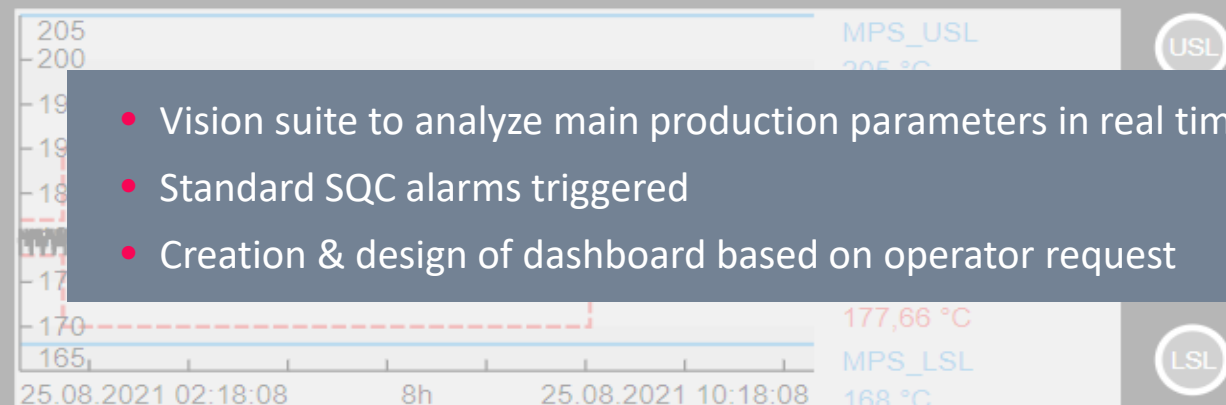
USL

UAL

LAL

LSL

Dryer1 Section4

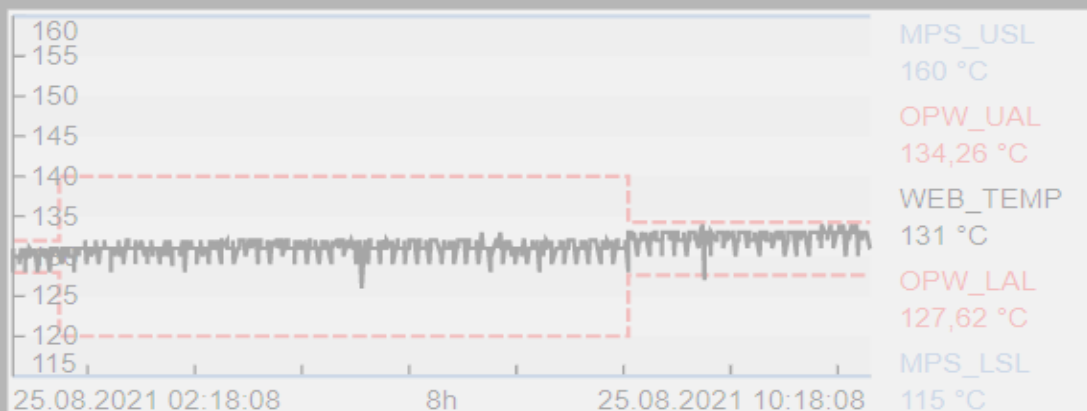


USL

LSL

- Vision suite to analyze main production parameters in real time
- Standard SQC alarms triggered
- Creation & design of dashboard based on operator request

Dryer1 Section2



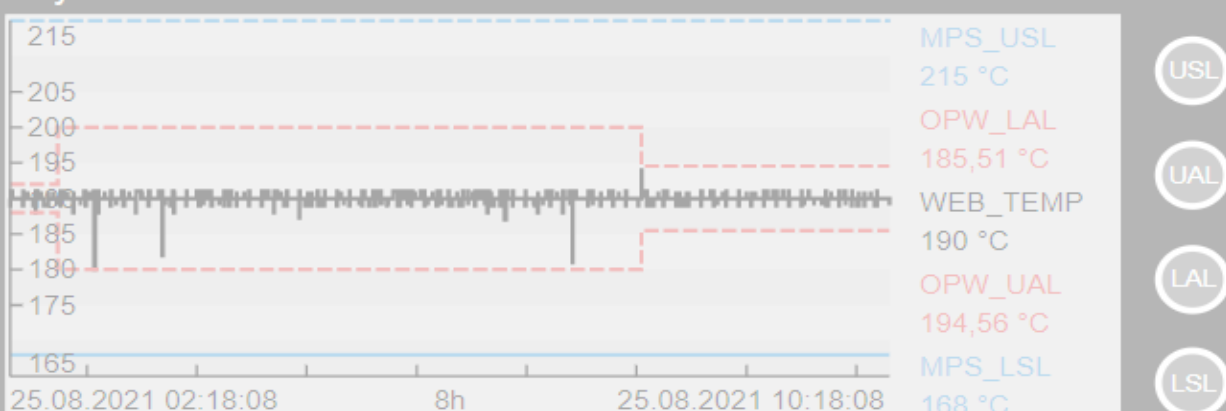
USL

UAL

LAL

LSL

Dryer1 Section5



USL

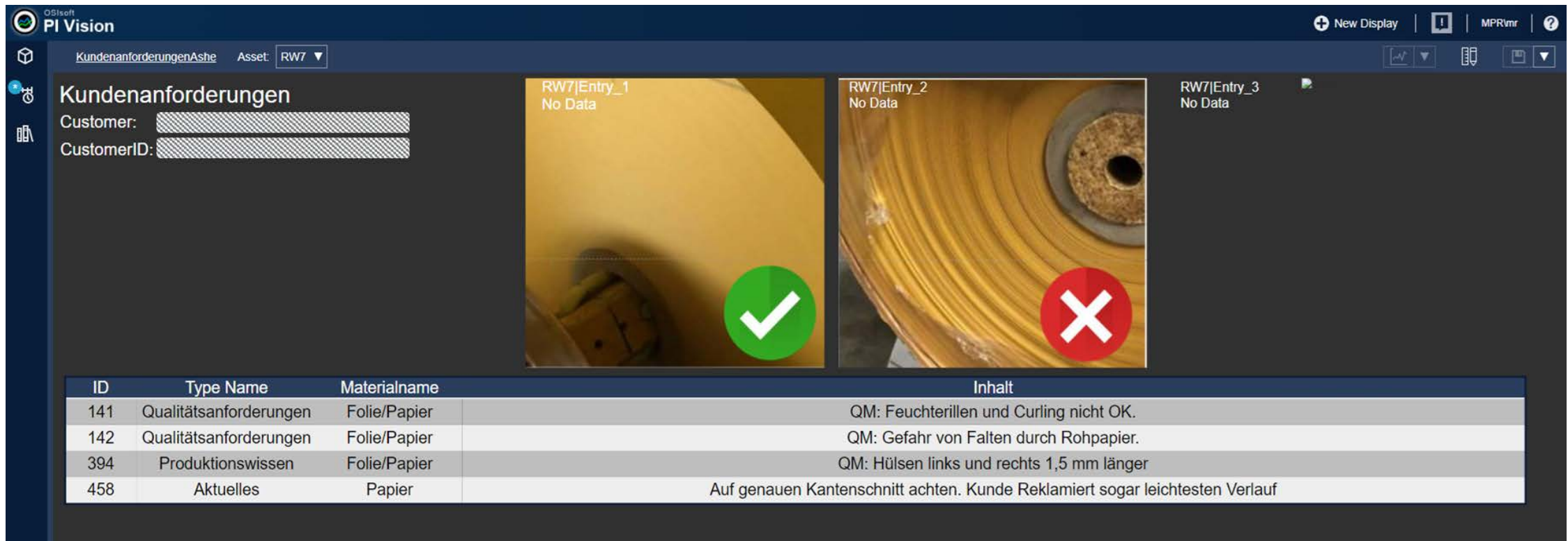
UAL

LAL

LSL

Customer requirements dashboard

- Direct information about customer demands in addition to spec.
- Direct usability in production for actual production run
- Usage of existing customer demand DB
- Keep it simple - without need to look for documentation



Kundenanforderungen

Customer:

CustomerID:

Asset: RW7

RW7|Entry_1
No Data

RW7|Entry_2
No Data

RW7|Entry_3
No Data

ID	Type Name	Materialname	Inhalt
141	Qualitätsanforderungen	Folie/Papier	QM: Feuchterillen und Curling nicht OK.
142	Qualitätsanforderungen	Folie/Papier	QM: Gefahr von Falten durch Rohpapier.
394	Produktionswissen	Folie/Papier	QM: Hülsen links und rechts 1,5 mm länger
458	Aktuelles	Papier	Auf genauen Kantenschnitt achten. Kunde Reklamiert sogar leichtesten Verlauf

Customer requirements dashboard



Successes

- Avoid non conformity & waste
- Reduce CO2 footprint
- Reputation on customer side
- Access to customer-specific product needs at a glance
- Cross departmental collaboration
- Experience & knowledge captured
- Use of existing PI technology for visualization and push notifications



Challenges

- Establish a process to maintain the data quality
- Constant updates from various departments need alignment
- Keep it simple
- While improving functionality



Learnings

- Process and owner for maintenance to define at start of implementations
- Extend the categories used for sharing information
- Include the project to FPF standard PI AF structure
- Rapid deployment more important than a 100% solution
- Standardized system framework for FPF to allow efficient implementation

What have we learned?

Success factors



What made it successful?

- Standardization based on proven architecture
- Incorporate feedback and initiatives from practitioners and experts
- Focus on benefit & customer
- Open to try, willing to “fail” & strive to learn and adapt
- Establish a culture of focused collaboration internally & externally
- Rapid deployment more important than 100% solution
- Visualize combined data on dashboards from all departments over the whole value chain - instead of data silos
- Management commitment to continuous improvement, not only to PoC

THANK YOU

謝謝

DZIĘKUJĘ CI

NGIYABONGA

TEŞEKKÜR EDERİM

DANKIE

TERIMA KASIH

GRACIES

WHAKAWHETAI KOE

DANKON

TANK

TAPADH LEAT

SALAMAT

SPASIBO

GRAZIE

MATUR NUWUN

ХВАЛА ВАМ

MULTUMESC

PAKMET CIZGE

고맙습니다

GRAZIE

شكرا

FAAFETAI

ESKERRIK ASKO

HVALA

GO RAIBH MAITH AGAT

БЛАГОДАРЯ

GRACIAS

ТИ БЛАГОДАРАМ

MAHADSANID

MAHALO IĀ 'OE

TAKK SKALDU HA

TEŞEKKÜR EDERİM

OBRIGADO

MERCI

DI OU MÈSI

ĎAKUJEM

RAHMAT

MERCI

GRAZZI

PAKKA PÉR

HATUR NUHUN

PAXMAT CAĞA

CẢM ƠN BẠN

WAZVIITA

FALEMINDERIT

SIPAS JI WERE

TERIMA KASIH

UA TSAUG RAU KOJ

ТИ БЛАГОДАРАМ

СИПОС

KÖSZÖNÖM

GRACIAS

MAHALO IĀ 'OE

TAKK SKALDU HA

TEŞEKKÜR EDERİM

OBRIGADO

MERCI

DI OU MÈSI

ĎAKUJEM

PAKKA PÉR

PAXMAT CAĞA

TERIMA KASIH

TI БЛАГОДАРАМ

СИПОС

Questions?

Please wait for the microphone

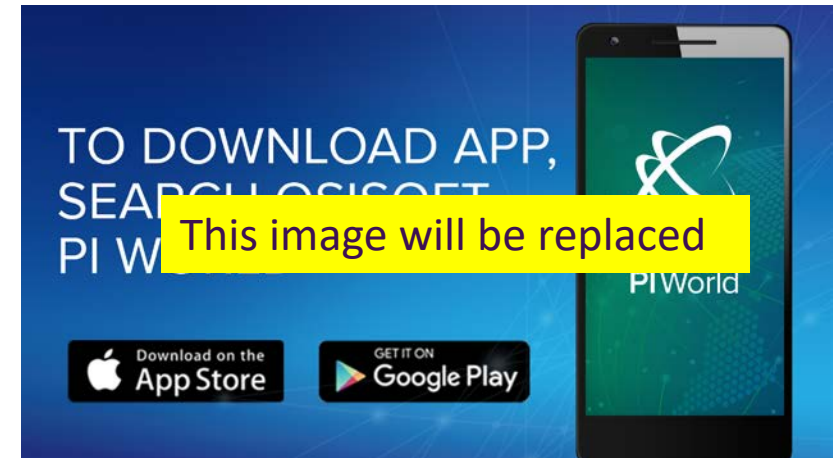
- State your name and company



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