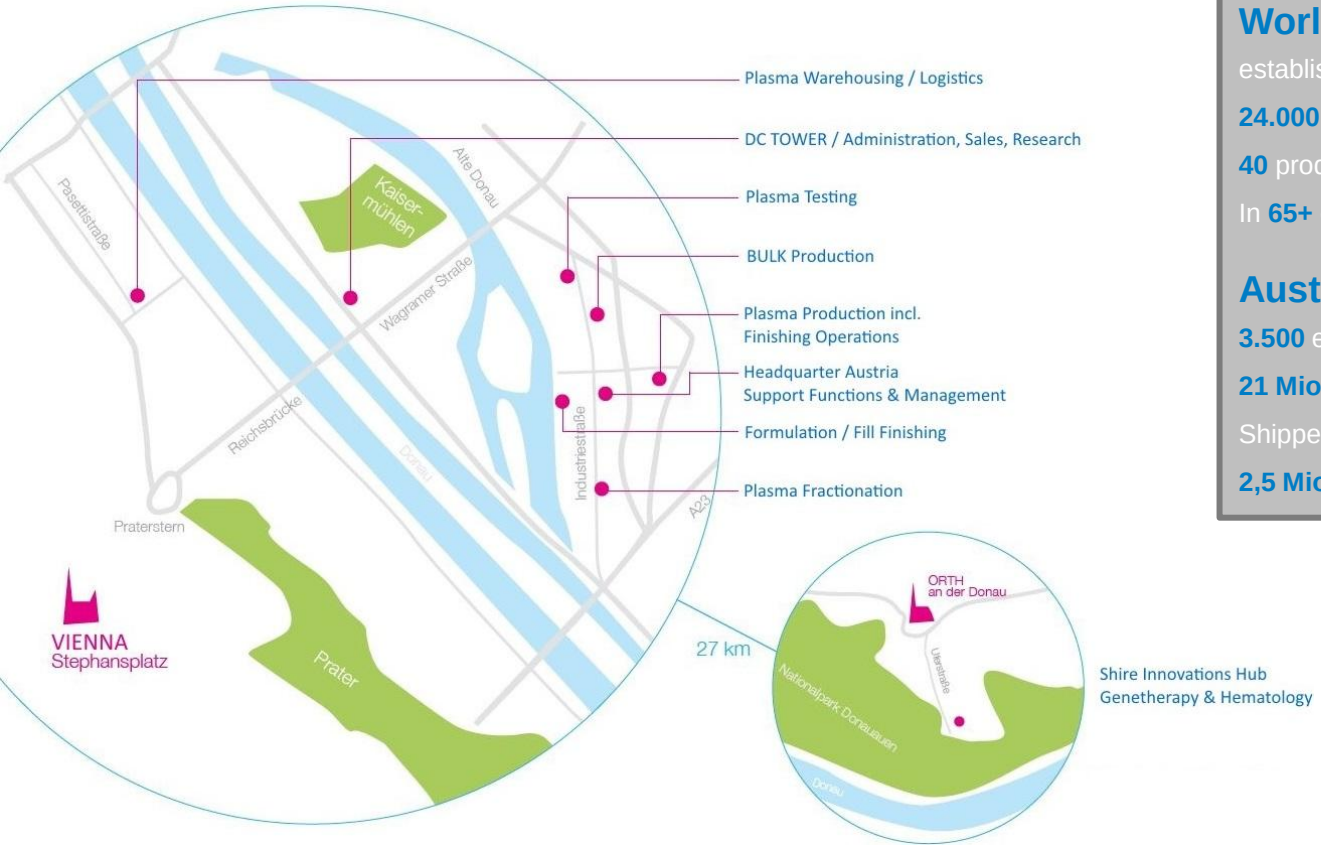
PI System AUSTRIA

Christian Bugl
Head of Site Engineering
24.9-27.9.2018

Agenda

- Shire Austria – short introduction of the company
- PI advantages
- Integrating PI System for engineering products
- Different users – internal process with interfaces like PDTS, Validation, Engineering, IT,…
- TCC – Technical Control Center
- Data & Facts – system architecture, tag count, data storage
- Use cases/Business impacts

SHIRE in Vienna



World Wide

established in Great Britain **1986**

24.000 employees

40 products on market

In **65+** countries

Austria

3.500 employees

21 Mio. product units per year

Shipped in **100** countries

2,5 Mio. liters of Plasma per Year

PI System Coverage Status in Vienna

BG

~ 14000Tags
~ 450 Units
~ 6 Keyuser

I 72

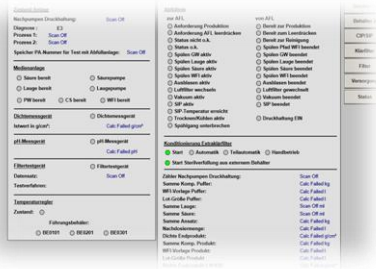
~ 11000 Tags
~ 130 Units
~ 7 Keyuser

I 131

~ 5000Tags
~ 120 Units
~ 9 Keyuser

LA 24

~ 21000 Tags
~ 350 Units
~ 11 Keyuser



Strategic approach of implementation

Clear strategy/roadmap and plan for 2018 ff

Coordination of the individual PI projects by a central department

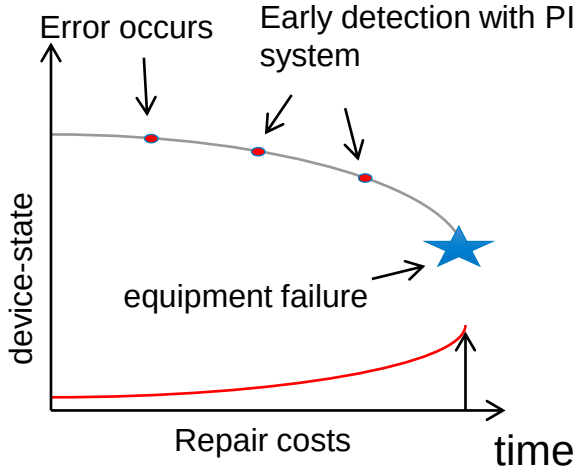
Standardization in the process of PI connections

Definition Roles and Responsibilities

New use cases define for more intensive use of PI data

Benefits of the PI System

- Data retrievable on every PC (browser) and data extraction possible at any time (.xls, .xcf)
- Live Overview of the process and the plants (batch data, quantities, ...) and the correlating support systems to recognize relationships and dependencies
- Monitoring / optimization of plant performance
- Direct notification of the users: Generation of event-controlled eMails with a typical system behavior for the information of the responsible departments
- Comparable records between sites, performance monitoring, dashboarding, investment estimation
- Early signal detection to avoid equipment malfunctions and associated corrective maintenance activities

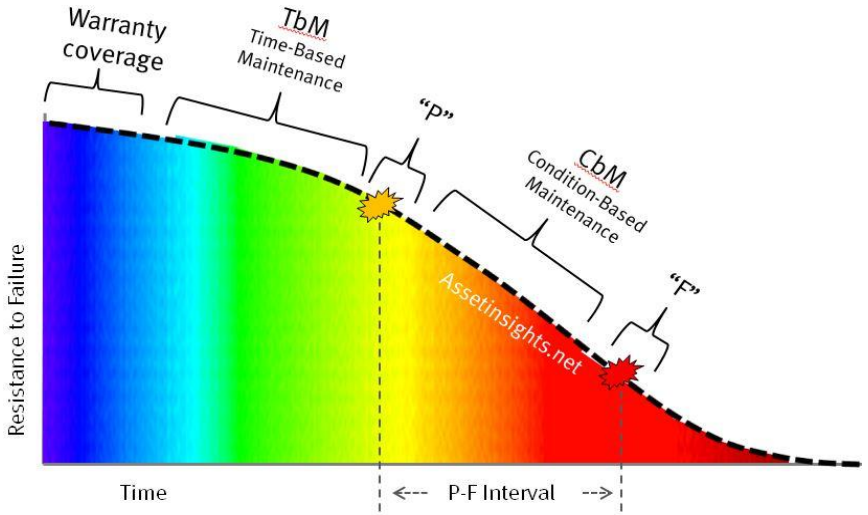


Condition based Maintenance via PI System

Maintenance depending on the plant condition by measuring physical parameters

Application examples:

- **vibration analysis**
  Cyclic maintenance of engines
  transmission maintenance
- **differential pressure**
  Preventive exchange of filters
- **switching cycle**
  Exchange of valve membranes
- **Operating hours**
  Maintenance of separators

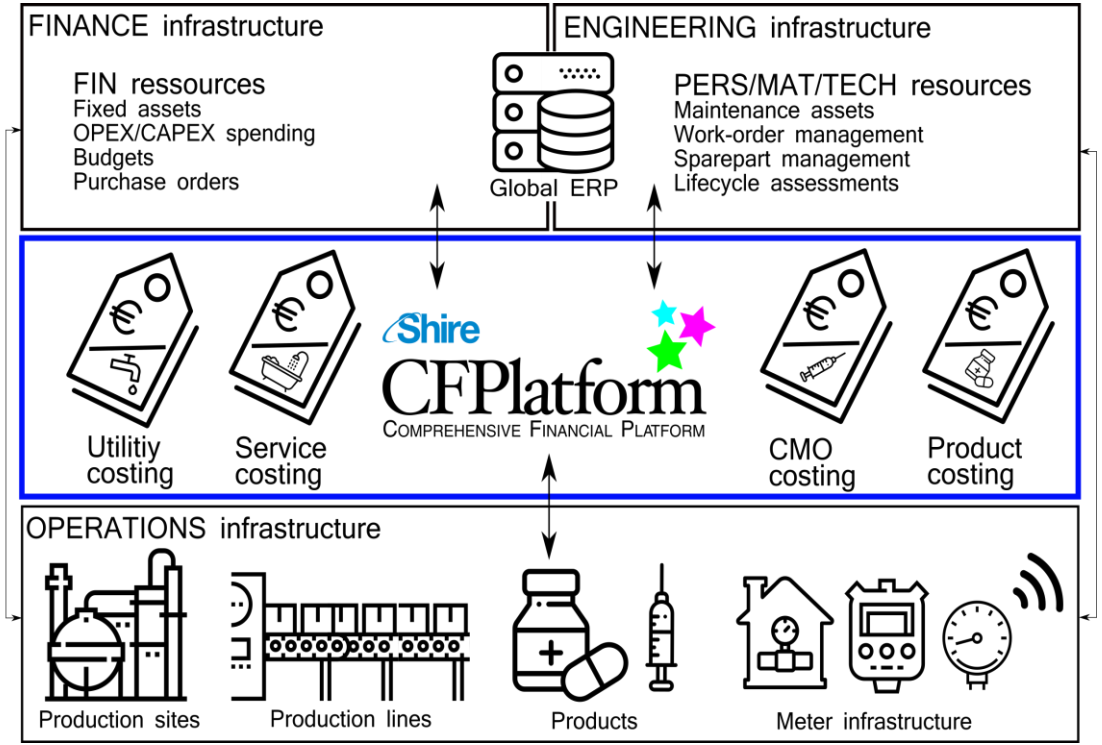


Integrating PI System for engineering products

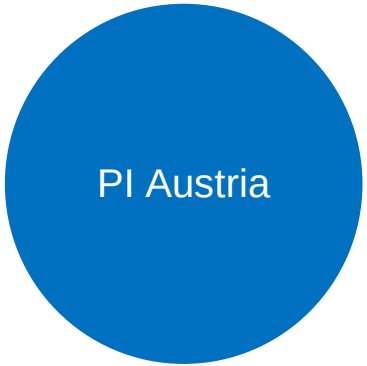
Business summary
- Information of indispensable advantage for justifying investments

Utility costing
- Metering utility flows to estimate cost per unit of utilities delivered

Product costing
- CMO
- Engineering contribution to product conversion costs



Coordination of the individual PI projects by a central department



- Connection of new and existing systems to the PI system (URS creation, project management & management, data verification, participation in validation ...)
- Definition of the PI standards
- Dashboards displays, notifications and event frames
- Preparation of the data for the end user
- User Meetings
- System Maintenance

Different users - different requirements

Quality

- Robust data for sharing
- For root cause analysis in deviation cases
- Trend analysis

PDTS

- Process performance management
- Relationships between individual parameters
- Multivariate process monitoring

TCC (Technical Control Center)

- Fast response to malfunctions
- Evaluation of Cross-Divisional Systems
- Prioritization of simultaneous malfunctions and failures

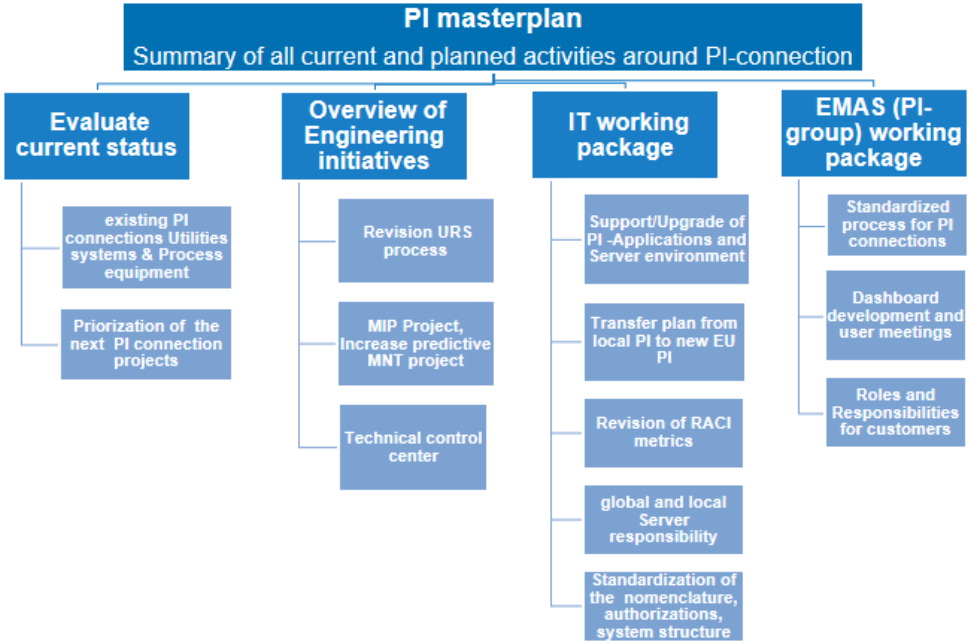
Manufacturing

- Batches comparable
- Manufacturing Performance monitoring
- noticeable problem tracking and intervention monitoring

Engineering

- Monitoring / optimization of plant performance
- Create energy models
- Predictive maintenance
- Data basis for potential future CAPEX investments

Clear strategy and plan for 2018 ff



- Make our departments and processes fit for PI

- Local governance board
  Focuses on important products / customer requirements

Standardization in the process of PI System connections

URS (User Requirements Standards) Integration of PI standards

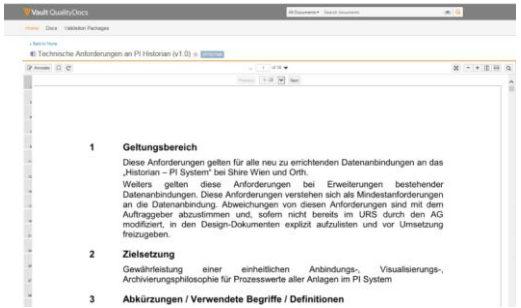
- Technical description about the process of a PI connection
- SOP's "USE OF THE PI HISTORIAN“

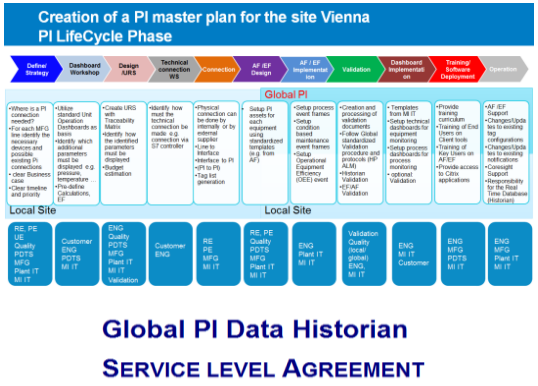
Global SLA (Service Level Agreement) between the system owner and the user of the data

- Troubleshooting
- Response times

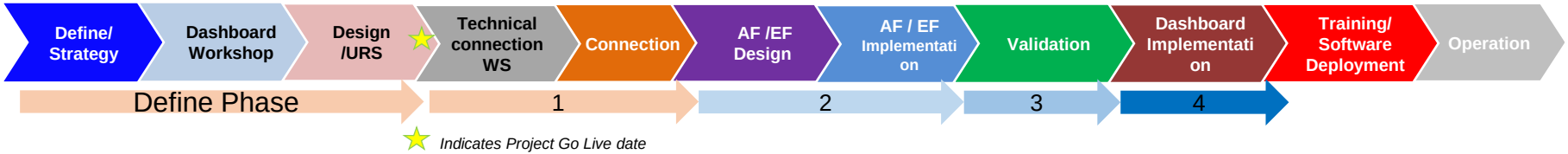
PI User Manual

- Description of the system
- Server environment
- PI lifecycle phases





The PI System Development stages



Physical connection

Plausibility check done
Correct network parameter
Connection to controller established
Data not yet visible in PI

Stage 1

Setup PI assets using standardized templates

Data visible in AF/Coresight
No Display available
Not usable for quality-relevant statements

Stage 2

Approved validation of tags /AF/EF

Number of tags is measurable

Stage 3

Combines parameters to enable early signal detection

Dashboard available
Usable for quality-relevant statements

Stage 4

The PI System Lifecycle phases

Global PI

Define/ Strategy	Dashboard Workshop	Design /URS	Technical connection WS	Connection	AF /EF Design	AF / EF Implementation	Validation	Display Implementation	Training/ Software Deployment	Operation
• Where is a PI connection needed? • For each MFG line identify the necessary devices and possible existing Pi connections • clear Business case • Clear timeline and priority • Budget	• Utilize standard Unit Operation Dashboards as basis • Identify which additional parameters must be displayed e.g. pressure, temperature … • Pre-define Calculations, EF	• Create URS/ Commissioning with Traceability Matrix • Identify how the identified parameters must be displayed	• Identify how must the technical connection be made e.g. connection via S7 controller	• Physical connection can be done by internally or by external supplier • Line to Interface • Interface to PI • (PI to PI) • Tag list generation	• Setup PI assets for each equipment using standardized templates (e.g. from AF)	• Setup process event frames • Setup condition based maintenance event frames • Setup Operational Equipment Efficiency (OEE) event frames	• processing of validation documents • Validation of connection from collector pc to production equip. • Validation of connection/ dataflow from prod. Equip. to global PI (incl. tag list)	• Setup technical dashboards for equipment monitoring • Setup process dashboards for process monitoring • optional: Validation	• Provide training curriculum • Training of End Users on Client tools • Training of Key Users on AF/EF • Provide access to Citrix applications	• Changes/Updates to existing tag configurations • Changes/Updates to existing notifications • Data Collector Infrastructure Support • Monitoring global PI Services • Global PI Application Support
Local Site						Local Site				
ENG MI IT Customer Validation	Customer ENG	ENG Quality Customer Plant IT MI IT Validation	Customer ENG	ENG Customer MI IT Validation Plant IT	ENG Quality Customer Plant IT MI IT Validation	ENG Plant IT MI IT Validation Quality	Validation Quality ENG, MI IT Plant IT Customer	ENG Customer Validation	ENG Customer MI IT	ENG MFG Plant IT MI IT Validation Quality

Definition Roles and Responsibilities

- **Various task packages at a PI connection assigned to the responsible departments – RACI**
- **PI Key User as a interface in the various user departments**

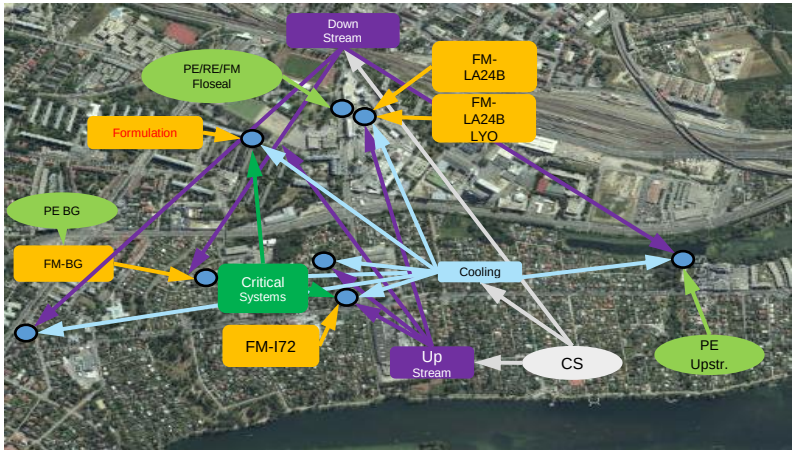
		Function IT (Global PI IT)	Shared Services IT (DC)	Plant IT	ENG	Validation local	Validation global	Quality global	Quality local	PDTS	MFG	OsiSoft	VIPRO	External
Definition / Strategy	Definition of where is a Pi connection needed (global Strategy)	A/R	C		C					R	C			
	Definition of Assets, Attributes , Events (using/creation of templates)	A/R			R	R			C	R	R			
Dashboard WS	Identify which parameters must be displayed e.g. pressure, temperature	I			A/R					C	C			C
URS	Create URS	C		C	A/R	C			C	C	C			
Technical connection WS	Creation of tags for import to PI				A/R									C
	Identify how must the technical connection be made e.g. connection via S7 controller	I		C	A/R	C					C			C
Connection	Physical connection can be done by internally or by external supplier			C	A/R						I			R
AF/EF Design	AF/EF global Configuration/Design using standardized templ	A/R		C	R		C	C					R	R
	AF/EF local Configuration/Design using standardized templ	C		C	A/R								R	R
	PI Ad-hoc displays creation	R		R	A/R	R			R	R	R			
	PI Displays development	A		C	R		C	C		R	R	C	R	R
AF/EF Implementation	AF/EF global Implementation	A/R		C	R		C	C					R	R
	AF/EF local Implementation	C		C	A/R								R	R
Validation	Validation of connection from collector pc to production equip.	I		C	A/R	R			R		R			C
	Validation of connection/ dataflow from prod. Equip. to global PI (incl taglist)	R		C	R		A	R		R	R		R	R
Drafts and Implem	Creation of PI notifications	I			A/R					I	C			C
Training/ Software Deployment	Validation				A	R					C			
	Training of End Users on Client tools				A/R									
	Training of Key Users on AF/EF	A/R			C							C		
	Installation and Deployment of Pi Client Tools			R	A									
Monitoring / Support / Maintenance	AF /EF Support & Maintenance ?	A/R			I					I	I		C	C
	Data Collector Interface Support (Help File needs to be developed)			R	A							C		C
	Changes/Updates to existing tag configurations				R	C			C		A			
	Changes/Updates to existing notifications				R						A			
	LCM - local PI System (Collector PCs)	I		R	A	C			C					
	Monitoring of the PI Services	A/R			I									
	Monitoring of the PI Tags (Health Monitoring)													

Implementation of a Technical Control Center

Past vs current situation

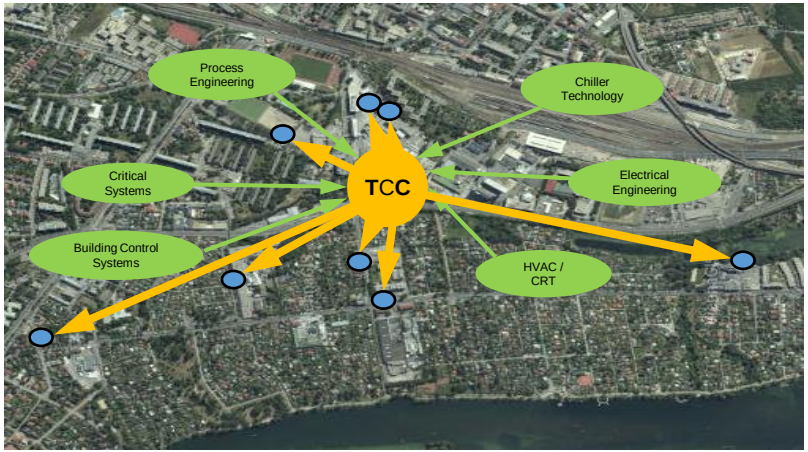
To be able to operate a technical control center with justifiable manpower requirements, it is necessary to establish a group of employees with a technical knowledge of all technical systems and a system which is able to monitor that all

Past State:



To support all systems we needed:
14 Stand-by Teams
2 Teams on 24/7 duty

Current:



With the TCC we monitor **all technical systems** (utilities, quality-related supply systems and production systems)

Core task of the TCC

Managed systems

- Production systems
- Building maintenance supply systems
- Building engineering

Main duties

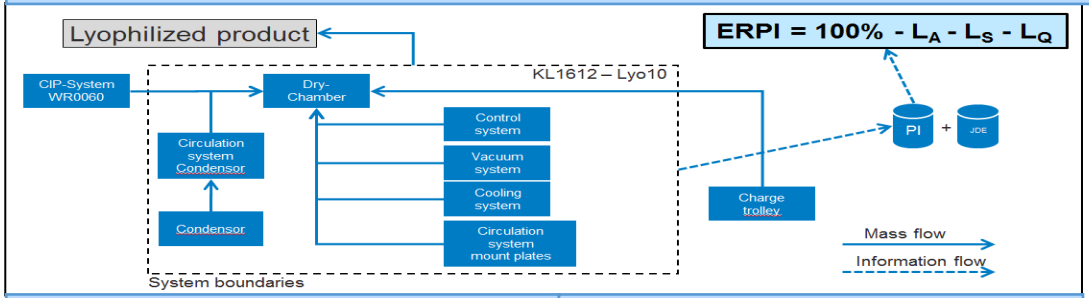
To react to alarms and abnormal operating states and restore required operating and system conditions (in coordination with customer requirements)

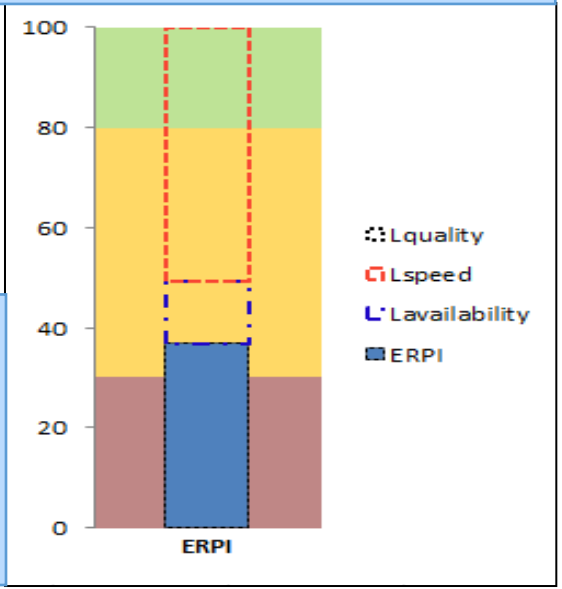
- Carry out critical commissioning and decommissioning
- Decide on approvals for system shutdowns due to maintenance and repair purposes

- Needs and economical based control of systems
- Carry out preventive maintenance measurements outside production hours

Introduction of a Reliability KPI

Reliability of critical equipment and utilities is utterly important for economical equipment usage and strategic business success. In industrial practice many varying approaches for calculating reliability KPI exist





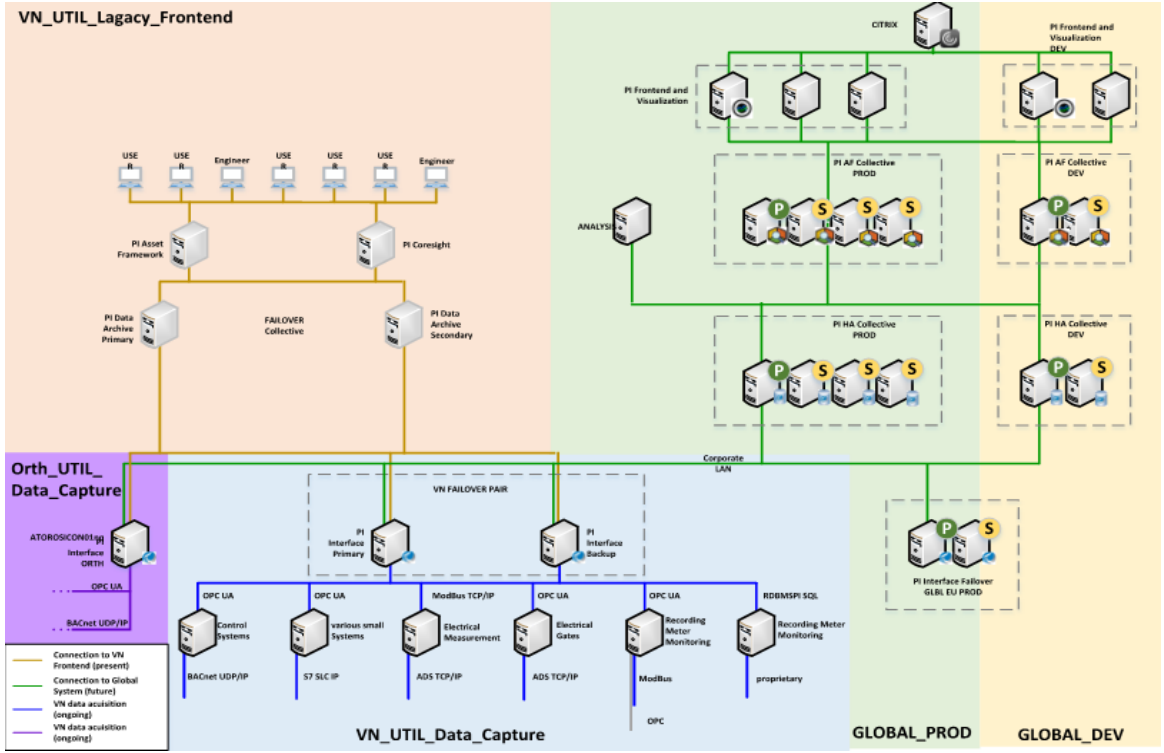
Benefits

Based on two production equipment, an ERPI (Equipment Reliability Performance Indicator) of ~ 37% was determined over the period 06-07 / 2018. Of these, ~ 50% were power losses (mainly idle) and ~ 12% loss of availability. Quality losses were 0%

Impact to Business

- Visibility for improvements on critical equipment
- Elimination of weak points
- Avoid of any Availability losses of critical equipment Idle time which could be used

PI System architecture

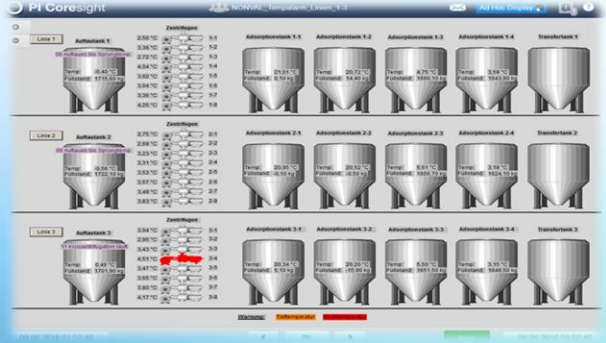


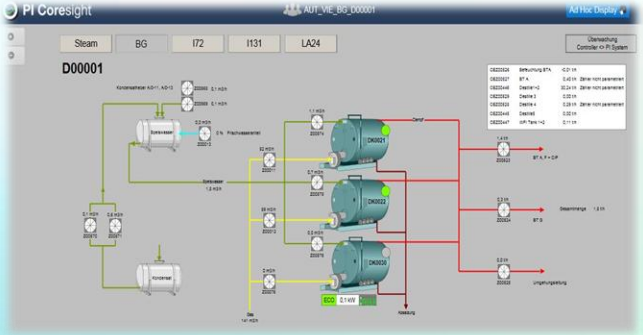
End 2017
~ 26.000 PI Tags
~ 700 units
~ 1 GB Data/week

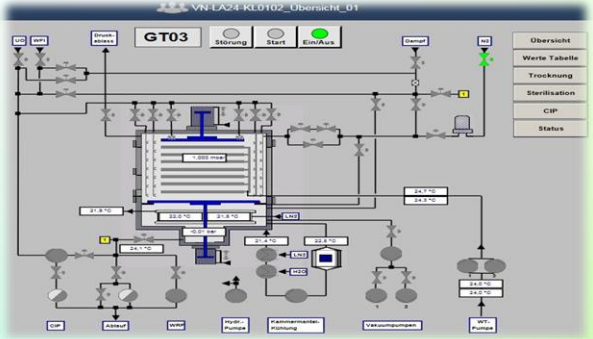
Current
~ 61.000 PI Tags
~ 1.000 units
~ 3 GB Data/week

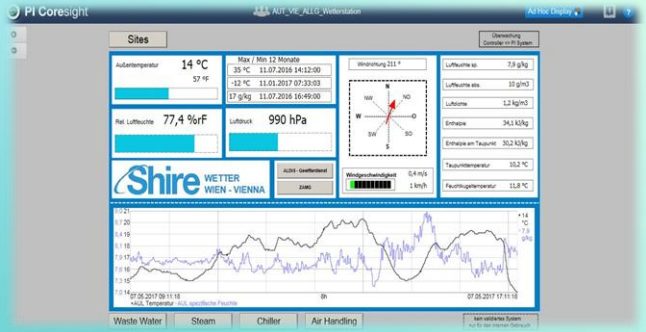
End 2019
~ 70.000 PI Tags
~ 1.100 units
~ 5 GB Data/week

Use cases define for more intensive use of PI System data









Predictive maintenance via PI system

In **the BG, 2 Westfalia** centrifuges are currently in use. The maintenance team did not have enough knowledge to perform a proper training to the Site team. Short maintenance intervals were necessary to prevent production downtime.

Impact :

- Not proper assembling creates higher vibrations
- Availability of the centrifuges far below 100%
- Unplanned repairing's impacted the production
- Maintenance cost increased

Improvements

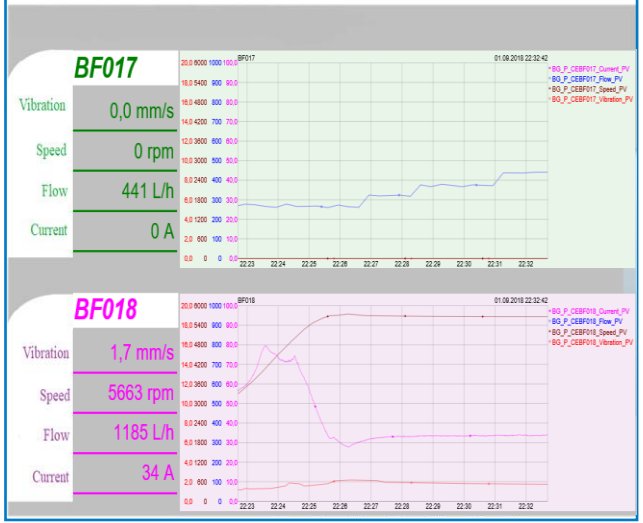
Training of site's team

Reliability improvement through Early Failure Detection of possible equipment failure (alarming, notification) via PI

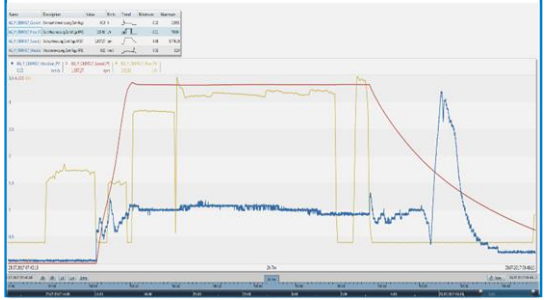
Benefits

Better/correct assembling delivers lower vibration signals
Reduction of maintenances costs by factor 2 to 4
Less impact to the production
Higher Asset availability

Vibration monitoring



Early Failure Detection

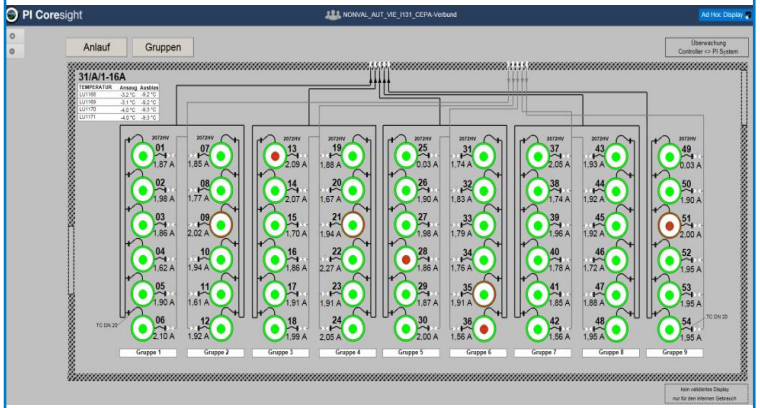


Power Measurement Centrifuges I131

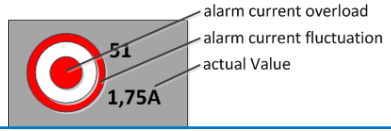
Implementation of a solution to gather data of the Centrifuges

At **I131, 54 CEPA** centrifuges are in use. Recently, **hollow-shaft fractures** have been increasingly found in centrifuges. For error analysis, a monitoring of the centrifuges was implemented.
The **motor power** of the drive motor of each centrifuge is detected and evaluated. If an error occurs, the staff will be informed. At the same time, the data is archived in the PI system. Based on this PI data, the process is evaluated and compared with other influences.

Navigation



Information



Overview

The motor power is monitored by means of a limit value. If the limit value is exceeded, an alarm message is generated at the existing HMI panel. Furthermore, an optically and acoustically alarm is generated.

Benefits

Immediate reduction of product loss after technical breakdowns (broken spindle)

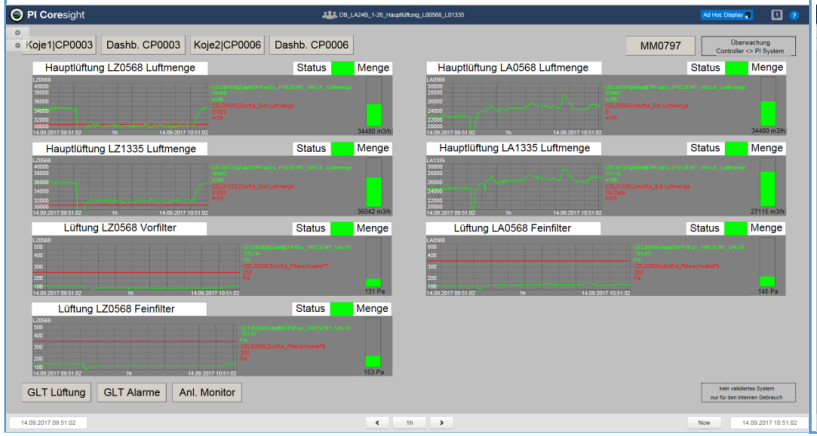
Detection of failures in equipment preparation

Basis for predictible / condition based maintenance of components

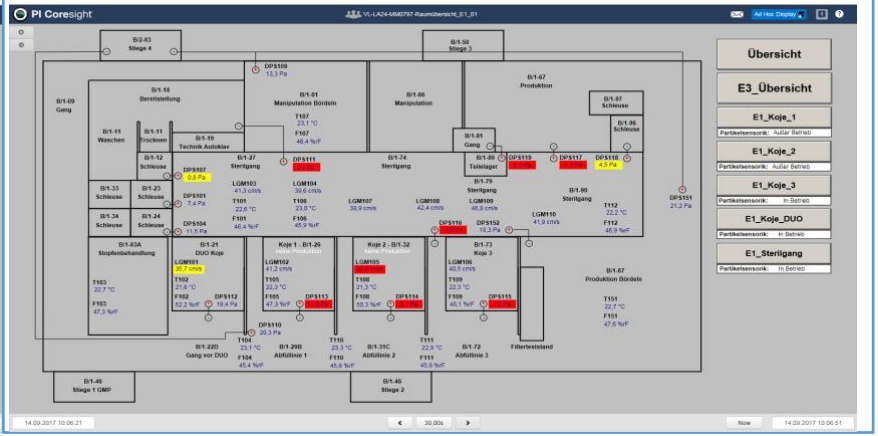
Power Failure Detection

In the event of a power failure of the entire Plant the impact on the differential pressures in the clean rooms could be very quickly reconstructed by analyzing the PI dashboard . (Example: “sterile tunnel LA24 / B“)

Automated analysis



Visual analysis

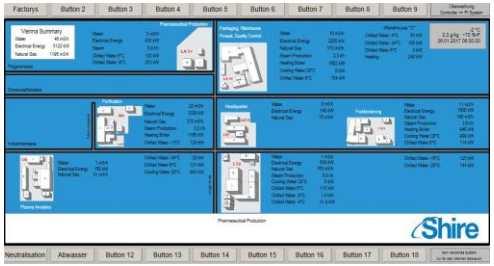


Vienna PI-System - Pharma production

Implementation of an IT solution to gather all relevant data of the filling process and all related supporting **systems**

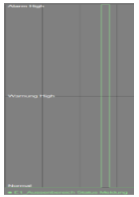
- **Combined process & utility data** visualization on one single platform to the user
- **Real time** monitoring & **long term** data archive
- Verifying if the **process or/and supply systems** are in a normal range, if not…**generating warnings or alarms** (vs deviation degree) to **inform responsible departments**
- Automatically **generate reports** when the filling process has finished – possible product release (future)

Plant Overview / Navigation

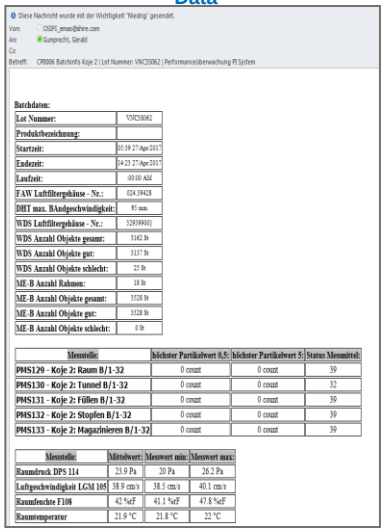


Real Time Dashboard

Early Signal Detection (Classification within Trend)



Report with Process & Utility Data



Diese Nachricht wurde mit der Wichtigkeit "Niedrig" gesendet.

Batchdaten:

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Produktbezeichnung:	
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Endezeit:	14:23 27/Apr/2017
Laufzeit:	00:00 Std.
FAW Luftfiltergehäuse - Nr.:	024.39428
DHT max. RAndgeschwindigkeit:	95 mm
WDS Luftfiltergehäuse - Nr.:	329399801
WDS Anzahl Objekte gesamt:	3162 Bt
WDS Anzahl Objekte gut:	3137 Bt
WDS Anzahl Objekte schlecht:	25 Bt
ME-B Anzahl Rahmen:	18 Bt
ME-B Anzahl Objekte gesamt:	3528 Bt
ME-B Anzahl Objekte gut:	3528 Bt
ME-B Anzahl Objekte schlecht:	0 Bt

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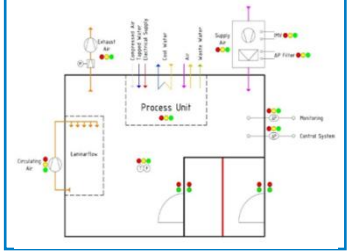
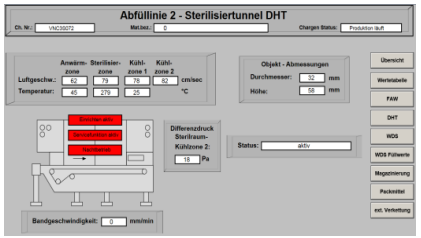
PMS130 - Koje 2: Tunnel B/1-32	0 count	0 count	32
PMS131 - Koje 2: Füllen B/1-32	0 count	0 count	39
PMS132 - Koje 2: Stopfen B/1-32	0 count	0 count	39
PMS133 - Koje 2: Magazinieren B/1-32	0 count	0 count	39

Messstelle:	Mittelwert:	Messwert min:	Messwert max:
Raumdruck DPS 114	23.9 Pa	20 Pa	26.2 Pa
Luftgeschwindigkeit LGM 105	38.9 cm/s	38.5 cm/s	40.1 cm/s
Raumfeuchte F108	42 %rF	41.1 %rF	47.8 %rF
Raumtemperatur	21.9 °C	21.8 °C	22 °C

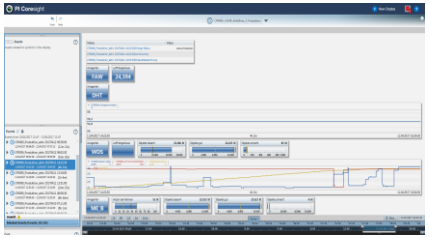
Combined Data



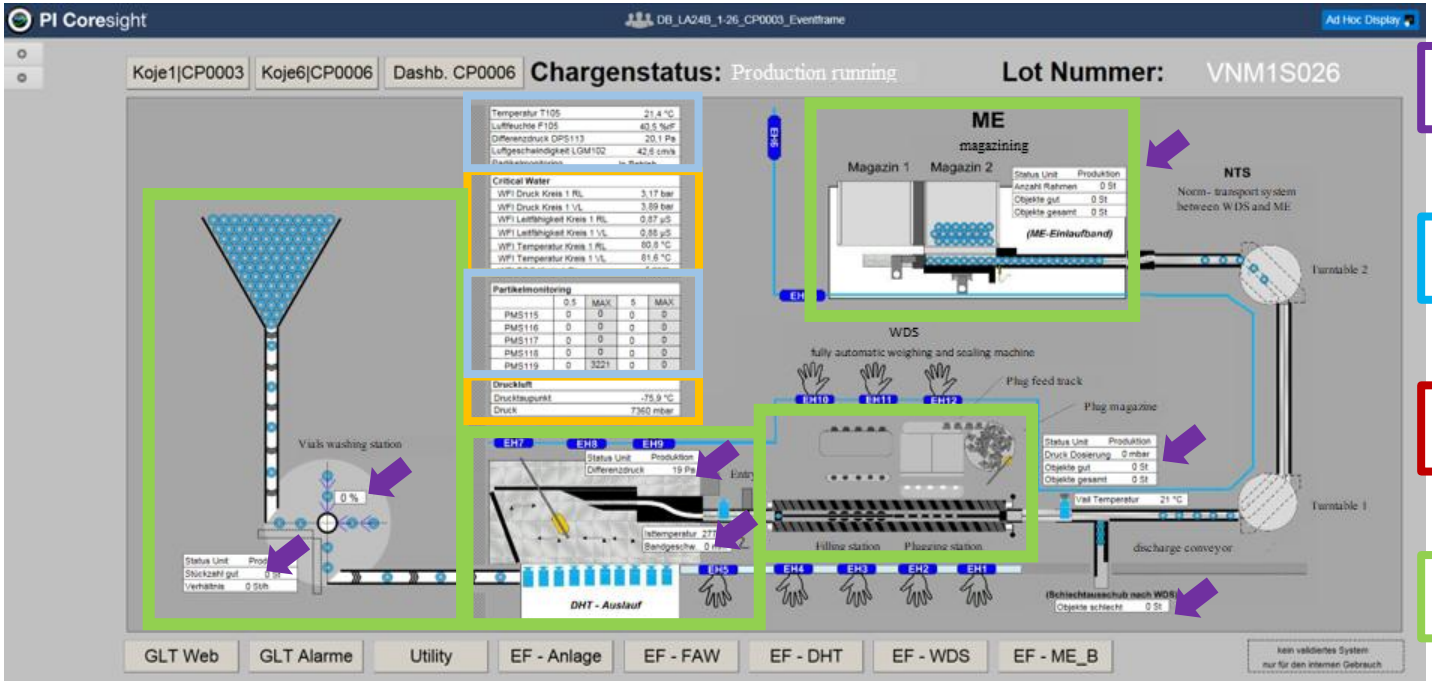
Real Time Monitoring Sterile Tunnel



Comparison of different Lots



Vienna PI-System - Pharma production Dashboard – Batch Events



Recent data: Filling lines

Production conditions

Recent data: Utility Systems

Links to Batchdata

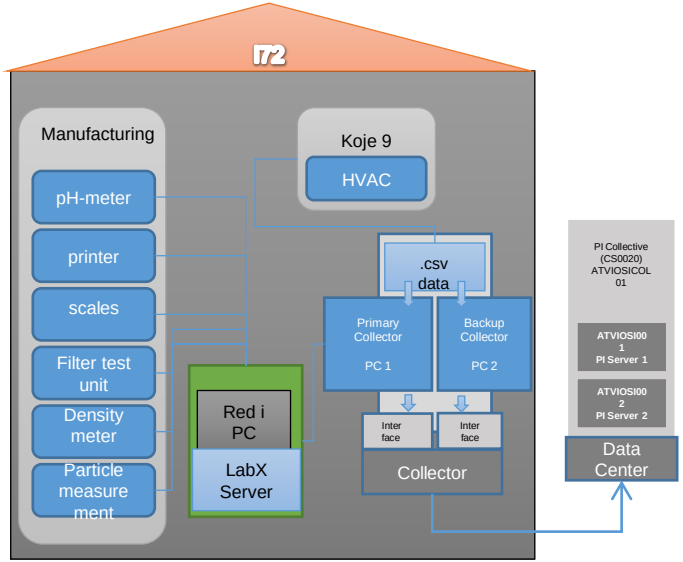
Vienna I72 Pharma production

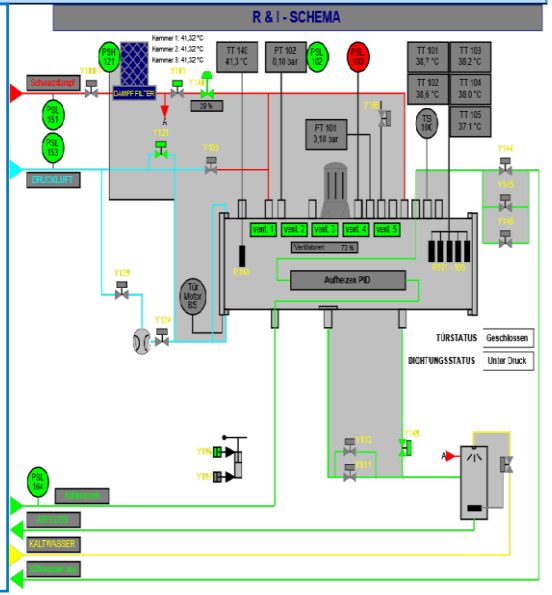
Implementation of an IT solution to gather all relevant data of the filling line and all related supporting **systems**

- **Combined process & utility data** visualization on one single platform to the user
- **Real time** monitoring & **long term** data archive

Recorded real time data

- ✓ density gauges
- ✓ pH conductivity
- ✓ table scales
- ✓ printer
- ✓ filter test units
- ✓ floor scales
- ✓ Flow meters
- ✓ Monitoring systems
- ✓ HVAC systems
- ✓ Particle measurement

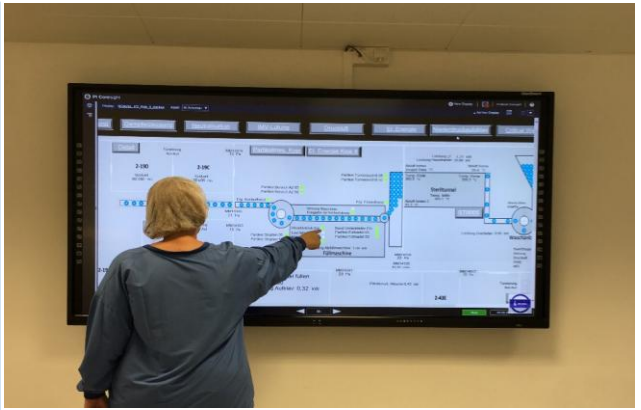


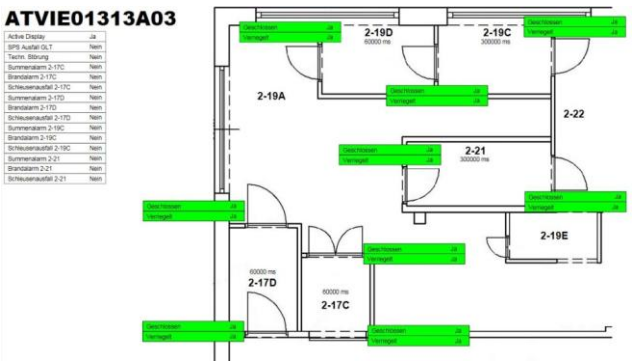


Vienna I72 Pharma production

Benefits

- **fast accessibility of data** for root cause analyses
- **saving resources** e.g. for collecting data
- Online Identification of possible **deviations or malfunctions**
- A fast way to capture the dimension of deviation in the first evaluation in less time – e.g. no unnecessary on hold status for products or unnecessary delay of production plan
- **Fast data and alarm availability**
- **Deviations avoidance** due to implantation of significant evaluation points
- **Continuous documentation** of the whole life cycle process of Albumin at Building I72





Our Journey with the PI System

Energy savings
Water
Electricity
Steam
…

Data driven decisions
Replacing of waste producer
Installation of Energy recovery Devices
…

Alarm notifications
reduce of Breakdowns
Predictive maintenance
…

Root cause analyses
Reduce of Deviations
Increase of Product Output
Data based decisions
…

Electronic batch release
Reducing paper loads
…

Our Key for Success

- One clear PI Strategy
- Defined PI Governance Board
- PI Key and End User defined
- PI data owner defined
- PI Projects and Implementation standardized
- Validation strategy (GxP, non GxP definition) available
- PI part of any URS for new equipment

- interfaces with other data management systems available
- PI templates
- PI business cases published

- Communication, Communication, Communication, Communication, Communication

Questions?

Please wait for the **microphone**

State your **name & company**

Please rate this session in the mobile app!