

11/15/2022

Digital Plant of B Braun for Discrete and Continuous Manufacturing

B Braun Medical Inc.

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AVEVA



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(Process Automation)

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Portrait of the B. Braun Group

B. Braun

- As one of the world's leading medical technology companies. B. Braun protects and improves the health of people around the world.
- For over 180 years, the family-owned company has been accelerating progress in health care with pioneering spirit and groundbreaking contributions. This innovative strength continues to be the foundation of B. Braun's success today—always with the goal of improving clinical outcomes, cost of care and patient benefits.
- More than 66,000 employees live Sharing Expertise worldwide, they make B. Braun a true partner that develops smart solutions and sets new standards.
- In 2021, the B. Braun Group generated sales of € 7.9 billion.

We stand for these values.

B. Braun

Innovation

We drive advancements.



We are actively pushing the boundaries of technology in health care through modern research and development, focused investments as well as strategic partnerships.

Efficiency

We focus our energy.



Process automation helps us to set new standards in production, quality and sales. In this way, we improve continuously and create added value for our customers.

Sustainability

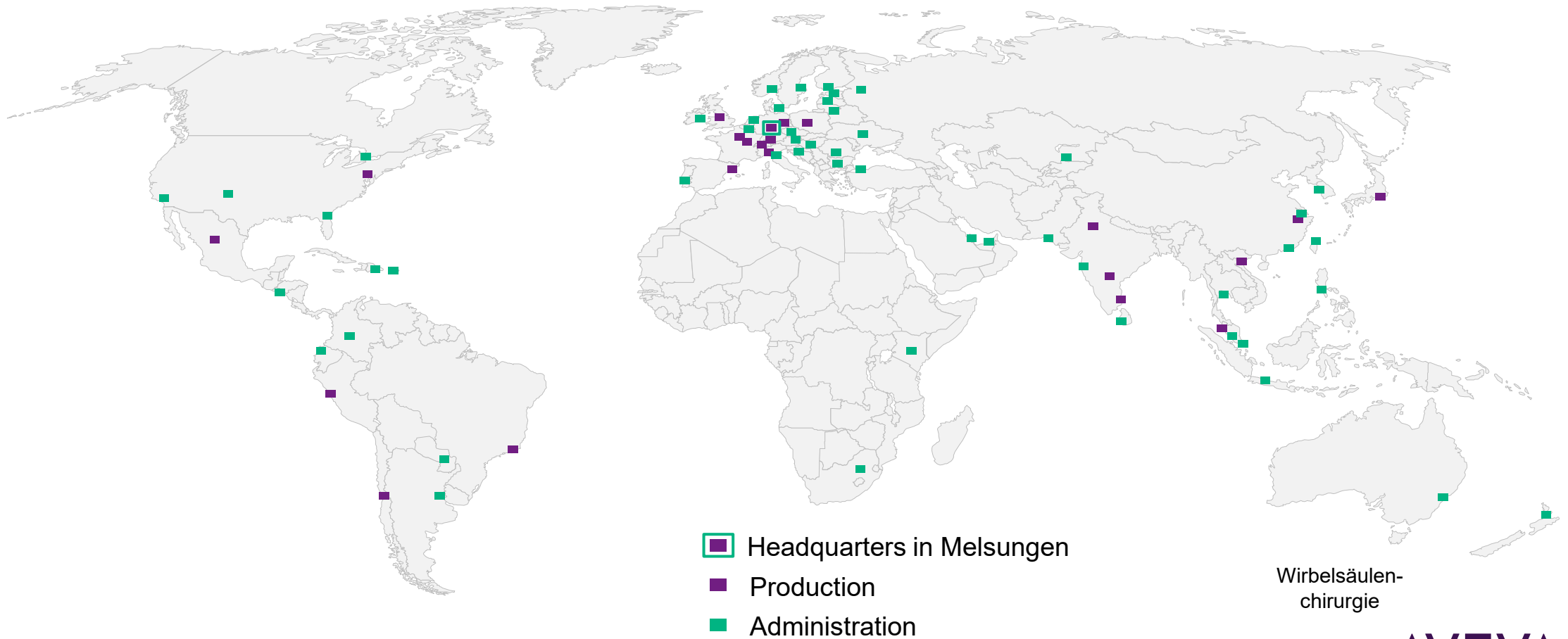
We live responsibly.



We take business decisions with future generations in mind and implement global sustainability management standards at our sites worldwide.

We have subsidiaries in 64 countries.

B. Braun



We have competence in numerous therapeutic areas.

B. Braun



Continence Care
and Urology



Extracorporeal
Blood Treatment
Therapies



Infection Prevention
and Control



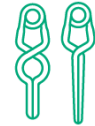
Infusion
Therapy



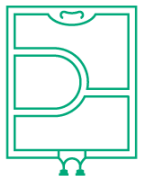
Interventional
Vascular Therapy



Minimally Invasive
Surgery



Neuro-
surgery



Nutrition
Therapy



Orthopaedic
Surgery



Ostomy
Care



Pain
Therapy



Spine
Surgery



Sterile Goods
Management



Sutures and
Surgical Specialties



Wound
Management

Sales



7,860

€ million

66,234

Employees



Investments



800
€ million

B. Braun 2021 At a glance



226

Social projects



Countries

Research and
development activities

417

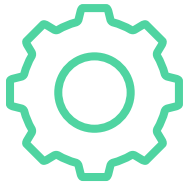
€ million



How PI enables B. Braun



Top Global Pharma & Medical Device – Integration



Challenge

- The data source are not integrated, and several tools & applications need to be used.
- KPI's need to integrate several data sources.
- Limited data storage capability
- Site personnel needs to cross check information from different data sources



Solution

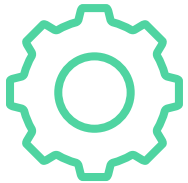
- Leverage AF structure using robust data integration strategy (PI Integrators, AF SDK etc.).
- OPC UA, UFL & RDBMS, OPC DA interfaces



Benefits

- Efficiency improvement for site personnel.
- Electronic record-keeping systems (audit trails) to fulfill cGMP requirements
- Pre-integrated information for diagnosis, troubleshooting and advanced analytics times.

Foundation for Digital Excellence



Challenge

How do we increase production to meet growing demands while optimizing and scaling production across multiple manufacturing sites, using only data from existing manufacturing equipment?



Solution

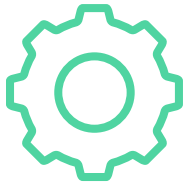
Deployed the latest AVEVA PI System technology including PI, PI AF, Event Frame, RtReport, and PI Vision, as an advanced foundation to manufacturing line.



Benefits

- Increased production and operational efficiency, reduced costs.
- Combining data with contextual information
- Easy to validate/ maintain/ operate (trainings, document lifecycle, operational and maintenance costs reduction)

Data contextualization



Challenge

Too much time was being spent in manual and paper-based batch reviews.

Visualization was difficult due to a general lack of data integration and lots of data errors



Solution

Event Frame and PI Vision display for the control room, and offices using curated, combined, analyzed, and interpreted data in a meaningful way for each specific function or task for the continuous and discrete manufacturing line.



Benefits

- The operators and engineers have early warning and prediction of performance degradation.
- Access to combined data and contextual information
- Easy to validate/ maintain/ operate
- Reduction of time needed to perform batch cycle times

Integration Challenge - Multiple Data Sources and No Insightful Data

What is the forecast
of productivity?
What are the
Losses?

COO



I need to combine
data from 6 data
sources

Plant
Manager



I need to search
critical process alarms
in 25 pages ?



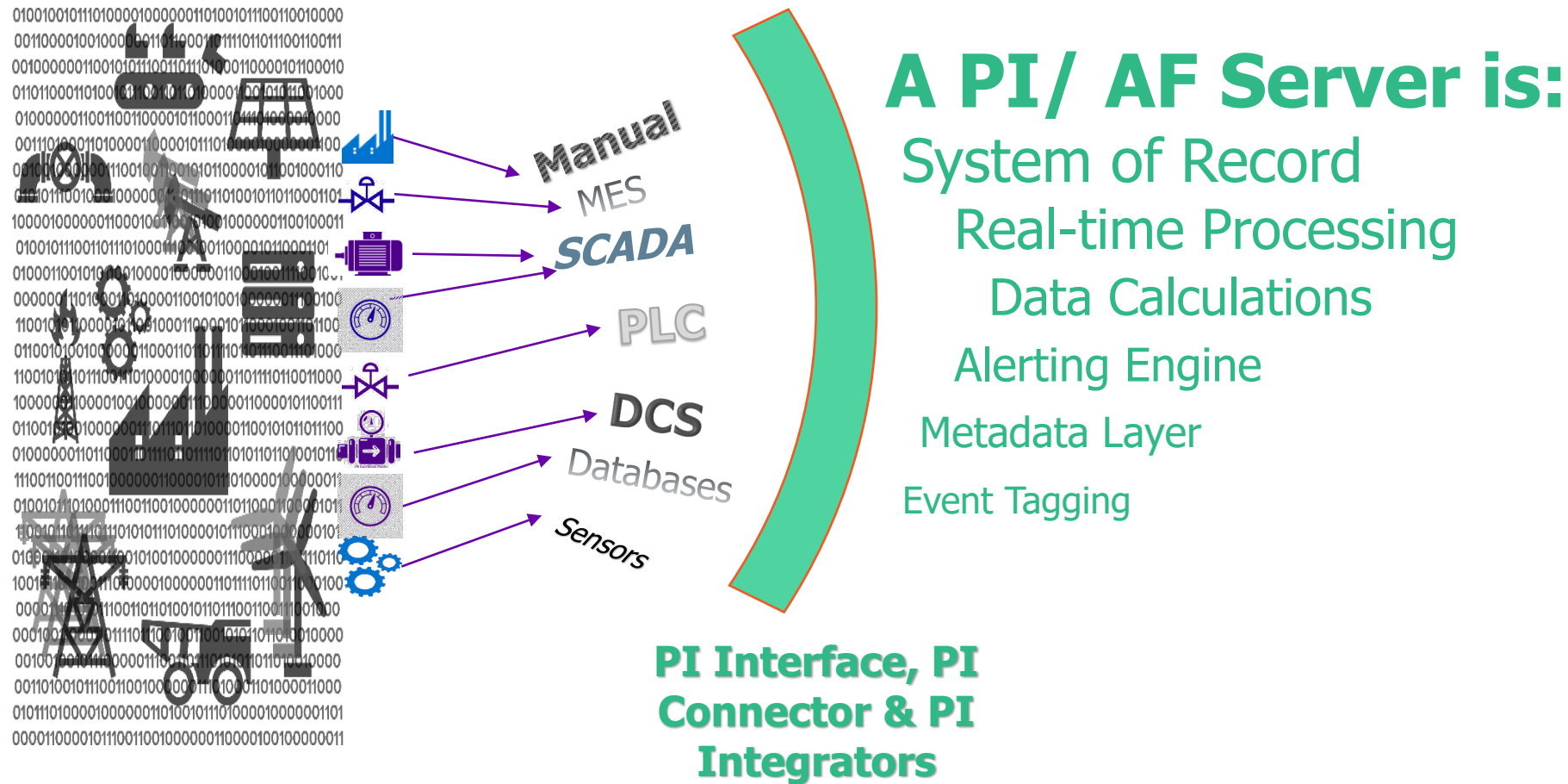
Quality Engineer

Maintenance
Technician



I need to know the
moment it goes out of
tune

Strong Connectivity to Plant OT Data Sources



Multiple Data Sources – Strong Connection to Data Sources

Data Sources in plant

- Allen Bradley PLC
- Siemens PLC (S7, WinCC, MES)
- PTC Kepware System
- Batch Execution Systems (Batch Engines)
- PC Based Manual Data Entry
- Rockwell PLC's, MES & HMI
- B&R PLCs & HMI
- SQL DB's
- Modbus
- OPC UA
- PTC KEPServerEX
- Wonderware

Takes data from this...

RTJ:END									
RTJ:BEGIN									
(28)ALM 12:01:15	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	0		
RTJ:END									
RTJ:BEGIN									
RTN 12:01:29	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	06		
(28)ALM 12:01:30	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	0		
RTJ:END									
RTJ:BEGIN									
RTN 12:01:40	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	06		
RTJ:END									
RTJ:BEGIN									
(28)ALM 12:01:44	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	0		
RTN 12:01:50	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	06		
RTJ:END									
RTJ:BEGIN									
(28)ALM 12:01:53	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	0		
ACK 12:01:55	59BIA112	PVLO			SENSOR DE LLANA QUEM	3	06		
RTJ:END									
RTJ:BEGIN									
RTN 12:02:00	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	06		
(28)ALM 12:02:04	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	0		
RTJ:END									
RTJ:BEGIN									
ACK 12:02:09	59BIA112	PVLO		LOW	SENSOR DE LLANA QUEM	3	06		
RTJ:END									
RTJ:BEGIN									
RTN 12:02:21	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	06		
(28)ALM 12:02:26	59BIA112	PVLO	180.000	LOW	SENSOR DE LLANA QUEM	3	0		
RTJ:END									
RTJ:BEGIN									
ACK 12:02:32	59BIA112	PVLO		LOW	SENSOR DE LLANA QUEM	3	06		
RTJ:END									

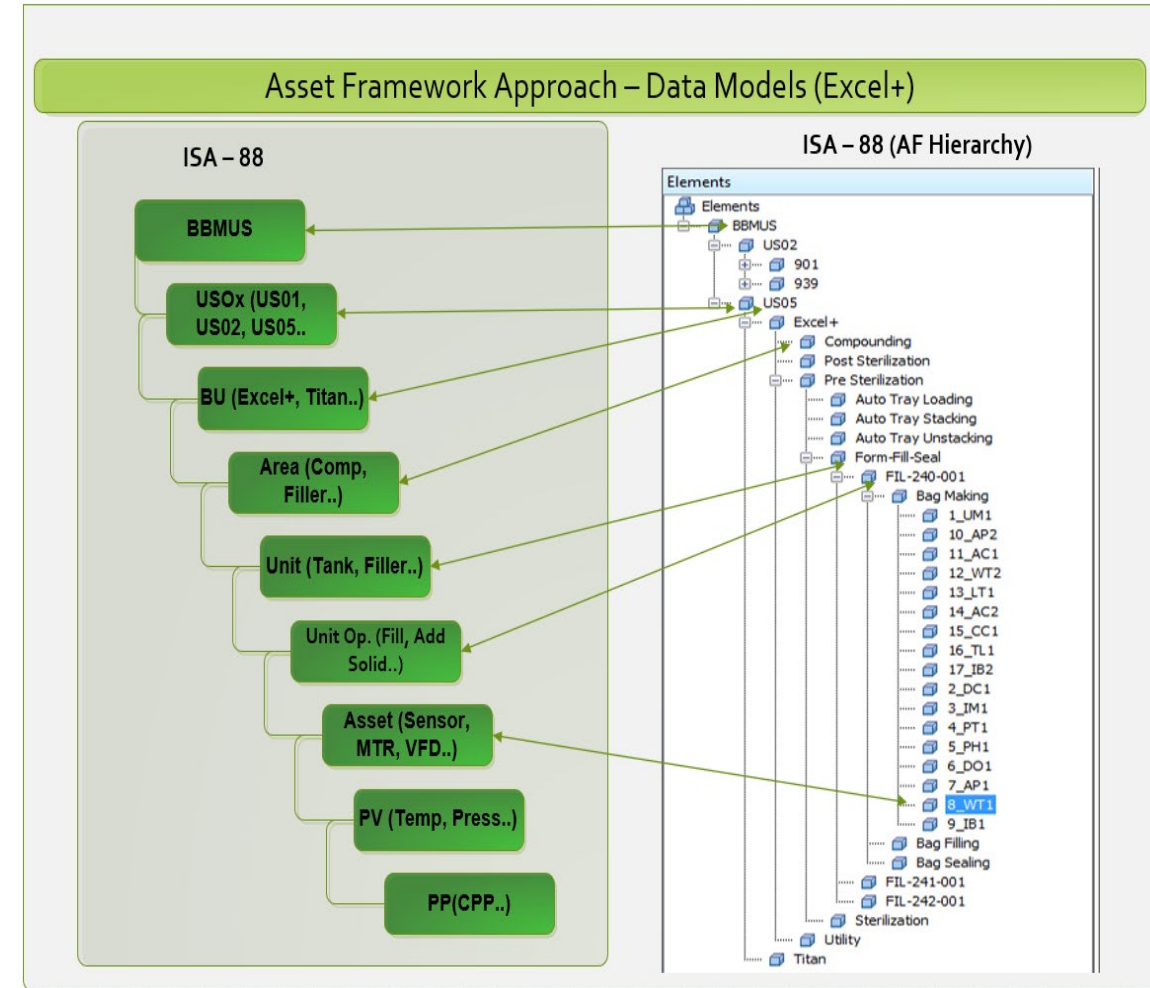
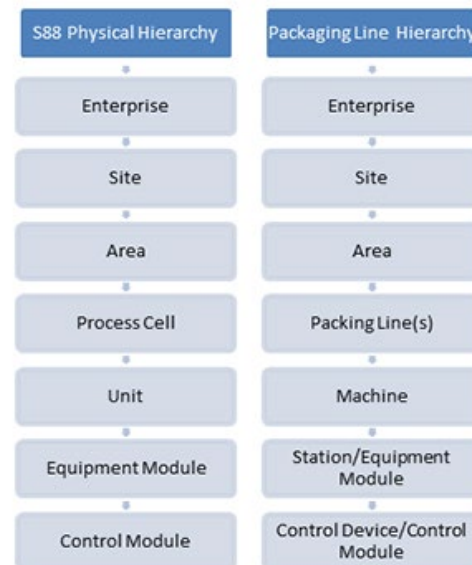
.... and organizes it into this

Timestamp	Message Type	Tag	Tag Description	Alarm Identifier	Priority	Value	Limit
2001/06/18 14:33:40.000	Alarm	3AI-302-LB	CODING->DCPD	MES BAD	A2	0	0
2001/06/18 13:44:41.000	Alarm	3AI-105-LB	C9+IN BTX TOWER	MES BAD	C	0	0
2001/06/18 13:21:22.000	Alarm	3AI-105-LB	C9+IN BTX TOWER	MES BAD	A3	0	0
2001/06/18 13:21:20.000	Alarm	3AI-105-LA	C5+LIGHTER IN BT...	MES BAD	A2	0	0
2001/06/18 13:09:33.000	Alarm	3AI-105-LB	C9+IN BTX TOWER	MES HI	A3	4.023399...	2
2001/06/18 12:56:53.000	Alarm	3AI-105-LB	C9+IN BTX TOWER	MES LO	A3	0.001	0
2001/06/18 12:49:17.000	Alarm	3AI-402A	H/C ALARM C9 RES...	MES BAD	C	0	0
2001/06/18 12:49:13.000	Alarm	3AI-402A	H/C ALARM C9 RES...	MES BAD	A2	0	0
2001/06/18 12:49:10.000	Alarm	3AI-402A	H/C ALARM C9 RES...	MES BAD	C	0	0
2001/06/18 12:49:02.000	Alarm	3AI-402A	H/C ALARM C9 RES...	MES BAD	A2	0	0
2001/06/18 12:49:52.000	Alarm	3AI-402A	H/C ALARM C9 RES...	MES HI	C	0	0
2001/06/18 12:49:45.000	Alarm	3AI-402A	H/C ALARM C9 RES...	MES HI	A3	18.04599...	10
2001/06/18 12:49:28.000	Alarm	3AI-402A	H/C ALARM C9 RES...	MES BAD	A2	0	0
2001/06/18 12:49:11.000	Alarm	3AI-402A	H/C ALARM C9 RES...	MES HI	A3	10.10100...	10
2001/06/18 12:45:09.000	Alarm	3AI-105-LB	C9+IN BTX TOWER	MES HI	A3	2.205700...	2
2001/06/18 12:42:40.000	Alarm	3AI-109-A	H/C DETECTION IN...	MES HI	C	0	0
2001/06/18 12:42:23.000	Alarm	3AI-109-A	H/C DETECTION IN...	MES HI	A3	13.52	13
2001/06/18 12:41:32.000	Alarm	3AI-110-A	H/C DETECTION IN...	MES HI	C	0	0
2001/06/18 12:41:18.000	Alarm	3AI-110-A	H/C DETECTION IN...	MES HI	A3	7.182000...	7
2001/06/18 12:33:25.000	Alarm	3AI-105-LB	C9+IN BTX TOWER	MES LO	A3	0.001	0
2001/06/18 12:00:33.000	Alarm	3AI-105-LB	C9+IN BTX TOWER	MES LO	C	0	0
2001/06/18 11:42:25.000	Alarm	3FIC-106	ATR BA3101	MES HI	C	0	0

To select, cleanse, and shape data for analysis

Template, Standard & Data Model

- PI Asset Framework & Event Frame
 - The models aligned to the S95/S88 standards
 - Process Level Hierarchy for Manufacturing process
 - Equipment Level for Discrete Manufacturing
 - Define conditions for State Model for all major modes & sub-modes of operation
 - Production
 - Running/Execute
 - Idle
 - Waiting for product
 - CIP
 - Running
 - On-Hold



Template, Analysis, Event Frame & Notifications

The image displays four screenshots of the software interface, illustrating different modules used for template, analysis, event frame, and notifications.

DPJ Filter (Top Left): This screenshot shows the 'DPJ Filter' module. It includes a tree view on the left with elements like 'BSM', 'CPM', 'Line 4', 'Duplex', 'Line 2', 'Line 3', 'EXCEL', 'Filing', 'Packing', 'PIC', 'PIC PALL', 'TTTAN', and 'Titan Filter'. The main area shows a table of variables and their values at evaluation and last trigger time.

Name	Expression	Value at Evaluation	Value at Last Trigger	Output Att
vToday	Day('**')	19	19	Map
vQ	TagVal('stdQuality') / 100	0.98564	0.98564	Map
vP	TagVal('stdPerformance') / 100	0.79311	0.79311	Map
va	TagVal('stdAvailability') / 100	0.46637	0.46637	Map
vMTD	vQ * vP * va * 100	36.437	36.437	mGEE

DPJ Filter (Top Right): This screenshot shows the 'DPJ Filter' module with a table of variables and their values at evaluation and last trigger time.

Name	Expression	Value at Evaluation	Value at Last	Output
vCurr	'Status'	COO	COO	MA
stateUPUL	if tagval('Status_UPUL') = True then TRUE else FALSE	False	False	MA
statePUL	if tagval('Status_PUL') = True then TRUE else FALSE	False	False	MA
stateProduction	if tagval('Status_Production') = True then True else FALSE	False	False	MA
stateOptional1	if tagval('Status_Optional1') = True then True else FALSE	False	False	MA
stateOptional2	if tagval('Status_Optional2') = True then True else FALSE	True	True	MA
stateOptional3	if tagval('Status_Optional3') = True then True else FALSE	False	False	MA
vDetected	stateUPUL or statePUL or stateProduction or stateOptional1	True	True	MA
vStateDefault	vCurr = 'Str_Status_Default'	False	False	MA
vUpdateDefault	vDetected = False and vStateDefault = False	False	False	MA
vUpdate	if (StateUPUL and (vCurr <> tagval('str_Status_UPUL')) or (StatePUL and (vCurr <> tagval('str_Status_PUL')) or (StateProduction and (vCurr <> tagval('str_Status_Production')) or (StateOptional1 and (vCurr <> tagval('str_Status_Optional1')) or (StateOptional2 and (vCurr <> tagval('str_Status_Optional2')) or (StateOptional3 and (vCurr <> tagval('str_Status_Optional3')) or (vUpdateDefault then TRUE else FALSE	False	False	MA

Attribute Templates (Bottom Left): This screenshot shows the 'Attribute Templates' module. It includes a tree view on the left with elements like 'BSM', 'CPM', 'Line 4', 'Duplex', 'Line 2', 'Line 3', 'EXCEL', 'Filing', 'Packing', 'PIC', 'PIC PALL', 'TTTAN', and 'Titan Filter'. The main area shows a table of attributes and their values.

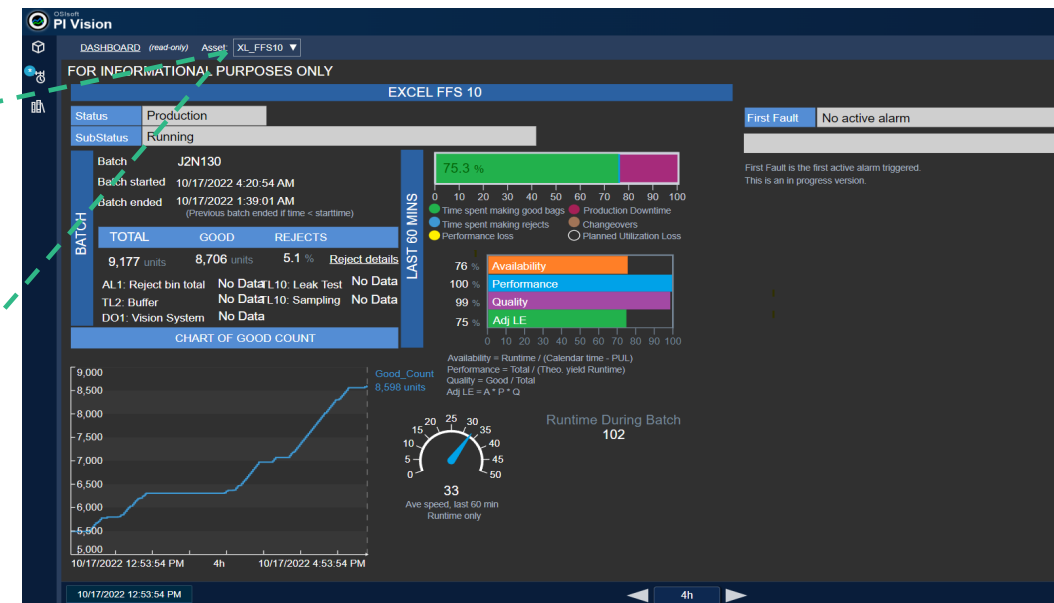
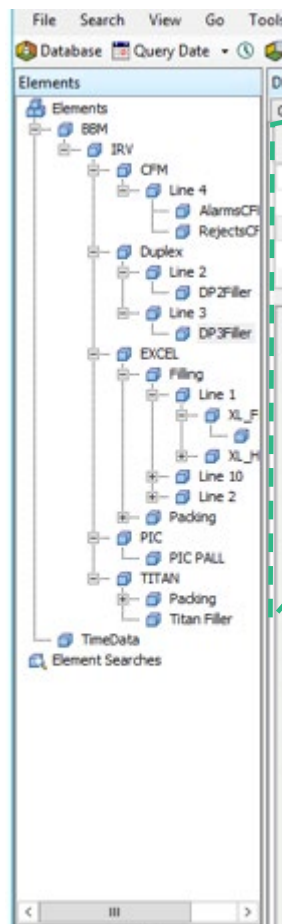
Name	Description	Default Value
Availability	Availability	0%
Performance	Performance	0%
Quality	Quality	0%
StoreWhen	1=Daily, 2=Weekly, 3=Monthly, 4=Quarterly, 5=Annually	1
TimePeriod	1=Daily, 2=Weekly, 3=Monthly, 4=Quarterly, 5=Annually	1

Event Frames (Bottom Right): This screenshot shows the 'Event Frames' module. It includes a tree view on the left with elements like 'BSM', 'CPM', 'Line 4', 'Duplex', 'Line 2', 'Line 3', 'EXCEL', 'Filing', 'Packing', 'PIC', 'PIC PALL', 'TTTAN', and 'Titan Filter'. The main area shows a table of event frames and their values.

Name	Duration	Start Time	End Time
Titan Filter_DT_2022-10-19 10:30:03	0:00:10.094	10/19/2022 10:30:03	10/19/2022 10:30:13
Line_4_DT_2022-10-19 10:30:03	0:00:10.094	10/19/2022 10:30:03	10/19/2022 10:30:13
Line_4_DT_2022-10-19 10:30:03	0:00:10.094	10/19/2022 10:30:03	10/19/2022 10:30:13
Line_4_DT_2022-10-19 10:30:03	0:00:10.094	10/19/2022 10:30:03	10/19/2022 10:30:13
Line_4_DT_2022-10-19 10:30:03	0:00:10.094	10/19/2022 10:30:03	10/19/2022 10:30:13

Pharma Production - PI Vision Dashboard

- Summarizing Multiple Analyses into single Relevant Visuals & Metrics – Shift / Batch Wise Dashboard
- Bringing it Together Through PI Vision
- AF templates makes finding your assets easy
- Plant States monitoring
- Automated loss classification and reporting
- Identify Out Of Specification (OOS) events for Critical Process Parameters
 - Time, Event and Asset Context
 - Batch Monitoring



CURRENT	Batch	J2N142	J2N164	J2N130	J2N143	
	Product	L7070	L7510	L8502	L8001	
	Cases Packed	1,236	500	779	628	
	Units Packed	14,832	6,000	18,696	15,072	
TODAY		LINE 1	LINE 3	LINE 2	LINE 4	TOTAL
		1000 ml		250 ml	500 ml	
	Cases Packed	1,448	4,778	1,364	1,866	1,600
	Units Packed	17,328	57,240	32,688	44,688	27,696
MTD		1000 ml		250 ml	500 ml	
	Cases Packed	36,644	117,330	57,647	44,866	5,449
	Units Packed	439,248	1,406,448	1,382,208	1,075,776	95,040
	Units Packed	1,845,696				

Reporting via DataLink & RtReport

- Ad-Hoc Data Contextualization
- Compare actual values with specifications and design limits.
- Easy to create reports using simple Ad-In actions or complex expressions.
- RtReport templates are fully versioned with an 'Effective Date' and changes are audit trailed.
 - Timed Values
 - Limit violations
 - Ramp rate violations
 - Tables of data values
 - Statistics
 - Expression results
 - Etc.....

	B	C	D	E	F
1	Master Batch Record for XXXXXXXX				
2	FFS CPP Report - XXX-XXX-001				
3	Batch #		Time #	17-Oct-22 17:58:48	
4	Machine: XXX-XXX-001 (Kiefel Filling Machine-1)				
5	Sr. No.	Set points	Expected	Actual Time	Actual setpoint values
6	1	240_FFS_PH1_upper_heater_temp	175.0 C -180.0 C	17-Oct-22 17:53:22	178
7	2	240_FFS_PH1_printing_time	0.10 - 0.25 s	17-Oct-22 17:53:22	0.180000007
8	3	240_FFS_AP2_Heater_Top_1	173.0 C -177.0 C	17-Oct-22 17:53:22	175
9	4	240_FFS_AP2_Heater_Top_2		17-Oct-22 17:53:22	175
10	5	240_FFS_AP2_Heater_Top_3		17-Oct-22 17:53:22	175
11	6	240_FFS_AP2_Heater_Top_4		17-Oct-22 17:53:22	175
12	7	240_FFS_AP2_Heater_Bottom_1		17-Oct-22 17:53:22	175
13	8	240_FFS_AP2_Heater_Bottom_2		17-Oct-22 17:53:22	175
14	9	240_FFS_AP2_Heater_Bottom_3	155.0 C -165.0 C	17-Oct-22 17:53:22	175
15	10	240_FFS_AP2_Heater_Bottom_4		17-Oct-22 17:53:22	175
16	11	240_FFS_WT1_Heater_Top_1		17-Oct-22 17:52:07	160
17	12	240_FFS_WT1_Heater_Top_2		17-Oct-22 17:52:07	160
18	13	240_FFS_WT1_Heater_Top_3		17-Oct-22 17:52:07	160
19	14	240_FFS_WT1_Heater_Top_4		17-Oct-22 17:52:07	160
20	15	240_FFS_WT1_Heater_Bottom_1		17-Oct-22 17:52:07	160
21	16	240_FFS_WT1_Heater_Bottom_2		17-Oct-22 17:52:07	160
22	17	240_FFS_WT1_Heater_Bottom_3		17-Oct-22 17:52:07	160
23	18	240_FFS_WT1_Heater_Bottom_4		17-Oct-22 17:52:07	160

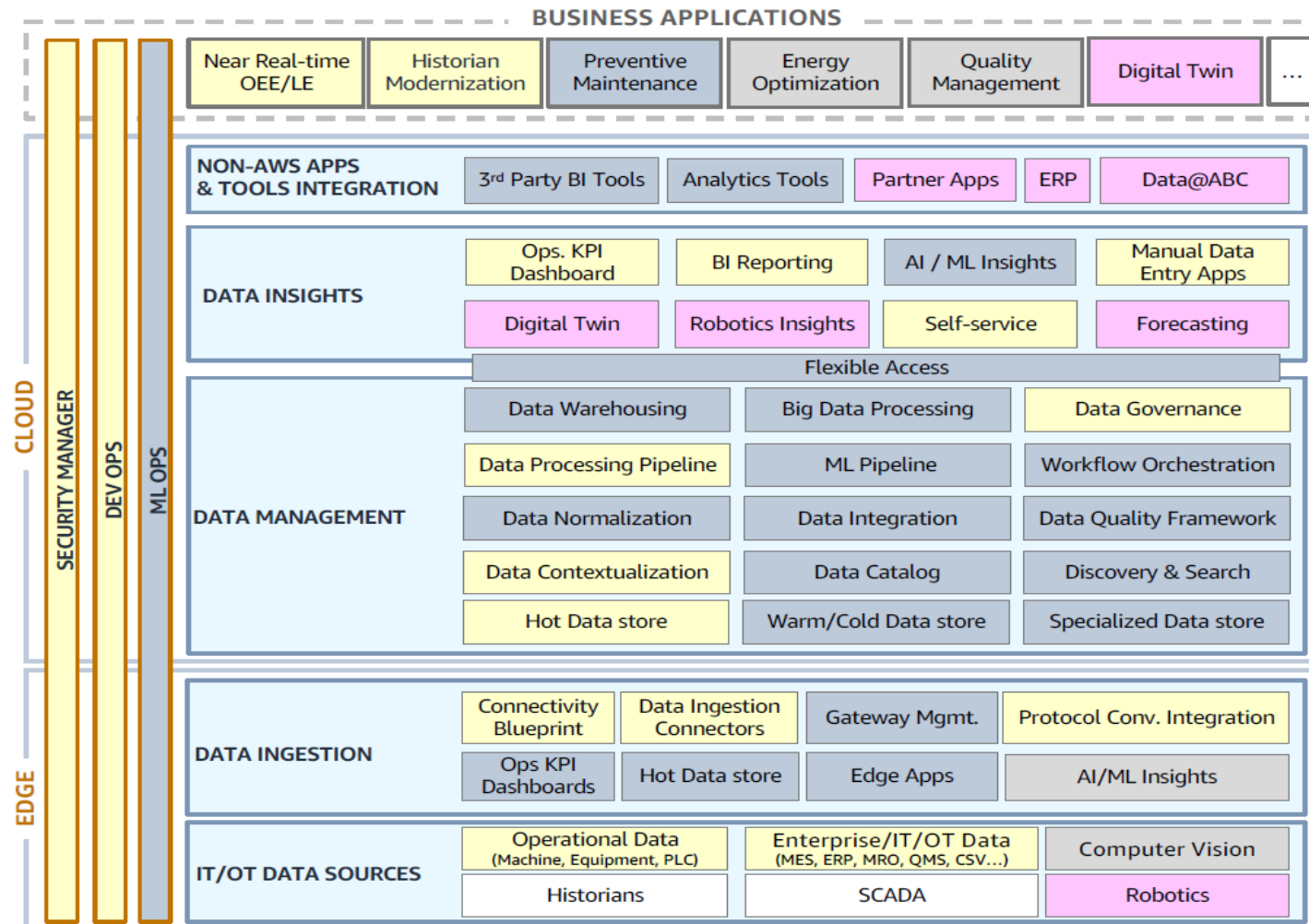
Reject Category	Sub Group	Units	% of cycle	Alert Level
Caps/Components	Cap Welding	0	0.00%	0.63%
Fill Volume	Fill Volume	0	0.00%	0.60%
Label Quality	Legibility, Vision	15	N/A	N/A
	Printer Rejects	6	N/A	N/A
	Total Label Quality	21	1.75%	7.30%

Cycle 3
 Start Time: 22-Sep-22 12:34:37 AM End Time: 22-Sep-22 01:52:49 AM
 Duration: 1 hour 18 minutes 12 seconds

Units per cycle: 1200 Total Units: 3602

Reject Category	Sub Group	Units	% of cycle	Alert Level
Caps/Components	Cap Welding	0	0.00%	0.63%
Fill Volume	Fill Volume	4	0.33%	0.60%
Label Quality	Legibility, Vision	11	N/A	N/A
	Printer Rejects	0	N/A	N/A
	Total Label Quality	11	0.92%	7.30%

Industrial Insights Platform – ISA S95 (Phased Execution)



B. Braun Industrial Insights Platform (BBIIP) (Phased Execution)

Phase 1 – OEE/LE, Historian Modernization (HM)

OEE/LE → HM

Phase 2 – Predictive Maintenance (PM), Foundation – Industrial Data Lake (IDL), Edge Management (EM)

PM → Foundation (IDL, EM)

Phase 3 – Scale to N Plants

Scale

Phase 4 – Quality / Defect Management (QDM), Energy Optimization (EO)

QDM → EO

Phase 5 – Next Priority Use Cases - Digital Twin (DT), Robotics Insights (RI), Forecasting

DT → RI → Forecasting

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!

This presentation may include predictions, estimates, intentions, beliefs and other statements that are or may be construed as being forward-looking. While these forward-looking statements represent our current judgment on what the future holds, they are subject to risks and uncertainties that could result in actual outcomes differing materially from those projected in these statements. No statement contained herein constitutes a commitment by AVEVA to perform any particular action or to deliver any particular product or product features. Readers are cautioned not to place undue reliance on these forward-looking statements, which reflect our opinions only as of the date of this presentation.

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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 [@avevagroup](https://twitter.com/avevagroup)

ABOUT AVEVA

AVEVA is a global leader in industrial software, sparking ingenuity to drive responsible use of the world's resources. The company's secure industrial cloud platform and applications enable businesses to harness the power of their information and improve collaboration with customers, suppliers and partners.

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. With operations around the globe, we are headquartered in Cambridge, UK and listed on the London Stock Exchange's FTSE 100.

Learn more at www.aveva.com