



AVEVAWORLD

Polyol Production Batch Tracking with PI Vision

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PETROCHEMICALS
MEMBER OF MOL GROUP

mol.hu





Máté Komonyi

Process Operation Technology Digitalization
Expert

- Power Platform developments
- Digitalization / automation
- Custom digital solutions



Csaba Horváth

Process Operation Technology Expert

- Data processing
- PI System developments
- Data visualizations

MOL GROUP...

- ▶ IS AN INTEGRATED, INTERNATIONAL OIL AND GAS COMPANY
- ▶ IS HEADQUARTERED IN BUDAPEST, HUNGARY
- ▶ HAS A TRACK RECORD OF OVER 100 YEARS IN THE INDUSTRY
- ▶ HAS LEAD POSITIONS IN OUR HOME MARKETS WITHIN CENTRAL EASTERN EUROPE

CORE ACTIVITIES



DOWNSTREAM



- ▶ 4 refineries and 2 **petrochemical** plants
- ▶ Transforms crude oil into a range of refined products for domestic, industrial and transport use
- ▶ The products include, among others, gasoline, diesel, heating oil, aviation fuel, lubricants, bitumen, sulphur and liquefied petroleum gas
- ▶ Produce and sell petrochemicals worldwide and hold a leading position in the petrochemical sector in the Central Eastern Europe region

PRODUCTION UNITS

6

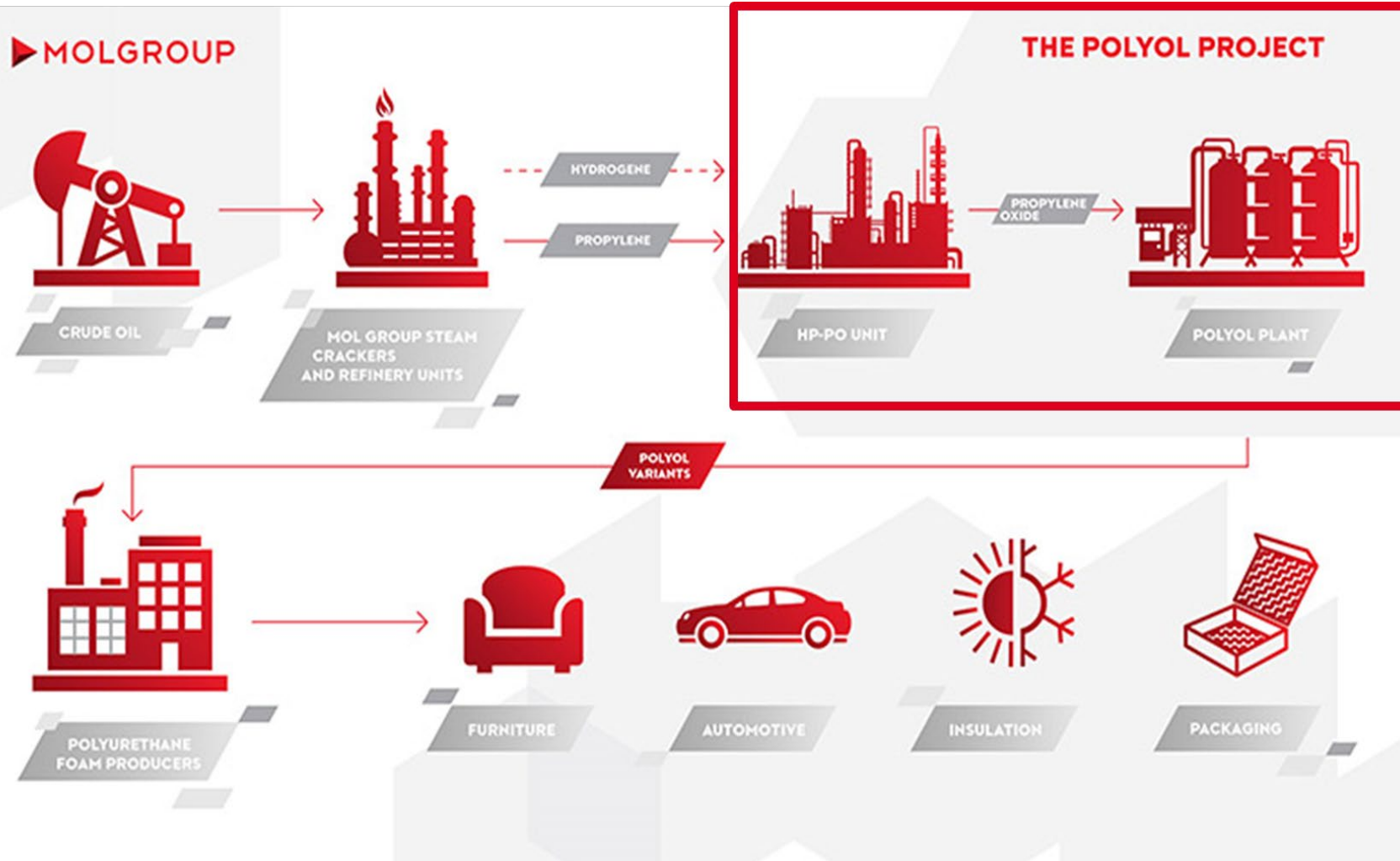


ENTER
TOMORROW

**POLYOL
PROJECT**



POLYOL



► Designed in:

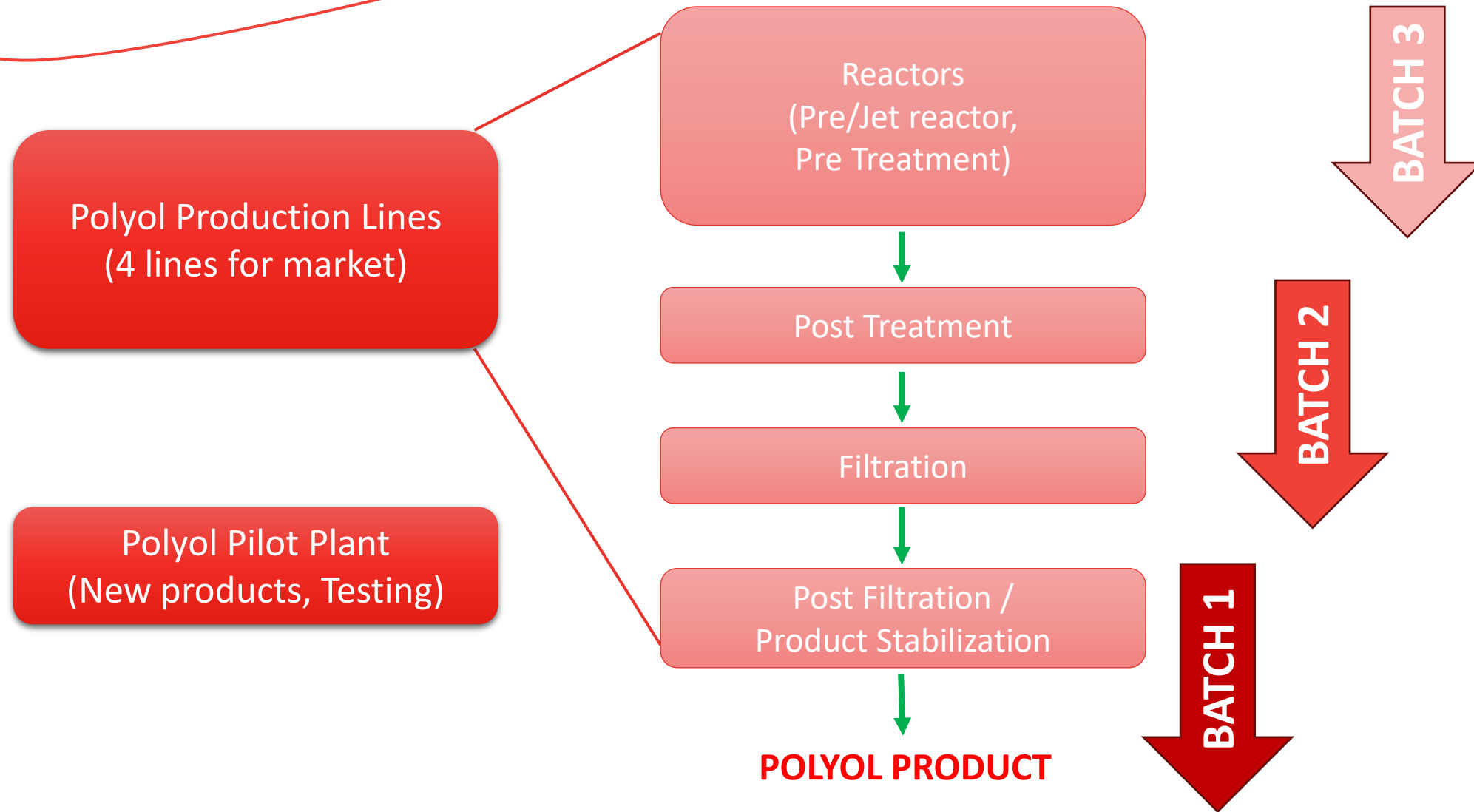
- Germany
- India
- Thailand

► Propylene oxide production:
200.000 tons/year

► Propylene glycol production:
60.000 tons/year

► Polyol production:
205.000 tons/year

Polyol Batch Process



Where We Started



Where We Started

Already Reporting, but...

Ad-hoc, manually created reports in Excel

	A	B	C	D	E	F	G	H	I	J	L
1	Delay color codes	>180 min	120-180 min	60-120 min		2024.10.15. - 2024.10.25.					2024.11.04. - 2024.11.12.
2		30-60 min	10-30 min	0-10 min		1.					2.
3	FH56-H	Execution order	PI - tag	Stage	1. recipe (min)	24P20001B	24P20001B	24P20001B	24P20001B	24P20001B	24P20003B
4				Effective Batch time		2724	2724				4276
5				EBT w/o Pause		2177			2177		1817
6						Delay (min)	Phase time (min)	Paused state (min)	Phase time -Pause (min)	Delay - Pause (min)	Delay (min)
7	Pre-Reactor				389	1095	1578	368	1210	727	3887
8	P-R	1	T62UT1.IC01	S6201001_Init.Cond.	0	11	11	5	6	6	342
9	P-R	2	T62UT1.RM01	S6201002_RM.Charg.	6	49	59	34	25	15	288
10	P-R	3	T62UT1.TA01	S6201003_TAdjustmen	5	10	15	0	15	10	21
11	P-R	4	T62UT1.CT01	S6201004_Cat.Chrg.	7	125	136	19	117	106	142
12	P-R	5	T62UT1.DR01	S6201005_Vac.Drying	90	559	739	121	618	438	3251
13	P-R	6A		NOT USED	0		0	0	0	0	0
14	P-R	6B	T62UT1.RE01	S6201007_PO/EO	236	51	283	3	280	48	-112
15	P-R	7	T62UT1.PR01	S6201008_Cookdown	30	223	253	186	67	37	-30
16	P-R	8	T62UT1.TR01	S6201010_Resid.Rem.	0	0	0	0	0	0	0
17	P-R	9	T62UT1.RR01	S6201011_Adjust	0	0	0	0	0	0	0
18	P-R	10	T62UT1.AC	S6201012_Cat.Chrg.	0	0	0	0	0	0	0
19	P-R	11	T62UT1.CT02	S6201013_Vac.Drying	0	0	0	0	0	0	0
20	P-R	12A		NOT USED	0	0	0	0	0	0	0
21	P-R	12B	T62UT1.DR02	S6201017_PO/EO	0	0	0	0	0	0	0
22	P-R	13	T62UT1.PR02	S6201015_Cookdown	0	0	0	0	0	0	0
23	P-R	14	T62UT1.RR02	S6201009_Transfer	5	31	36	0	36	31	-5
24	P-R	15	T62UT1.RE02	S6201016_Resid.Rem.	10	36	46	0	46	36	-10
25	Jet Reactor				383	950	1488	456	1032	494	1057
26	P-R	1	T62UT2.IC02	S6202001_Init.Cond.	5	13	13	4	9	9	52
27	P-R	2	T62UT2.RM01	S6202002_RM.Charg.	5	21	26	0	26	21	22

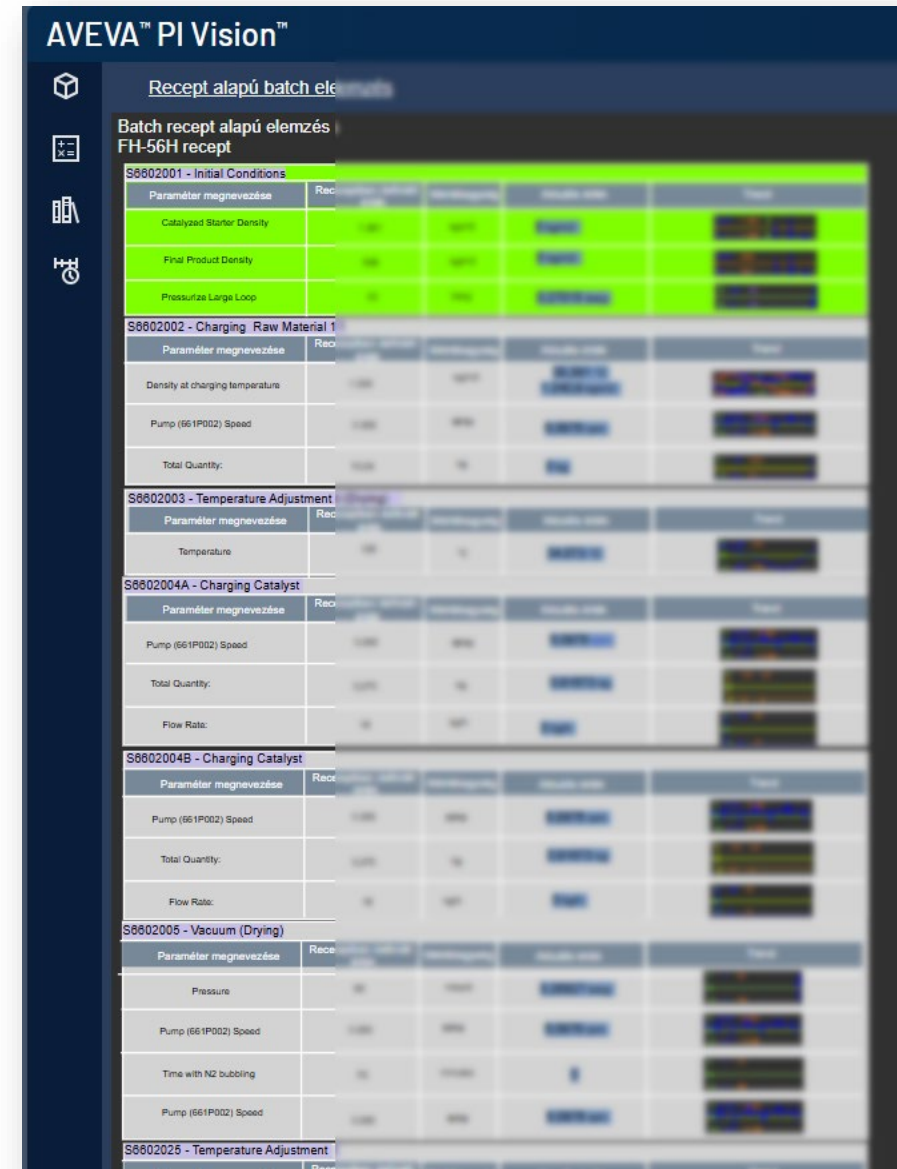
Where We Started

Started Monitoring, but...

- Static, manually created PI Vision displays for each batch products
- Batch production can not be tracked

Not sustainable, because...

- Generates high workload for engineers
- Difficult to maintain displays with multiple recipe versions



The Idea

Goals

- Consolidate requests into **one solution**
- Create a **universal** data usage system
- **Provide:**
 - Real-time monitoring
 - Backtracking
 - Investigation support
 - Data export
 - Reporting

Solutions

- **The Core:** PI System asset framework structure
- **Batch** related **visualizations** in PI Vision
- Ready to use results for **advanced reporting**

Challenges



- Lack of batch technology experience
- Handling multiple batches simultaneously
- Recipe target values not available in PI

Implementation

Using AVEVA PI System tools **connected to each other** as an integrated system, enables **unique opportunities** for monitoring and reporting complex **batch technology**

PI System asset framework

- ✔ Common asset context and data source
- ✔ Advanced calculations and business logics

PI Vision

- ✔ Easy to use visualization tool
- ✔ Used for batch phase tracking

PI Event Frames

- ✔ Provide timeframe information for PI Vision displays
- ✔ Basis of data exports and BI reporting

Test productions,
manipulated values!

Comprehensive batch information at a glance.

Batch ID	MOL ID	Recipe	Recipe name	Start	End	Recipe time	Real time	Deviation	%	Paused time	Phases	Pump stopped
06PY250130B01		T66G20V03	RH455-HS	2025. 01. 30. 14:12:53	2025. 01. 30. 15:57:53	650 min	105 min	-545 min	16,1538 %	27 min		1
06PY250127B01		T66G20V03	RH455-HS	2025. 01. 27. 14:52:49	2025. 01. 29. 1:49:51	650 min	2096 min	1446 min	322,462 %	841 min		1

Jet reactor

Batch ID: 06PY250203B04

MOL ID: 25P60006B

Recipe Name: RH475-HS

Recipe ID: T66G21V01

StartTime of Recipe: 2025. 02. 03. 19:32:15

Actual Phase: S6602005

Unit Status: RUNNING

Post Treatment

Batch ID: 06PY250127B01

MOL ID: 25P60004B

Recipe Name: T66G20V03

Recipe ID: T66G20V03

StartTime of Recipe: 2025. 01. 29. 0:12:23

Actual Phase: S6602005

Unit Status: END

Filtration

Batch ID: 06PY250127B01

MOL ID: 25P60004B

Recipe Name: Bad Input

Recipe ID: Bad Input

StartTime of Recipe: 2025. 01. 29. 13:38:51

Actual Phase: S6602005

Unit Status: END

Post Filtration

Batch ID: 06PY250127B01

MOL ID: 25P60004B

Recipe Name: Bad Input

Recipe ID: Bad Input

StartTime of Recipe: 2025. 01. 29. 14:45:38

Actual Phase: No Data

Unit Status: END

06PY250130B01		T66G20V03	RH455-HS	2025. 01. 30. 14:12:53	2025. 01. 30. 15:57:53	650 min	105 min	-545 min	16,1538 %	27 min		1
06PY250127B01		T66G20V03	RH455-HS	2025. 01. 27. 14:52:49	2025. 01. 29. 1:49:51	650 min	2096 min	1446 min	322,462 %	841 min		1

06PY250127B01	25P60004B	T66G20V03	RH455-HS	2025. 01. 29. 0:12:50	2025. 01. 29. 20:03:57	313 min	1191 min	878 min	380,511 %	94 min		1
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06PY250127B01	25P60003B	Bad Input	RH455-HS	2025. 01. 29. 13:38:55	2025. 01. 29. 21:59:57	No Data min	500 min	No Data min	No Data %	9 min		1
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06PY250127B01	25P60004B	Bad Input	RH455-HS	2025. 01. 29. 14:45:55	2025. 01. 29. 22:03:57	No Data min	437 min	No Data min	No Data %	19 min		0
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PI Vision

Test productions,
manipulated values!

Drilldown for batch phases.

Batch ID	MOL ID	Recipe	Recipe name	Start	End	Recipe time	Real time	Deviation	%	Paused time	Phases	Pump stopped
06PY250130B01		T66G20V03	RH455-HS	2025. 01. 30. 14:12:53	2025. 01. 30. 15:57:53	650 min	105 min	-545 min	16,1538 %	27 min		1
06PY250127B01		T66G20V03	RH455-HS	2025. 01. 27. 14:52:49	2025. 01. 29. 1:49:51	650 min	2096 min	1446 min	322,462 %	841 min		1

Uri Builder Data Reference

Type: ☐ Web ☒ PI Vision Restart configuration

PI Vision website address

https://server/PIVision/

Display

/Displays/45264/Batch-phase-monitoring ▶

Parameters

Key	Value	
Asset	\\%System%\%Database%\%ElementPath%	✕
StartTime	%StartTime%	
EndTime	%EndTime%	

Test productions,
manipulated values!

♥ Easy parameter investigation.

[MPK Startpage](#) > [Recipe base batch monitoring](#) >

T66 Jet reactor

Transfer crude polyol to Post Treatment vessel

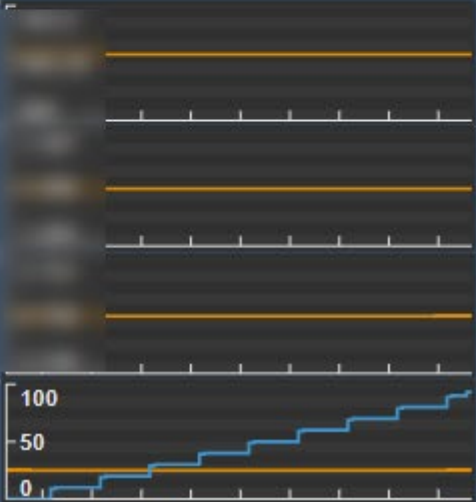
Recipe Name
RH455-HS
Recipe ID
T66G20V03

Batch ID:
06PY250127B01
MOL ID:
25P60004B



Run	ID	Phase	Phase name	Start	End	Time
0	23	S6602012	Transfer crude polyol to Post Treatment vessel	2025. 01. 29. 0:12:42	2025. 01. 29. 1:46:43	1h 34m

	Parameter	Recipe value	Last value
1	Fluid quantity		
2	Flow rate		
3	Pump (661P002) speed		
4	Time	25 min	93 min



Advantages

PI Vision + PI Asset Framework (with Templates) + PI Event Frames

Whole batch parameter
monitoring only with

3

PI Vision displays

Minimal maintenance

- ✔ Quick rollout
- ✔ Define/modify parameters in AF
- ✔ No display creating/editing

MOL Petrochemicals reaches target Polyol production capacity 30% faster

Challenge

- Manual batch production reporting consumed excessive work hours and resources
- Needed a backtracking solution to enhance investigations and lower response times
- Standalone batch related solutions used without a common asset and data sources made difficult developments

Solution

- Developed an AVEVA PI System asset framework solution to provide a basis for batch production solutions
- Designed PI Event Frames-driven PI Vision displays for monitoring and backtracking.

Results

- **PI Vision displays improved investigation effectiveness, time reduced by 45%**
- **Eliminated manual reports, save 2 FTE, helping engineers focus on analyzing**
- **Reduced batch presence time by 80% in start-up period, reaching nominal capacity 30% faster**



Batch Report




POLIOL BATCH ÉRTÉKELŐ RIPORT

Legutóbbi frissítés: 2025.03.28 07:13

Line ID
Mind

Recipe Name
FH56-H

MOL/Batch ID
Mind

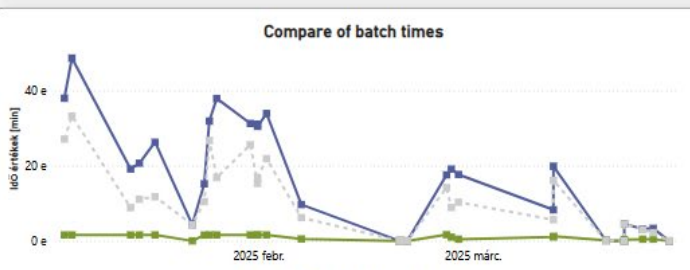
Start time

2024.12.14.

2025.03.27.

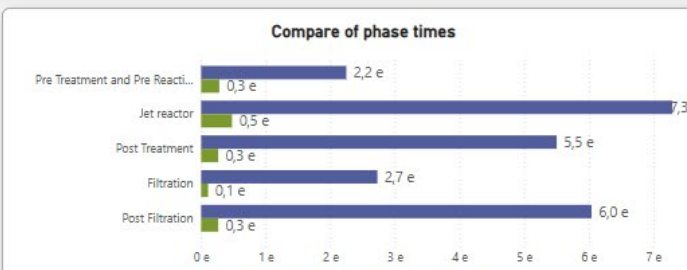
MOL/Batch ID	2SP20001B / 02PY250106B01				2SP20002B / 02PY250107B01				2SP10001B / 01PY250115B02				2SP30001B / 03PY250116B01				2SP30002B / 03PY250118B01			
Unit name	Recipe	Real time	Paused	Delay	Recipe	Real time	Paused	Delay	Recipe	Real time	Paused	Delay	Recipe	Real time	Paused	Delay	Recipe	Real time	Paused	Delay
56X03003 - Temperature and Pressure Adjustment (Neutralization Conditions)																				
56X03004 - Water Charging 1																				
56X03005 - Neutralization 1																				
56X03007 - Nitrogen Stripping																				
56X03008 - Neutralization 2																				
56X03010 - Transfer Neutralized Product to Filtration Package																				
56X03014 - Steam Stripping																				
56X03015 - Water Charging 2																				
56X03016 - Homogenization 1																				
Filtration																				
56X06001 - Initial Conditions																				
56X06002 - Polyol Receiving from Post-Treatment Vessel																				
56X06004 - Solid Charging to Filter Aid Vessel																				
Post Filtration																				
56X05001 - Initial Conditions																				
56X05002 - Receiving Final Polyol from Filtration Package																				
56X05003 - Filtrate Sampling & Analysis																				
56X05006 - Transfer Final Product to Tank Yard (1)																				
Összesen																				

Compare of batch times



This line chart tracks three metrics over time: Real time (blue), Recipe time (green), and Active time (grey). The Y-axis represents time in minutes. Real time shows significant fluctuations, peaking above 40 minutes, while recipe and active times remain consistently low, near zero.

Compare of phase times



Phase	Actual phase time [min]	Recipe time [min]
Pre Treatment and Pre Reaction	2,2 e	0,3 e
Jet reactor	7,3 e	0,5 e
Post Treatment	5,5 e	0,3 e
Filtration	2,7 e	0,1 e
Post Filtration	6,0 e	0,3 e



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**THANK
YOU!**

**Waiting for your
questions!**