



Introducing Umicore Precious Metal Refining

Dave Carpels

Introducing PMR

The leading precious metals recycler



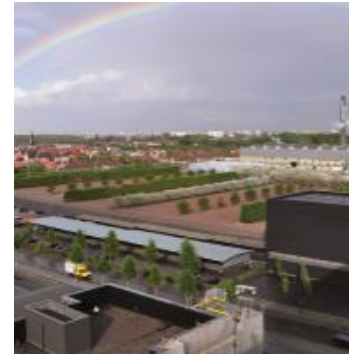
Largest and most complex precious metals recycling operation in the world



Processes more than 200 different types of raw materials



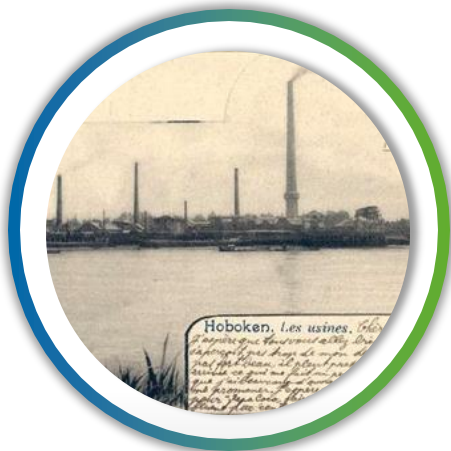
World leading refiner of 17 different metals



World class environmental and quality standards

Introducing PMR

Our history



1887

Start of a lead
de-silvering operation
in Hoboken



1995

Investment programme
launched to re-engineer
flowsheet



Now

Capacity to 500 kt/y

Refining @ PMR

Global presence

Worldwide presence through UMS network



Hoboken (BE)
+ Headquarters



Shanghai (CN)



Bangkok (TH)



Mumbai (IN)



Raleigh (US)



Americana / Guarulhos (BR)



Commercial activities



Refining



Sampling & Assaying

Refining @ PMR

Refining @ PMR

Recyclables



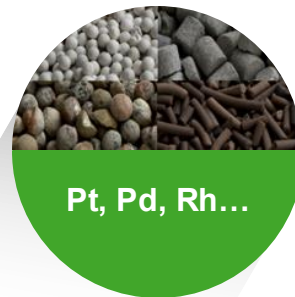
Electronic Scrap

e.g.
mobile phones
printed circuit
boards



Spent Automotive Catalysts

end-of-life
car catalysts



Spent Industrial Catalysts

industrial catalysts
from oil refining &
petrochemical
industry

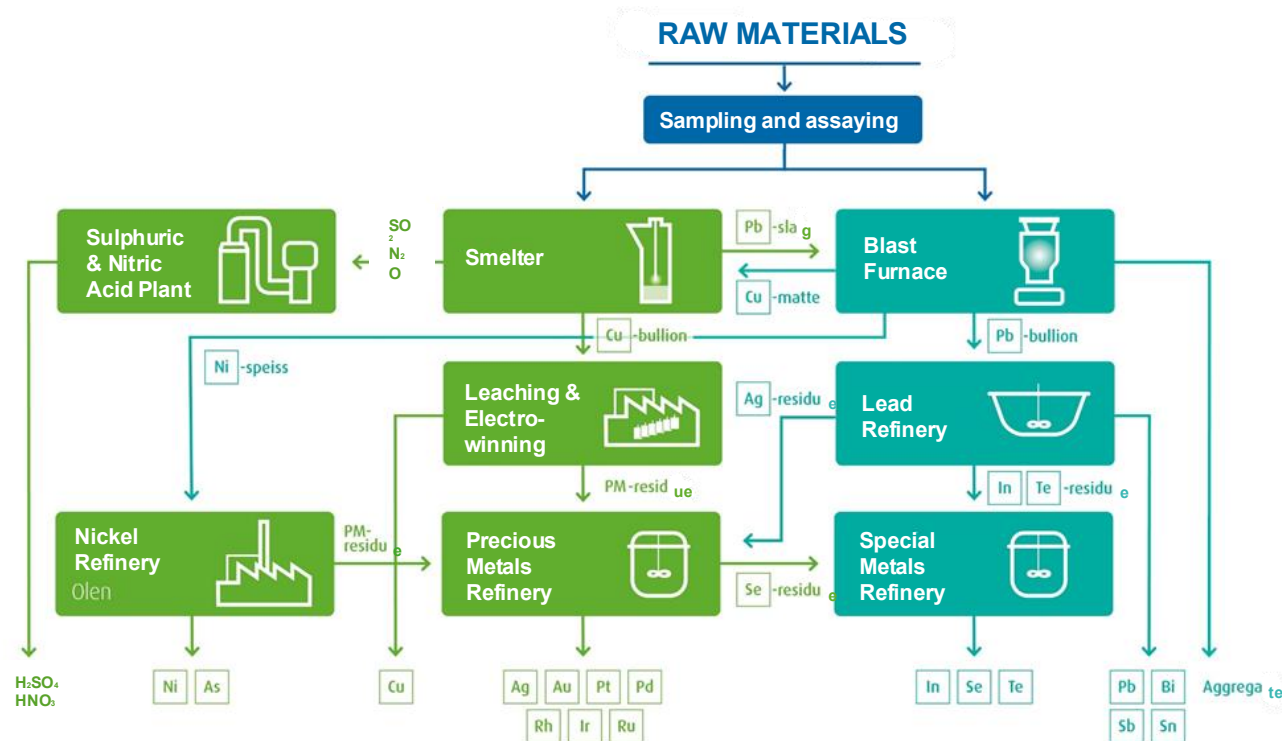


Other precious metal bearing materials

e.g.
fuel cells
photographic
residues

Refining @ PMR

Our unique metallurgical flowsheet



Refining @ PMR

Precious Metals Recycling



Smelter

- Unique application of ISASMELT technology
- Precious metals concentrated in copper bullion



Leaching & Electrowinning

- Highly flexible technology
- Copper leaching to collect precious metals residue
- Production of pure copper cathodes



Precious Metals Refinery

- Both classical and unique processes used
- Incorporating pyro- and hydro-metallurgy
- Production of high purity metals

Refining @ PMR

Base Metals Recycling



Blast Furnace

- Production of lead bullion
- Construction aggregate to construction industry in three grain sizes: Umirock, Betogrind, Betozaand



Lead Refinery

- Refining of lead bullion
- Production of 99,99% lead, LME-registered brand
- A major European lead producer



Special Metals Refinery

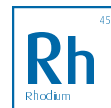
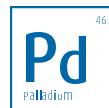
- Refining side-stream materials from the lead and precious metals refineries
- Production of high purity metals

Refining @ PMR

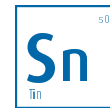
Products



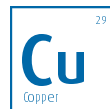
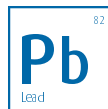
Precious metals



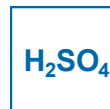
Minor metals



Base metals



Other products





How we onboard 400+ operators



OPVOLGBLAD LEEFMILIEU
Dienst : Edele Metalen
Afdeling : PNI

DATING

Afwijkingen in de werking van de installaties ter bescherming van het leefmilieu / Abnormale emissies:
Afwijkingen met mogelijke invloed op het leefmilieu worden gemeld ook al gebeuren ze systematisch, lok het tijdstip (begin - einde) -> van de afwijking worden indien mogelijk opgegeven.

Afstellingen en genomen maatregelen.

Microsoft®
Visual Basic
for Applications



BESTELLEN EN AANKOPEN

2/12/2007

Ordernummer	Produkt	Hoeveelheid in kg	Leveringsdatum	Behoefte- nummer	Nummer bestelling
-------------	---------	----------------------	----------------	---------------------	----------------------

iktie Ag-schuim	0 kg
iktie fijn zilver	5710 kg
1 BB NaNO ₃ granula	9

SALPETERZUUR 69%

Ag-schuim	3168 kg	B313	##### liter
A+B	#NAME? liter	B1750	##### liter
A+B	#NAME? liter	B1755	##### liter
	#NAME? liter	Tot. HNO ³	
	#NAME? liter	B1700	##### m ³
	#NAME? liter	C280	##### liter
	#NAME? liter	Toename:	##### liter tov vorige ploeg
	#NAME? liter	Toename:	##### liter tov vorige ploeg
	#NAME? %	Toename:	##### % tov vorige ploeg

#NAME?	Bestelunt HNO_3 + 12 m ³ bij zaterdagwerk!
#NAME?	Bestelunt NaOH + 4,8 m ³ bij zaterdagwerk!

dinsdag 25/2		Talen plogel	
Controlerend: Vrijdouw		Controlerend: Vrijdouw	
Nazicht kwaliteits denken en aanpak om scheefreken te voorkomen!	Nazicht kwaliteits denken en aanpak om scheefreken te voorkomen!	Nazicht kwaliteits denken en aanpak om scheefreken te voorkomen!	Nazicht kwaliteits denken en aanpak om scheefreken te voorkomen!
Reingen pompencaal	Reingen vier filteraal	Reingen vier filteraal	Reingen pompencaal
Opruimenringsen C2 en Labo	Reingen pompencaal	Reingen pompencaal	Opruimenringsen C2 en Labo
Staalmonduzen-rengen	Opruimenringsen C2 en Labo	Opruimenringsen C2 en Labo	Staalmonduzen-rengen
Vier rond persillen afpakken (pluigfahankel)	Staalmonduzen-rengen	Staalmonduzen-rengen	Vier rond persillen afpakken (pluigfahankel)
Droge stufploging om alle	Vier rond persillen afpakken (pluigfahankel)	Vier rond persillen afpakken (pluigfahankel)	Droge stufploging om alle
Controle maats tem VVO en klem afpakken en datscheen!!!	Droge stufploging om alle	Droge stufploging om alle	Controle maats tem VVO en klem afpakken en datscheen!!!

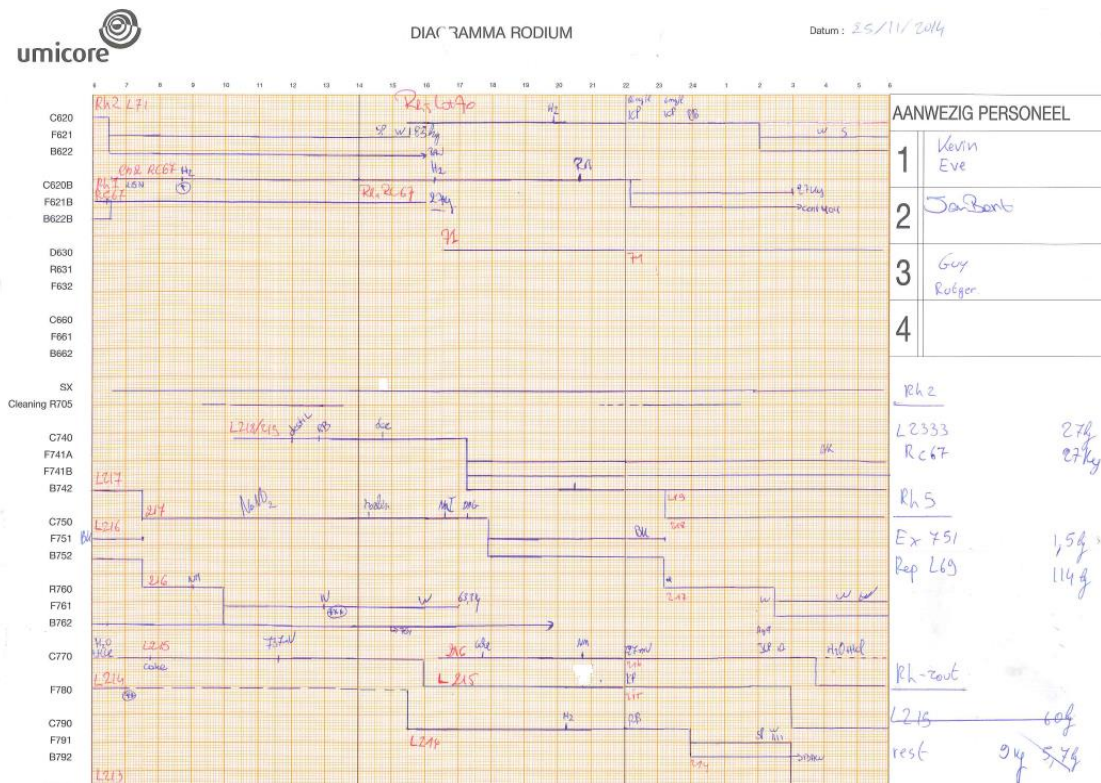
Invullen met initialen aub !!!
 Begin ploeg1 : opvragen bij ploegverantwoordelijke
 Einde ploeg3: afgeven aan ploegverantwoordelijke
 Taken niet kunnen afwerken? Communiceren met opkomende ploeg

Why ?

Tool chaos



- Process times wrong
- Missing data / context
- Data loss



Why ?

Support our operations

- Standardized way of work / uniformity
- Less manual input
- Higher quality process data
- All info (context) gathered in a structured way
- Maintainable
- Fast & datadriven decision making

How ?

Integration LIMS, SQL, PI & TrendMiner

- PI Event Frames
Attributes

- LIMS

- SQL Server (local tools)

- Manual Input

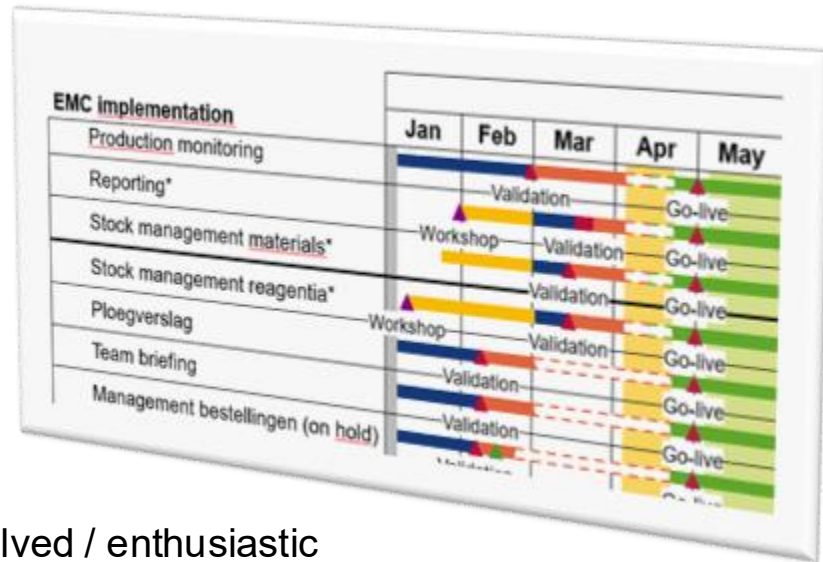
PI Event Frames
Attributes

Context Types
Context Fields

How ?

Project with Delaware

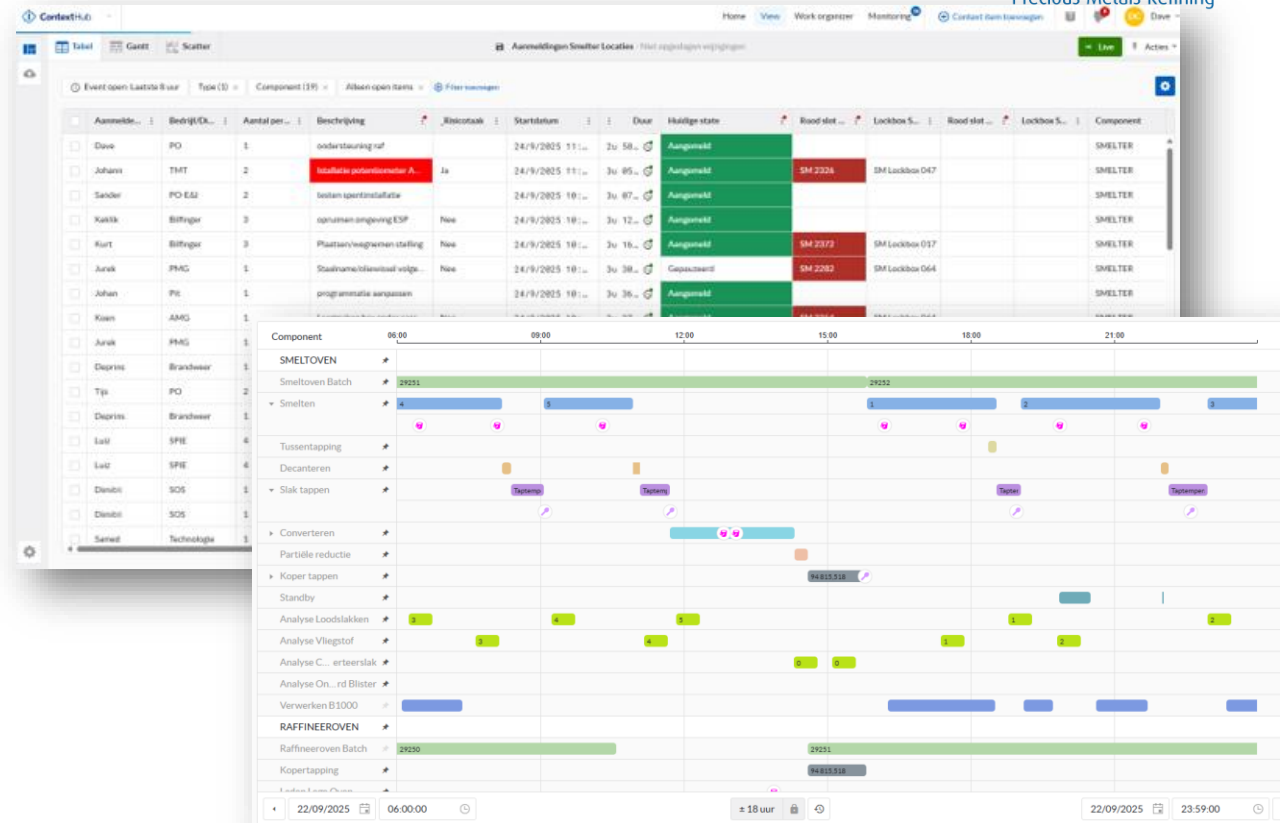
- Design study
 - Functional design
 - Technical design
 - Blueprint
- Build & Implement
 - Operators, coaches, management involved / enthusiastic
 - Resources en timeline managed by Delaware
 - Cutover !! No way back
 - Floorwalking
 - Ongoing support & improvements



UPMR Set Up

Context types

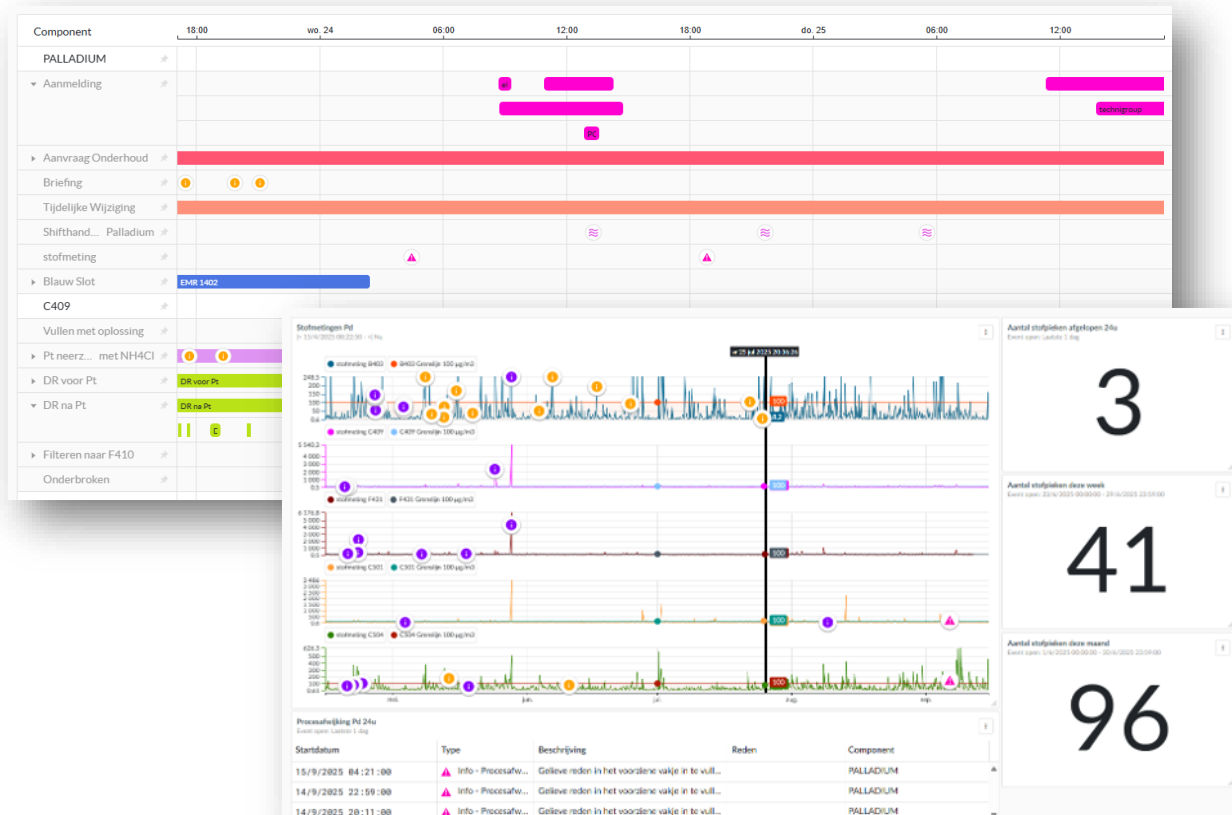
- Maintenance Request
- **Visitor Request**
- **Locks**
- Temporary Changes
- Process Deviation
- Process Success
- Briefing
- **Measures**
- **Consumptions**
- **Productions**
- **Analytical Request**
- **Info**



UPMR Set Up

Context types

- Maintenance Request
- Visitor Request
- Locks
- **Temporary Changes**
- **Process Deviation**
- **Process Success**
- Briefing
- **Measures**
- Consumptions
- Productions
- Analytical Request
- **Info**



UPMR Set Up

Synthesis

- Reports
- Dashboards
- Shifthandovers

CA0-66F - Shifthandover Palladium

Details Bijlagen

CONTEXT ITEM DETAILS Options

Component PALLADIUM

Type Shifthandover Palladium - TrendMiner

Beschrijving

Tijdstip 24/9/2025 13:18:33

Sleutelwoorden

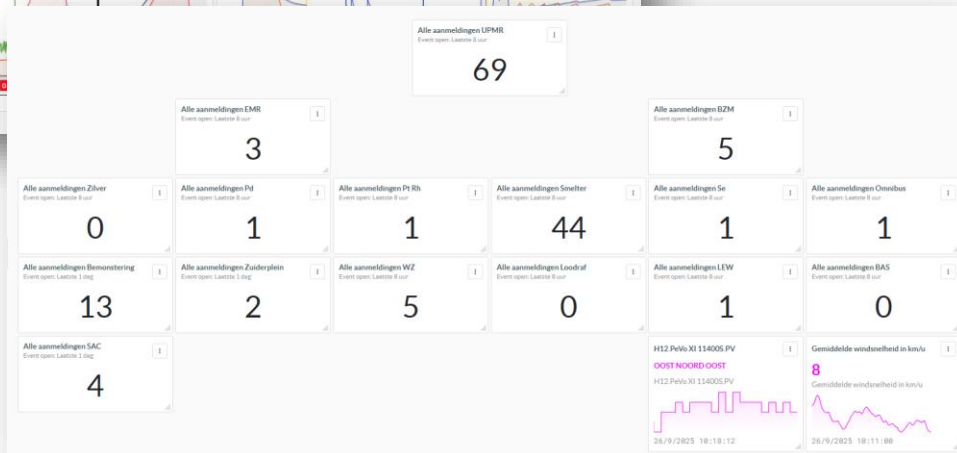
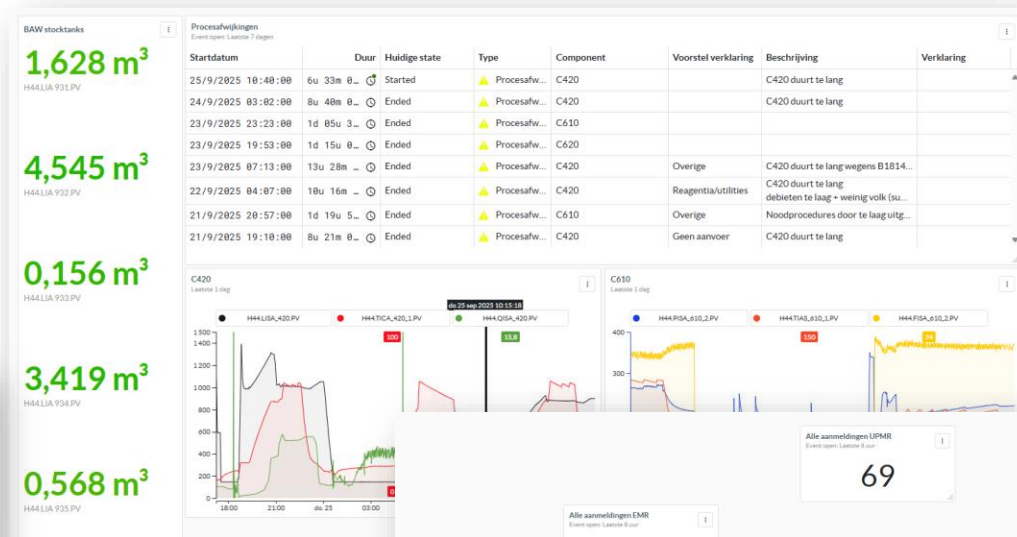
Event frame name Shifthandover Palladium

ITEM AANGEMAAKT

FV frank.vanoverloop - Frank Van Overloop
24/9/2025 13:18:37

GOEDKEURINGEN Goedkeuring toevoegen

QR Quinten Ruelens 24/9/2025 13:49:11



Benefits

After GO Live

- All data in 1 place
- Easy to reach & filter
- Standard Operation Procedure
 - Operators make less mistakes
 - Differences between teams are cleared
 - Stricter process follow up (through dashboards, easy data analysis,...)
- Learn from incidents
- Continuous improvement
 - Standardized feedback
 - Correlations via TrendHub
 - Historical data



Standard	Extra reference	ETA	Route	Analysis Ag	Analysis Bk	Analysis Au	Analysis Pd	Analysis Pt	Analysis Rh	Analysis Ru	Analysis Cu
2019/08/03 00:13	ARME AG/SLAM	EP133	20196	53 183	134	45.17	0.9	0.55	0.8753	0.1987	0.55
27/08/2020 22:16	NA REDUCTIO	EP133	20195	28 184	136	41.36	0.26	1.48	0.8670	0.2004	4.05
27/08/2020 00:16	AG/SLAM	EP133	20194	28 175	137	41.80	0.06	1.91	0.8595	0.2003	4.17
2019/08/03 01:24	AG/SLAM	EP133	20193	6 187	138	40.92	0.70	1.2	0.8460	0.1932	4.40
2019/08/03 21:24	ARME AG/SLAM	EP133	20192	11 124	111	40.76	0.72	1.8	0.8475	0.2075	4.71

Standard	Extra reference	ETA	Route	Analysis Ag	Analysis Au	Analysis Pd	Analysis Pt	Analysis Rh	Analysis Ru	Analysis Cu
2019/08/03 00:11:20	RECONTRAL	EP121	20196	910 248	13 383	21 898	29 870	644	0.8753	0.20
2019/08/03 01:20:16	RECONTRAL	EP121	20195	927 146	14 128	20 868	21 400	644	0.8654	0.20
27/08/2020 00:28:10	RECONTRAL	EP121	20194	920 317	14 206	20 868	16 800	644	0.8607	0.21
2019/08/03 10:29:13	NA EXTRA INZET	EP121	20193	947 418	11 989	21 718	14 900	644	0.8650	0.21
2019/08/03 00:29:12	RECONTRAL	EP121	20192	958 251	11 845	10 998	11 845	644	0.8650	0.21

Lessons learned

Roll Out

- Big change, change management
- Process coördinator role
 - Very important
 - Process knowledge
 - Internal ownership
- Project based with Delaware
 - Timeline
 - Resources
 - Plan
- Support
 - Floorwalking
 - Immediate support



Thank you

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materials for a better life