



Online Batch Filtration Optimization

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Online Batch Filtration Optimization



CHALLENGE

- Real-time batch optimization with on-the-fly model training.



SOLUTION

- Seeq used for data organization/cleaning/inference, Azure used for model training and pipelining.



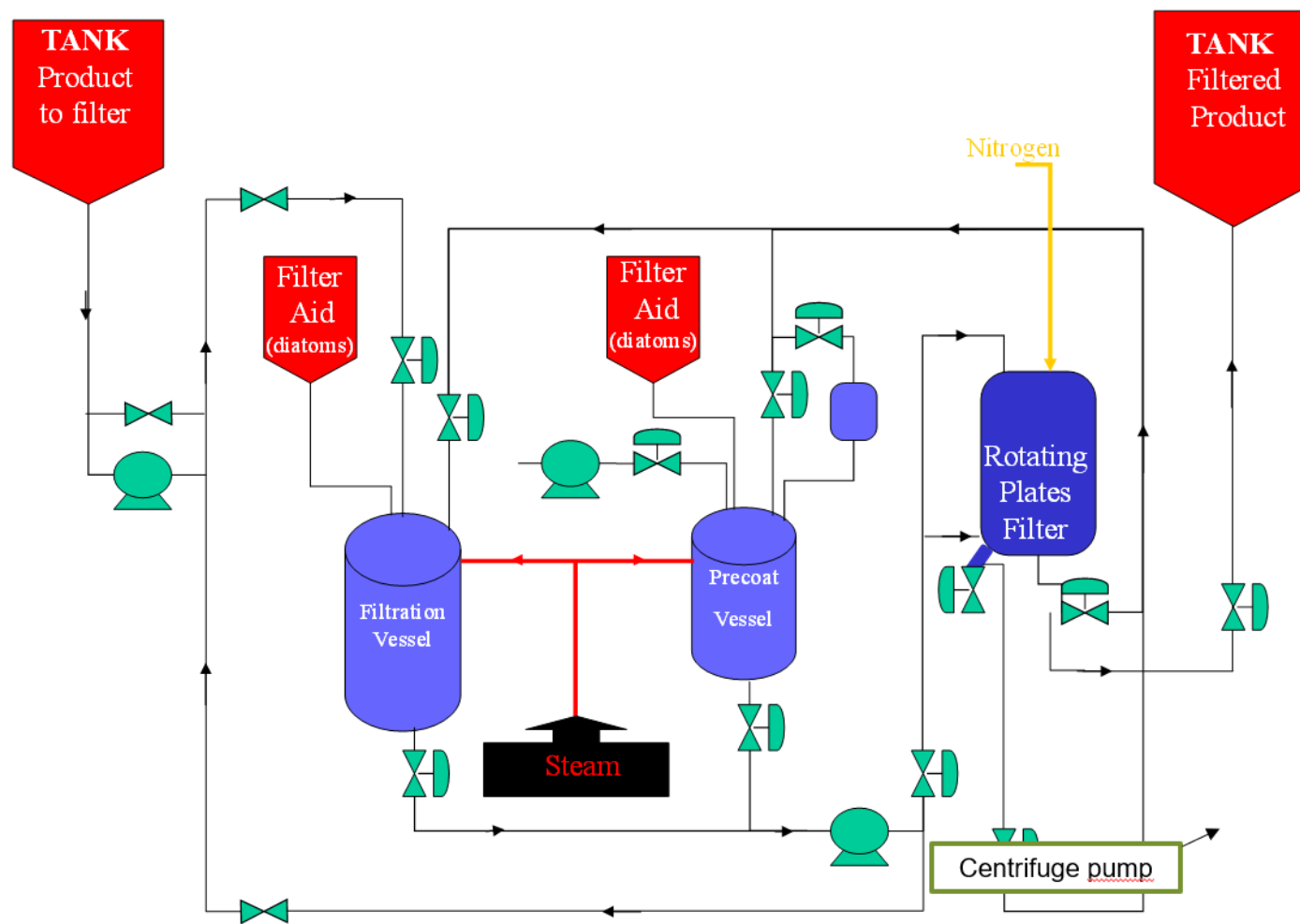
RESULTS

- Dashboard in hands of operations and future improvements planned for Continuous Integration/Continuous Deployment (CICD).

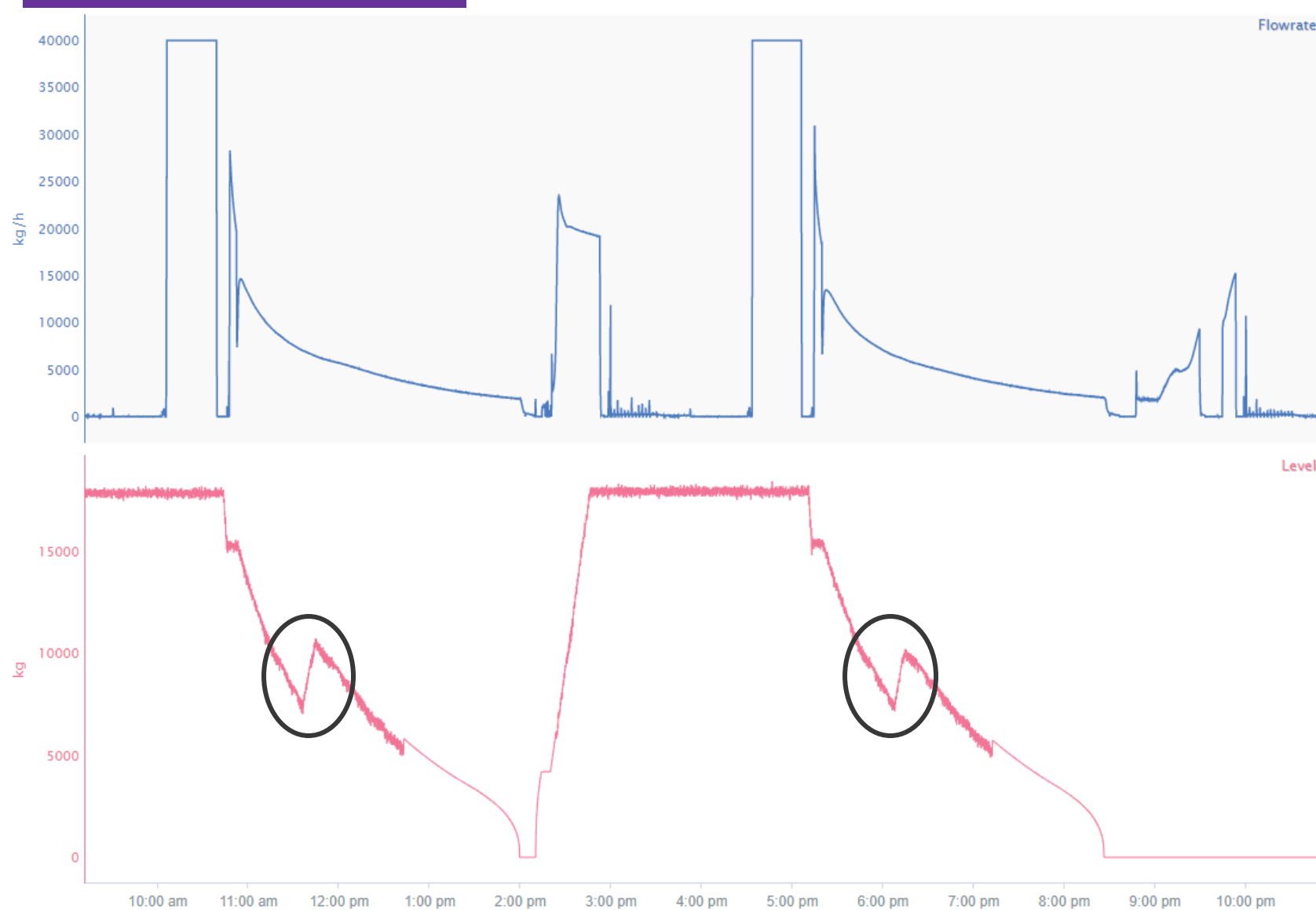


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Process Flow Diagram



Batch Limits

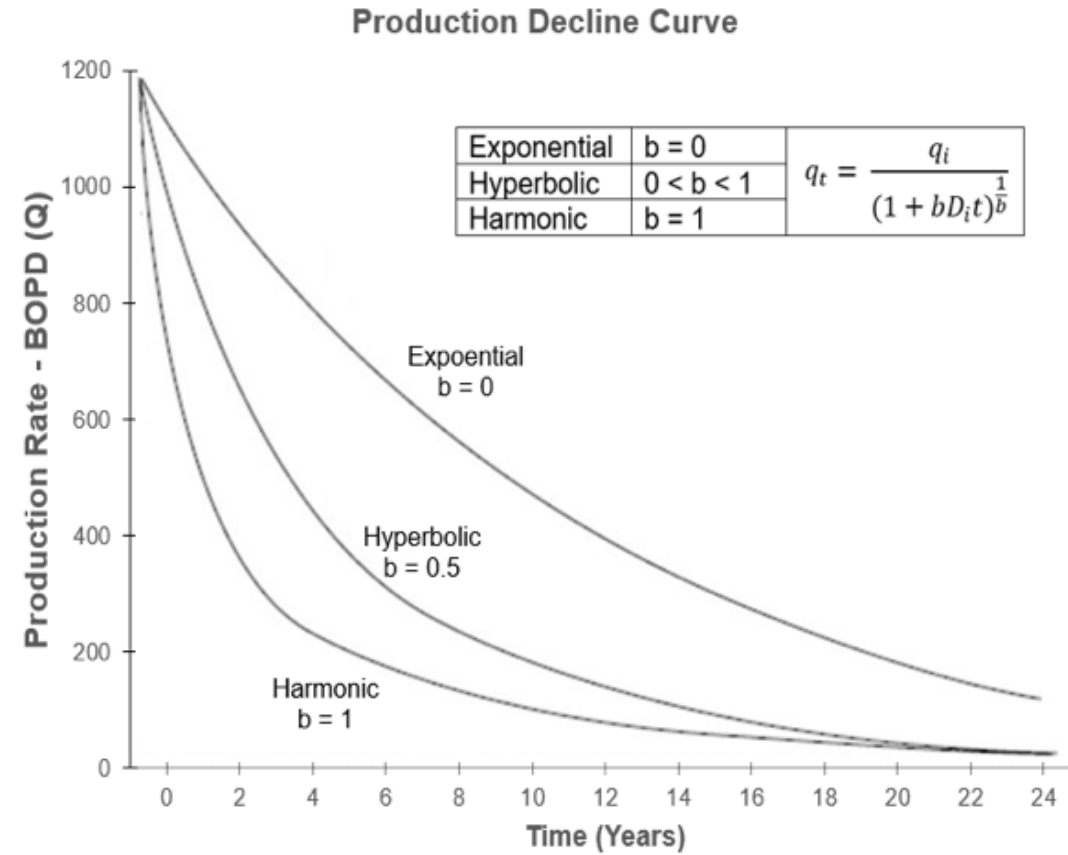


- Final Flowrate > 2,000 kg/hr
- Batch Duration < 4 hrs

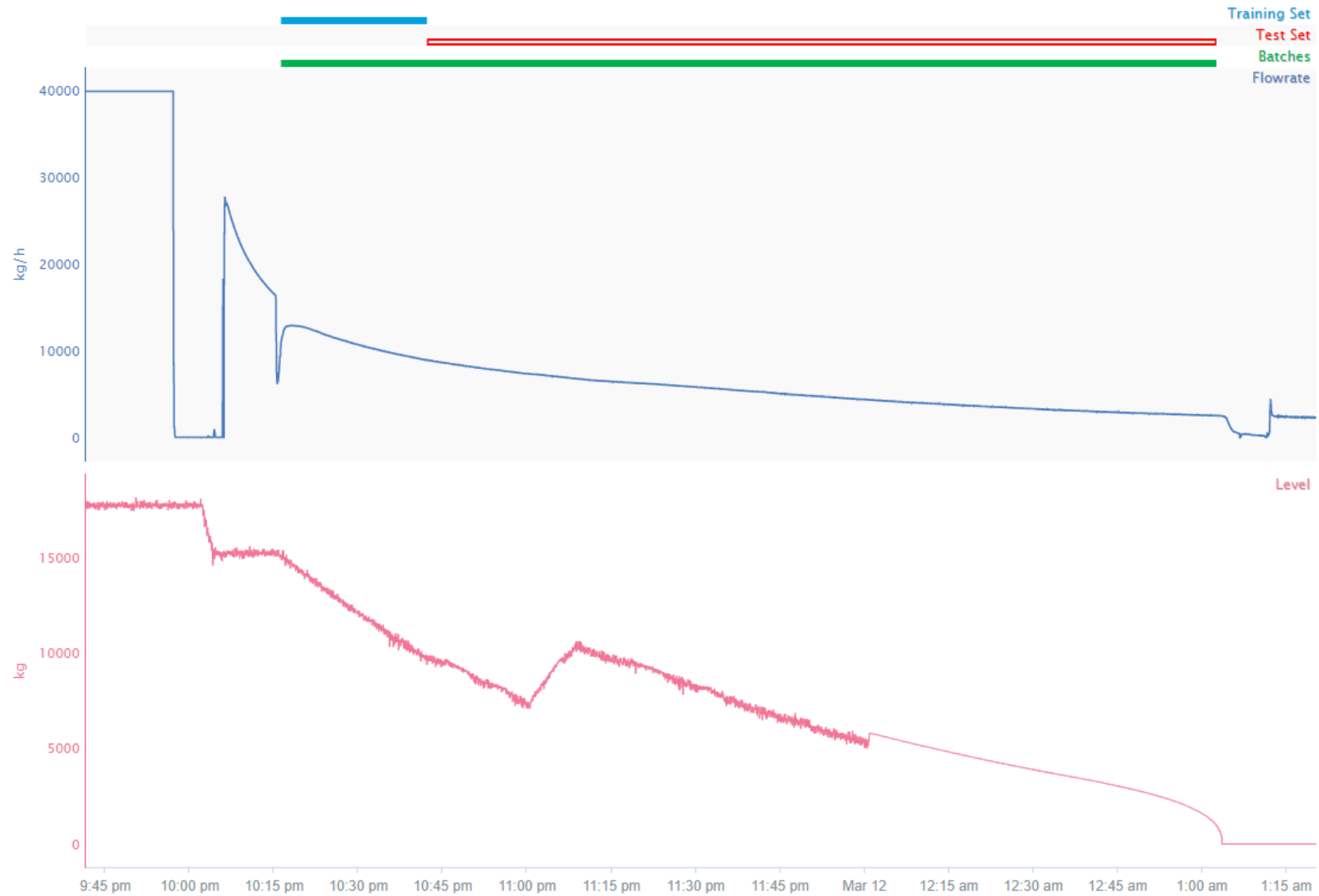


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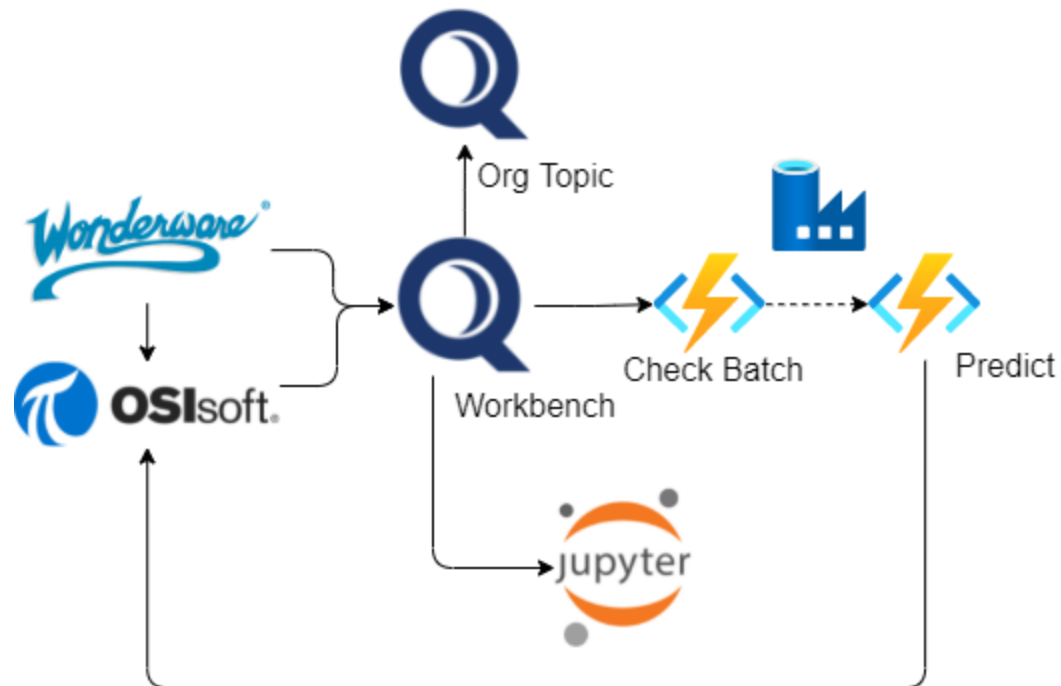
Decline Curve



Seeq Analysis



Solution Architecture



Check Batch:

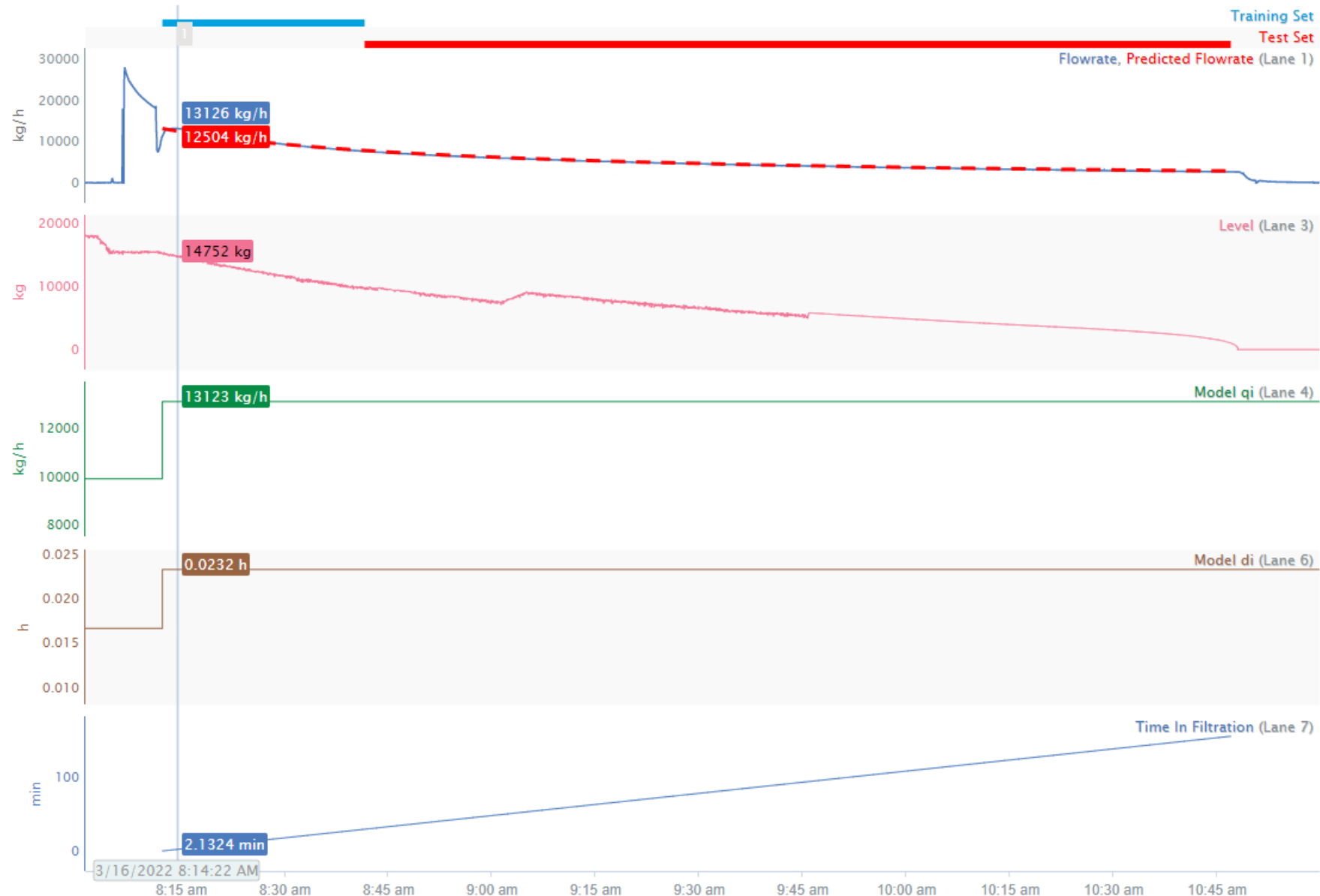
- Pull Training condition for last 5 mins to check if a batch has ended.
- Trigger predict only if we have a valid batch.

Predict:

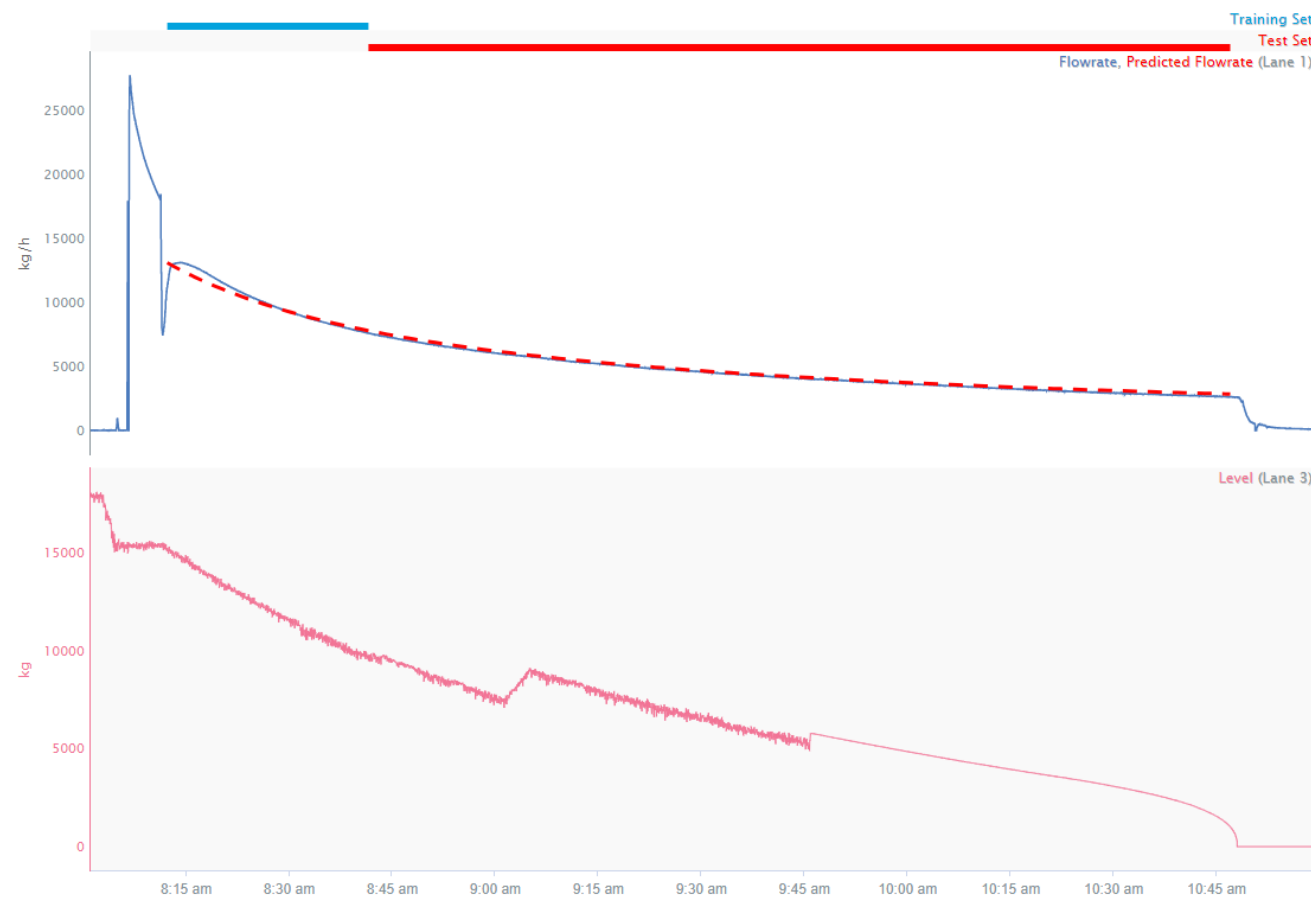
- Use capsule start/end date from Check Batch to pull in time and flowrate timeseries signals.
- Perform decline curve formula optimization.
- Push recommendations back to PI.



Model Outputs & Forecasted Flowrate



Operator Recommendation



	11/3 5:22 PM - 11/3 6:50 PM	11/3 10:16 PM - 12/3 1:02 AM	13/3 3:18 AM - 13/3 7:28 AM
Appoint recommandé	4800 kg	5500 kg	0 kg
Appoint réalisé	0 kg	4045 kg	4039 kg
Débit final	4960 kg/h	2520 kg/h	1260 kg/h
Durée filtration	1.5 h	2.8 h	4.2 h

Final Flowrate > 2,000 kg/hr
Batch Duration < 4 hrs

Seeq Org Topic

Recommandation appoint
(visible entre les niv 9500 kg et 7000 kg)

Critères pour une bonne* filtration

	Bon	opportunité	pas souhaitable
Débit final	< 3500 kg/h	3500 à 4500 kg/h	> 4500 kg/h
Durée filtration	2 à 4 heures	< 2 heures	> 4 heures
Conso Adj./Qté filtrée	< 18 kg/t	18 à 20 kg/t	> 20 kg/t

Si possible, essayer de suivre les recommandations d'appoint
(elles sont limitées à 4000 kg.pour la phase test)

*qui génère moins de déchets et plus productive

Si la courbe rouge n'apparaît pas et que la recommandation est "-", cela signifie que la recommandation n'a pas pu être calculée par le modèle (à cause d'un niveau V172 inférieur à 9500 kg en début de phase filtration, ou d'une raison informatique ou bien de données insuffisantes).

Dans le tableau en haut à droite, l'outil recommande un appoint quand le niveau du V172 décroît en-dessous de 9500 kg. L'appoint peut être alors entré dans la



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Seeq Asset Tree

»Oronite»Gonfreville		
K101		
K102		
K103		
K104		
K105		
K106		
K107		
K301		

»Oronite»Gonfreville»K-105		
Conditions		
Derived Features		
Model Outputs		
Raw Features		
Scorecard Metrics		

»Oronite»Gonfreville»K-105»Raw Features		
Flowrate (kg/h) Valeur analogique mesurée		
Flowrate Into Vessel (kg/h) Valeur analogique mesurée		
Level (kg) Valeur analogique mesurée		
Precoat Filter Aid (kg) Process Attribute		
Product Filter Aid (kg) Process Attribute		
Product Filtered Value		
Sequencer The UserDefined object provides a starting point for creating cust...		

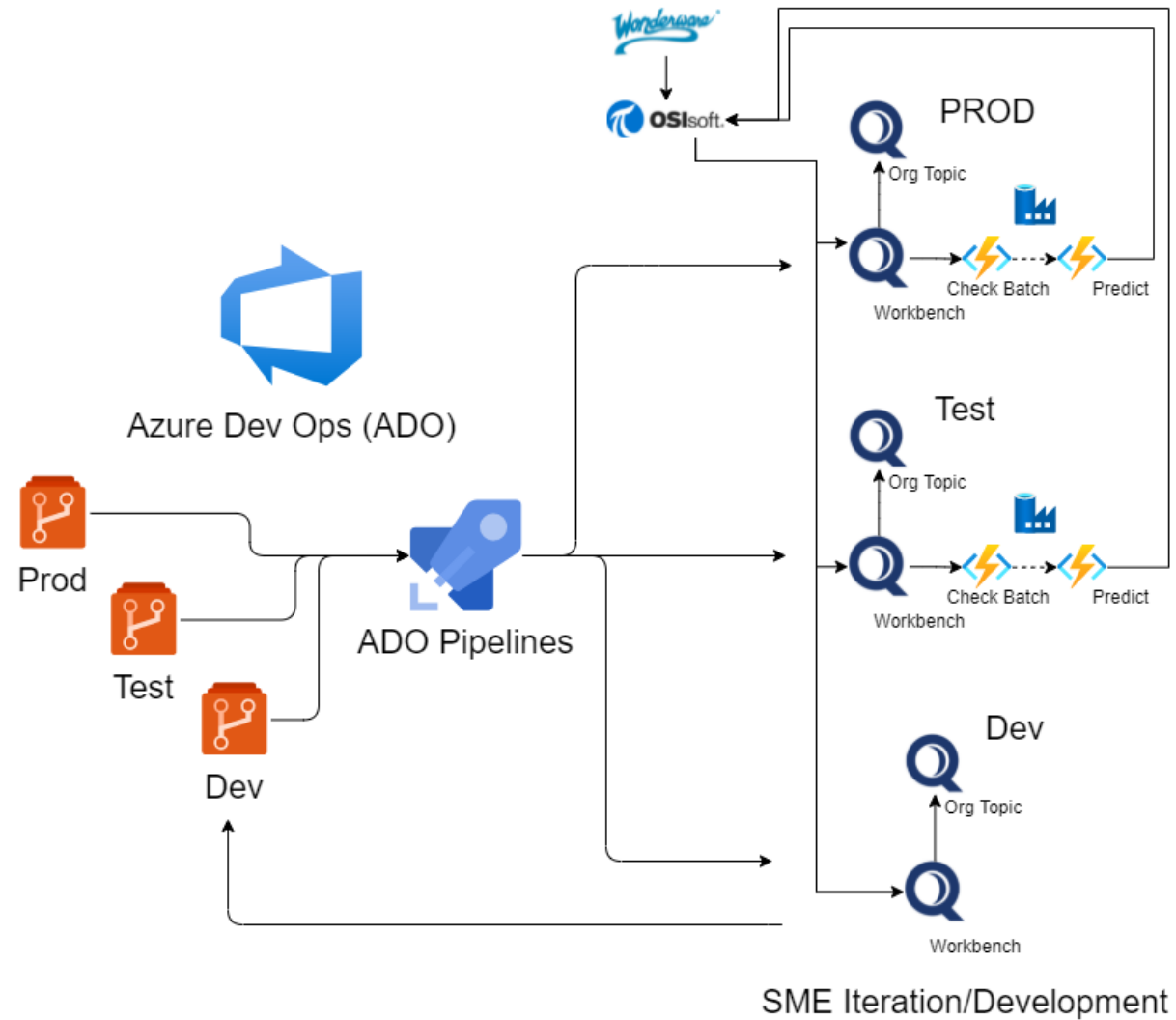
»Oronite»Gonfreville»K-105»Derived Features		
Actual Level Added (kg)		
Filter Aid Consumption (kg/t)		
Filtered Flowrate (kg/h)		
Precoat Filter Aid Quantity (kg)		
Product Filter Aid Quantity (kg)		
Time In Filtration (min)		
Total Filter Aid Quantity (kg)		
Total Quantity Filtered (kg)		

»Oronite»Gonfreville»K-105»Model Outputs		
Model di (h)		
Model qi (kg/h)		
Negative 9999		
Predicted Flowrate (kg/h)		
Problematic Batches		
Recommendation Made		
Recommended Level Addition (kg)		
Valid Training Condition		
Weekly		

»Oronite»Gonfreville»K-105»Scorecard Metrics		
Appoint recommandé		
Appoint recommandé - batch en cours		
Appoint réalisé		
Conso Adj./Qté filtrée		
Durée filtration		
Débit final		



CICD





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