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Leveraging the Power of Generative One Model

A Game-Changer in Refinery and
Petrochemical Simulation

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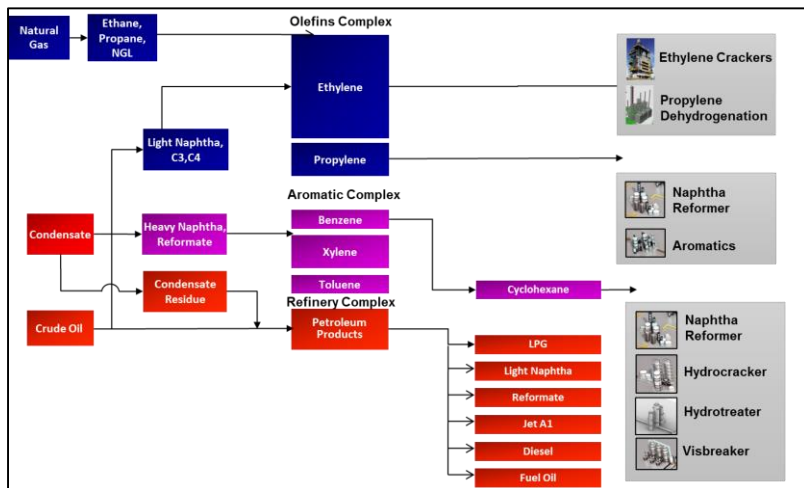
Bringing
DECARBONIZATION
to Life



Agenda

- ◆ Navigating Business Challenges
- ◆ Generative One Model for Holistic Optimization
- ◆ Delving into GC's Digital Twin System
 - Model Health Monitoring
 - Planning
 - Process Reliability
 - Dynamic Realtime Optimization
- ◆ KBC Technology Vision – Partnering to maximize value

Navigating Business Challenges



- Feedstock costs, accounting for 80-90% of expenses, majorly affect our profit margins.
- Streamlining planning, scheduling, and real-time optimization can greatly boost our business efficiency and benefits.

One Model Framework, Single Source of truth

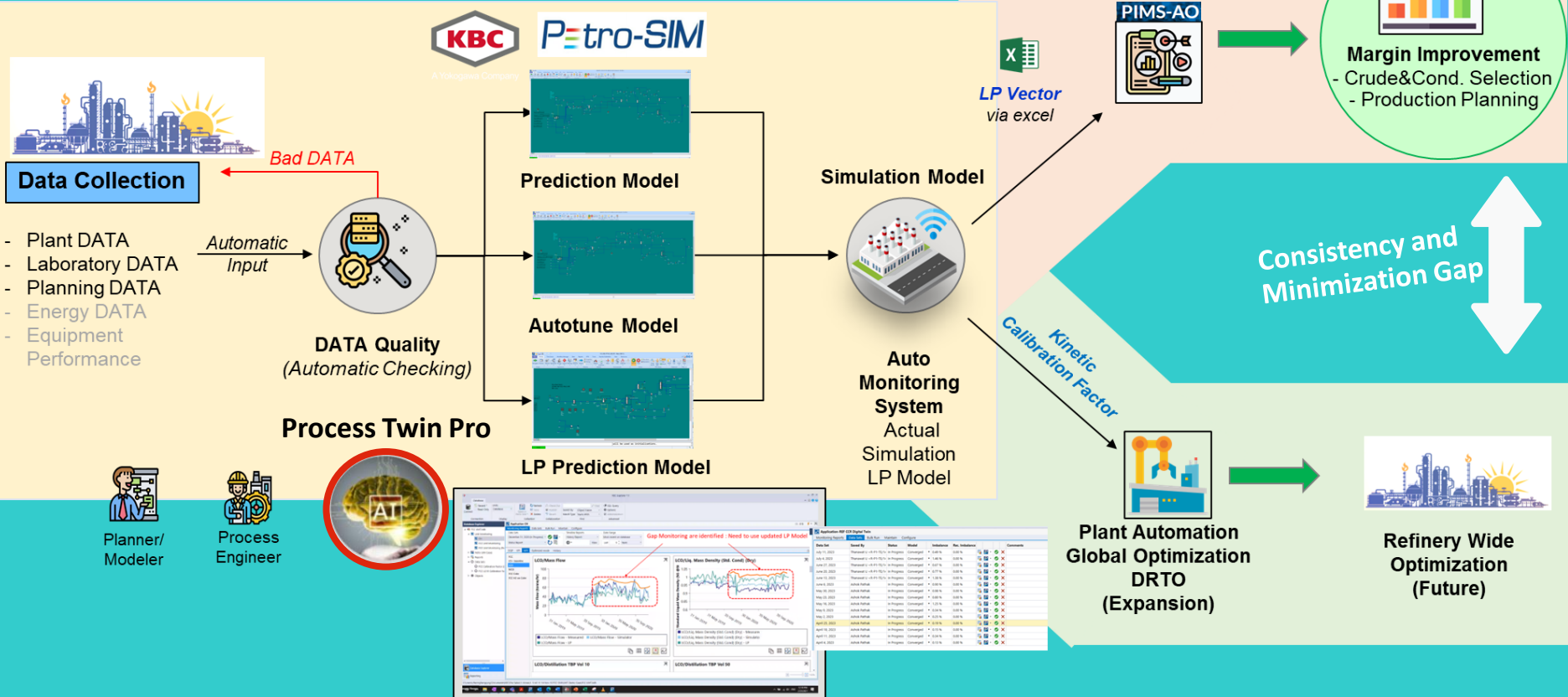


- Adapting to new processes can lead to initial productivity dips
- Simulation Model, ML and AI demands new skill sets, potentially creating talent gaps within the organization.
- Process Engineers can be empowered by ability to access the digital twin system to support decision making and troubleshooting

New Work process and Talent Development

Generative One Model

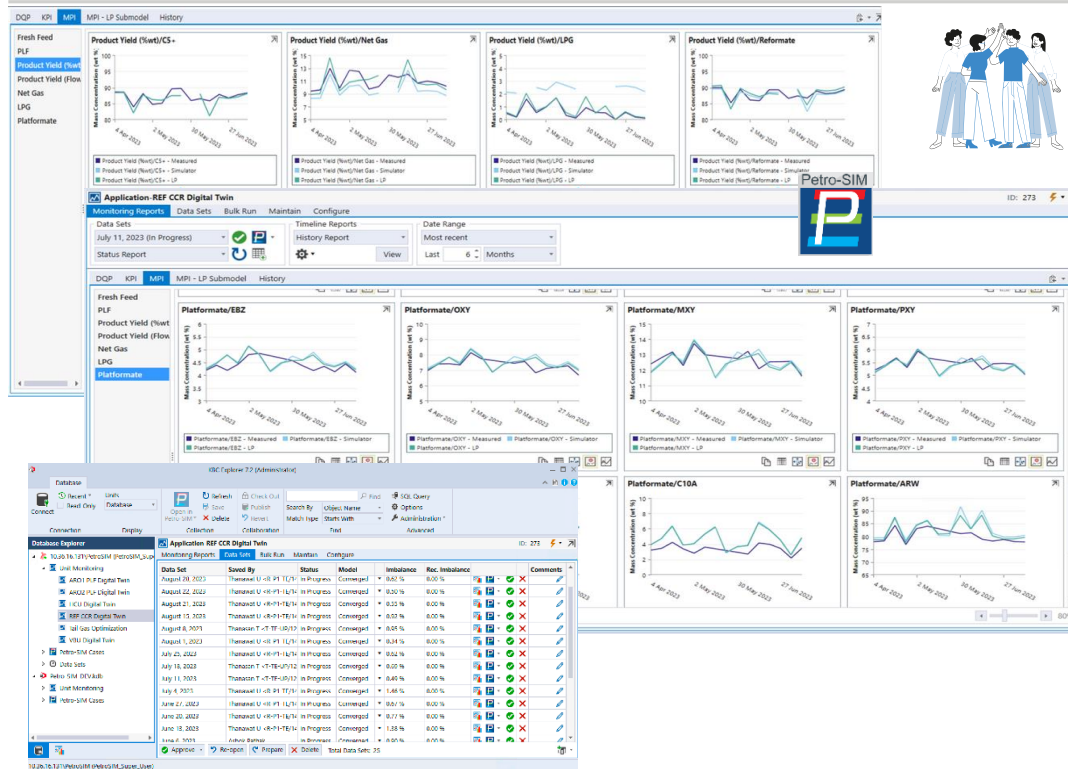
New Work Process
--> Update model in Weekly Basis



Digital Twin System Monitor Health of Kinetic Model



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MPI (Actual, Simulation and LP)

Streamlined alignment between actual plant, simulation and planning monitoring in the same system

Advance KPI Monitoring

- Catalyst Performance
- Equipment Performance

Manpower Saving for Process Engineer and LP modeler

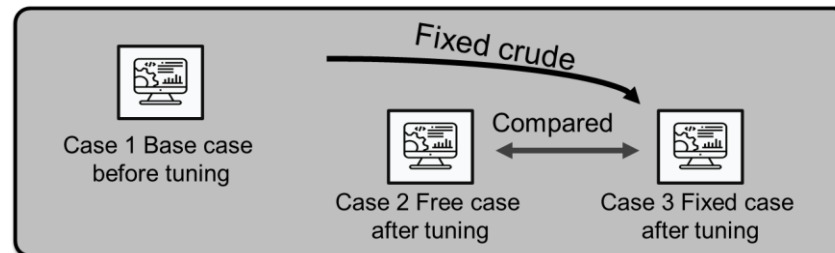
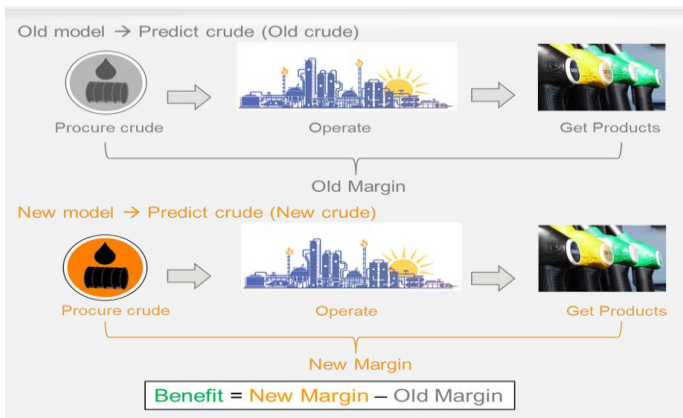
- Manpower saving 4000 Hrs./yr.
- Improve frequency to update planning model leading to improve planning optimization

Supercharge Optimization by automating the Retro Process, bridging the gap between the actual plant, planning, and simulation

Revolutionizing Planning: The Power of One Model



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Accurate Planning unlocks advanced feedstock selection, significantly enhancing operation profitability

Case Number	UOM	Case 1 Base case before tuning	Case 2 Free case after tuning	Case 3 Fixed case after tuning	
Objective Function Value		KUSD / M	XX,201	XX,469	XX,040
Similar volume crudes recipe (e.g., Crude A, B and C)		KBD	73.5	73.5	73.5
Crude D	KBD	0.0	4.0	0.0	
Crude E	KBD	0.0	2.2	0.0	
Crude F	KBD	8.7	9.7	8.7	
Crude G	KBD	9.5	0.0	9.5	
Crude H	KBD	15.5	14.6	15.5	
Crude I	KBD	4.8	4.8	4.8	
Crude Paz	KBD	0.0	12.6	0.0	
Crude J	KBD	23.4	23.4	23.4	
Crude K	KBD	9.6	0.0	9.6	
Crude CO	KBD	0.1	0.0	0.0	
Import A KERO	KBD	10.2	10.2	10.2	
Import B Diesel	KBD	10.0	10.0	10.0	
C HVGO	TPD	2.6	2.6	2.6	
Import NG to GT	TPD	0.3	0.3	0.3	
Import NG to RFG/HMU	TPD	0.8	0.7	0.7	



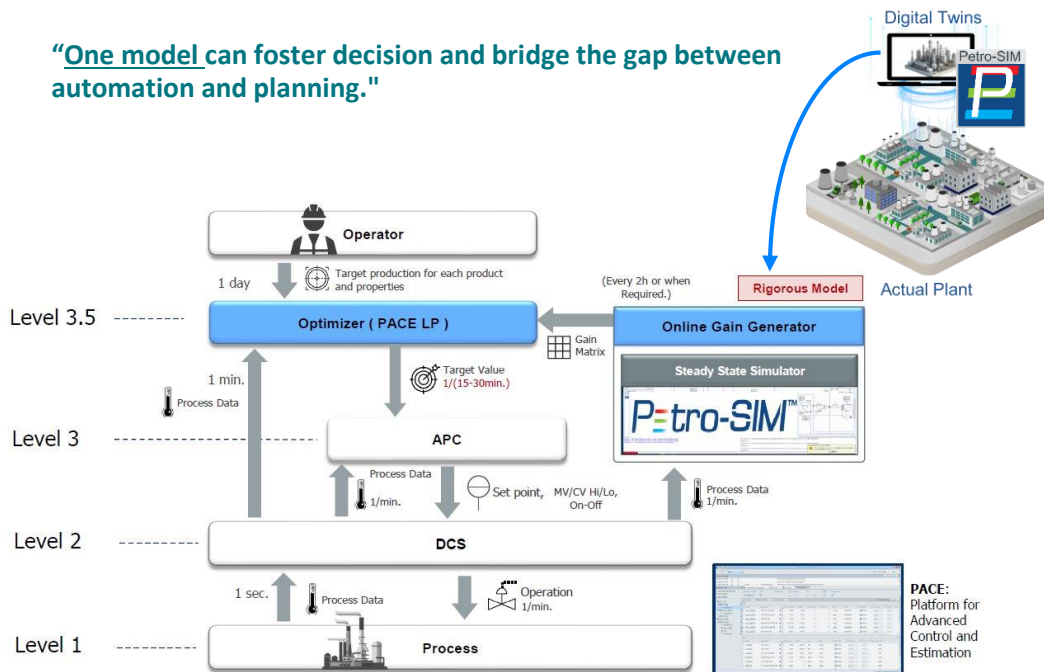
**+ 3
M\$/YR**

Dynamic Real Time Optimization (DRTO)



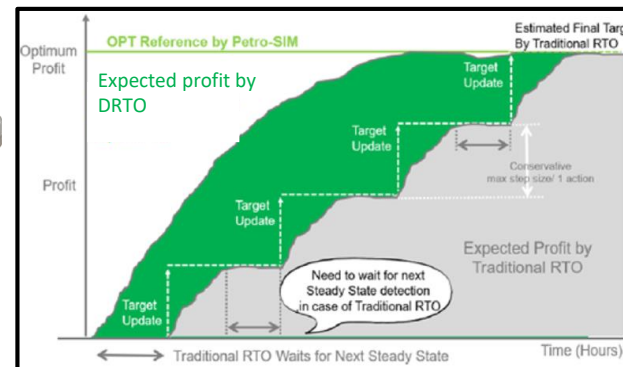
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“One model can foster decision and bridge the gap between automation and planning.”



$$\text{Profit} = \text{PRODUCTs} - (\text{FEEDs} + \text{OPERATING COST} + \text{CO}_2)$$

RTO v.s. DRTO



+ 1
M\$/Yr

Benefits of DRTO System

- **Planning Alignment:** Optimization aligned with strategic planning.
- **DRTO:** Real-time dynamic optimization for High/Low RON modes.
- **Performance Gains:** Boosts margins by 1 M\$/year and cuts CO₂ by 2,500 tons/year.
- **Digital Twin Use:** Supports monitoring and analysis for process engineers.



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KBC Technology Vision

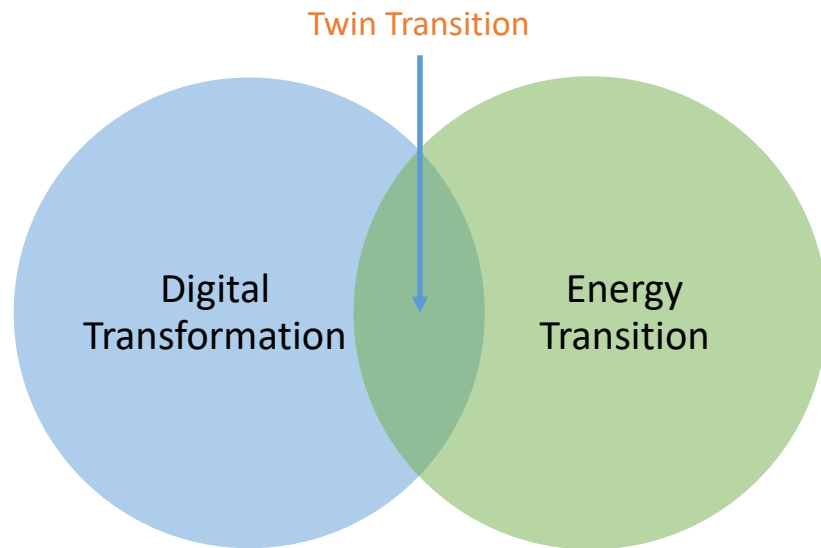
Partnering to maximize value

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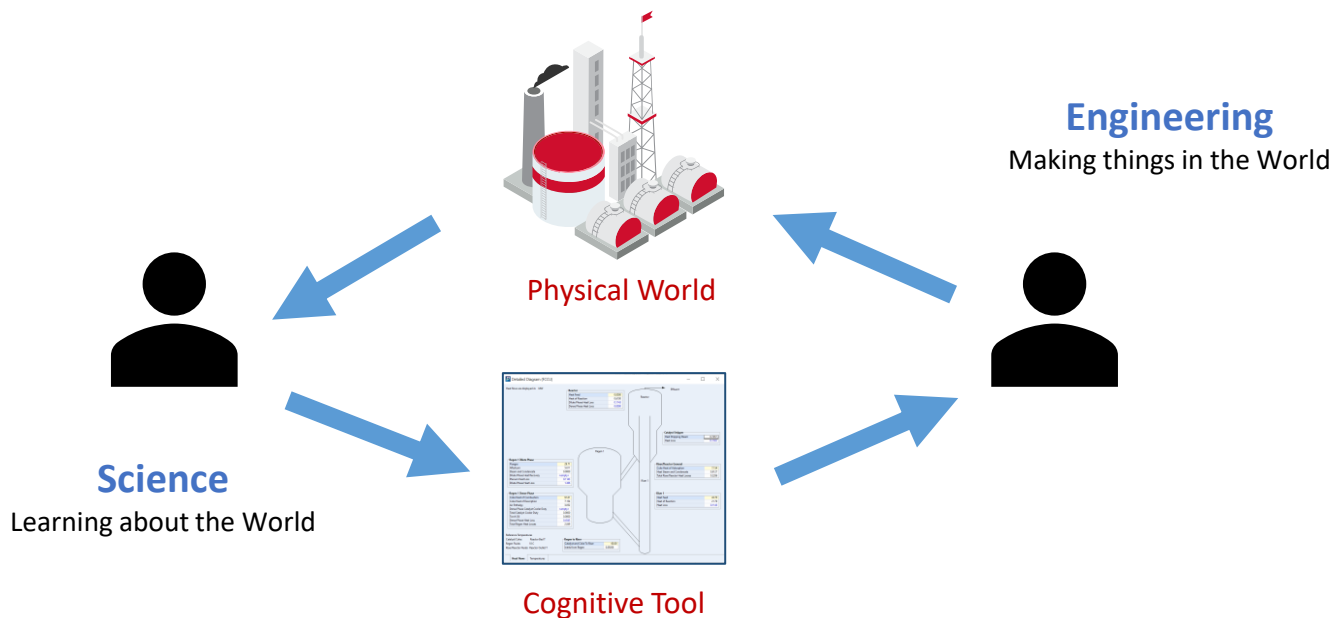


The Problem – The Twin Transition

- The energy transition is disrupting our industry
- AI is disrupting the world
- But AI has not yet disrupted our industry



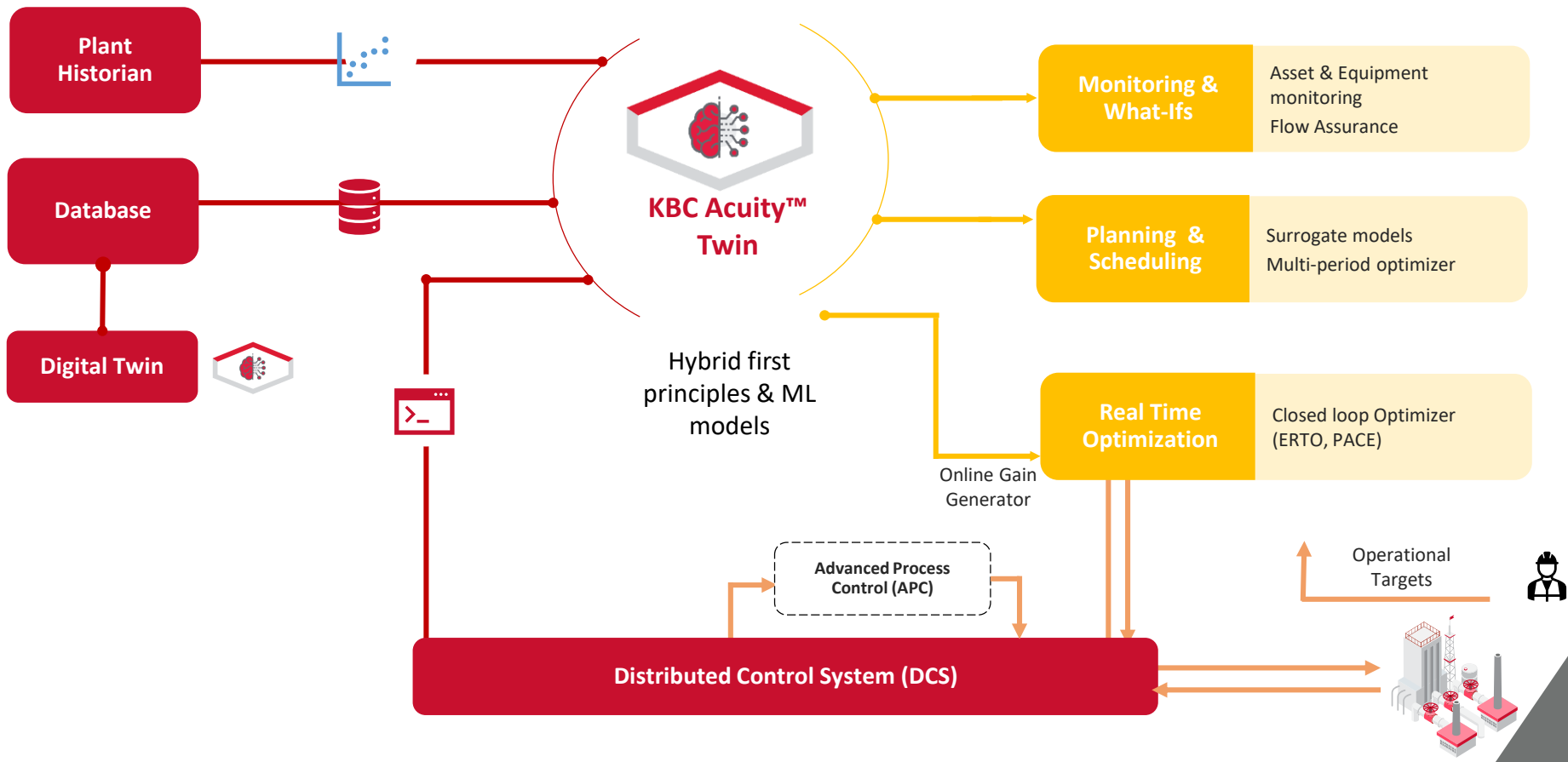
Why First Principles Twins?



After Prof. Judy Fan

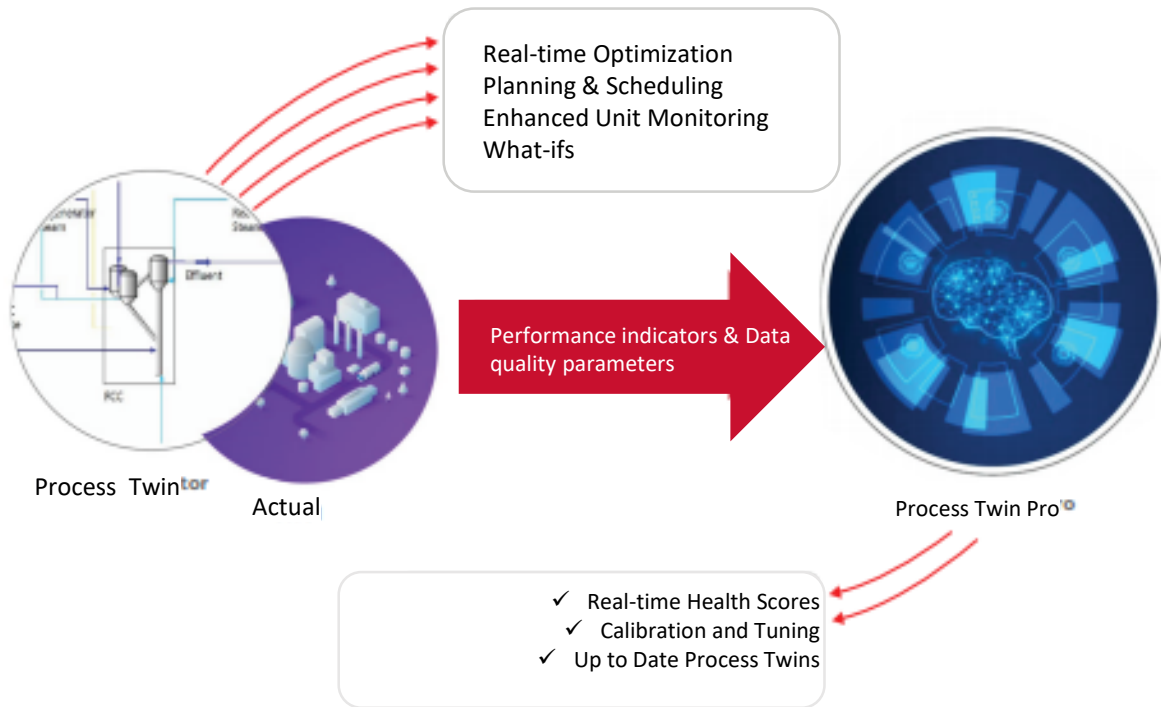
A cognitive tool to abstract what we know about the plant and provide insights into how it works

Process, Production & Energy Twins



Streamlining Workflow

Keeping Process Digital Twins Updated



RESULTS

- Universal data & model access
- Employee empowerment
- Employee engagement
- De-bottlenecking & decision-making
- Sustainable value chain benefits



GC



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Thank You

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