

AVEVA PI WORLD



AVEVA Simulation & Learning

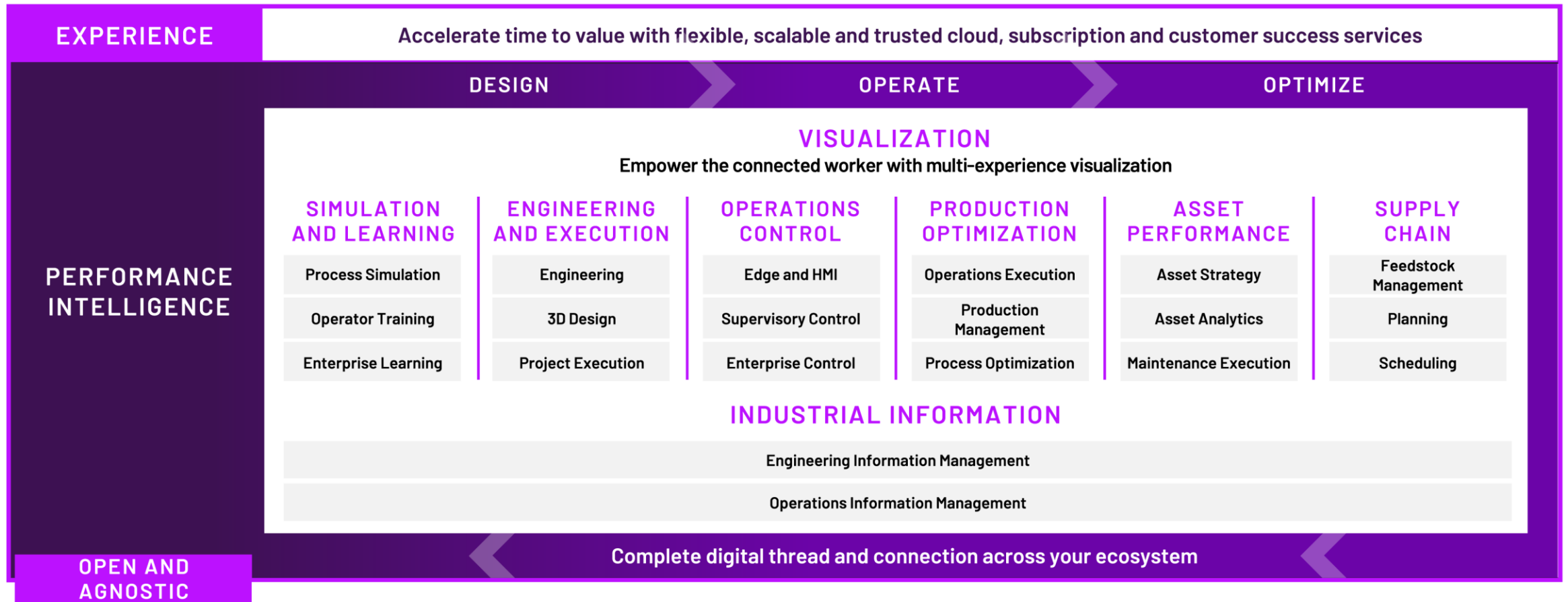
The Process Digital Twin

Presented By: Dr Ian Willetts

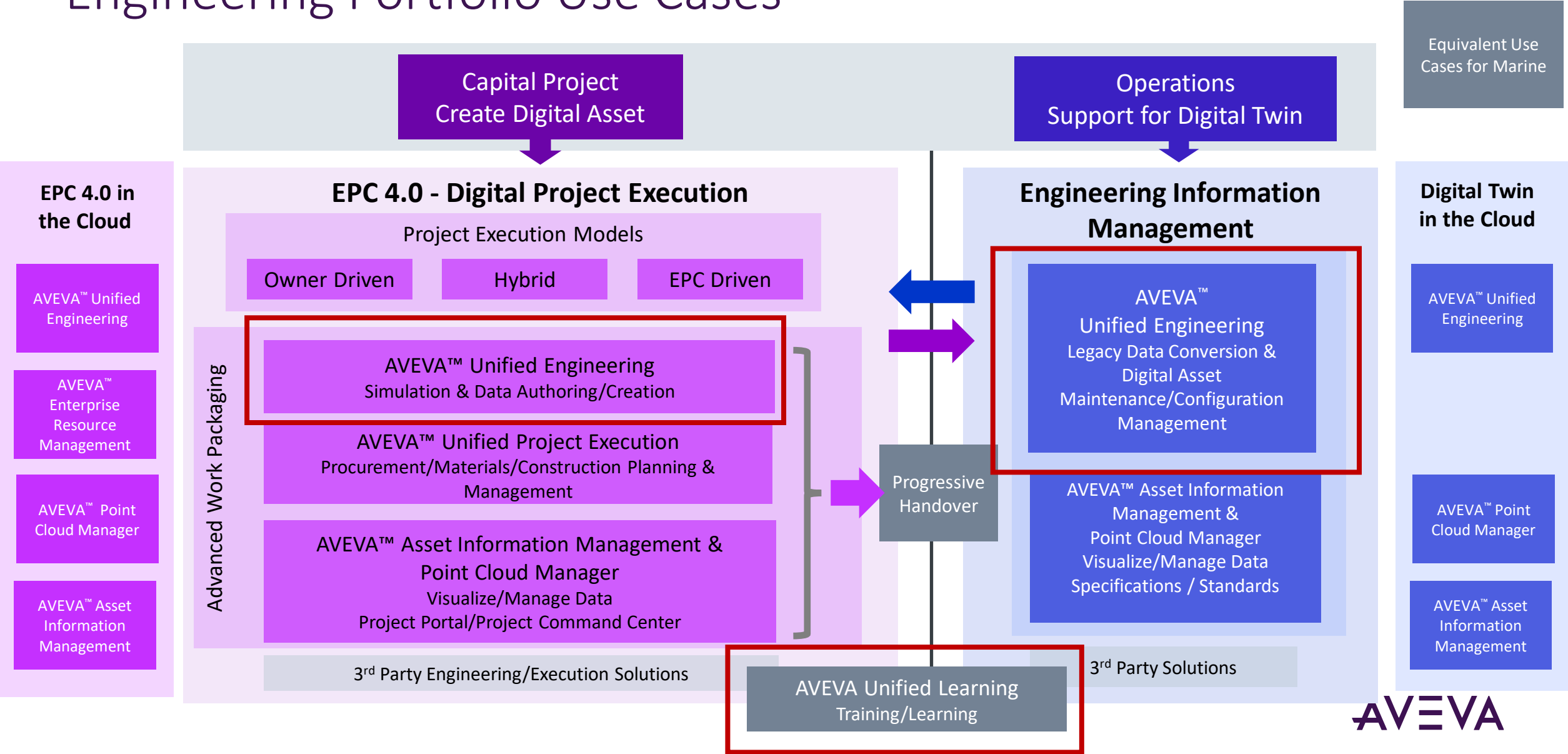
AVEVA

Unlocking Performance Intelligence

Accelerating digital transformation of the industrial world

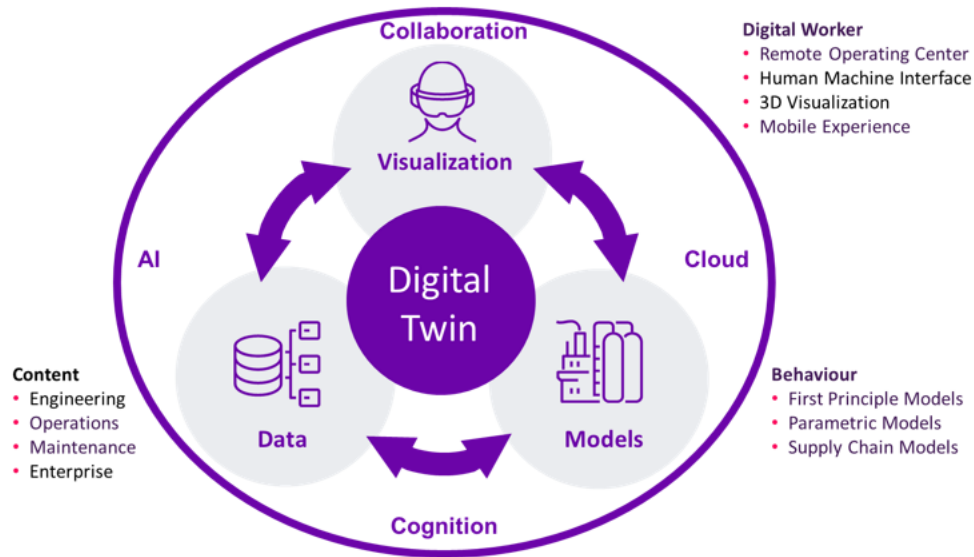


Engineering Portfolio Use Cases



Digital Transformation is changing the way companies design and operate their assets

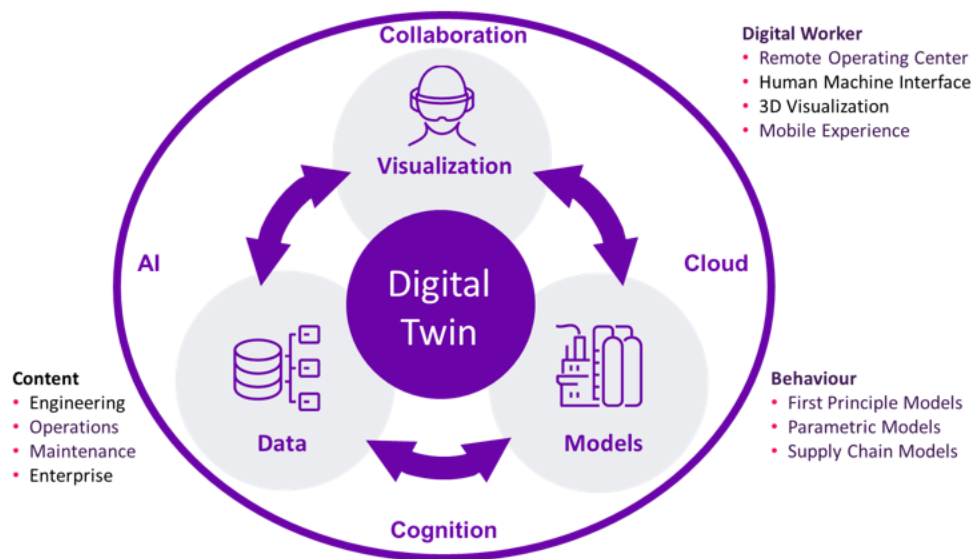
AVEVA Digital Twin - Connecting People, Process and Assets



What was a longer-term vision has quickly become a current imperative

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AVEVA Digital Twin - Connecting People, Process and Assets



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The New Normal

By connecting **people, process and assets**, digital transformation enables new business models and addresses business imperatives



Reduce CAPEX Project Risk



Run agile, continuously optimized supply chains to protect the bottom line



Operate critical assets reliably and safely with reduced manual supervision



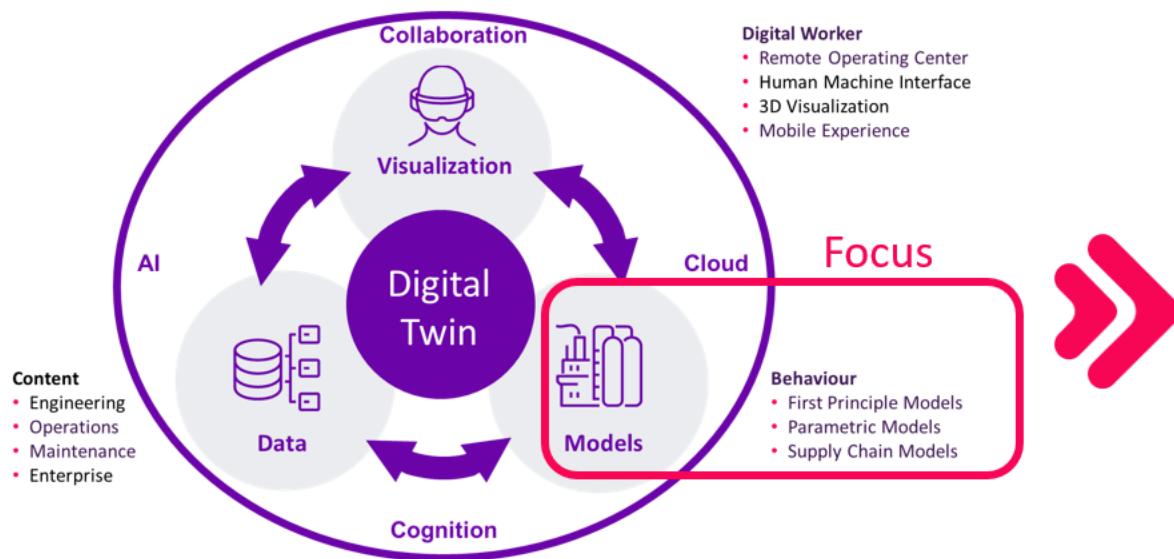
Provide remote 'digital' teams rich insights and decision support to collaborate, work efficiently and safely



Reduce environmental footprint and operate profitably and in a sustainable way

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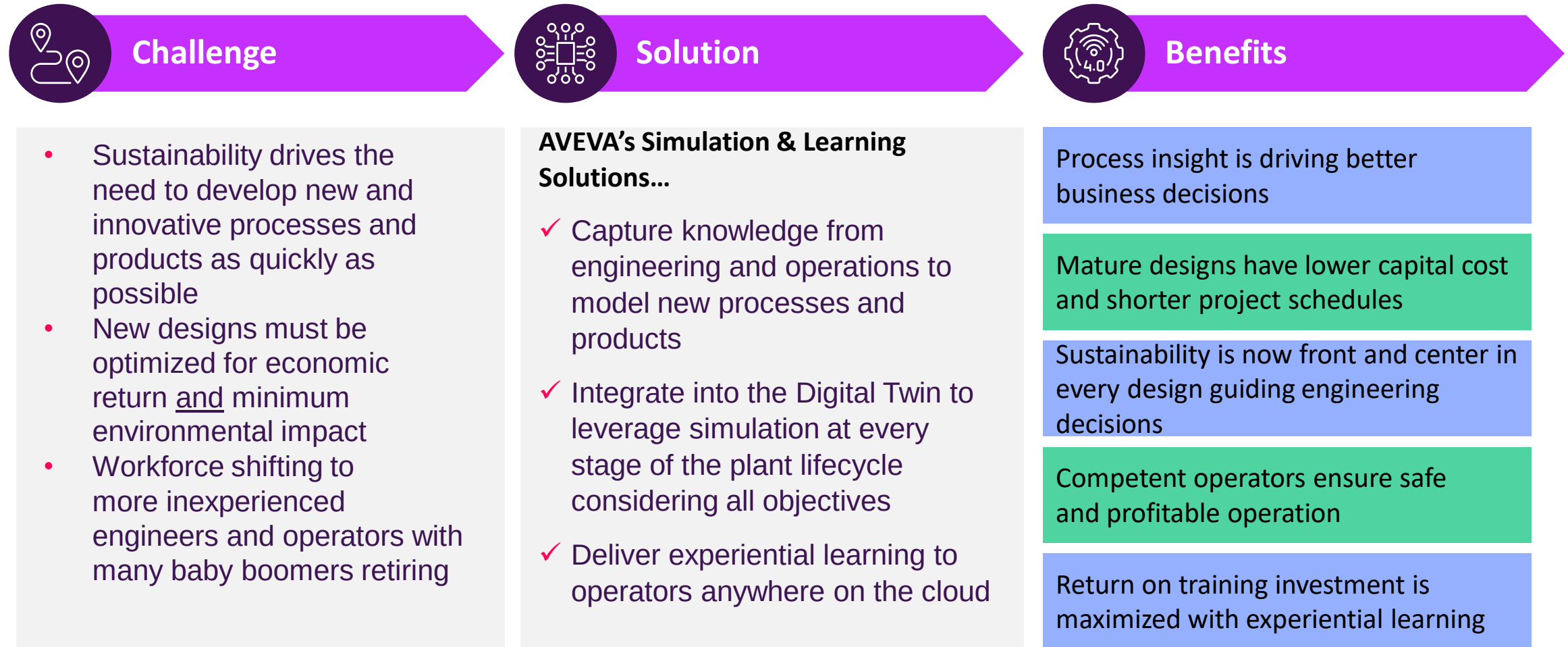


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AVEVA Simulation and Learning



Process Simulation 101

First principles models



$$\rightarrow V = \frac{4}{3} \pi r^3$$

Physical Properties & Thermodynamic models

NIST
DIPPR
DETERM



$$+ PV=nRT$$

VLLE
Peng Robinson
SRK

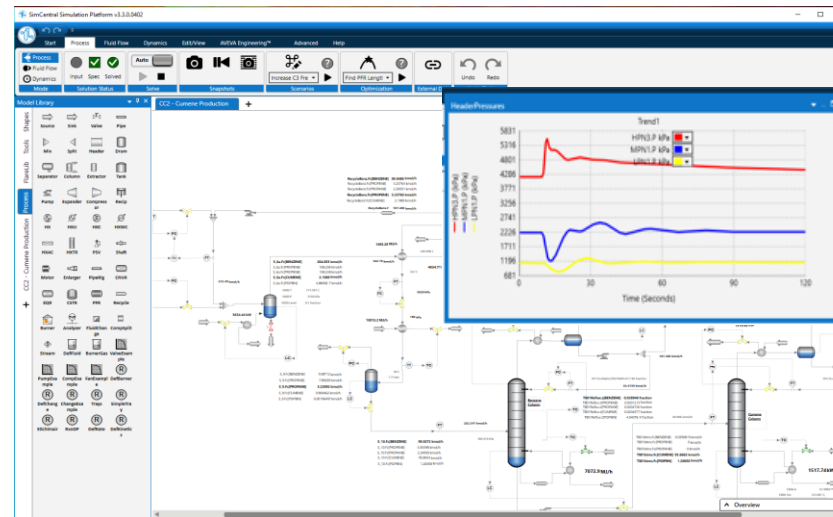
Unit Operations



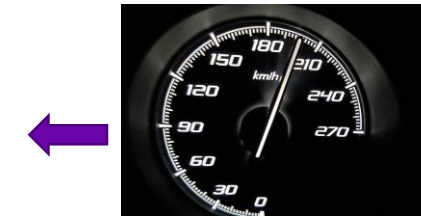
Distillation
Reactors
Vessels

Compressors
Heat exchangers
Etc.....

Flowsheeting Environment

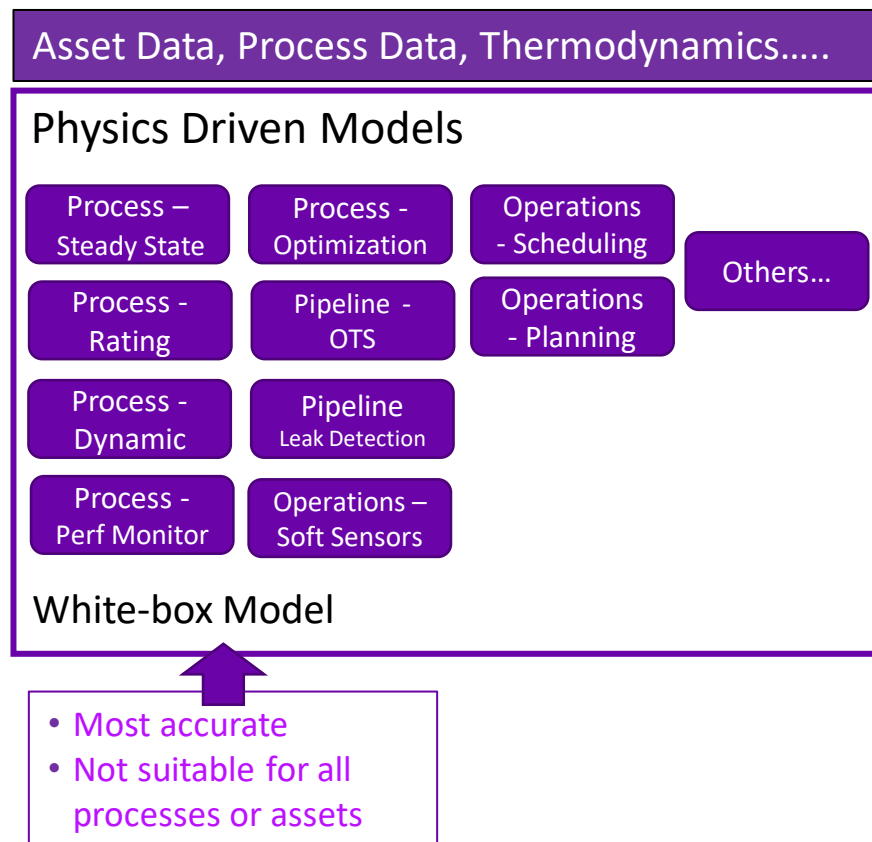


Static & Dynamic Models


$$\Delta t$$

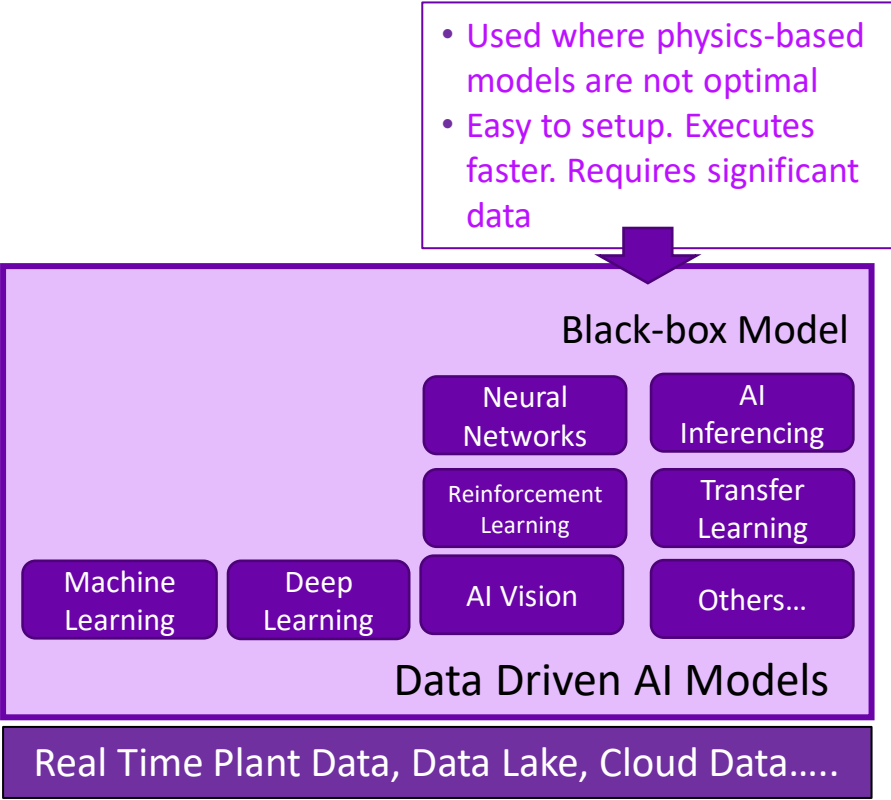
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Process Simulation Models



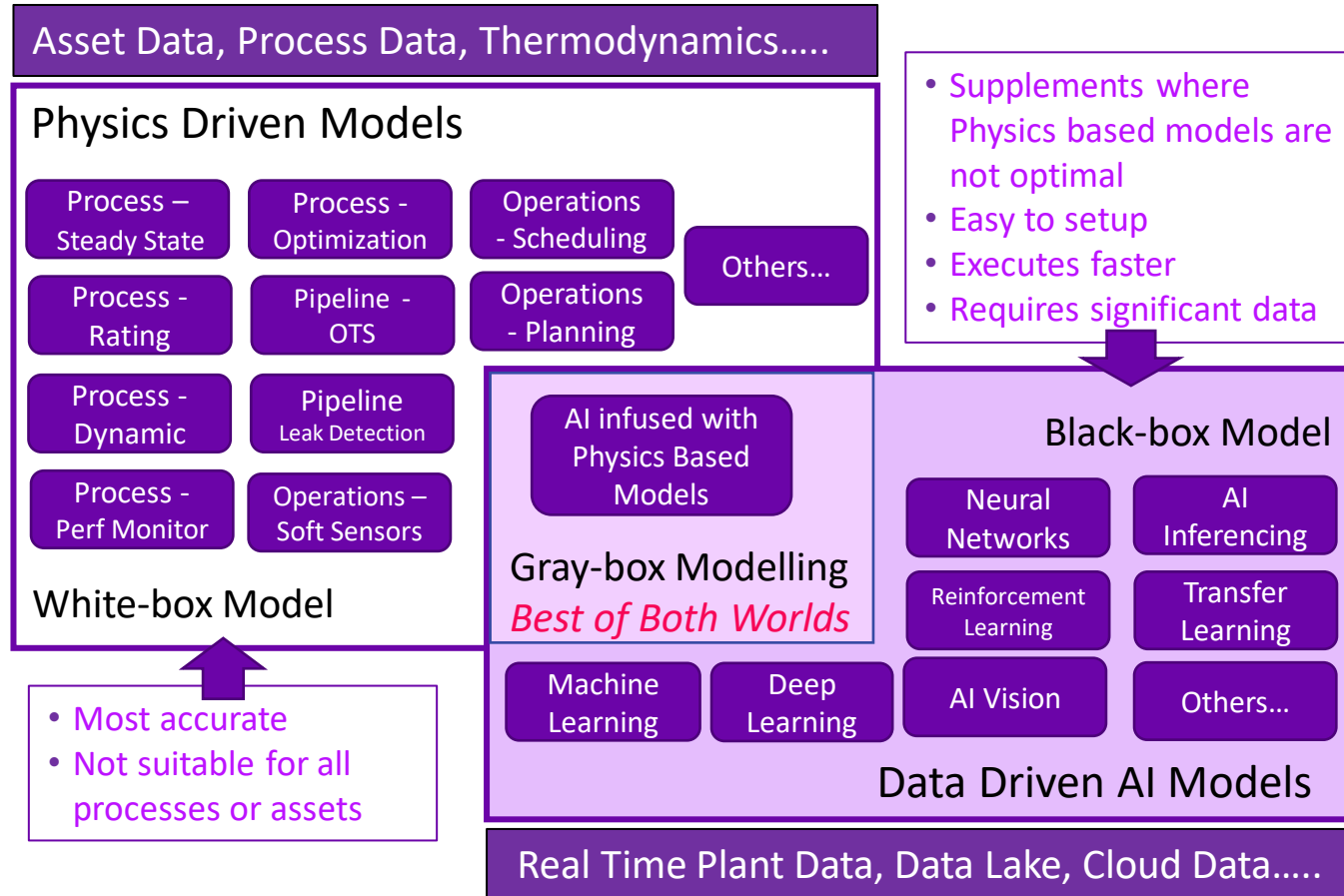
	What Questions can I address?
White Box	What design has the lowest environmental impact?
	Is my heat exchanger correctly sized?
	Will my plant be stable and controllable?
	How do I know when I have a leak in my pipeline?
	What crude is best for my refinery?
	Can you optimize my process to identify new levels of untapped productivity?
	How do I get my operators ready for operations on day one?

Data Based Analytical Models



Black Box	How do you calculate key Asset KPIs when first principles algorithms don't accurately model the asset?
	How do you keep a digital twin live for a brownfield operation?
	Can sections of my plant be run autonomously?
	Can you predict performance using AI cognitive capabilities such as machine learning, deep learning, and computer vision?

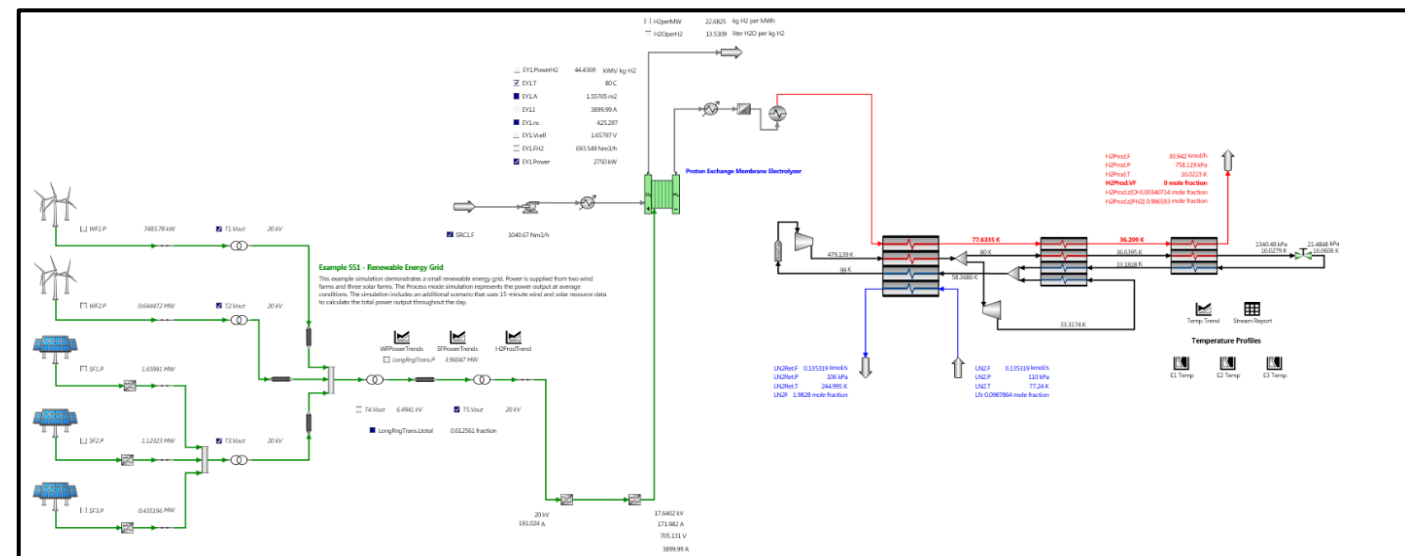
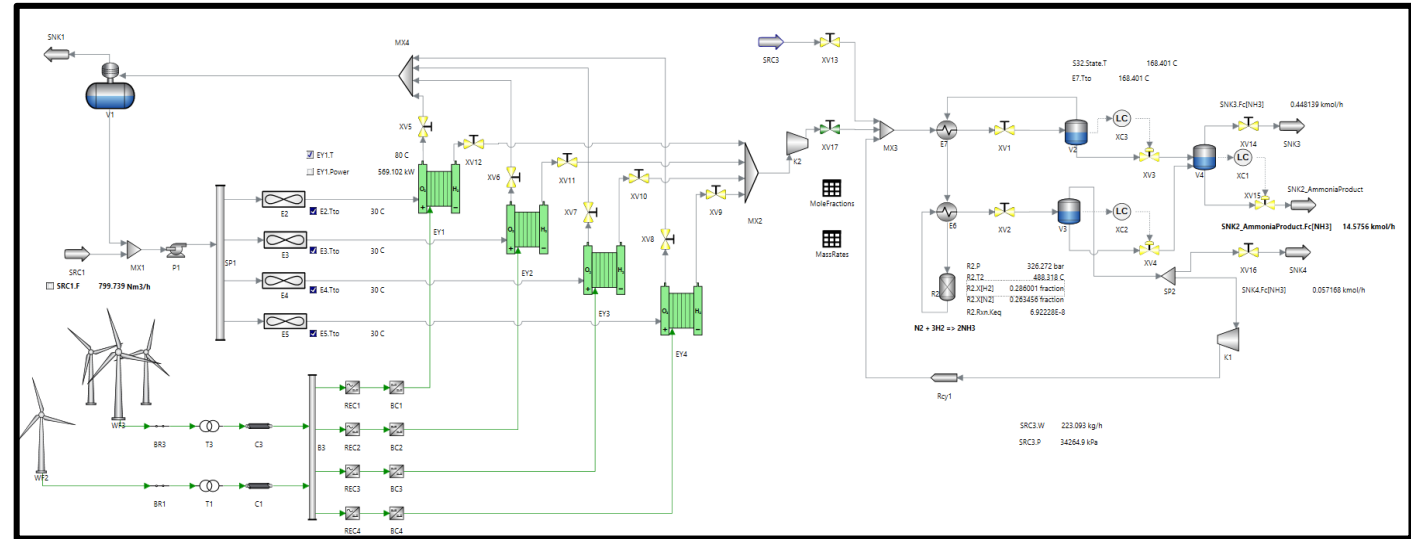
Hybrid Models



White Box	What design has the lowest environmental impact?
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	Can you optimize my process to identify new levels of untapped productivity?
	How do I get my operators ready for operations on day one?
Gray-Box	Can I model a new process that only has first principles models for <u>some</u> of the assets?
	How do I reinforce learning after the formal training is over?
	Can you learn from past behavior to recommend optimal schedules?
Black Box	How do you calculate key Asset KPIs when first principles algorithms don't accurately model the asset?
	How do you keep a digital twin live for a brownfield operation?
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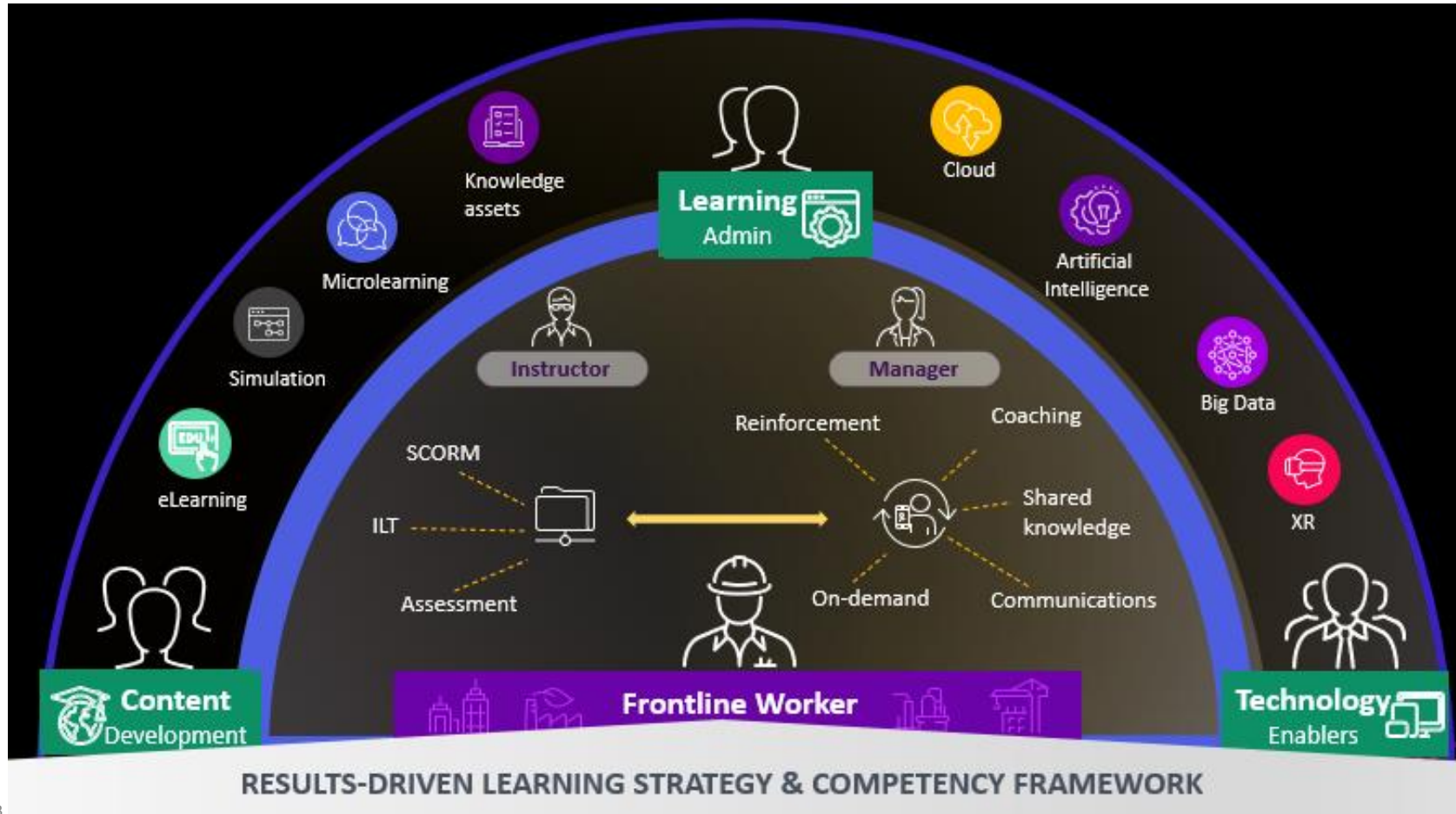
Process Simulation Powers Tomorrow's Energy Decisions

- From Wind Farm to Green Ammonia Production
 - What power can I get from my Wind Farm?
 - How many Electrolyzers do I need?
 - How does Hydrogen production change over time?
 - What is the energy demand for Nitrogen Production?
 - What is the overall energy demand?
 - What is my CO2 equivalent environmental footprint?
- From Wind and Solar to Liquid Hydrogen
 - What is the variability of Hydrogen production over 24hr period?
 - How many Electrolyzers do I need?
 - What is the design of refrigeration cycle to liquefy Hydrogen?
 - What is the overall energy demand?
 - What is my CO2 equivalent environmental footprint?



Process Simulation Powers AVEVA Unified Learning

Performance-driven learning platform for today's industrial connected worker



- Increase the effectiveness of training programs incorporating simulation based experiential learning
- Available on-demand anytime, anywhere through AVEVA Connect



- ✓ Cloud OTS has reduced training time from months down to weeks
- ✓ TotalEnergies can train up to 2000 trainees per year

AVEVA

Process Simulation & PI Powers Real-Time Performance Insight

Operational Problem

A complex distillation system does not achieve the required product purity predicted by simulation.

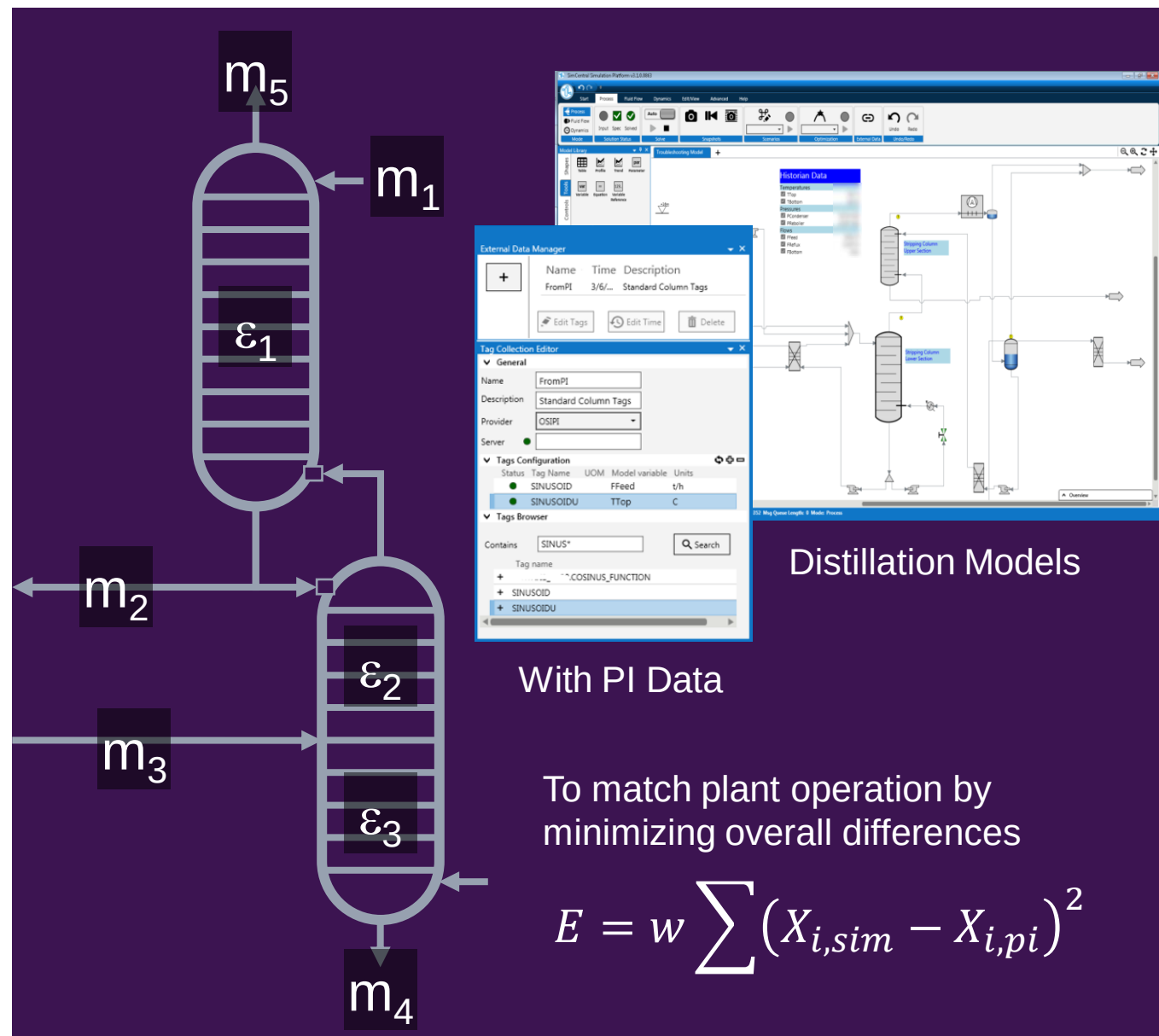
Question

Is the deviation from the simulation prediction explained by reduced efficiency due to plugging of the column internal packing?

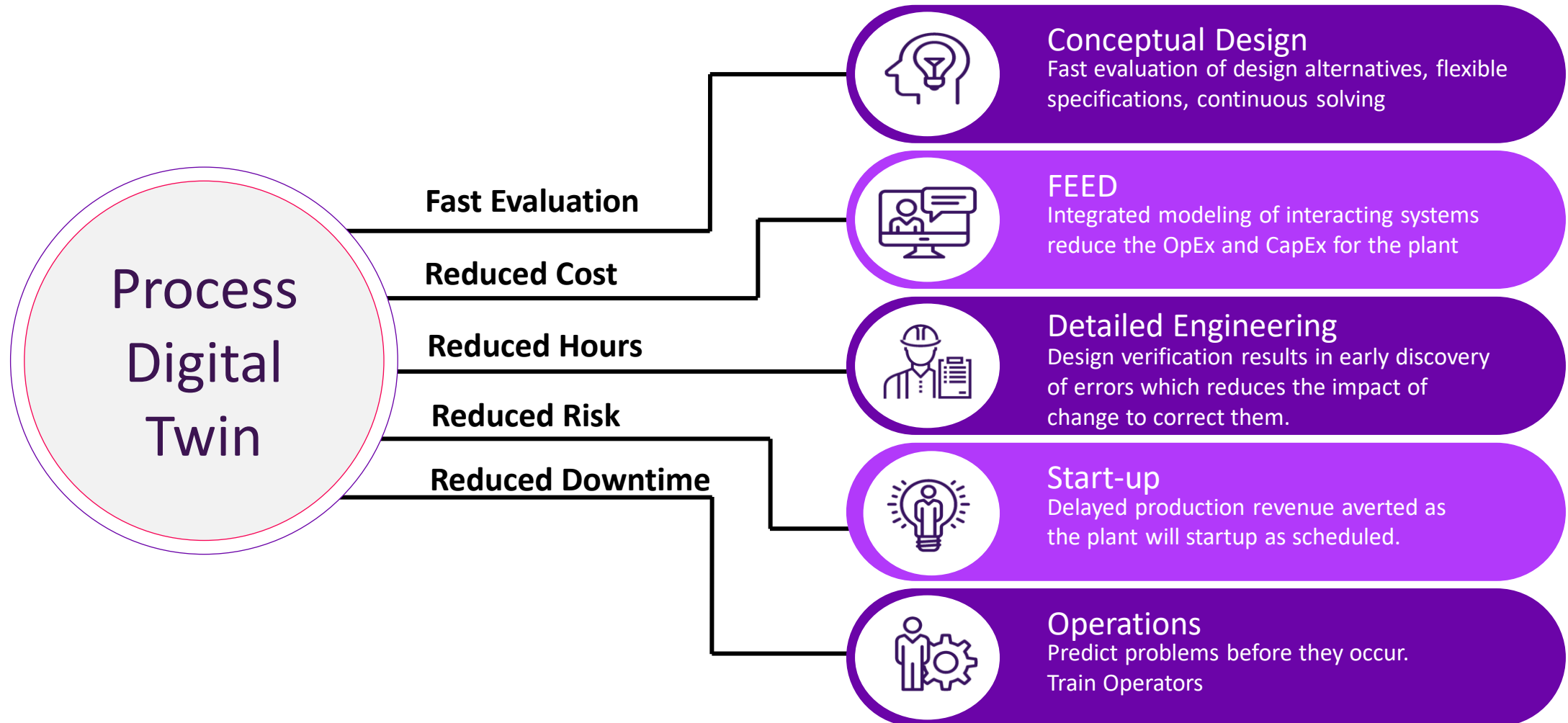
Result

“Model validation with PI data gave confidence on the applicability of the model. Then, observations of simulated column packing efficiency, gave the insight to improve our upcoming maintenance plans.”

Jan Haertel, Global Technology Expert, Covestro



Key Takeaway - Knowledge and Insight from Process Simulation drives improved business decisions throughout the process lifecycle



“The dynamic simulators allow us to create a wide range of exercises which allows us to adapt our training program to all trainee profiles”

- Pierre Fabre, OTS Trainer TOTAL Oleum



"AVEVA Process Simulation allows us to perform model validation and troubleshooting using live or archived PI data”



- Christian Redepenning, Covestro

Thank you

Contact for more information:

Ian Willets

VP Simulation & Learning, AVEVA

Ian.Willetts@AVEVA.com

LinkedIn:



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ABOUT AVEVA

AVEVA, a global leader in industrial software, drives digital transformation for industrial organizations managing complex operational processes. Through Performance Intelligence, AVEVA connects the power of information and artificial intelligence (AI) with human insight, to enable faster and more precise decision making, helping industries to boost operational delivery and sustainability. Our cloud-enabled data platform, combined with software that spans design, engineering and operations, asset performance, monitoring and control solutions delivers proven business value and outcomes to over 20,000 customers worldwide, supported by the largest industrial software ecosystem, including 5,500 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 6,000 employees at 90 locations in more than 40 countries. For more details visit: www.aveva.com