OCTOBER 24, 2023

Simulation & learning

Portfolio overview and roadmap

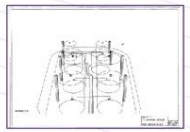
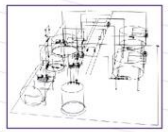
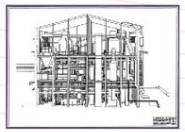
Chloe Smith – Director of Product Management, Simulation & Learning

Andrea Macri – Sr. Product Manager Dynamic Simulation, OTS, Unified Learning

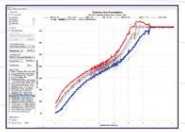
AVEVA

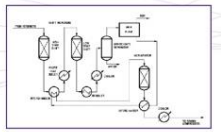
The evolution of AVEVA

1970 1980 1990 2000 2010





1967 SimSci founded with Plant Level Simulations

1973 Citect founded as Control Instrumentation

1983 Avantis formed with Enterprise Asset Management

1987 SimSci PRO/II

Wonderware founded with HMI SCADA (InTouch)

1991 Telvent OASyS SCADA System

1995 InStep founded with Predictive Analytics

SAT Corp founded with Mobile Asset Management

1996 Serck Controls ClearSCADA

1997 Skelta founded with Business Process Management

Indusoft founded with embedded HMI

Wonderware Historian

1998 System Platform

FactorySuite

Spiral founded with Planning Software

2003 Wonderware MES with SCADA

2009 Virtual based Operator Training

Schneider Electric Software

1969 Tribon formed with marine vessel design

1967 AVEVA founded as CADCentre

1987 Logimatic founded with Enterprise Resource Management (ERM)

2001 AVEVA Global

2002 AVEVA Net

2005 AVEVA Marine

AVEVA

1980 OSIsoft founded with real-time data management

1993 PI Datalink

PI System 2

1994 Process Book

1995 PI System 3

2000 PI SDK

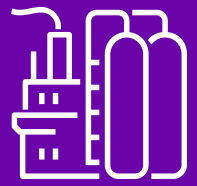
2004 PI Asset Framework

2005 PI Datasheet

OSIsoft

Decades of expertise

AVEVA has over 50 years of experience in developing leading process simulation software



80% of refining capacity in the world has been designed with AVEVA™ PRO/II Simulation

AVEVA is the only company to have developed a next generation simulation platform

More than 1,300 OTS delivered for all process intensive industries

AVEVA simulation & learning provides benefits across the life cycle of the plant

FEED and detailed design

- Fast evaluation of design alternatives
- Bring innovation to the forefront
- Sustainability at the core of each decision
- Seamless integration with AVEVA™ Unified Engineering

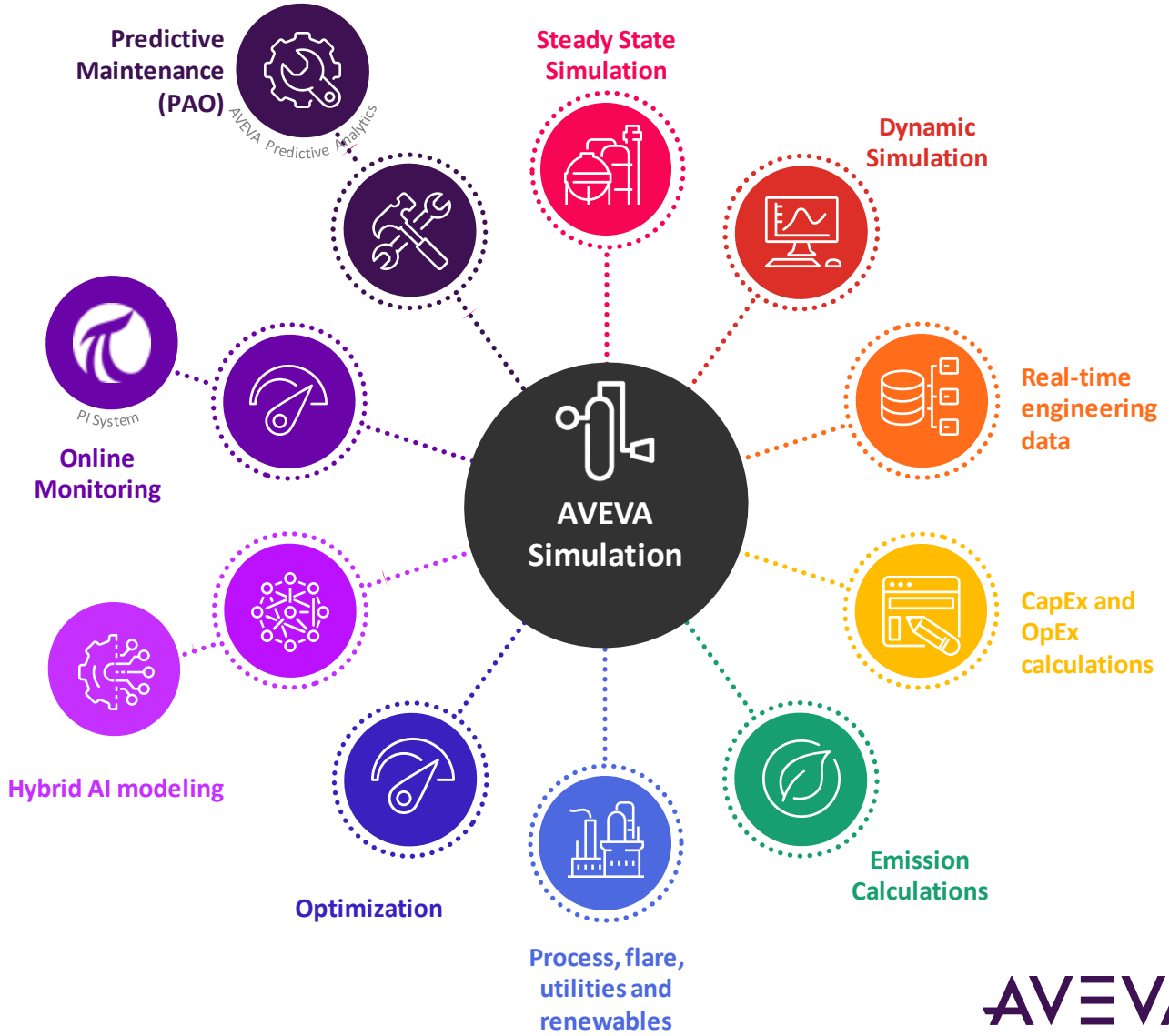
Start-up and operations

- Validate controls and logics before commissioning
- Measure and improve sustainability
- Fewer unplanned shutdowns
- Road to autonomous operations

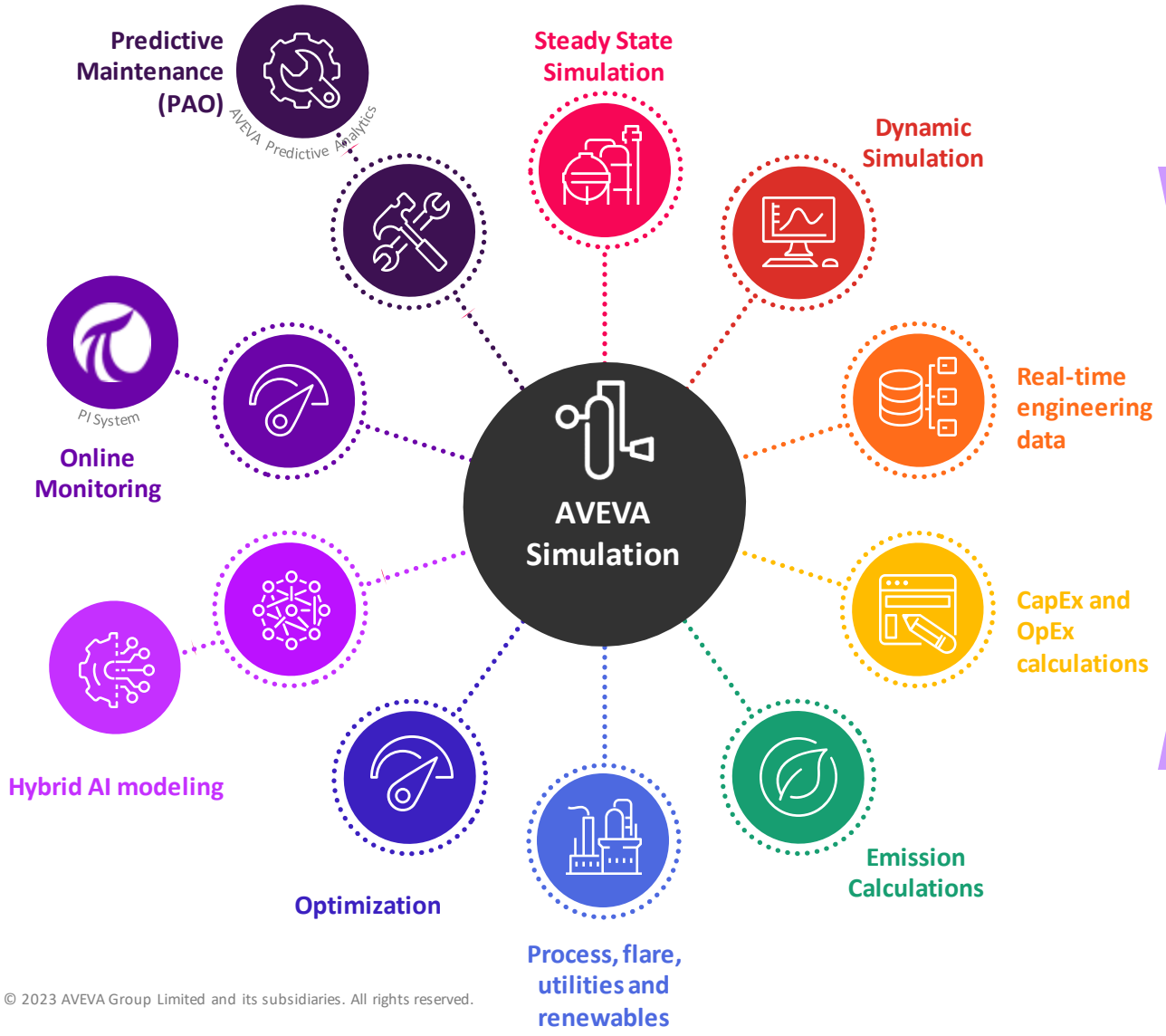
FEED and detailed design

Bringing an integrated approach to process simulation

- AVEVA™ Process Simulation is a **multi-purpose integrated** process simulation tool designed to support digital transformation
- **Replace dozens of specialized programs** for one solution integrating all facets of process design across the entire plant life cycle
- Design sustainable processes, products, and plants with **groundbreaking ease-of-use** features and built-in **sustainability features**
- Build simulations that leverage your full digital transformation **with real-time data from operations**



Bringing an integrated approach to process simulation



Shell
AVEVA Process Simulation performance for a Shell Propane Precool-Mixed refrigerant (C3-MR) LNG plant line-up

ISU / AVEVA
Hybrid simulation with AI

AVEVA
Predictive asset optimization & simulation with AVEVA™ PI System™

AVEVA
Improving engineering efficiency with AVEVA Process Simulation and AVEVA Unified Engineering

ThyssenKrupp
Maximize your operational excellence with AVEVA Process Simulation and scripting automation: A digital twin story by ThyssenKrupp Uhde GmbH and AVEVA

Schuller / AVEVA
AVEVA Unified Engineering - The caravan story

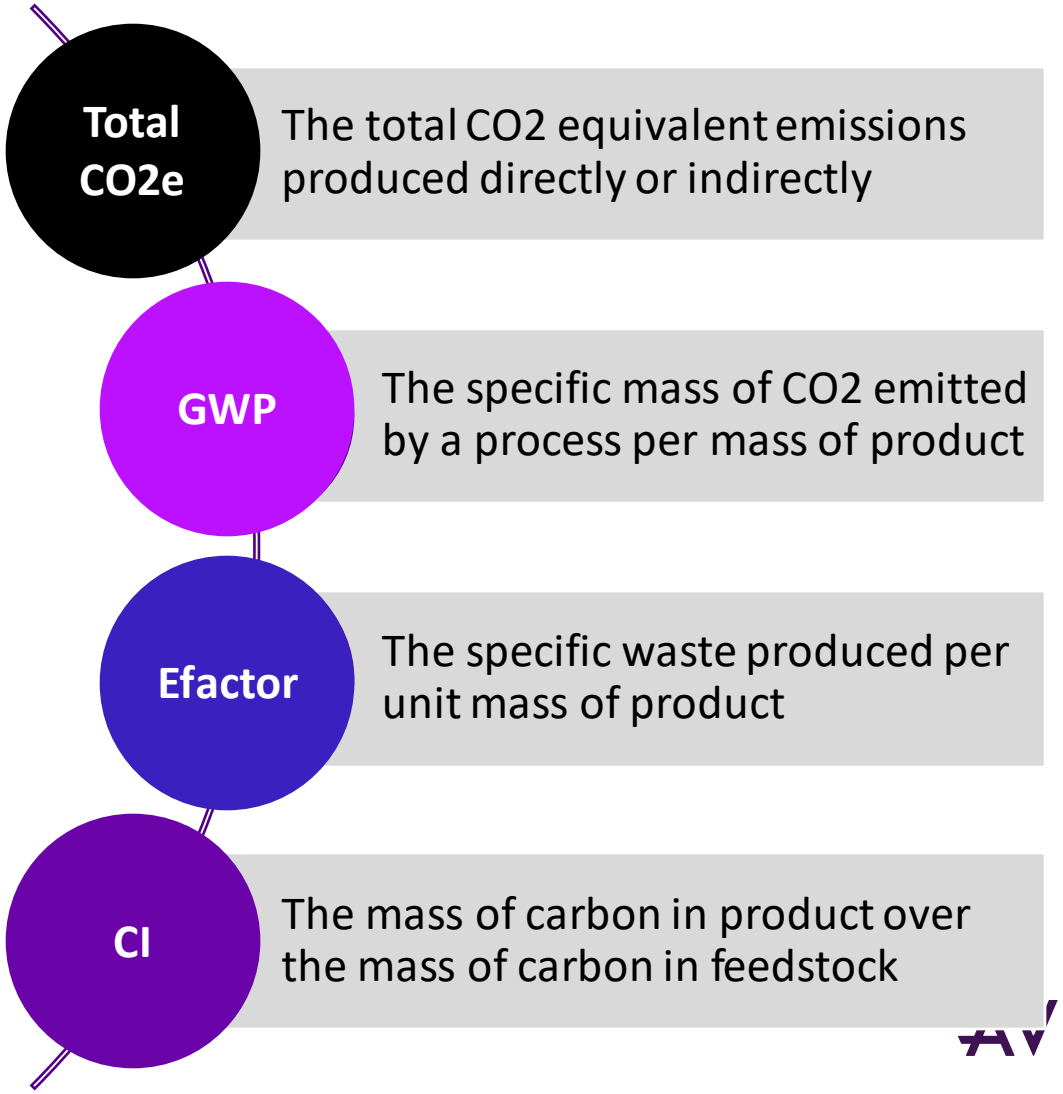
Alteragreen
Feasibility case study on the mitigation of Carbon Dioxide Emissions from an Ammonia synthesis plant via green Methanol and Dimethyl Ether synthesis in Coffeyville, KS

Focus on sustainability

1

Greenhouse gases

Predict the amount of GHG emissions to improve process design or operations



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Greenhouse gases

Predict the amount of GHG emissions to improve process design or operations

Total CO2e

The total CO2 equivalent emissions produced directly or indirectly

GWP

The specific mass of CO2 emitted by a process per mass of product

Efactor

The specific waste produced per unit mass of product

CI

The mass of carbon in product over the mass of carbon in feedstock

Focus on sustainability

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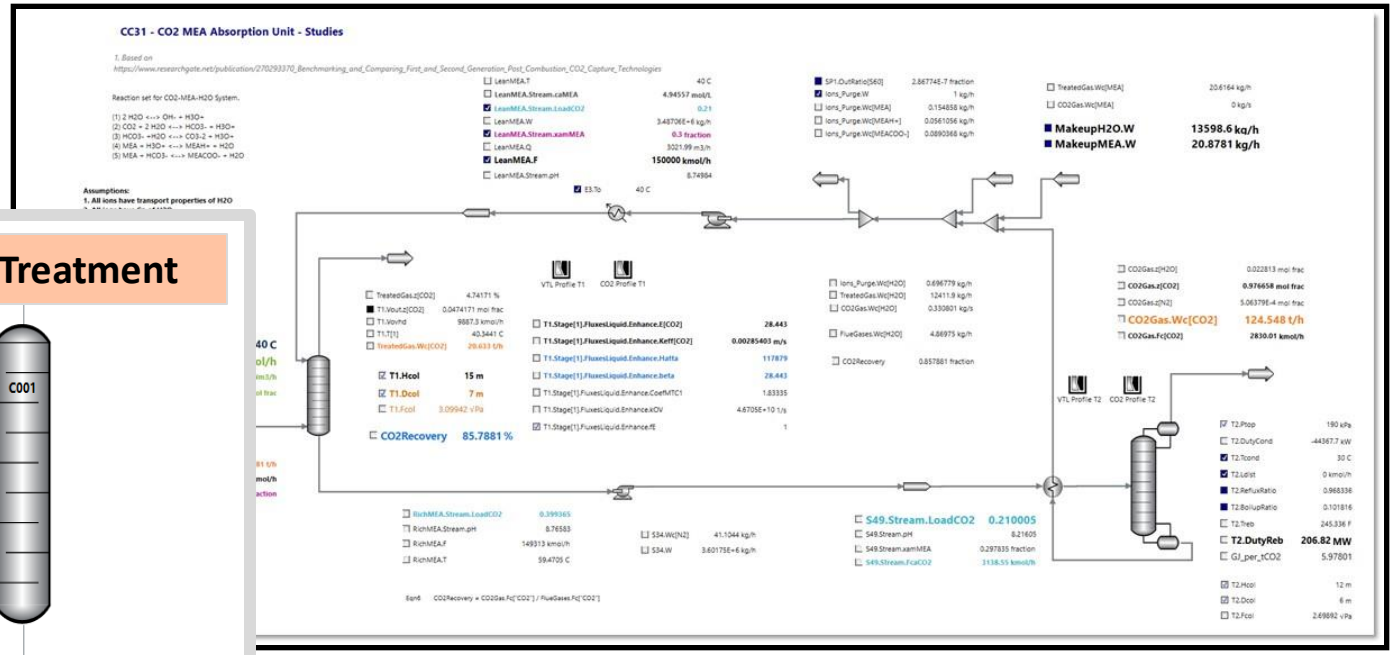
Greenhouse gases

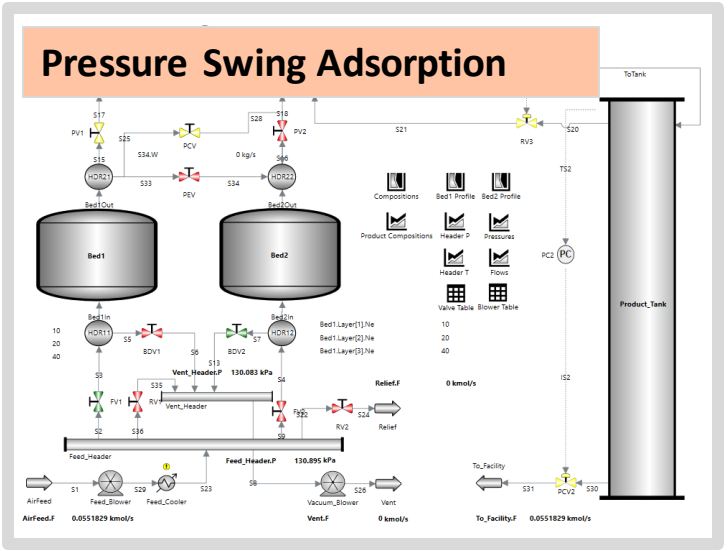
Predict the amount of GHG emissions to improve process design or operations

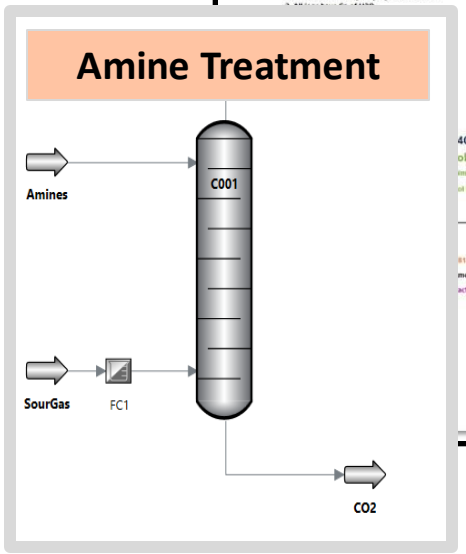
2

Carbon capture

Model amines and other solvents to remove CO2 from effluent streams.







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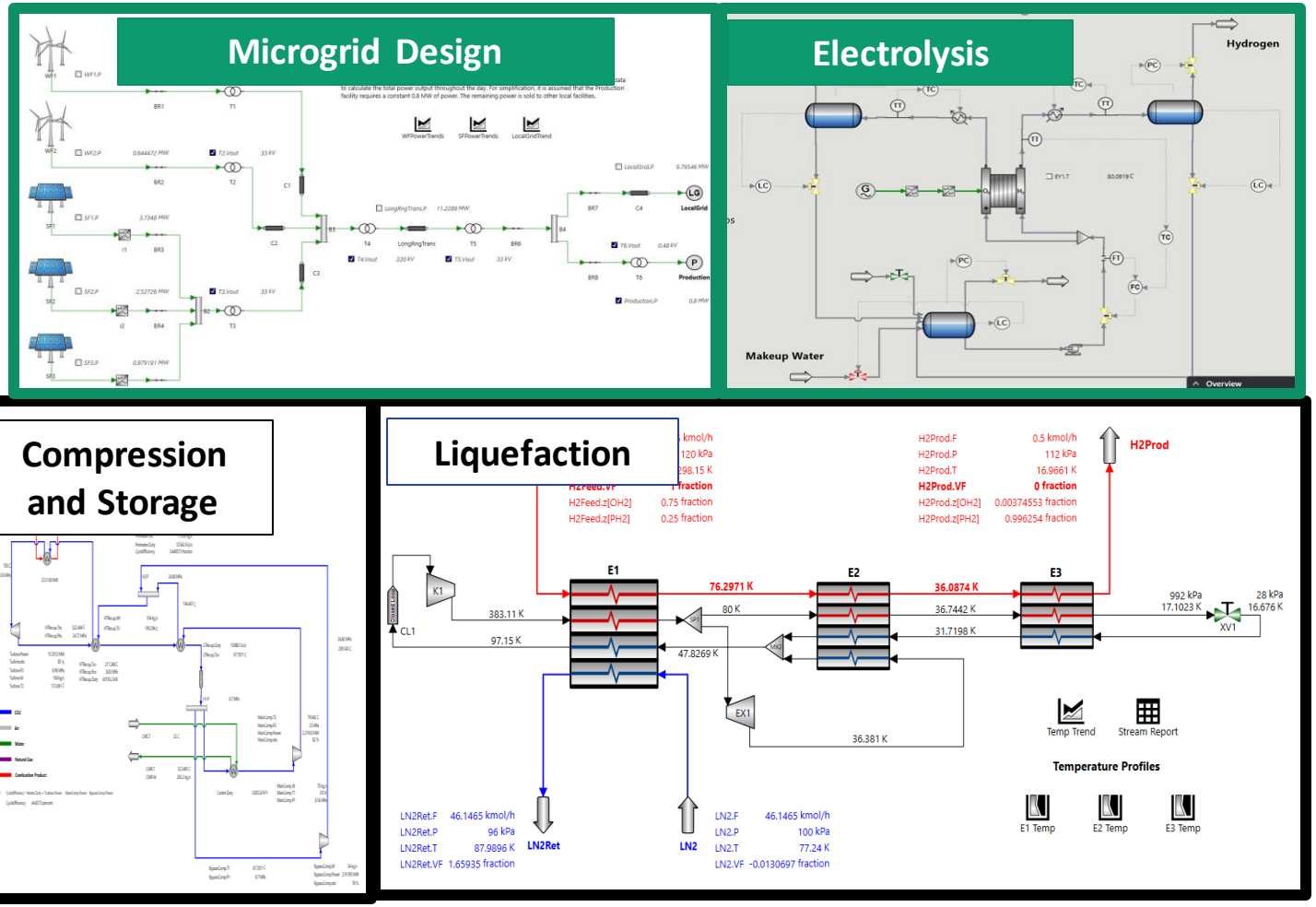
Energy transition

Use solar and wind to electrolyze water to create hydrogen



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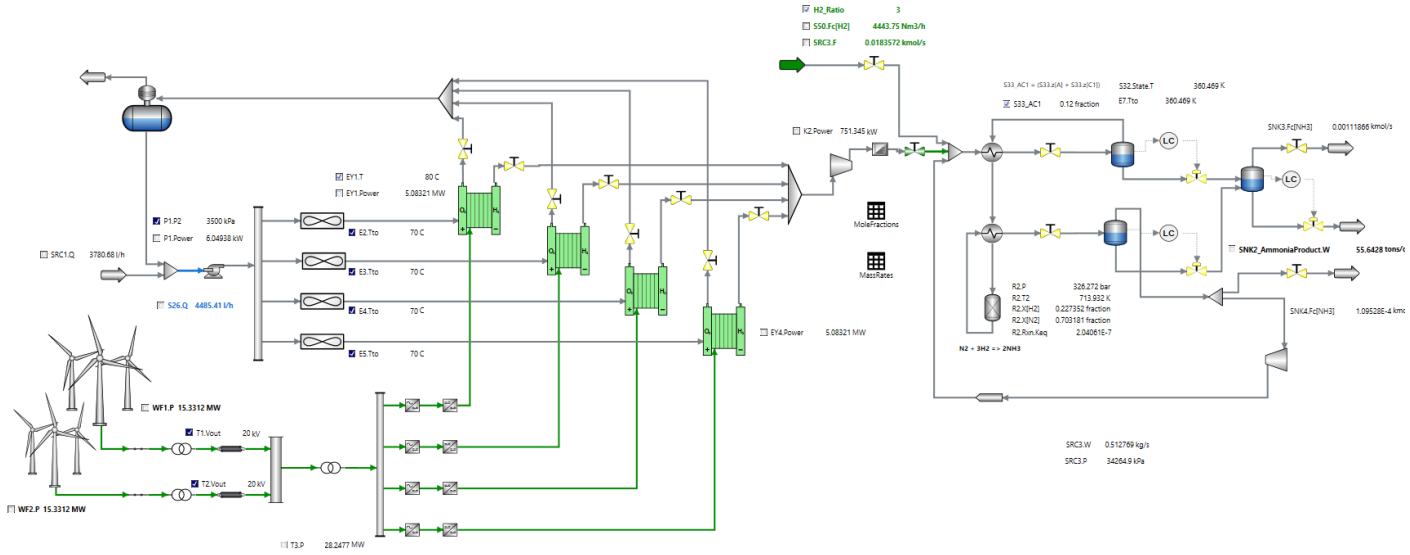
Power to X

Synthesize chemicals and fuels (e.g. ammonia) from electrolysis products.

Green ammonia example



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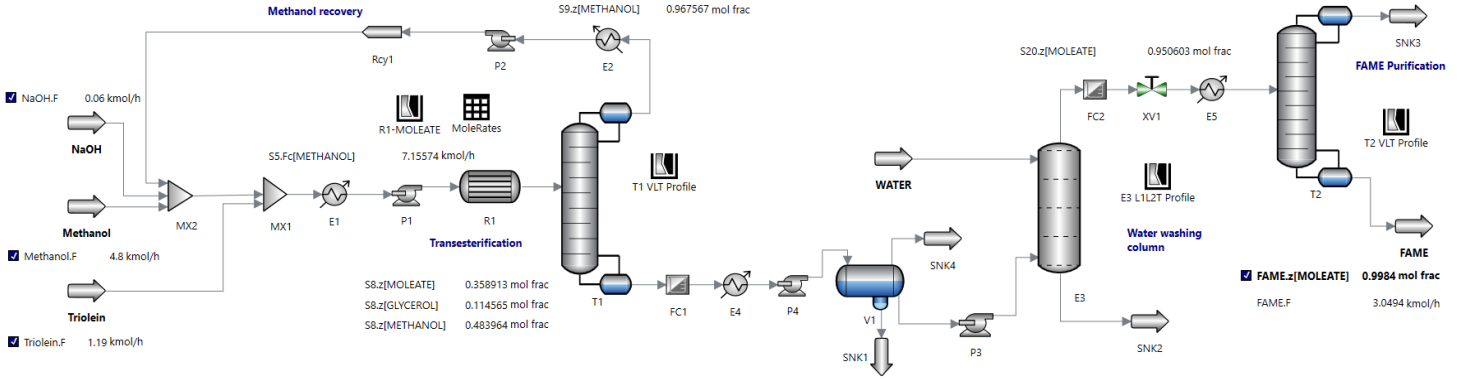
Circular economy

Chemical companies must reinvent portfolio of products with sustainability in mind

Biodiesel example



AI + simulation = hybrid models

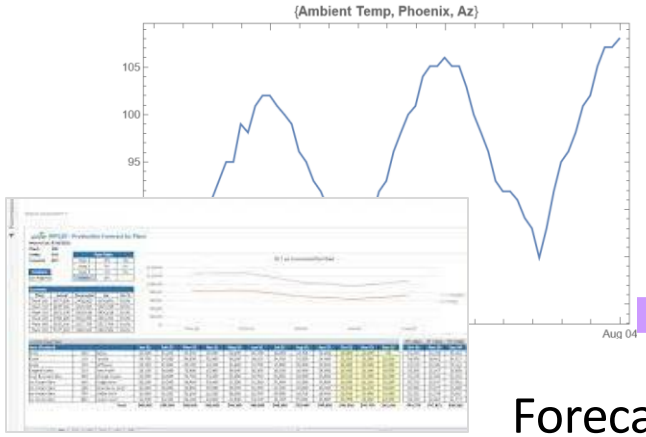
First principles models

Can be:

- Difficult to describe the process
- Slow or unreliable
- Time consuming to create

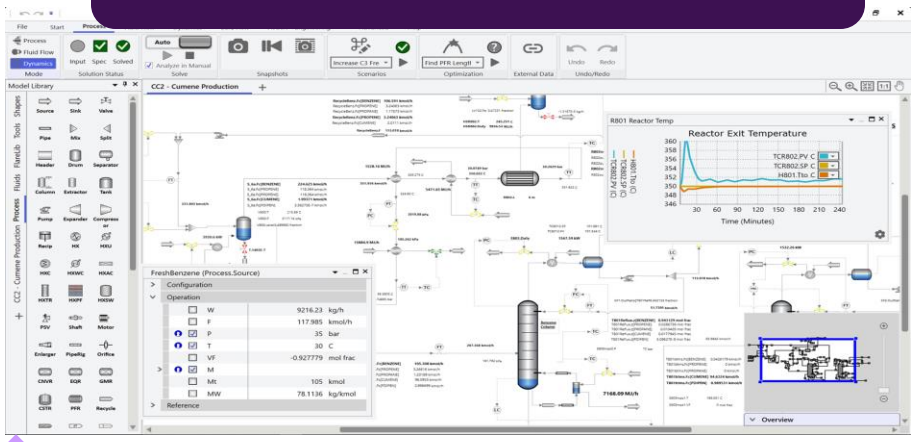
Start-up and operations

Online modeling and troubleshooting



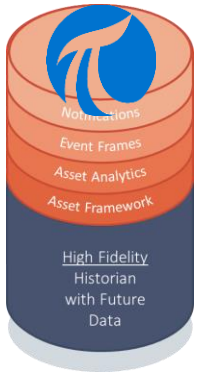
Forecast

AVEVA Simulation



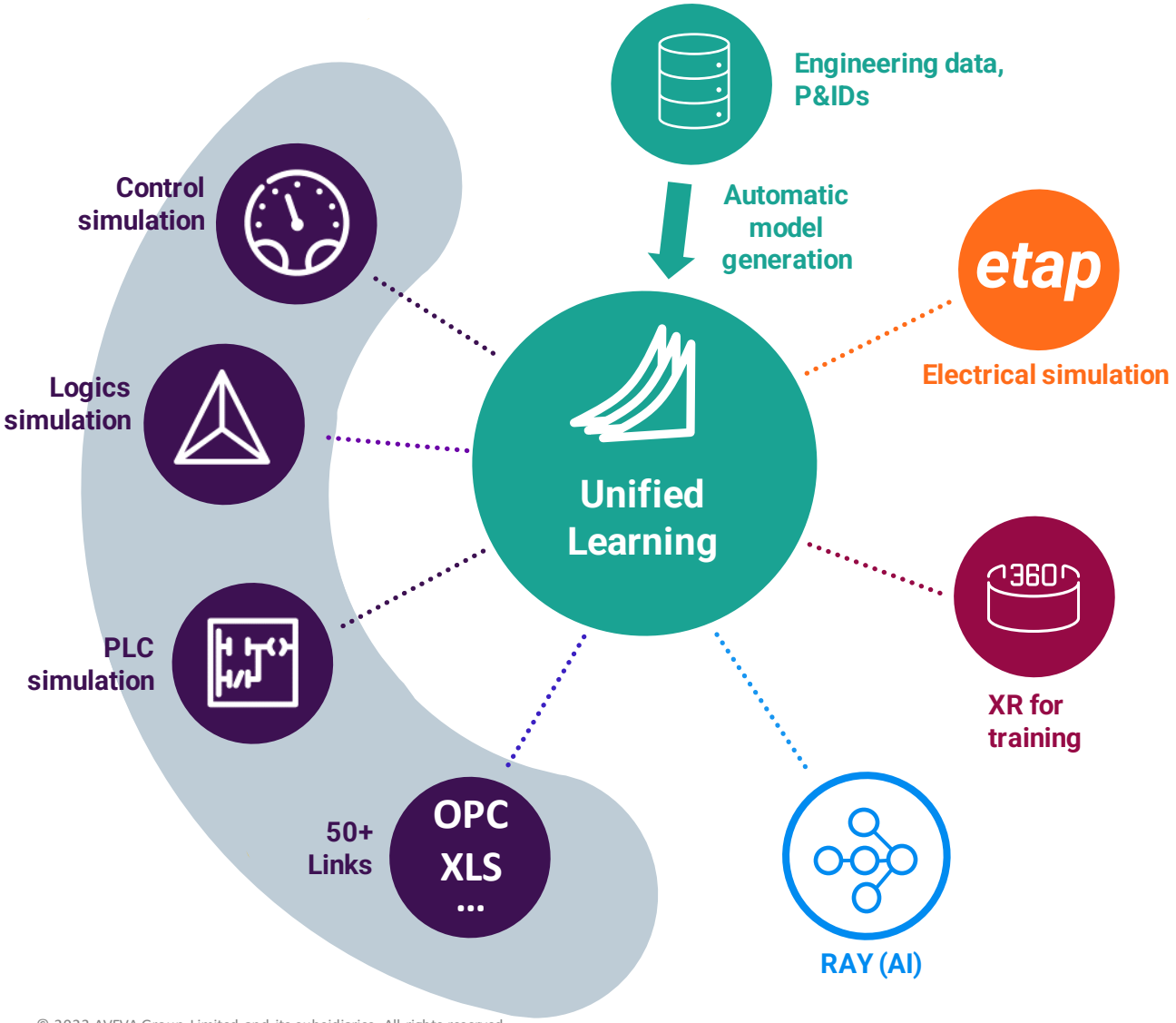
- Soft sensing
- Asset and plant monitoring
- Look ahead
- Optimization

RTS (Real-Time System)



Real-time and historical plant data

What is AVEVA™ Operator Training Simulator?



Dynamic case studies: Validate the process design and determine if process specifications, production goals, and safety requirements can be met. Design and validate process control strategies to reduce risk during abnormal events.

Electrical design studies: Integrate simulations with Schneider Electric's ETAP platform for rigorous simulation of electrical components in the process.

VCSU: Integrate dynamic models with DCS/SIS/PLC controls and logic to bring controls 'online' and test automation systems in the virtual plant to reduce the risk of startup delays.

Operator training: Train engineers and operators using an emulated DCS system in the virtual plant environment to ensure the workforce is ready to operate safely and efficiently from Day 0.

Immersive training: Deploy VR models of every asset and overlay equipment tags, real-time data, and simulated data for training, maintenance, and remote troubleshooting of the process.

AI advisory models: Build and train AI advisory models that reduce startup time and automatically optimize plant operations with minimal operator inputs.

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Schneider-Electric

A link between load behavior and overall electrical network stability

Schneider-Electric

Integrated simulation: bridging power and process for contextualized insight and optimization

TRI-Sen

Elevating Compressor Control Systems & Operator Training with AVEVA dynamic simulation solutions

Shell

Multipurpose dynamic simulation use at Shell Polymers Monaca

AVEVA / Shell

AI-driven autonomous plant operation for Shell Scotford

Technip Energies

Integrating SPYRO® Into AVEVA's Optimization, Steady-State & Dynamic Simulators

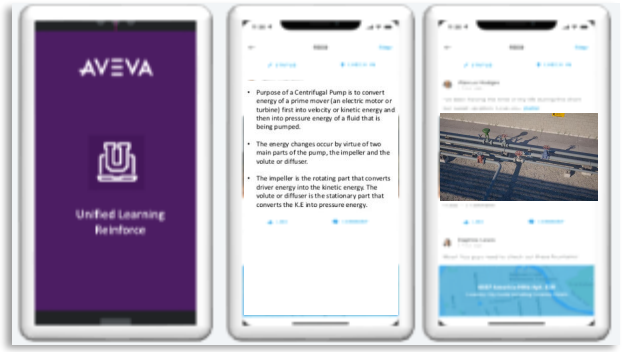
“To master anything in life all you have to do is spend 10,000 hours on it.”

Malcolm Timothy Gladwell, author of *Outliers: The Story of Success*

AVEVA™ Unified Learning helps reduce these 10,000 hours into just a few days!

AVEVA™ Unified Learning

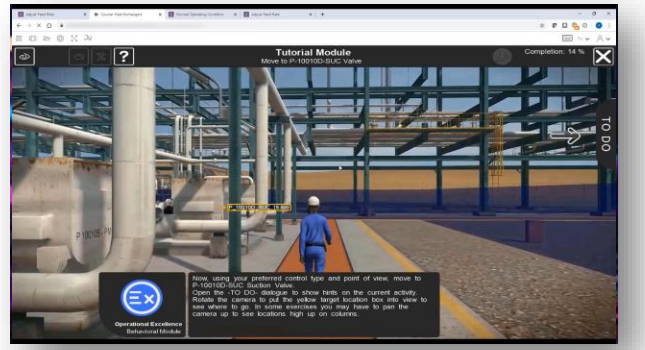
Reshaping industrial learning: The road to operational excellence

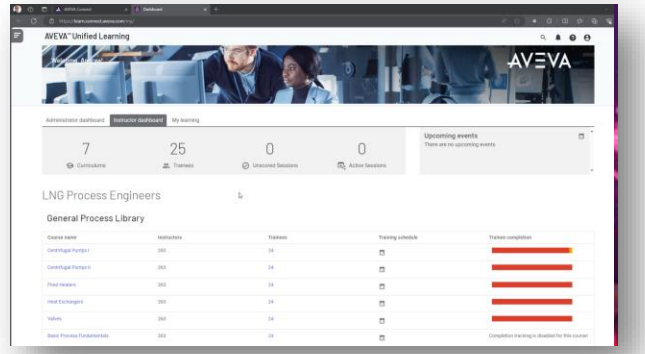


Learn

Reinforce

Practice





Assess

Images created with AI

AVEVA

TotalEnergies

TotalEnergies uses AVEVA's cloud-based training to safely simulate dangerous environments

Training programs reduced in length from several months to a few hours

The cloud-based training provides access from anywhere and at any time

Train operators how to cope with dangerous incidents that are otherwise difficult to practice

Solution: AVEVA™ Operator Training Simulator

"It was key to combine AVEVA's proven leadership in OTS training with the secure operational agility of a cloud-based platform. This has never been more important than today when global lockdowns force many teams to operate remotely."

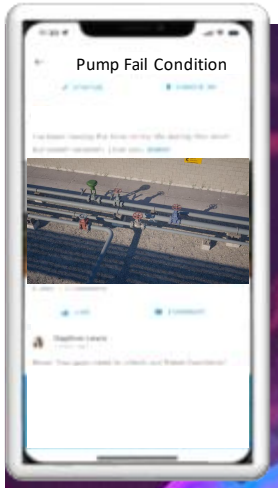
Meriam Chebre, Competences Program Manager, TotalEnergies

AVEVA

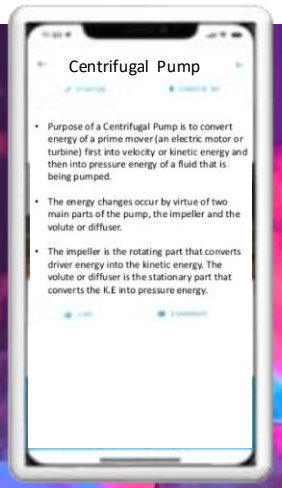
AVEVA™ Unified Learning mobile app… is coming

Industrial learning at your fingertips

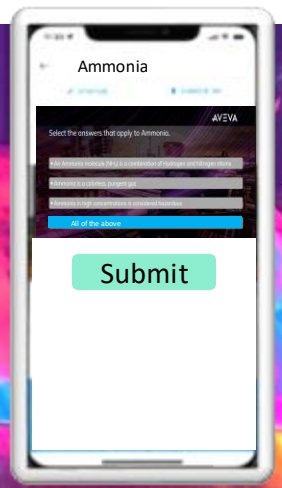
Videos



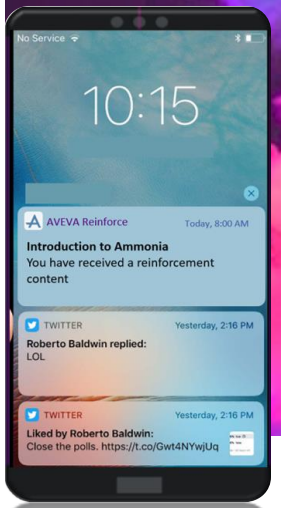
Highlights



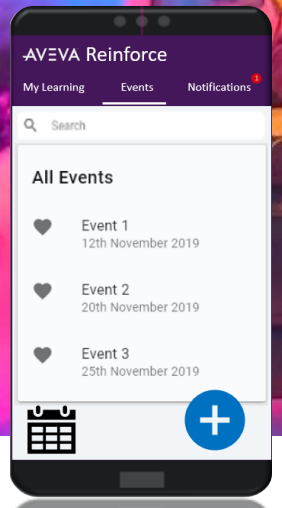
Quiz



Notifications



Events

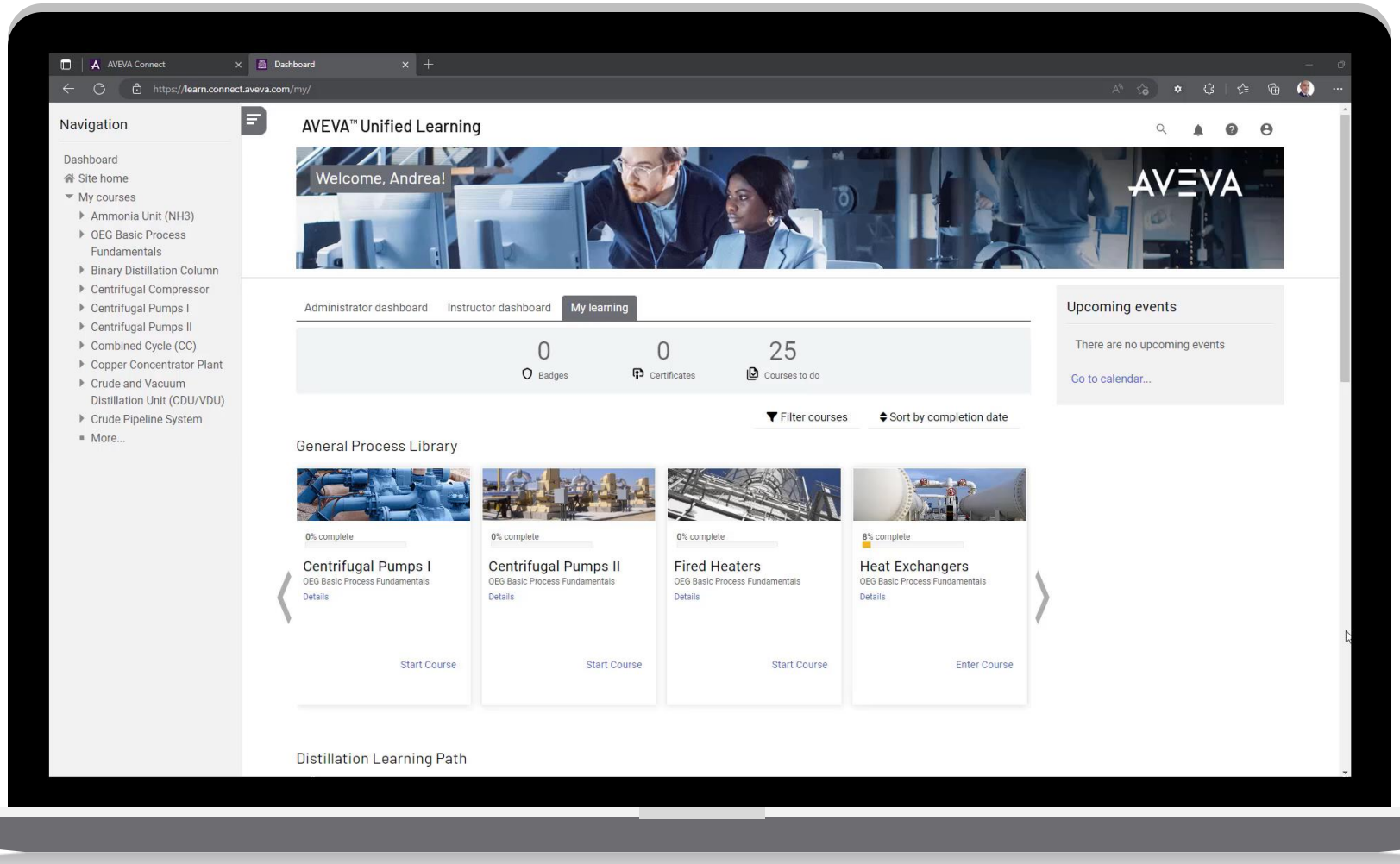


Images created with AI

AVEVA™ Unified Learning

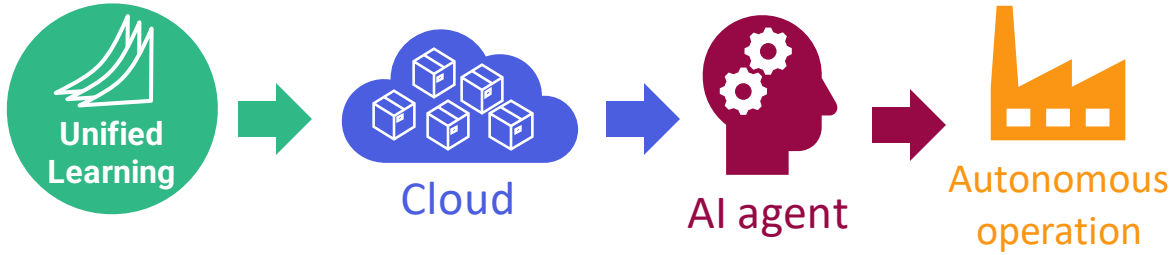
Empower sustainable behavior

- New renewable library for OTS
  - PEM electrolyzer
  - AEL electrolyzer
- Sustainability indicators can be used to score the learner performance together with other process / operation KPIs
- Integration with ETAP for process and electrical simulation



AI autonomous operations

Training and deploying AI for autonomous operation



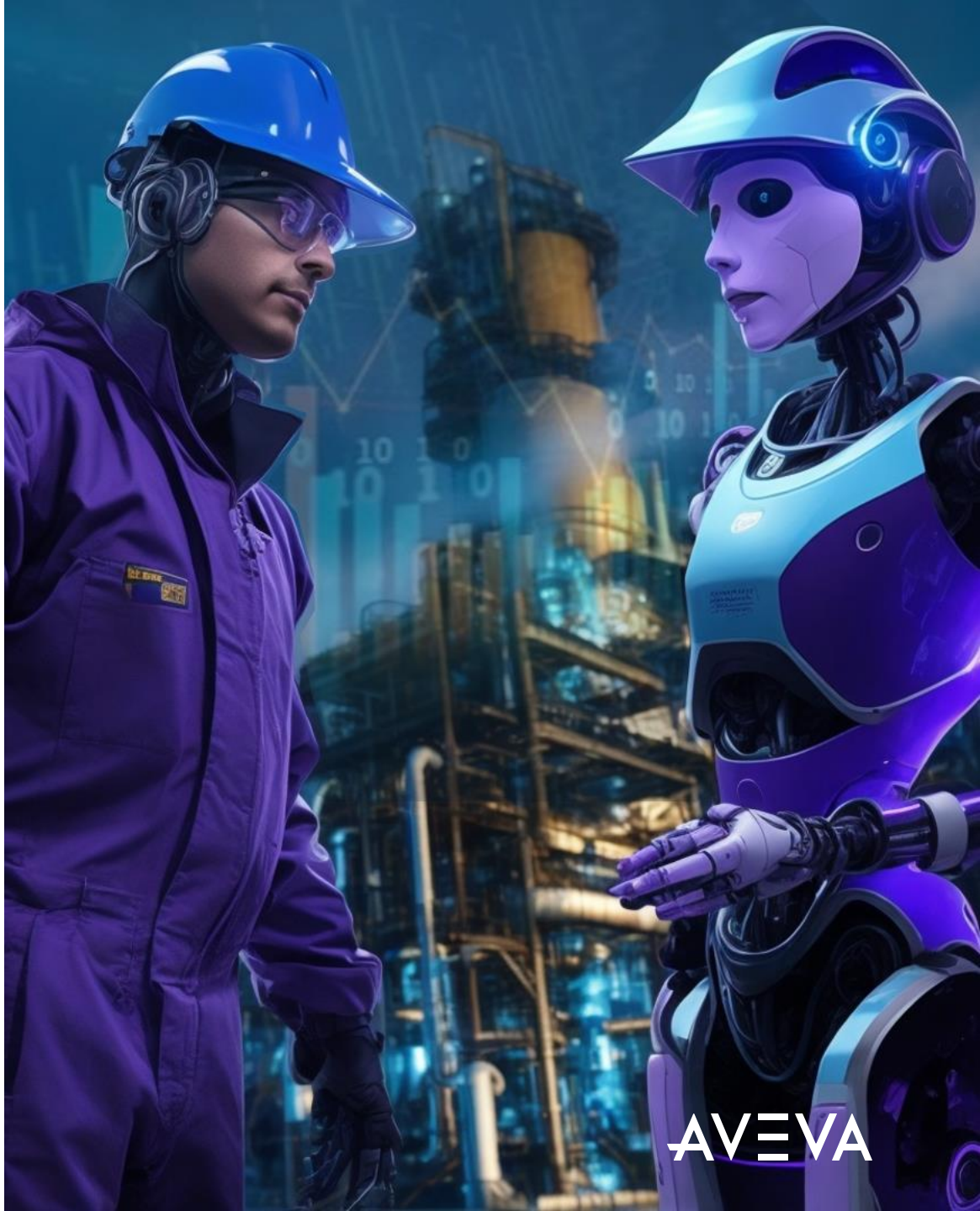
Dynamic simulation is used to train an **AI agent** to identify the optimal operation to complete a transient.

The AI tries different operations using parallel sessions of the model on the **cloud** to identify the one that can be completed in less time, with less alarms and with lower emissions.

The AI agent is finally deployed in the plant for **autonomous operation.**

This translates into **higher production**, **safer operations** and **lower environmental impact**.

Examples: Crude feed changeover, plant load change, start-up



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Chloe Smith

Director of Product Management, Simulation & Learning

- AVEVA
- chloe.smith@aveva.com

Andrea Macri

Sr. Product Manager Dynamic Simulation, OTS, Unified Learning

- AVEVA
- andrea.macri@aveva.com

Questions?

Please wait for the microphone.

State your name and company.

Please remember to…

Navigate to this session in the mobile app to complete the survey.

Thank you!

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ABOUT AVEVA

AVEVA is a world leader in industrial software, providing engineering and operational solutions across multiple industries, including oil and gas, chemical, pharmaceutical, power and utilities, marine, renewables, and food and beverage. Our agnostic and open architecture helps organizations design, build, operate, maintain and optimize the complete lifecycle of complex industrial assets, from production plants and offshore platforms to manufactured consumer goods.

Over 20,000 enterprises in over 100 countries rely on AVEVA to help them deliver life's essentials: safe and reliable energy, food, medicines, infrastructure and more. By connecting people with trusted information and AI-enriched insights, AVEVA enables teams to engineer efficiently and optimize operations, driving growth and sustainability.

Named as one of the world's most innovative companies, AVEVA supports customers with open solutions and the expertise of more than 6,400 employees, 5,000 partners and 5,700 certified developers. The company is headquartered in Cambridge, UK.

Learn more at www.aveva.com