AVEVA™ Simulation & Learning Sustainability

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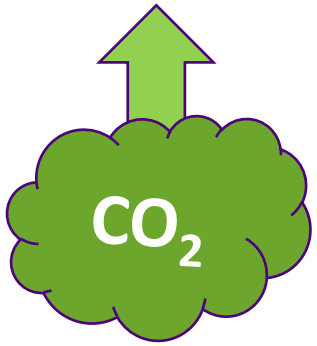
AVEVA™ Process Simulation

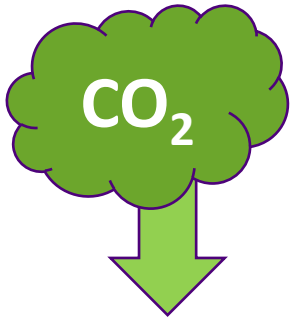
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Trends in Sustainability

AVEVA Process Simulation focused on Four Areas of Sustainability



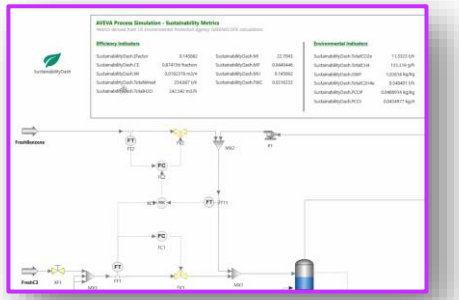






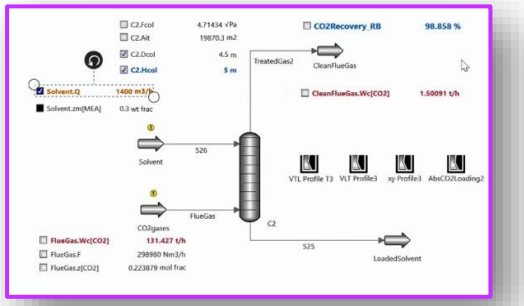
Greenhouse Gas Emissions

Use simulation to predict the amount of GHG emissions so that you can improve process design.



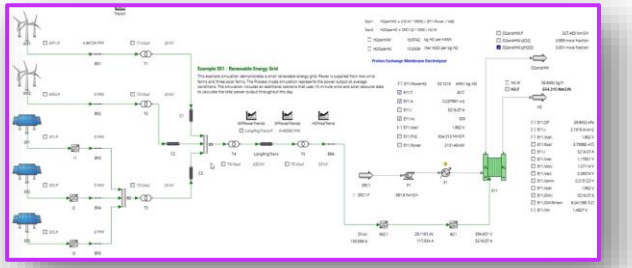
Carbon Capture

All process industries must reduce the amount of equivalent CO2 they release



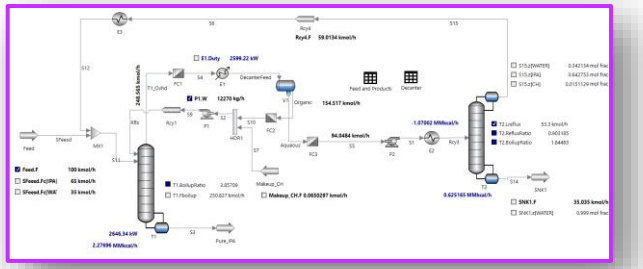
Energy Transition

Transition from “Oil & Gas” to “Energy” using renewable power and hydrogen



Circular Economy

Chemical companies must reinvent portfolio of products with sustainability in mind

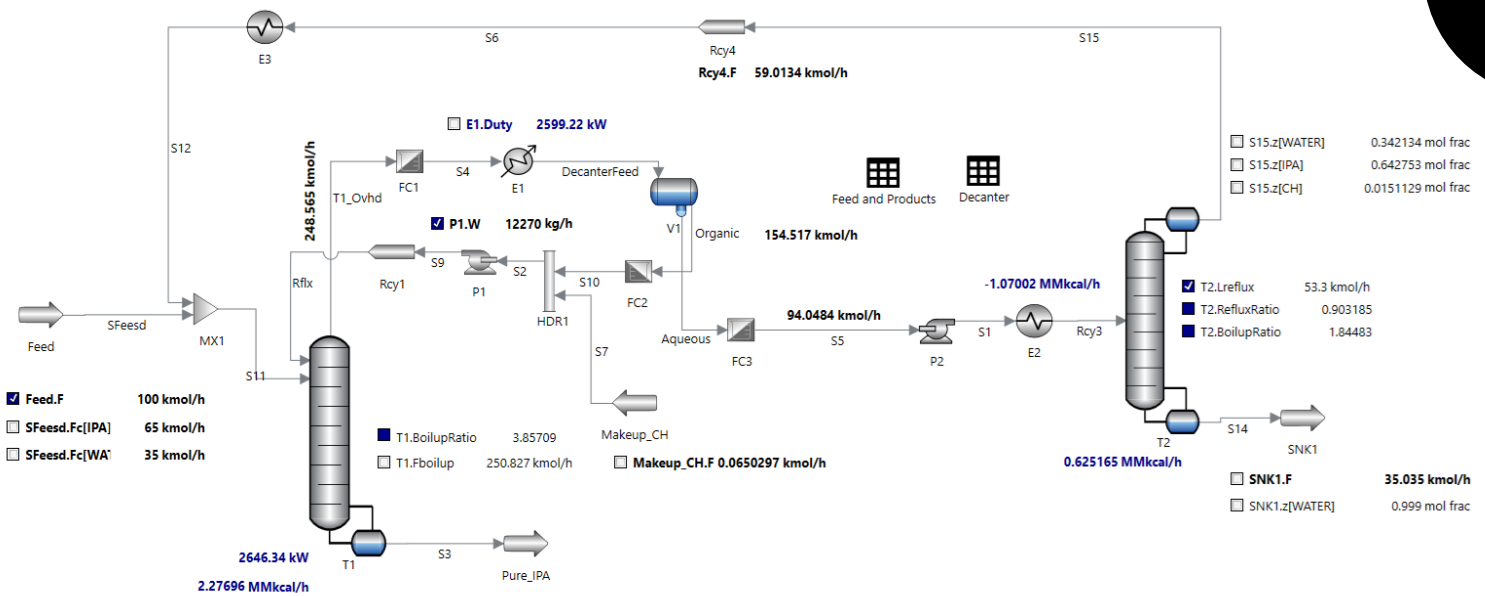


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Process Simulation Features for Sustainability

Greenhouse Gas Emissions in Economics Library



SustainabilityDash

AVEVA Process Simulation - Sustainability Metrics

Metrics derived from US Environmental Protection Agency GREENSCOPE calculations

Efficiency Indicators

SustainabilityDash.Efactor	0.145862	SustainabilityDash.MI	22.7043
SustainabilityDash.CE	0.874156 fraction	SustainabilityDash.MP	0.0440446
SustainabilityDash.WI	0.0192378 m3/¤	SustainabilityDash.MLI	0.145862
SustainabilityDash.TotalWmat	254.667 t/h	SustainabilityDash.FWC	0.0216233
SustainabilityDash.TotalH2O	242.542 m3/h		

Environmental Indicators

SustainabilityDash.TotalCO2e	11.5323 t/h
SustainabilityDash.TotalCH4	133.319 g/h
SustainabilityDash.GWP	1.02814 kg/kg
SustainabilityDash.TotalC2H4e	0.548401 t/h
SustainabilityDash.PCOP	0.0488914 kg/kg
SustainabilityDash.PCOI	0.0434977 kg/¤

Energy Indicator

SustainabilityDash.eta_e	0.0735659

Total CO2e — The Total CO2 equivalent emissions produced directly on 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

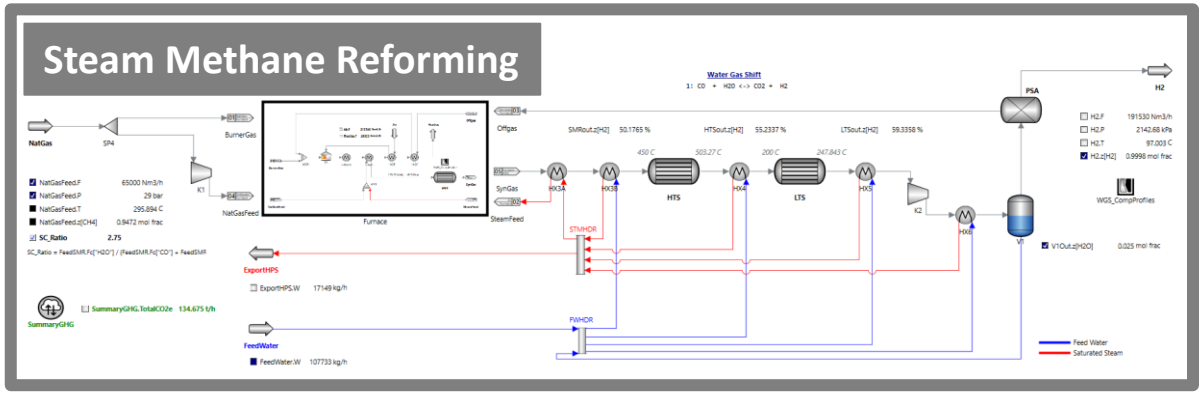
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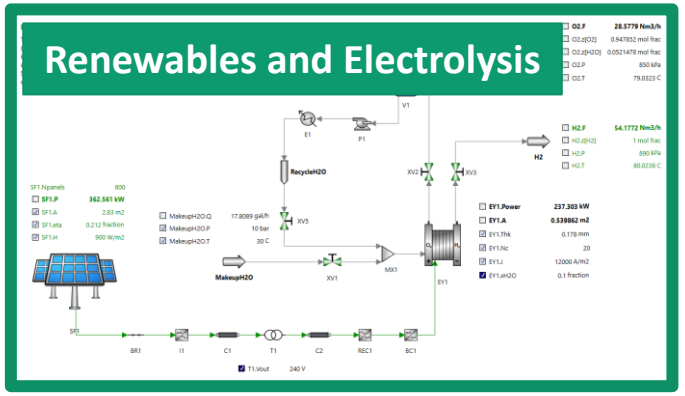
Hydrogen Value Chain

Model the entire hydrogen value chain from production to liquefaction

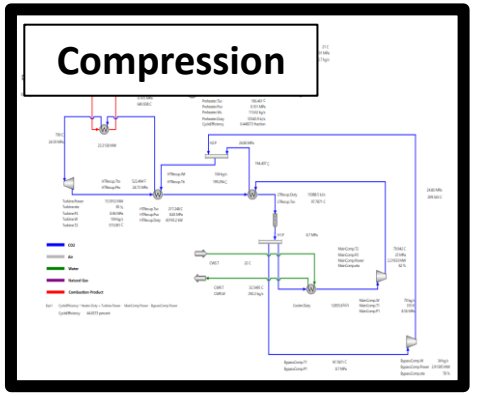
Steam Methane Reforming



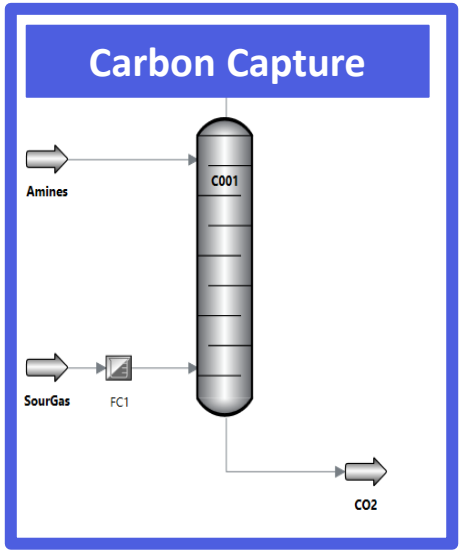
Renewables and Electrolysis



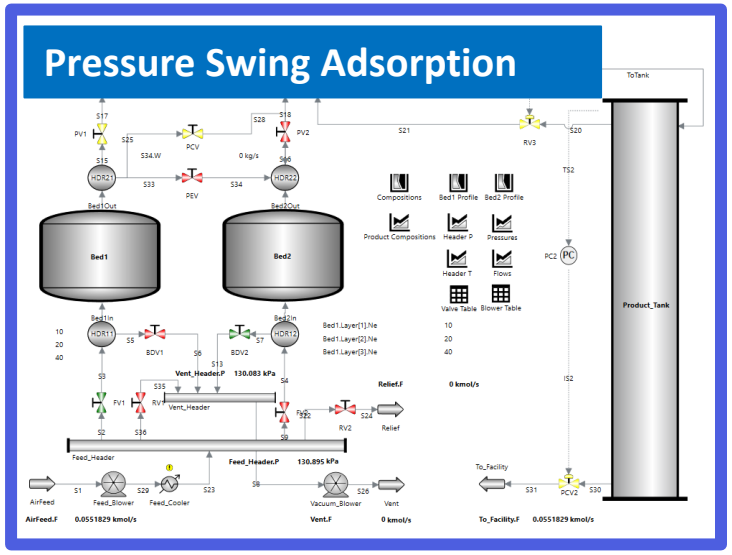
Compression



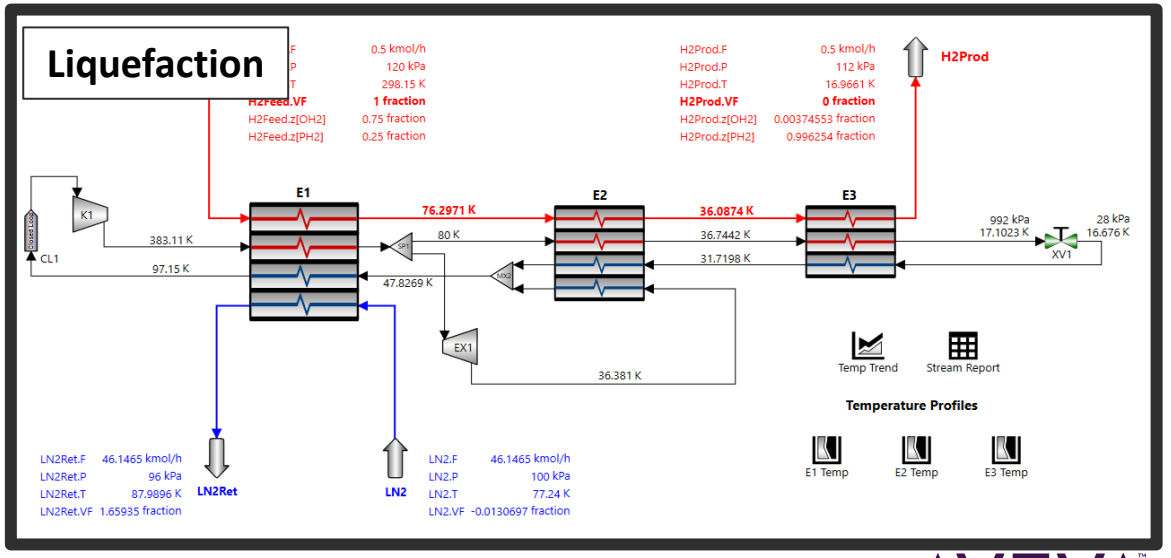
Carbon Capture



Pressure Swing Adsorption



Liquefaction



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AVEVA™ Process Simulation 2022.3 Features

Battery Model

Objectives/Background

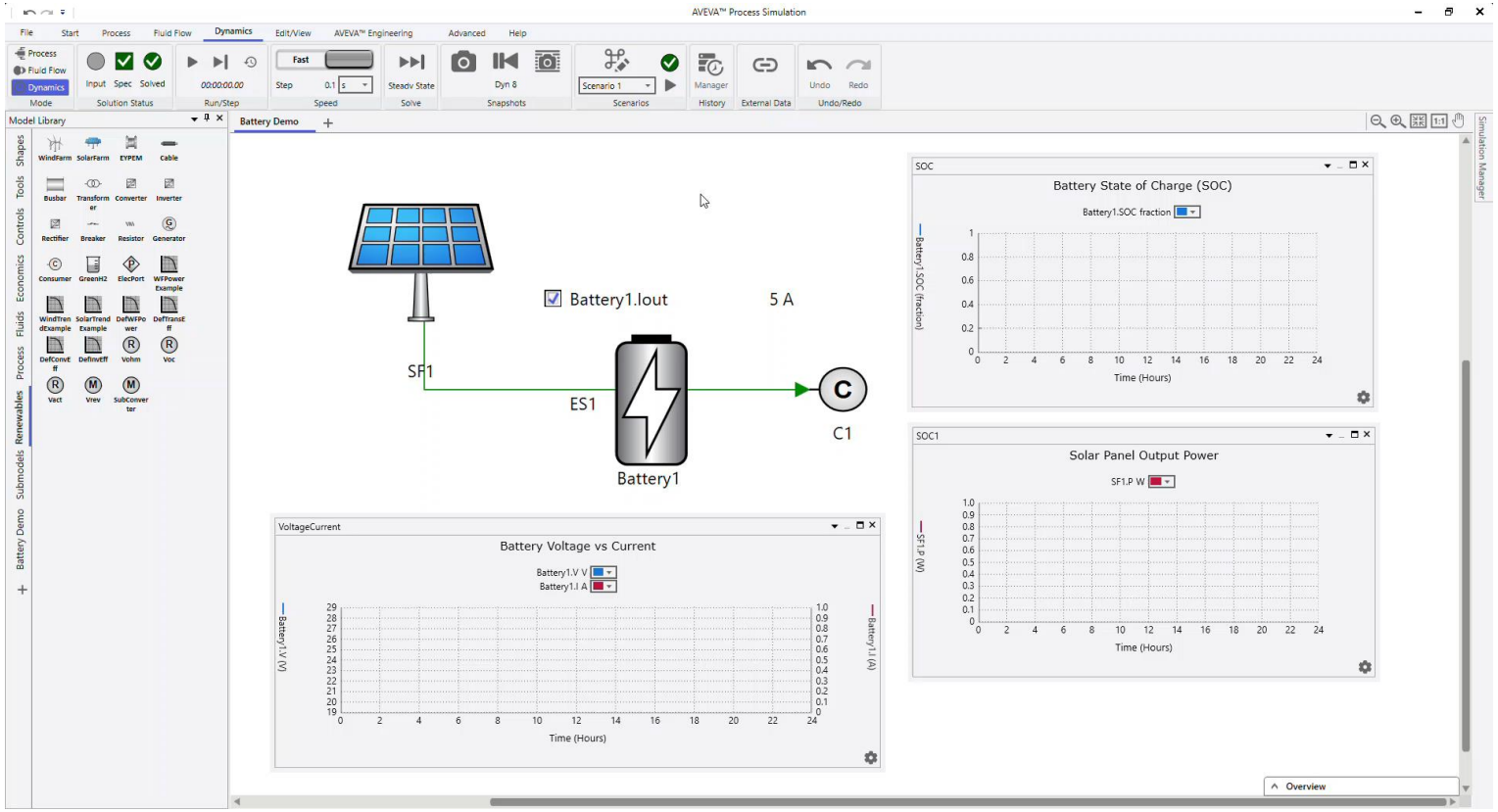
- Charge and discharge a battery during dynamics to provide a constant electrical current output while solar and wind power varies throughout the day.

Solution

- Battery Bank Model

Status/Delivery

- Version 2022.3



Play Video

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AVEVA™ Process Simulation Features for 2023

Prototype CO2 MEA Absorption Unit and Regeneration

Objectives/Background

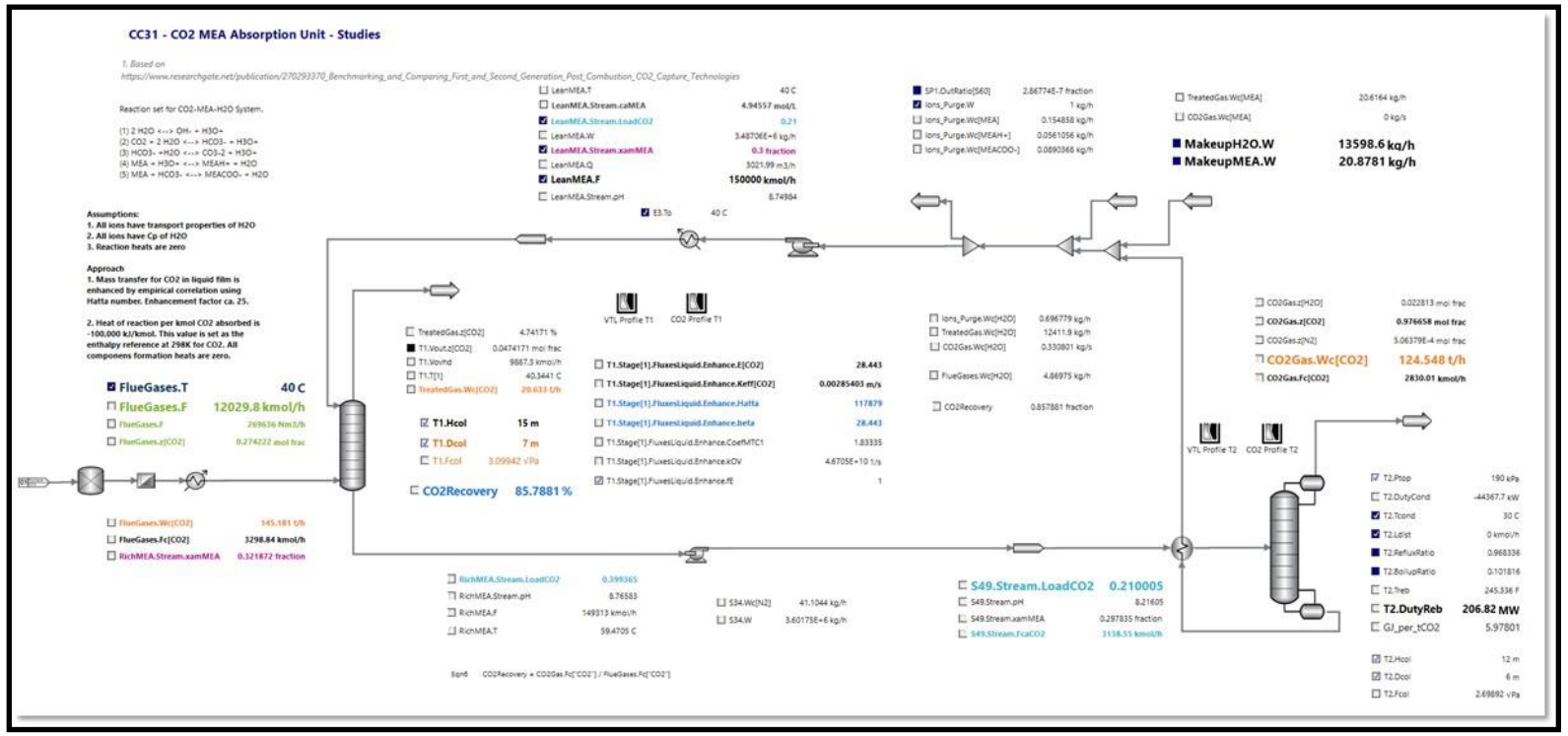
- Demonstrate a CO2 absorption process using MEA fluid and reactions, electrolyte NRTL, and Rate based distillation with enhancement factors.

Solution

- Validated with data from published Castor and Octavius FP7 projects
- Compares favorably with Aspen Plus Ratesep and Promax.

Delivery Plan

- To be delivered as an example in a future version
- Additional Amines to be added other than MEA



Example CC31 Prototype CO2 absorption with MEA

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Airbridge Australia

Scaling up of Airbridge’s patented technology for Carbon Capture and Utilisation from pilot plant to commercial project

Challenges

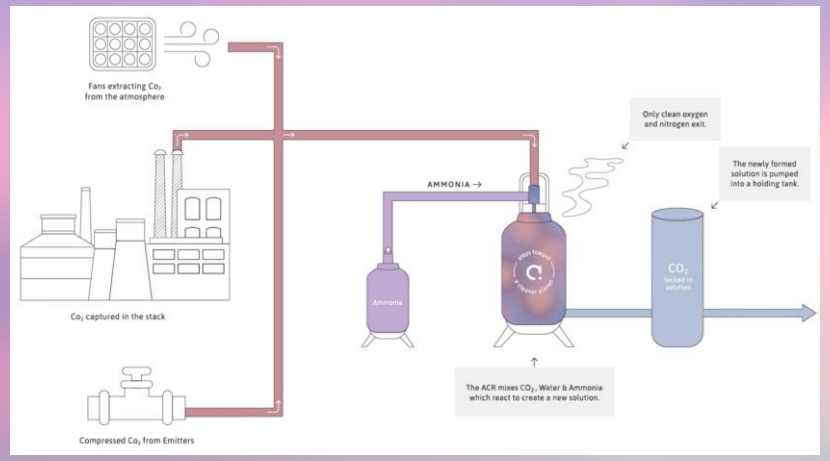
Airbridge’s patented technology and process safely capture CO_2 from a wide range of emitters and industries before it enters the atmosphere. CO_2 is then locked into a liquid form and can be easily transported and converted into highly valuable, highly profitable commercial products. The technology has been demonstrated at Airbridge’s pilot plant. The next phase of Airbridge’s journey presented a number of challenges, including collecting information to assist in producing a heat and material balance and accurately simulating the process to better understand how it could be scaled up from pilot to commercial size.

Results

Pilot plant operations can be monitored and analyzed from both on premises and from the cloud

The carbon capture process and chemical reactions have been modelled using a detailed electrolyte thermodynamic model using AVEVA Process Simulation. A simulation of the plant has been matched against actual laboratory analysis of samples taken during a 24-hour pilot plant run.

Detailed Modelling of the process enables Airbridge to run various scenario’s, including how the process can be scaled up. It also assists Airbridge in discussions with potential investors and industrial emitters interested in their technology.



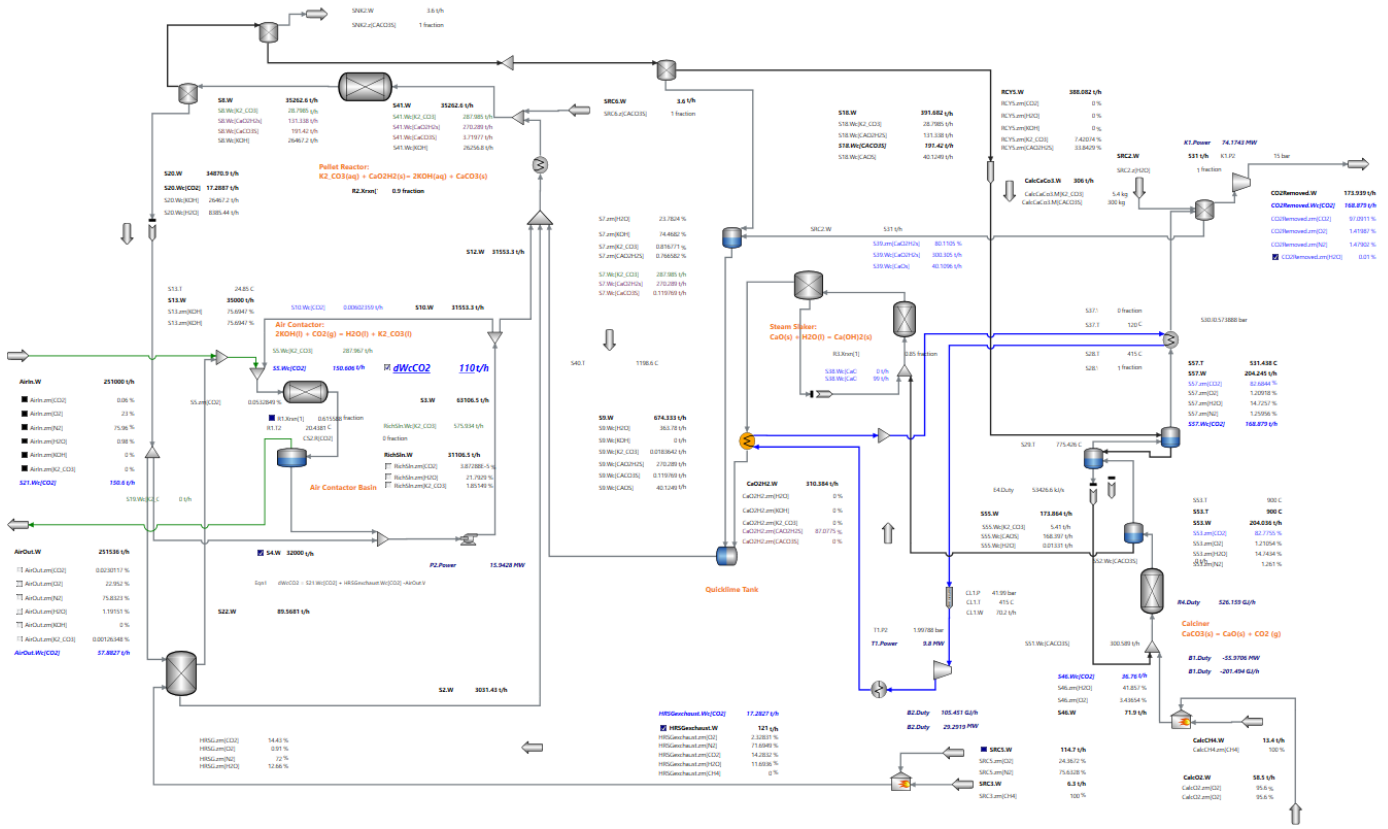


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Direct Air Capture

Calcium Looping Process to remove CO2 from the atmosphere



Typical direct air capture such as that modeled by Carbon Engineering using AVEVA Process Simulation

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AVEVA™ PRO/II Simulation

Sustainability

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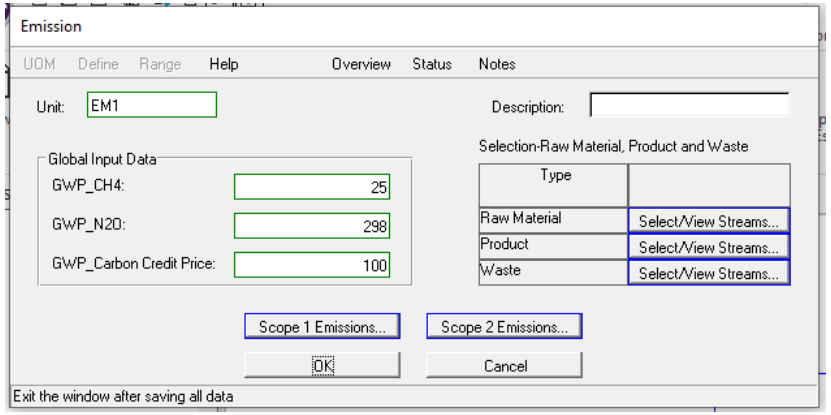
Sustainability in AVEVA PRO/II Simulation

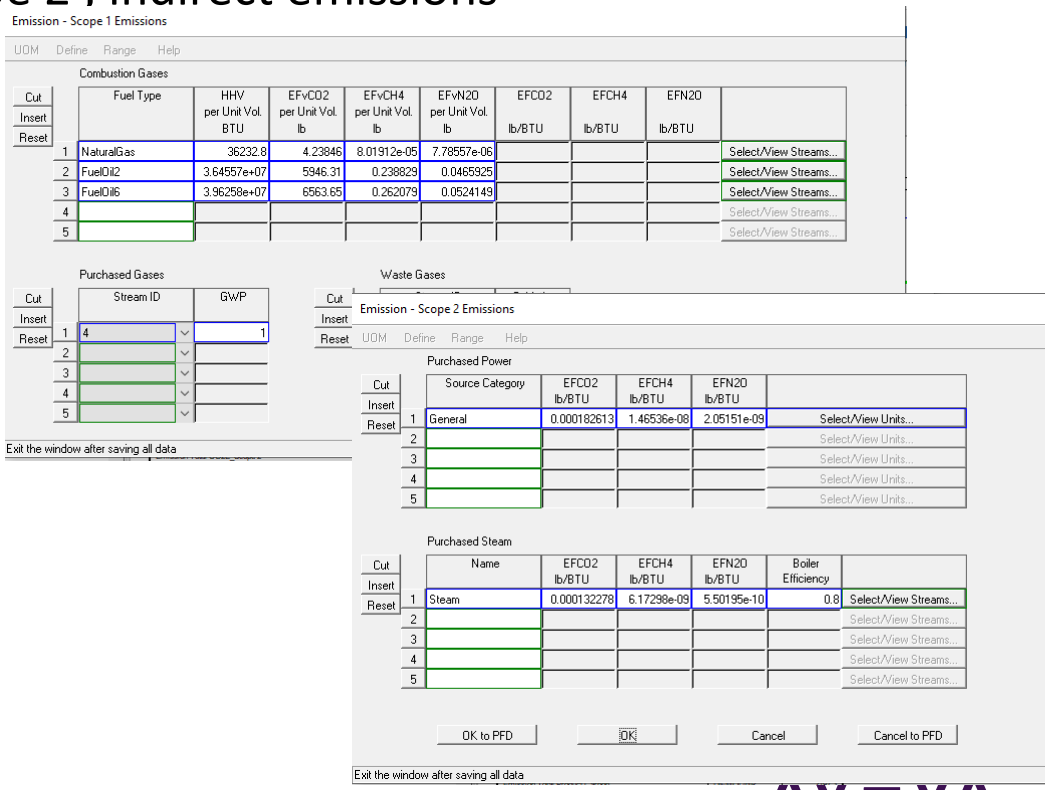
As part of Environment, Social and Governance (ESG) initiatives, PRO/II provides an option for users to track environment affecting green house gases or wastes from the current process

- New Emission unit operation
  - Reports both scope 1, direct process emissions and scope 2 . indirect emissions



Emission Name Emission Description		EM1
Emission Global Warming Potential(GWP)	LB/TON	3.7325e+02
Emission Environmental Factor		20.6
Emission Total CO2E	LB/HR	5.2210e+03
Emission Total CH4	LB/HR	3.3514e-02
Emission Carbon Efficiency	FRAC	0.7
Emission Total Combustion GHG	LB/HR	0.0000e+00
Emission Total Purchased Gas GHG	LB/HR	3.4175e+03
Emission Total Waste Gas GHG	LB/HR	1.3637e+03
Emission Total CO2E_Scope 1	LB/HR	4.8011e+03
Emission Total Purchased Steam GHG	LB/HR	0.0000e+00
Emission Total Purchased Power GHG	LB/HR	4.1988e+02
Emission Total CO2E_Scope 2	LB/HR	4.1988e+02
Emission Total Product	LB/HR	30838.3
Emission Total Waste	LB/HR	1494.7
Emission Total Raw Material Carbon	LB-MOL/HR	1497.7
Emission Total Product Carbon	LB-MOL/HR	2197.3
Emission Carbon Credit Cost per Year		2075975





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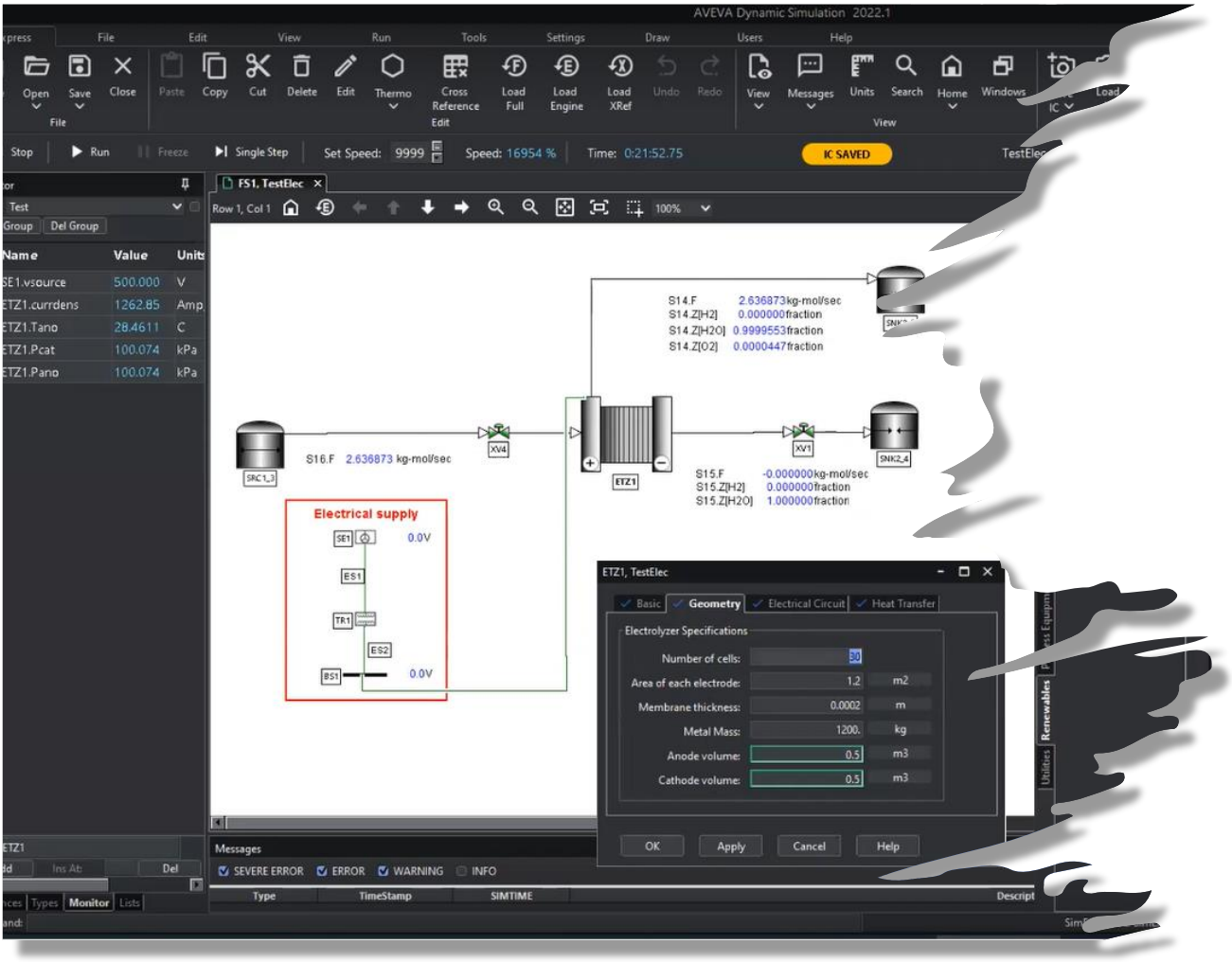
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AVEVA™ Dynamic Simulation / OTS / Learning

Sustainability

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New Renewable Library in AVEVA Dynamic Simulation



Electrolyzer is the first model object in the Renewable library of AVEVA Dynamic Simulation. It is suitable for OTS projects.

This model is based on Proton Exchange Membrane (PEM) water electrolysis where water is electrochemically split into Hydrogen and Oxygen at their respective electrodes.

It can represent one or multiple cells of the electrolyzer.

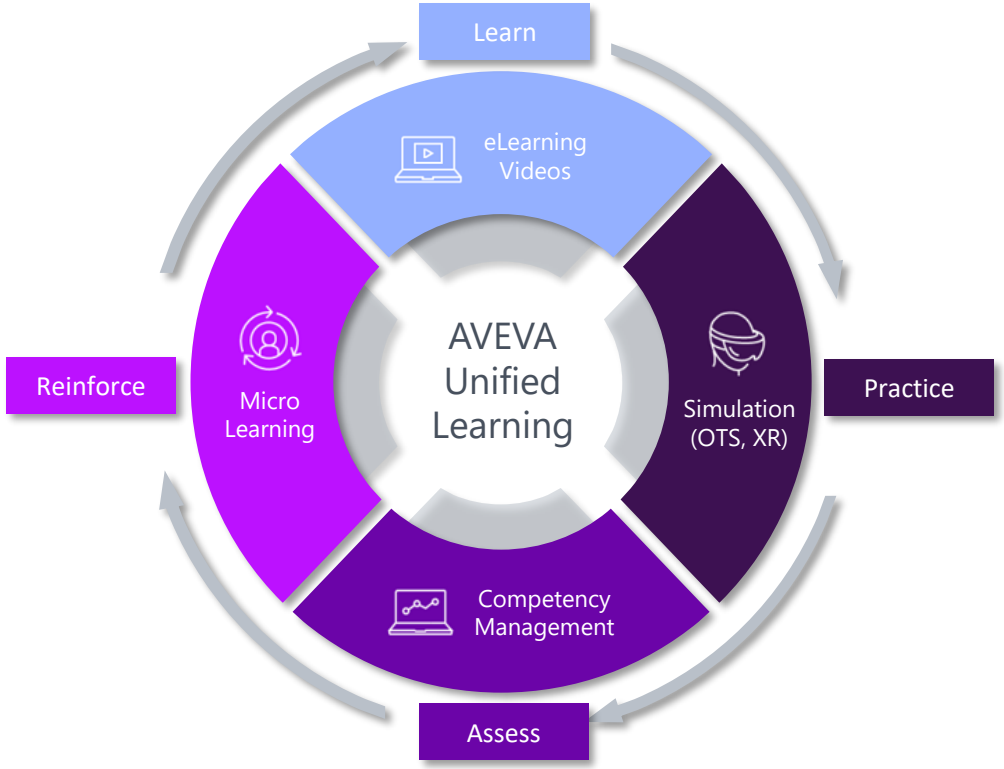
Alkaline and Solid Oxide electrolyzers will be released in 2023.

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Reduce travel requirements with cloud training

AVEVA Unified Learning is our award-winning, cloud-first, integrated and scalable platform for development, deployment and management of industrial learning programs

Take the operator training simulator and learning content to the trainees wherever they are





Operations Mastery Project
AVEVA for Shell



OLEUM: Cloud operator training during the pandemic
AVEVA for TotalEnergies

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Summary of Sustainabilty Presetnations at AWC

Sustainability

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Sustainability Related Presentations at AWC

Our customer sare using AVEVA Simulation Products for a sustainable future

- Esteco will present on ModeFrontier connected to AVEVA Process Simulation to find sustainable designs.
- ExxonMobil will present on overall power, steam, fuel gas, hydrogen, and greenhouse gas balances using AVEVA Process Simulation
- Airbridge will present on carbon capture using AVEVA Process Simulation
- Atkins will present on sustainable nuclear fusion using AVEVA Process Simulation
- Technip will present on renewables using AVEVA PRO/II Simulation



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ABOUT AVEVA

AVEVA is a global leader in engineering and industrial software driving digital transformation across the entire asset and operational life cycle of capital-intensive industries.

The company's engineering, planning and operations, asset performance, and monitoring and control solutions deliver proven results to over 16,000 customers across the globe. Its customers are supported by the largest industrial software ecosystem, including 4,200 partners and 5,700 certified developers. AVEVA is headquartered in Cambridge, UK, with over 4,400 employees at 80 locations in over 40 countries.

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