Sustainability in Action: Industry Insights and Curriculum Innovation for Carbon Capture

aspentech

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Today’s Presenters

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Aspen Technology, Inc.

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Aspen Technology, Inc.

Today's Discussion

AGENDA

1. About AspenTech

2. AspenTech Academic Program

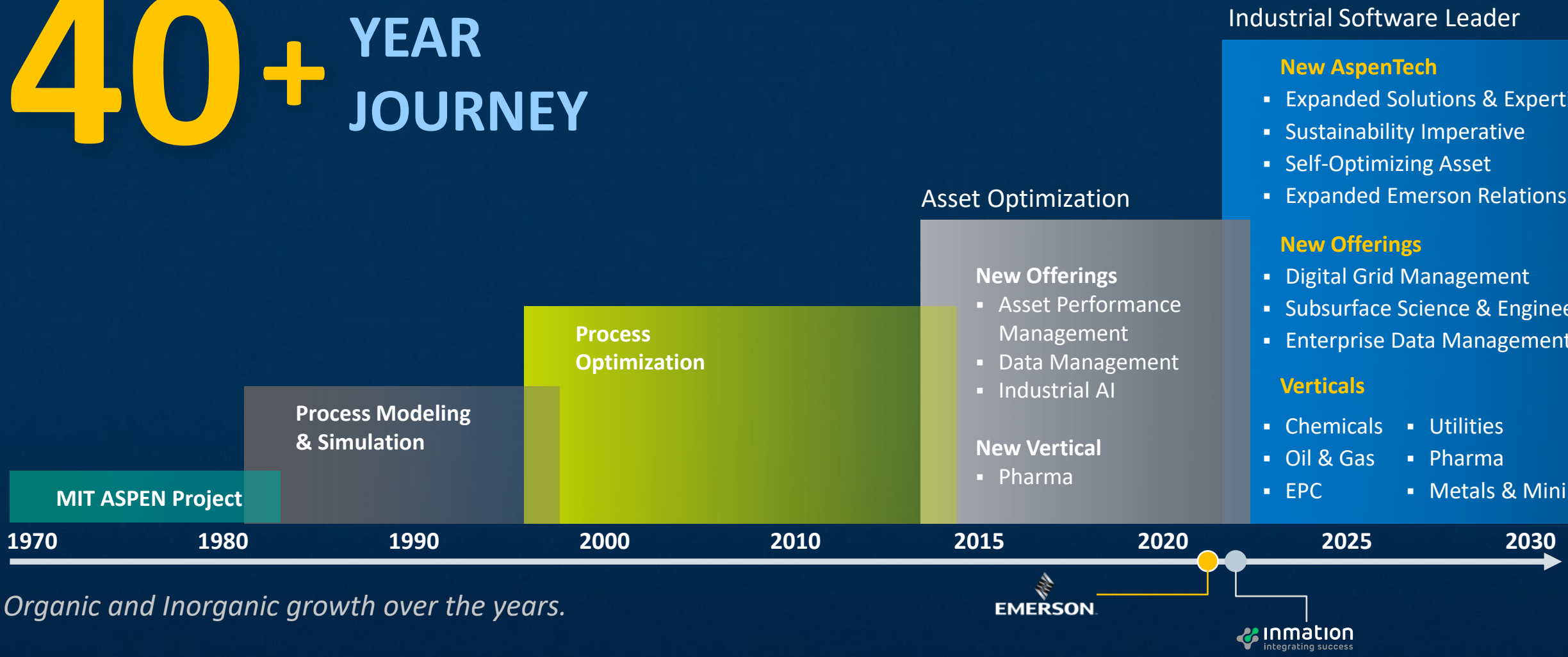
3. AspenTech Solutions for Carbon Capture
Industry Insights

4. New Carbon Capture Teaching Modules

5. AspenTech Sustainability Models Available

AspenTech – A History of Innovation

40+ YEAR JOURNEY



Organic and Inorganic growth over the years.

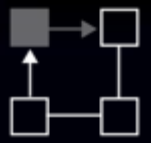
Asset Optimization — Extending the Lifecycle

DESIGN → **OPERATE** → **MAINTAIN**

Pushing the Boundaries of What's Possible

Running to the Limits of Performance

Driving Uptime Through Actionable Insights



Performance Engineering

Manufacturing & Supply Chain

Asset Performance Management

Subsurface Science & Engineering

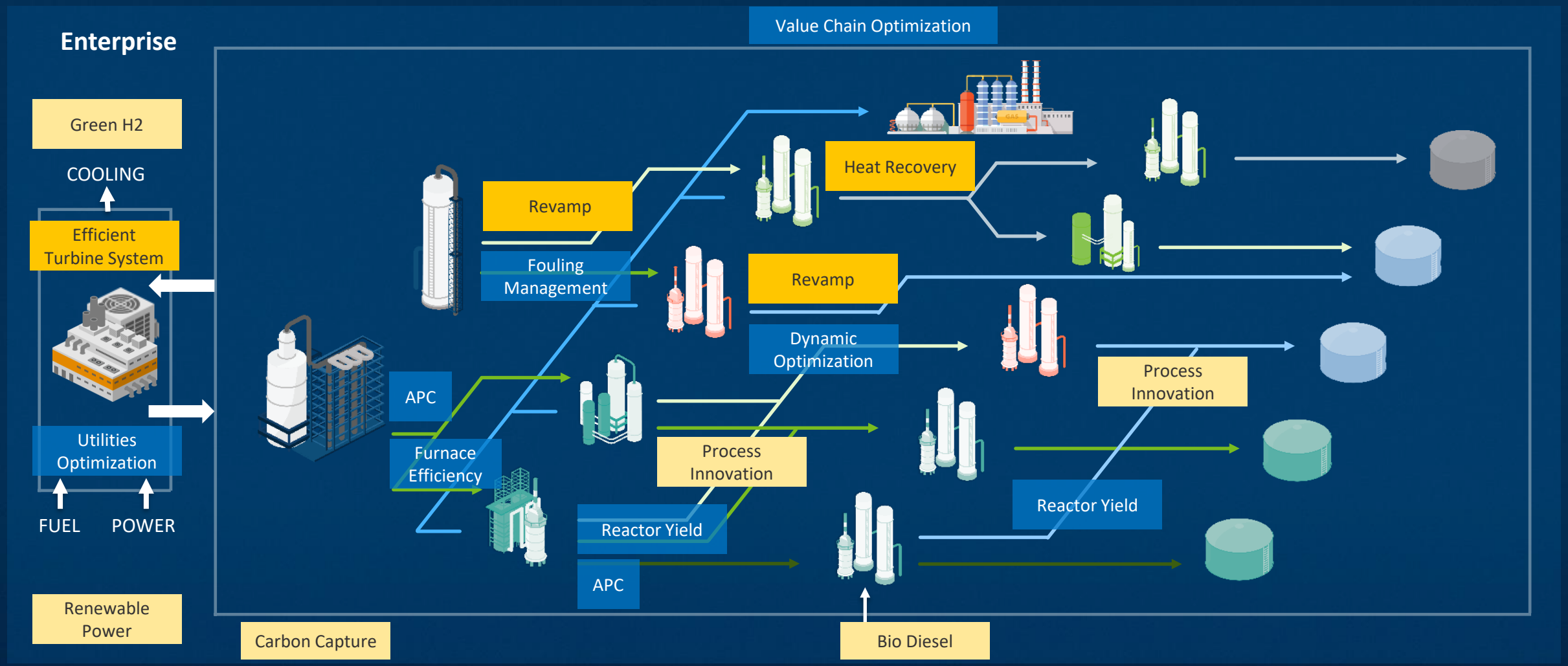
Digital Grid Management

Industrial Data Management

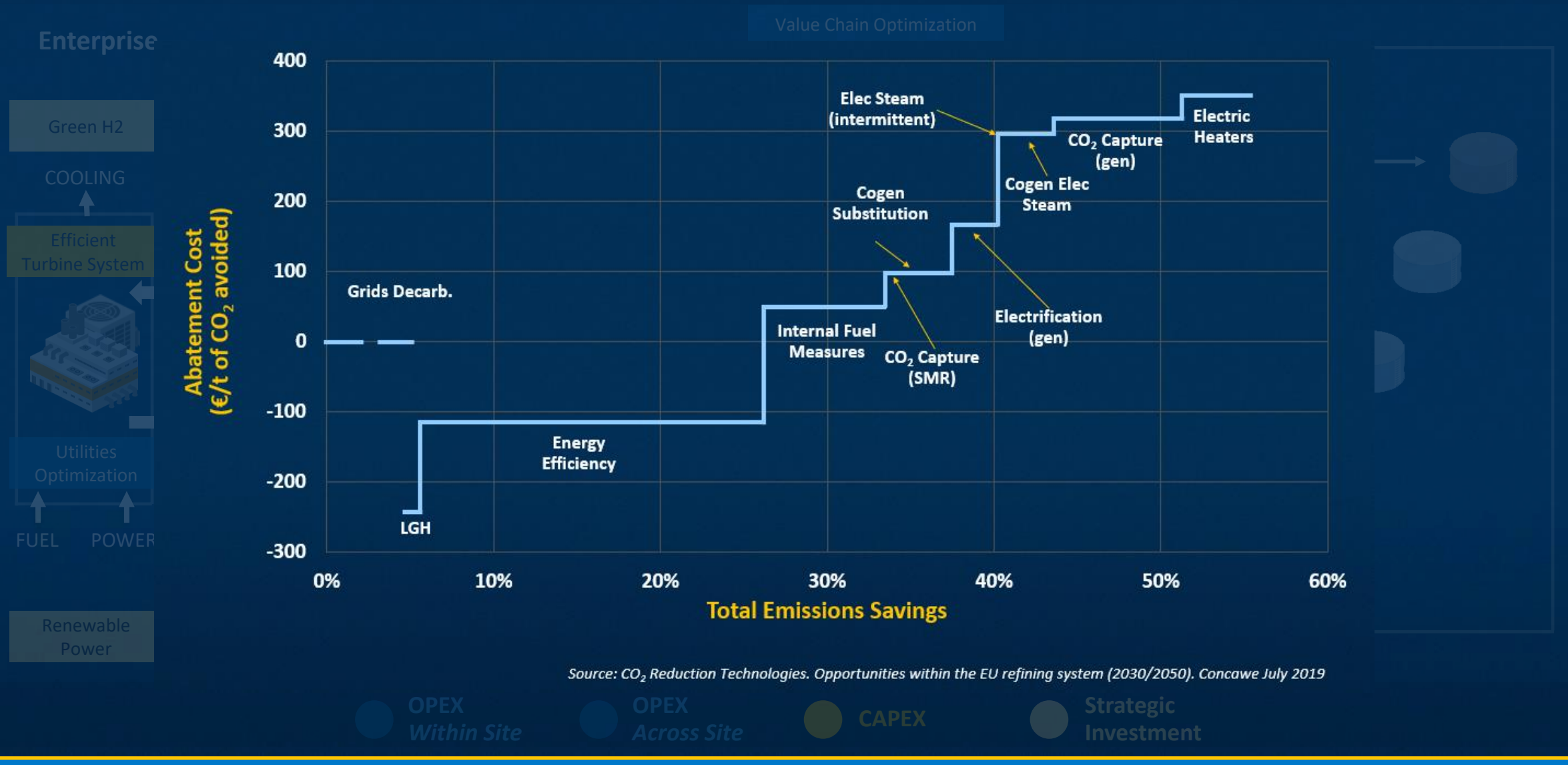
AspenTech Mission

Accelerate the digital transformation of the industries we serve by optimizing their assets to run safer, greener, longer and faster

Optimizing for Sustainability, Profitability and Resilience



Optimizing for Sustainability, Profitability and Resilience



Source: CO_2 Reduction Technologies. Opportunities within the EU refining system (2030/2050). Concawe July 2019

Sustainability Pathways to Address the Dual Challenge

TODAY

Energy Efficiency

Emissions Management

Electrification

Water Conservation

Waste Reduction

TOMORROW

Bio based Feedstocks

Hydrogen Economy

Renewable Energy

Carbon Capture & Storage

Plastics Circularity

New Materials

CO_2 as Feedstock

Value Delivered by Digitalization

Optimizing for Sustainability and Profitability

Process Ecology

Reduce fugitive emissions 10-50%

OGE

Next generation grid & advanced cybersecurity

Chevron

Ensure pressure relief safety & save $30M CAPEX

YPF

Understand geology to optimize exploration

CTBE

2nd generation biofuels

GSK

Reduce lifecycle maintenance costs 50%

Saint John Energy 100 Years

Reduce emissions 50%

Air Products

Blue & green hydrogen

CO2 Technology Centre Mongstad

Accelerate innovation in carbon capture

Iberdrola

Improve grid reliability, distributed generation, cyber-security

أرامكو السعودية saudi aramco

Saved $550M optimizing upstream assets

ADNOC

Monitor gas field CO_2 emissions & reduce water use 5%

Braskem

Reduce energy 20% for ethylene process

Bharat Petroleum

Refinery-wide emissions monitoring

Saras

Wind turbine reliability & uptime

ग्रिड-इंडिया GRID-INDIA

Improve resiliency, cyber-security of 425 GW grid

Aditya Birla Hindalco

Protect 40 assets: e.g., smelter, power plant

S-OIL

Reduce CO_2 emissions and save $39M in energy use

Doosan

Accelerate innovation for fuel cells

AP

Reduce CO_2 and plastic waste in value chain

LG Chem

Save 15% energy use in world-scale ethylene plant

Glencore

1.35% increase in metal recovery

AspenTech Academic Program

Overview

AspenTech Academic Program

Creating future generation of engineers that are industry ready

Mission

Equip universities to prepare their graduates for industry careers with skills and knowledge in industrial leading digital technology

Access to 50+ AspenTech applications

1000+ Universities

130K+ active students

Academic License Software Portfolio

Performance Engineering

- Aspen HYSYS®
- Aspen Plus®
- Aspen Capital Cost Estimator™
- Aspen Basic Engineering™

Manufacturing & Supply Chain

- Aspen PIMS™
- Aspen DMC3™
- Aspen PIMS-AO™

Asset Performance Management

- Aspen Fidelis™
- Aspen ProMV®
- Aspen Unscrambler™

Resources Available to Academia

Teaching Modules

60+ modules available for Aspen HYSYS, Aspen Plus and Advance Process Control

AspenTech University

Access to content and offerings, including discounted training for faculty

Knowledge Base Solutions

Over 30K+ solutions available

Includes Tech Tips, Best Practices and How to use products videos, Tutorials

Resource Center

Blogs, White papers, Case Studies, Webinars (live & on-demand), self-guided demos and more

AspenTech Solutions

Carbon Capture Utilization & Storage

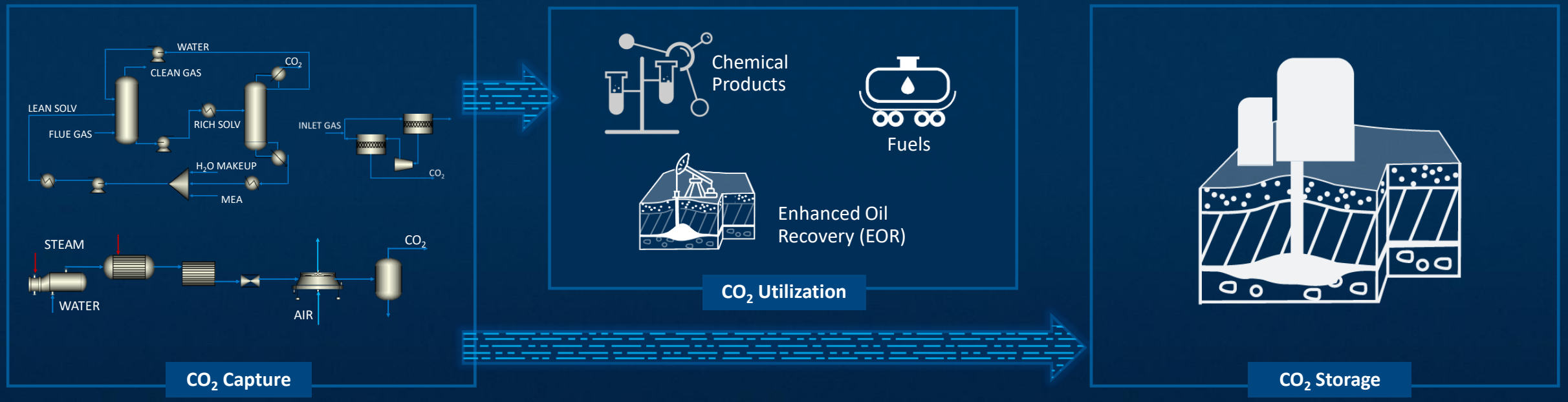
Carbon Capture Utilization & Storage (CCUS)

Challenges

- Unfavorable economics & unproven scalability
- Dispersed assets & operations across value chain
- Limited commercial options to use CO_2
- Uncertainty & risks around storage

Benefits of Digital Solutions

- Identify options to reduce project lifecycle cost
- Make informed decisions and justify investment
- Accelerate innovation & improve processes for CO_2 utilization
- Ensure confidence in low-risk, long-term storage

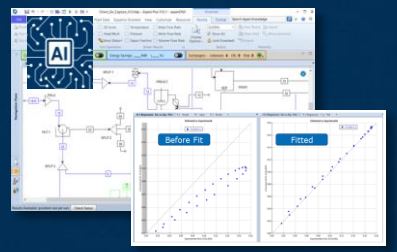


AspenTech Sustainability Pathway: CCS/CCUS

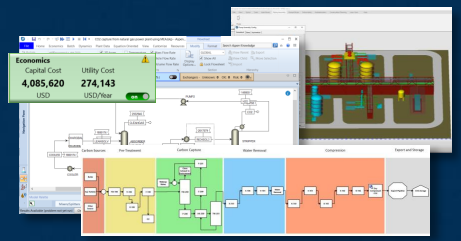
Development & Project Execution

Optimization & Monitoring

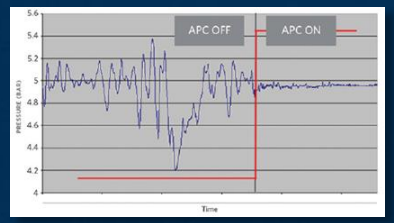
Research & Develop New Processes



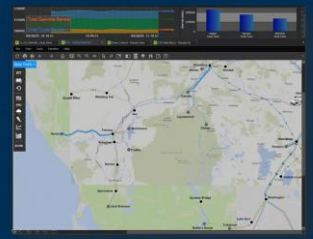
Scale-up & Execute Projects



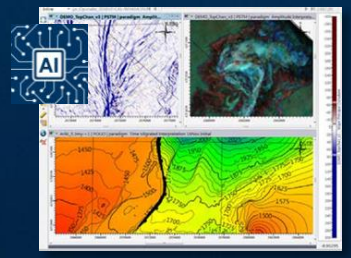
Optimize CO_2 Capture & Utilization



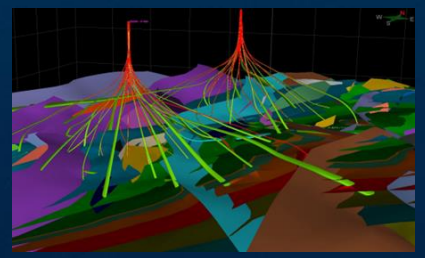
Optimize CO_2 Transport to Storage



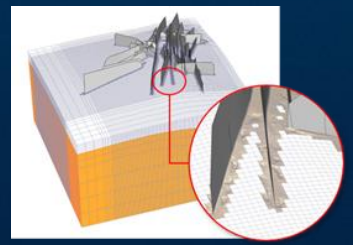
Characterize Geological Storage



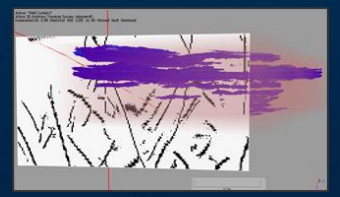
Design Storage & Injection



Optimize Storage Operations



Ensure Proper Storage & Site Closure



Accelerate Innovation
Carbon Capture & Storage

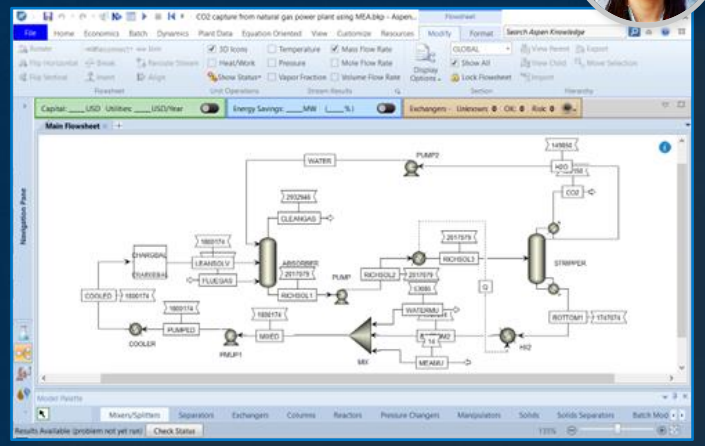
Minimize risks, improve economics and reduce time to value

- ***Evaluate feasibility of carbon capture processes***
  Rigorous modeling w/integrated equipment design & cost analysis
- ***Quickly scale and execute projects***
  Concurrent engineering workflows, risk analysis, cost estimation
- ***Select storage candidates and support permitting***
  Subsurface analytical, modeling and simulation

Carbon Capture Demo

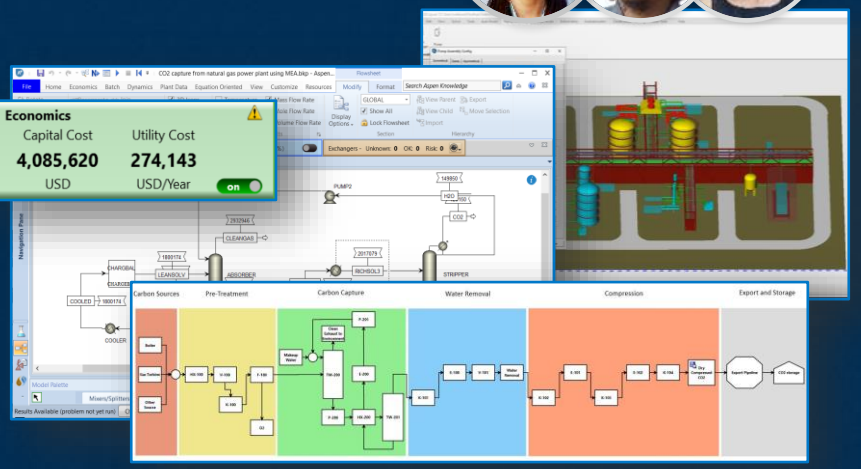
AspenTech Performance Engineering

Process Engineer



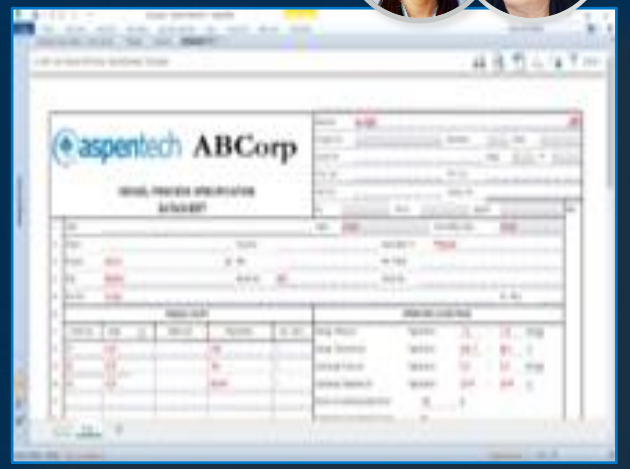
Technoeconomic analysis of carbon capture process

Process & pipeline engineers, estimators



Risk & reliability analysis, detailed cost estimation & layout optimization

Process & Project Engineers

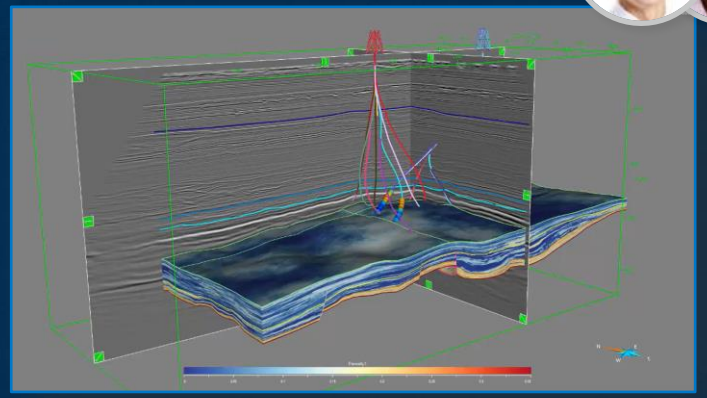


Standardization of project deliverables

Carbon Sequestration

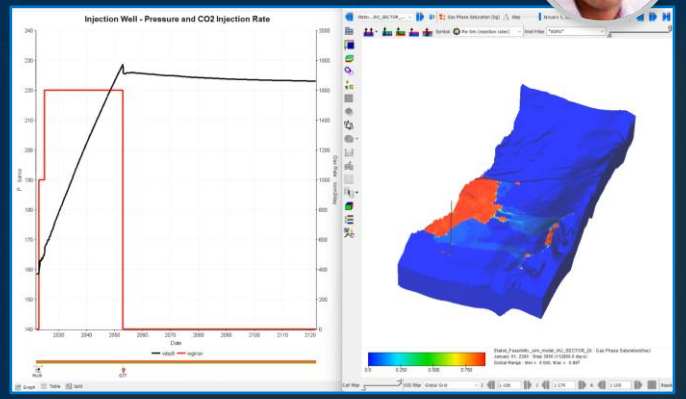
AspenTech Subsurface Science & Engineering

Geophysicists, Petrophysicists, Geologists & Reservoir engineers



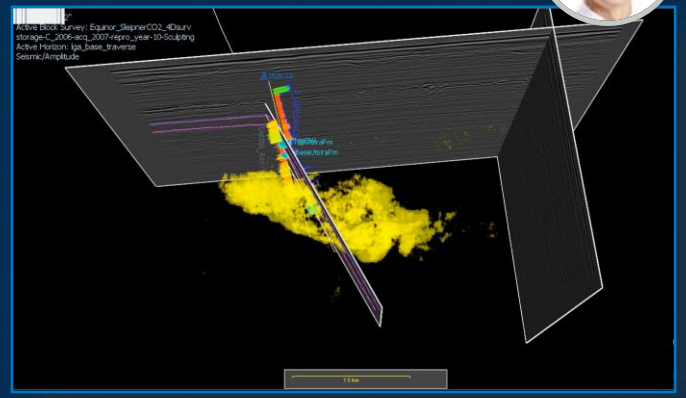
Site characterization, screening and storage development planning

Reservoir engineer



Injection optimization across design & operations

Geophysicist



Analysis of seismic surveys to accurately track CO_2 migration

TECHNOLOGY CENTRE MONGSTAD

Performance & economic predictions with **>98% accuracy**

Carbon Engineering

Optimized design & economics of 1Mt/y DAC process for carbon capture

BASF
We create chemistry

Utilized waste CO_2 with **new methanol process technology**

أرامكو السعودية
saudi aramco

Evaluate feasibility of **CCUS technologies** using ArKaTAC3

KINDER MORGAN INC.

Optimize production & CO_2 storage through EOR with geological & reservoir model

NFR studies

Seismic interpretation & **reservoir modeling to validate CO_2 storage**

Carbon Capture Utilization & Storage Successes

Viewer Poll

Do your degree programs currently include sustainability electives or modules?

a) Yes

b) No, but will consider in the future

c) No plans to include

New Carbon Capture Teaching Modules

Knowledge base solutions

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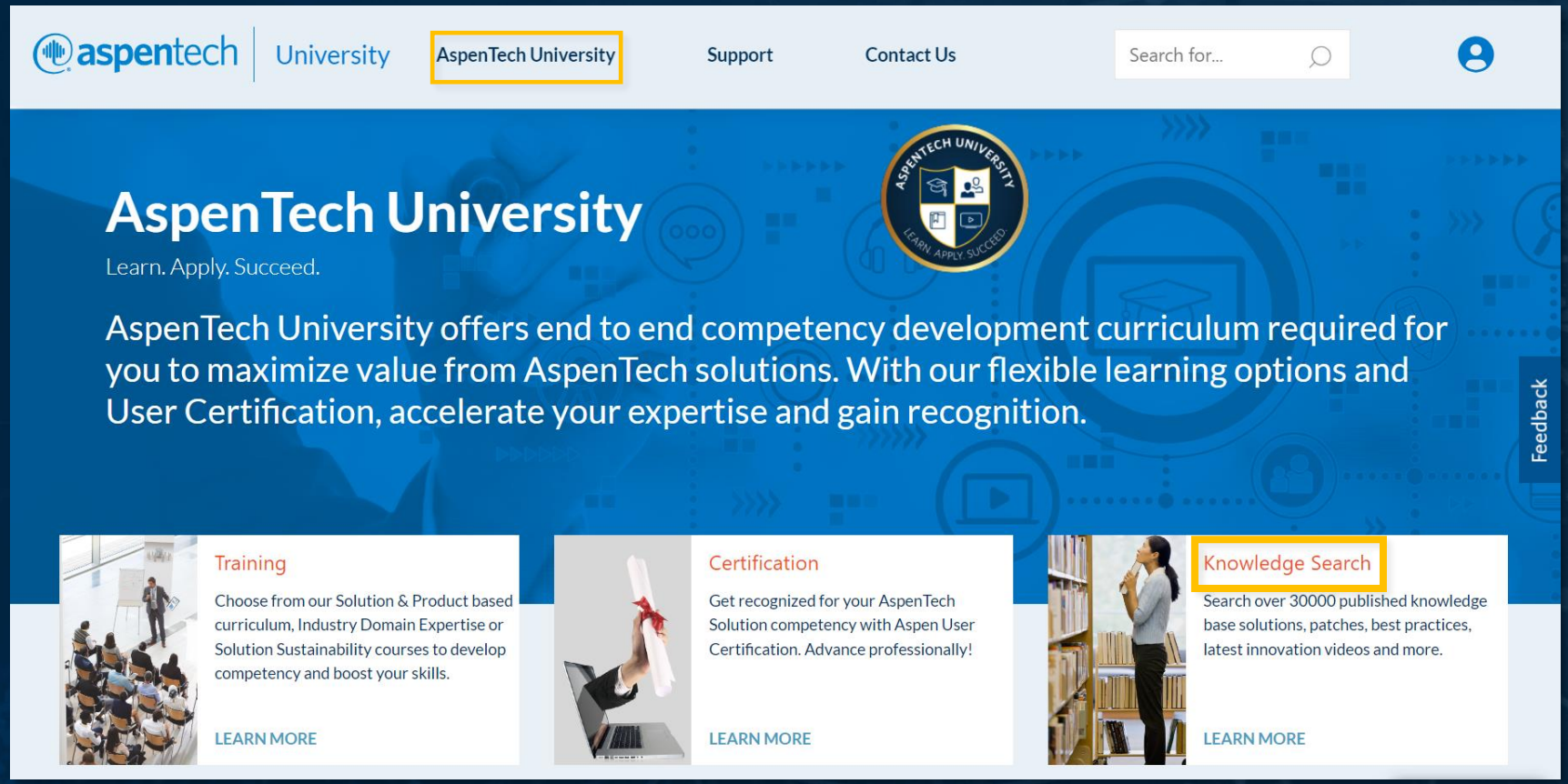
Integrating Carbon Capture Modules into the Curriculum

Knowledge Base Solutions

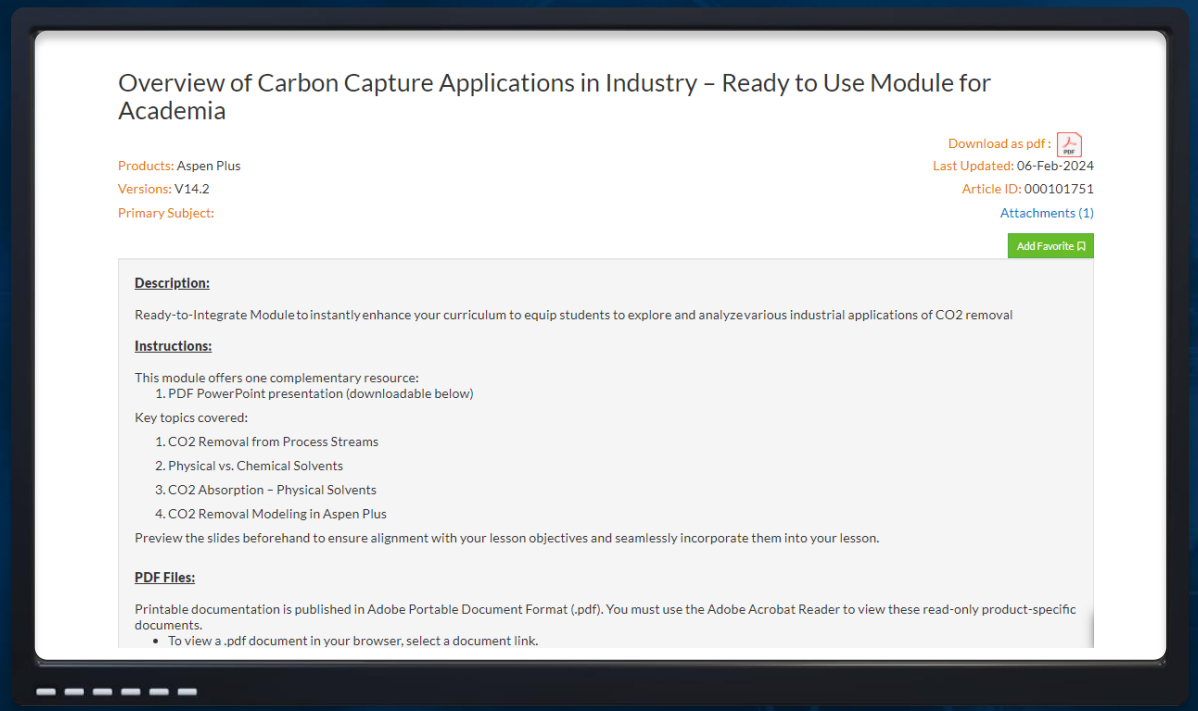
Over 30K+ solutions available Including:

Tech Tips, Best Practices and How to use products videos, Tutorials



Available Modules for Academia

Overview of Carbon Capture Applications in Industry



Overview of Carbon Capture Applications in Industry – Ready to Use Module for Academia

Products: Aspen Plus
Versions: V14.2
Primary Subject:

Download as pdf :
Last Updated: 06-Feb-2024
Article ID: 000101751
Attachments (1)

Add Favorite

Description:

Ready-to-Integrate Module to instantly enhance your curriculum to equip students to explore and analyze various industrial applications of CO2 removal

Instructions:

This module offers one complementary resource:
1. PDF PowerPoint presentation (downloadable below)

Key topics covered:

1. CO2 Removal from Process Streams
2. Physical vs. Chemical Solvents
3. CO2 Absorption – Physical Solvents
4. CO2 Removal Modeling in Aspen Plus

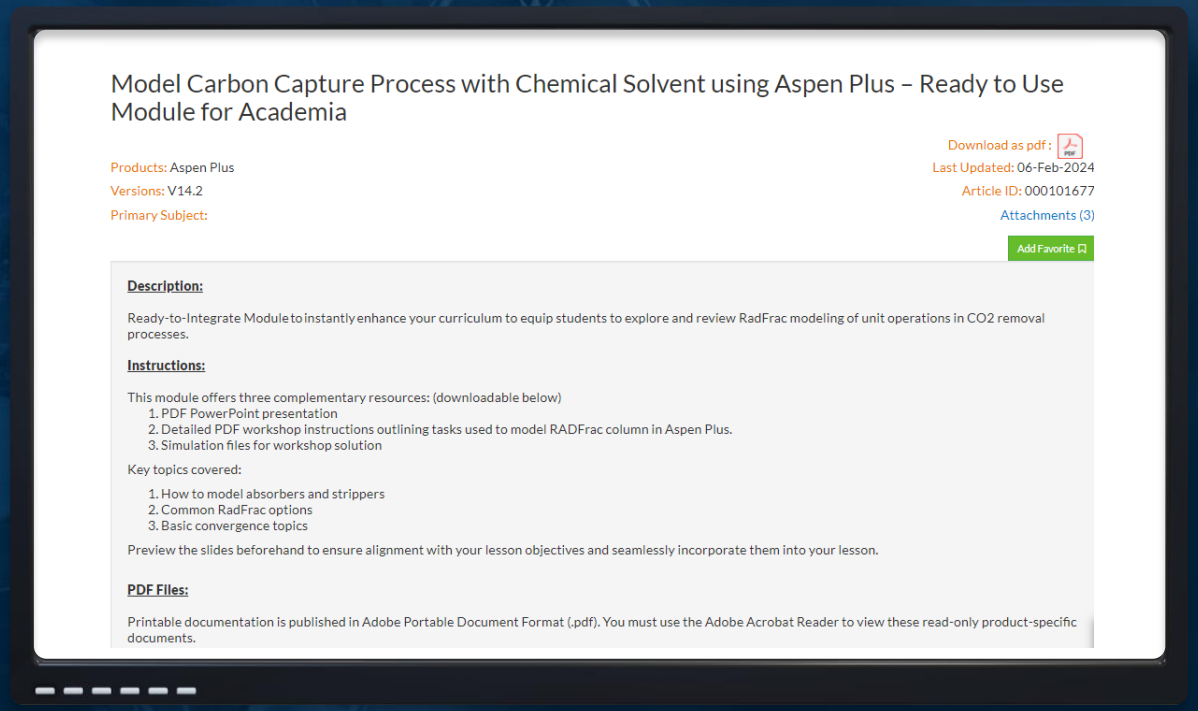
Preview the slides beforehand to ensure alignment with your lesson objectives and seamlessly incorporate them into your lesson.

PDF Files:

Printable documentation is published in Adobe Portable Document Format (.pdf). You must use the Adobe Acrobat Reader to view these read-only product-specific documents.

- To view a .pdf document in your browser, select a document link.

Model Carbon Capture Process with Chemical Solvent using Aspen Plus



Model Carbon Capture Process with Chemical Solvent using Aspen Plus – Ready to Use Module for Academia

Products: Aspen Plus
Versions: V14.2
Primary Subject:

Download as pdf :
Last Updated: 06-Feb-2024
Article ID: 000101677
Attachments (3)

Add Favorite

Description:

Ready-to-Integrate Module to instantly enhance your curriculum to equip students to explore and review RadFrac modeling of unit operations in CO2 removal processes.

Instructions:

This module offers three complementary resources: (downloadable below)
1. PDF PowerPoint presentation
2. Detailed PDF workshop instructions outlining tasks used to model RADFrac column in Aspen Plus.
3. Simulation files for workshop solution

Key topics covered:

1. How to model absorbers and strippers
2. Common RadFrac options
3. Basic convergence topics

Preview the slides beforehand to ensure alignment with your lesson objectives and seamlessly incorporate them into your lesson.

PDF Files:

Printable documentation is published in Adobe Portable Document Format (.pdf). You must use the Adobe Acrobat Reader to view these read-only product-specific documents.

AspenTech Sustainability Models

Now Available to Academia

aspentech

Integrating Carbon Capture models into the curriculum.

Industry scale simulation models for various carbon capture technology

- Amine based chemical solvents / physical solvents for flue gas from various sources
- Direct air capture using aqueous potassium hydroxide solution
- Low temperature carbon capture from nature gas
- Carbon capture via Benfield process (potassium carbonate)
- Carbon capture using membranes
- Membrane-based direct air capture
- Best practices for building a thermodynamic model for carbon capture
- Dehydration, compression and catalytic oxidation of CO2 for transportation
- Strategic decision planning for carbon capture

DEMO

Questions & Answers

Viewer Poll

Which webinar topic would you be interested in attending?

a) Energy efficiency

b) Emissions management

c) Hydrogen economy

d) Bio based feedstocks

e) Other

Next Steps: Access to Relevant Resources

Get started with key resources

Teaching Module: Overview of Carbon Capture Applications in Industry

Teaching Module: Model Carbon Capture Process with Chemical Solvents using Aspen Plus

Sustainability Models: Carbon Capture Model Examples

Learn more about AspenTech Academic Program

Visit our website: AspenTech Academic Program

AspenTech Academic Order: Form to submit your new order or renewal

Questions: If you have any questions email Cecilia.singh@aspentech.com


Thank You!
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