Integrating a proprietary simulation tool into a commercial process simulator

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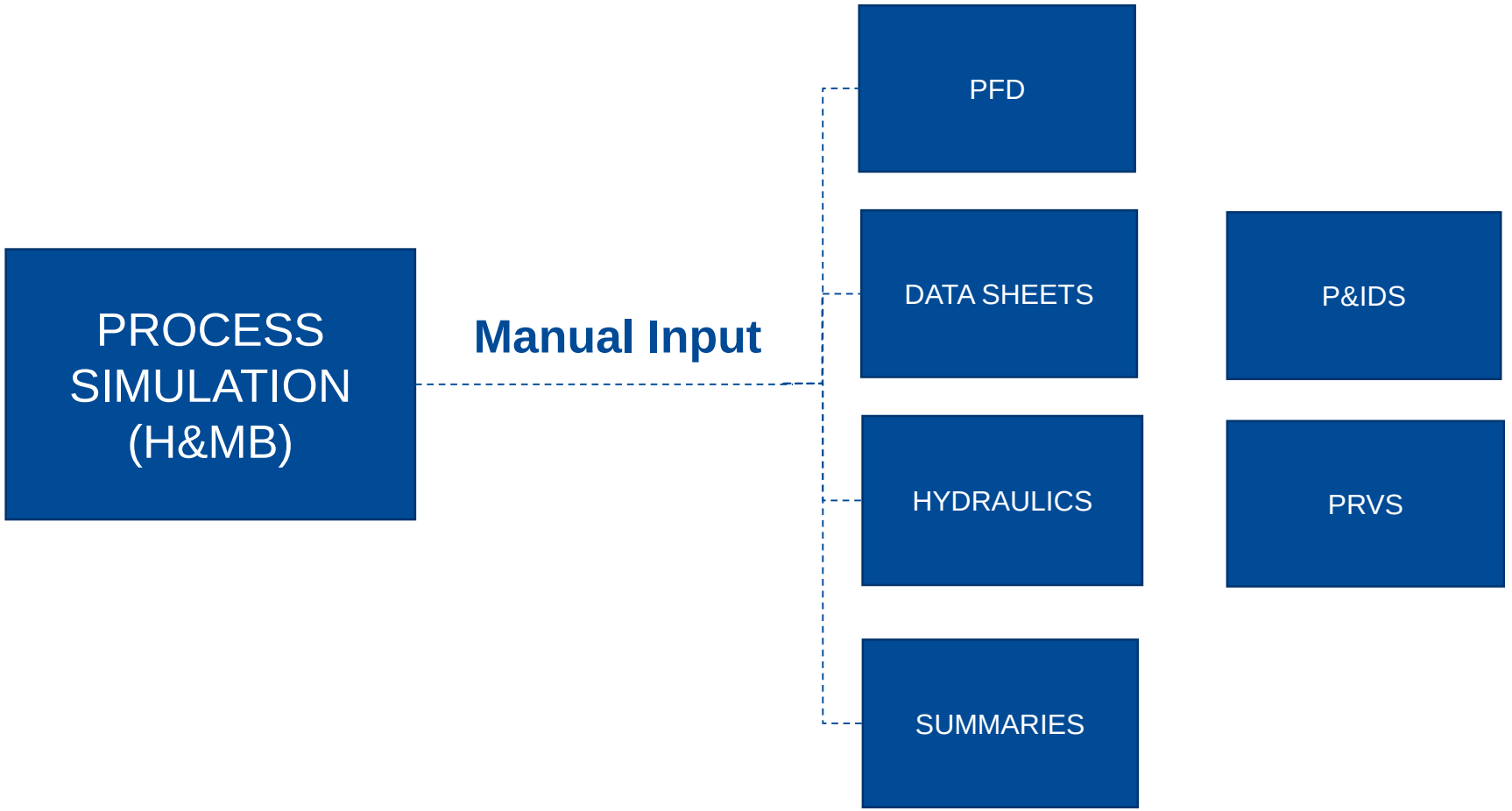
Motivation

EPC Work Flow

Motivation

Basic Engineering Work Flow



Disadvantages of manual data transfer in current workflow

- Breaks the digitalization process/flow
- Engineering workflow interrupted
- Time and resource consuming
- Prone to errors and inconsistencies
  - During creation of heat and material balance
  - When processing change requests
- Complicates collaboration as a global team, if e.g.
  - Heat and material balance
  - Equipment data sheets are generated in different office locations

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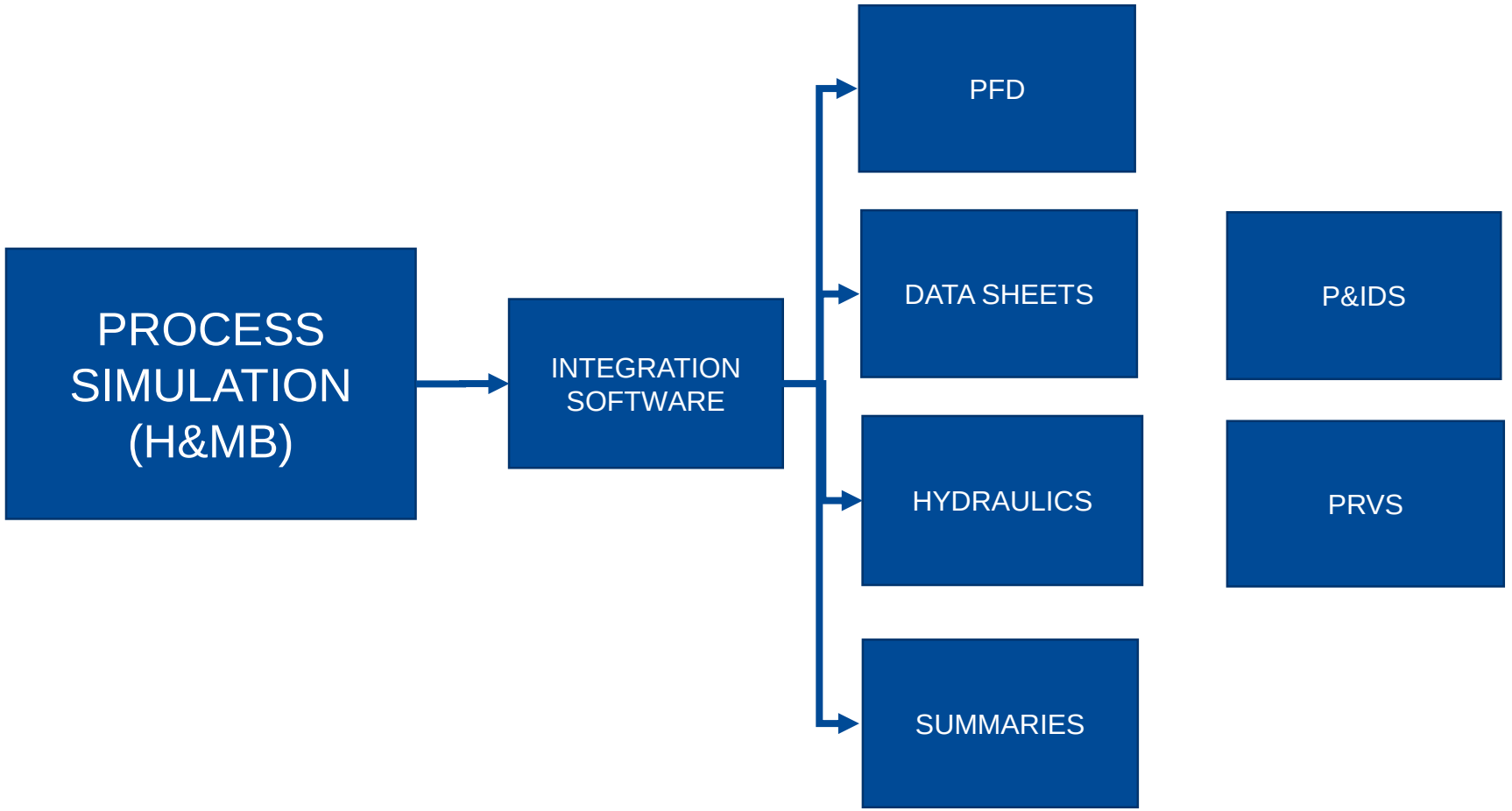
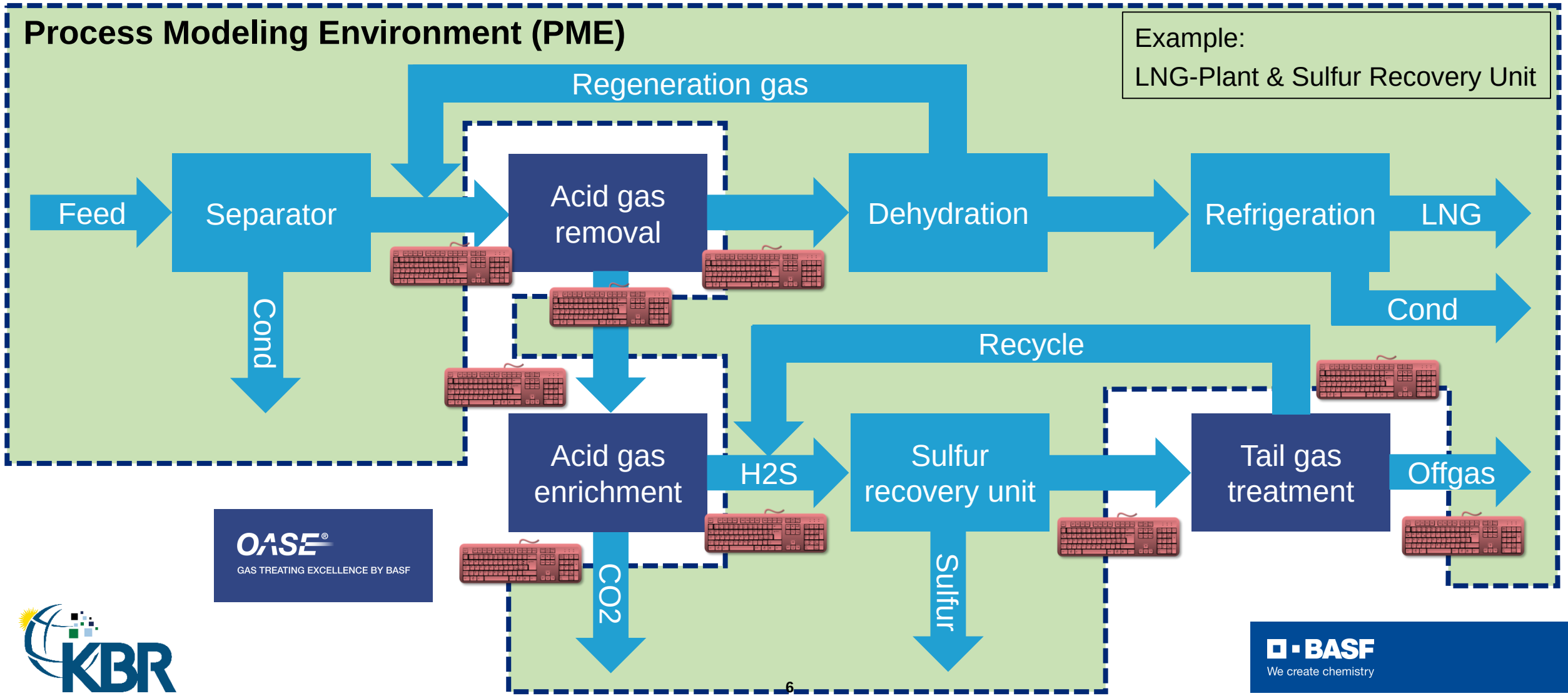
Motivation

Basic Engineering Work Flow



Interaction with in-house or proprietary simulation tools in process simulation → Manual transfer of input and output data required



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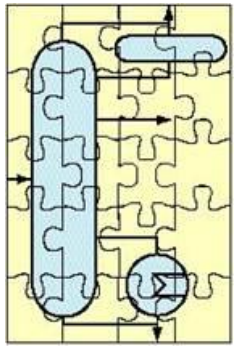
CAPE-OPEN



- **The CAPE-OPEN Standard**
  - … defines **rules** and **interfaces** that allow **CAPE** (**C**omputer-**A**ided **P**rocess **E**ngineering) applications to interoperate
    - Examples: Interfaces for **thermodynamic models** and for **unit operations**

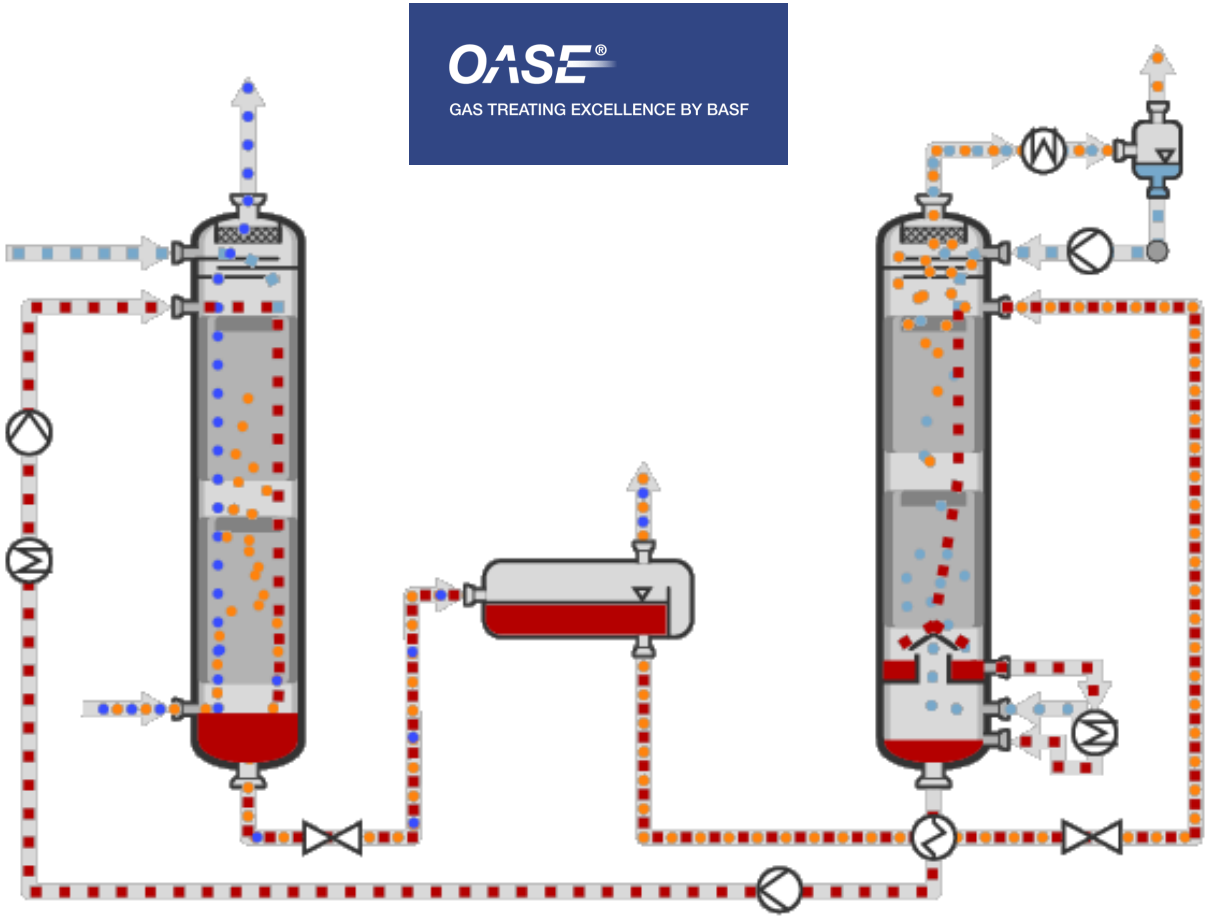
- **CO-LaN (**http://www.colan.org/**)**
  - … is a not-for-profit member society established in France in 2001
  - … **manages the CAPE-OPEN standard**
  - … facilitates the implementation of CAPE-OPEN interfaces through software tools and services

CAPE-OPEN interfaces – What are we talking about?

Process Modeling Environment (PME)	CAPE-OPEN interface	Process Modeling Component (PMC)
Software environment that supports • construction of a process model • process simulation or optimization	Communication between CAPE applications	Software component, which is intended to carry out a well-defined function with limited scope
Flow sheet simulator, e.g. • Aspen Plus® • Aspen HYSYS® • COFE • ProMax® • Pro/II • UniSim® Design • …	Material Streams Energy Streams Parameters Others	Examples: • Computation of physical properties • Simulation of a particular unit operation • Numerical solution of certain types of mathematical problems

Example for PMC

- BASF's OASE® gas treatment technology for removal of acid gases
- Acid gas removal unit (AGRU) is part of large production plants, e.g.
  - LNG plants / natural gas processing plants
  - Ammonia plants / synthesis gas plants
- **Proprietary simulation tool OASE connect:**
  - Allows rigorous calculation of BASF's OASE® gas treatment technology
  - Is provided as server client application



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Realization of CAPE-OPEN interface in OASE connect

Specification

- Material Ports
- Energy Ports
- Parameter
- Component mapping
- Visualization of simulation progress
- Simulation messages
- Authentication procedure
- …

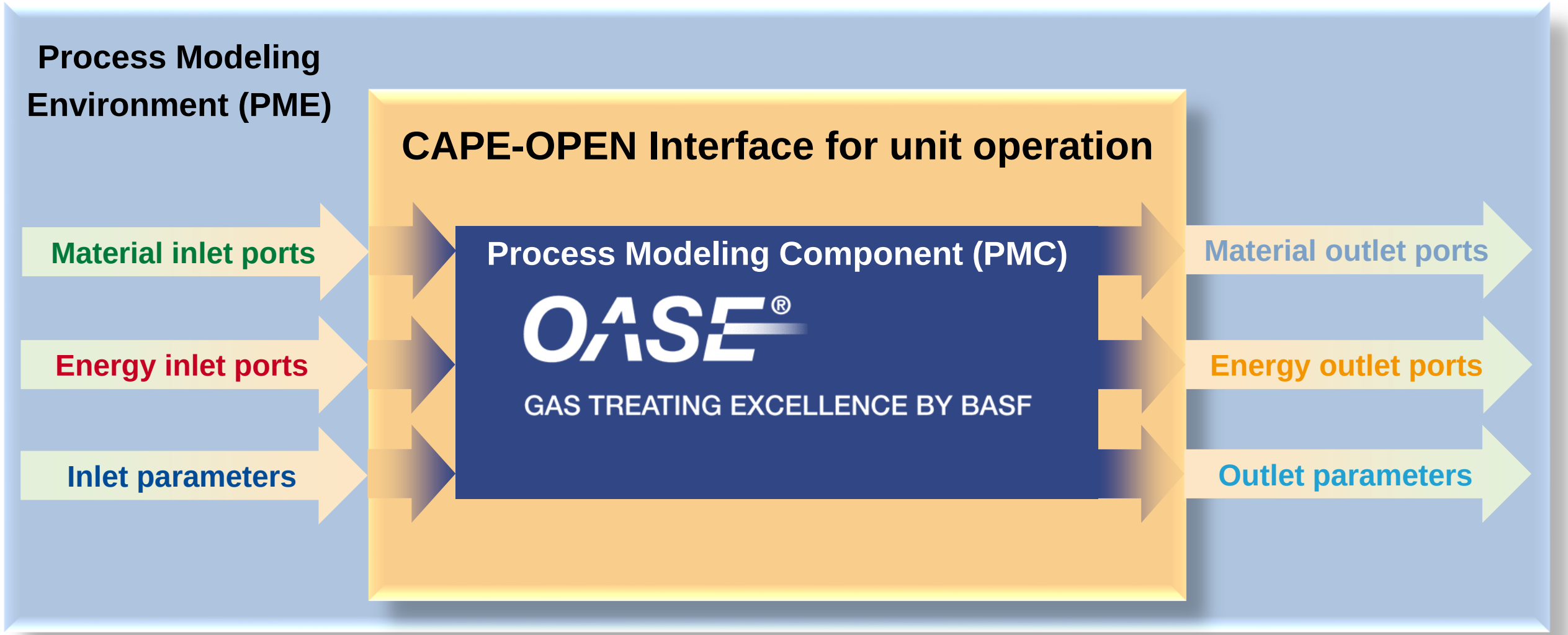
Implementation

- CAPE-OPEN interface
- PMC: Interaction with interface

Testing

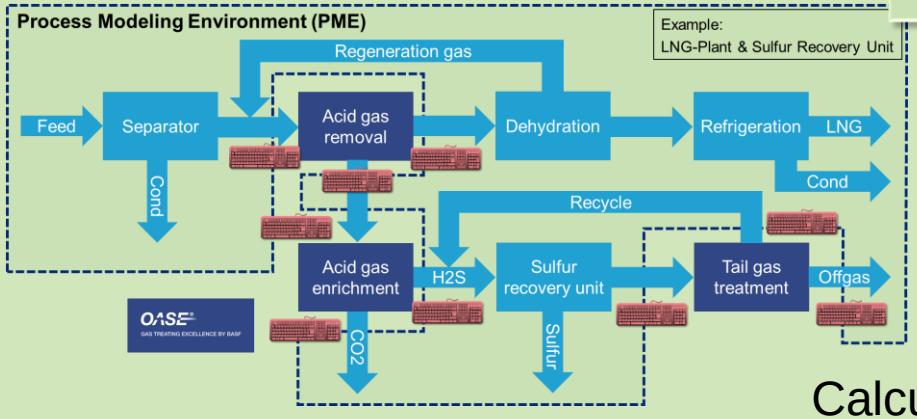
- Several PME’s
- Connection of material streams, energy streams, parameter
- Application of parameters in control blocks
- Display of report information
- …

CAPE-OPEN interface allows communication between PME and PMC

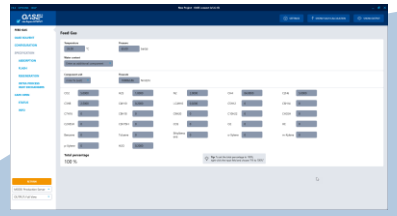


Interaction between PME and OASE connect via CAPE-OPEN interface

Process Modeling Environment (PME)



CAPE-OPEN interface



OASE connect input

BASF Server

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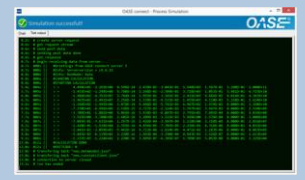
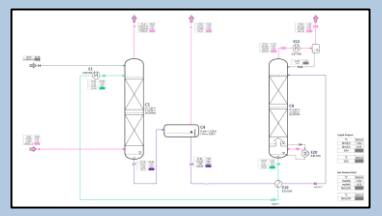


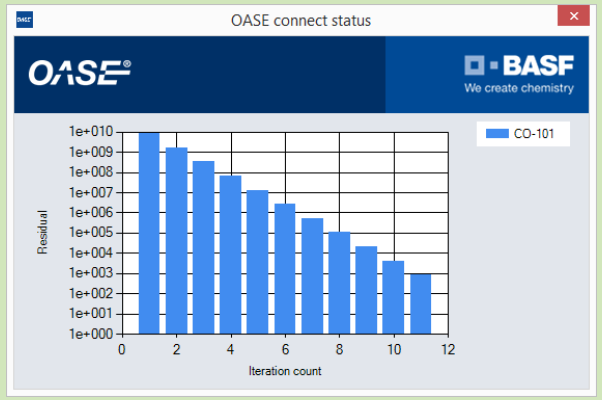
Calculation in OASE connect

OASE connect output



CAPE-OPEN interface

Calculation in PME



KBR

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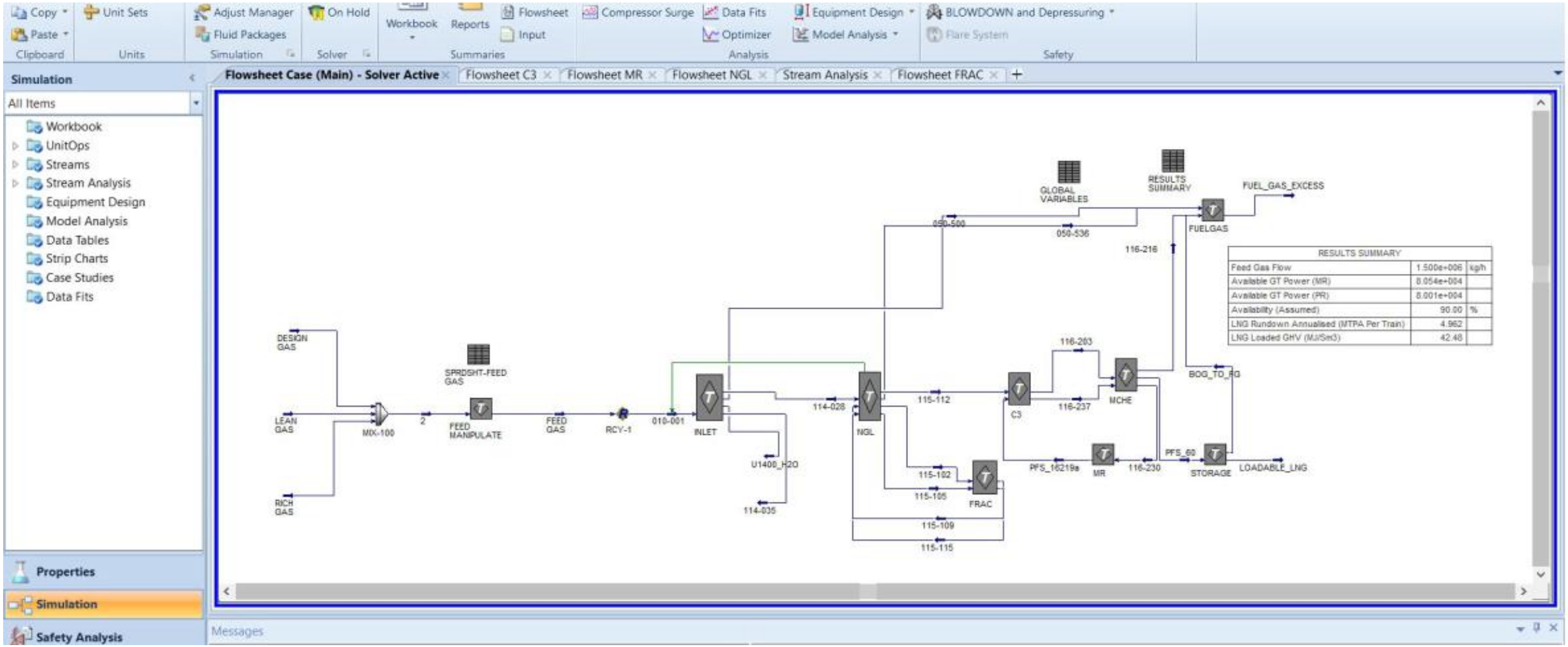
Example: OASE connect embedded into KBR's LNG Model



Screenshot from Aspen HYSYS®

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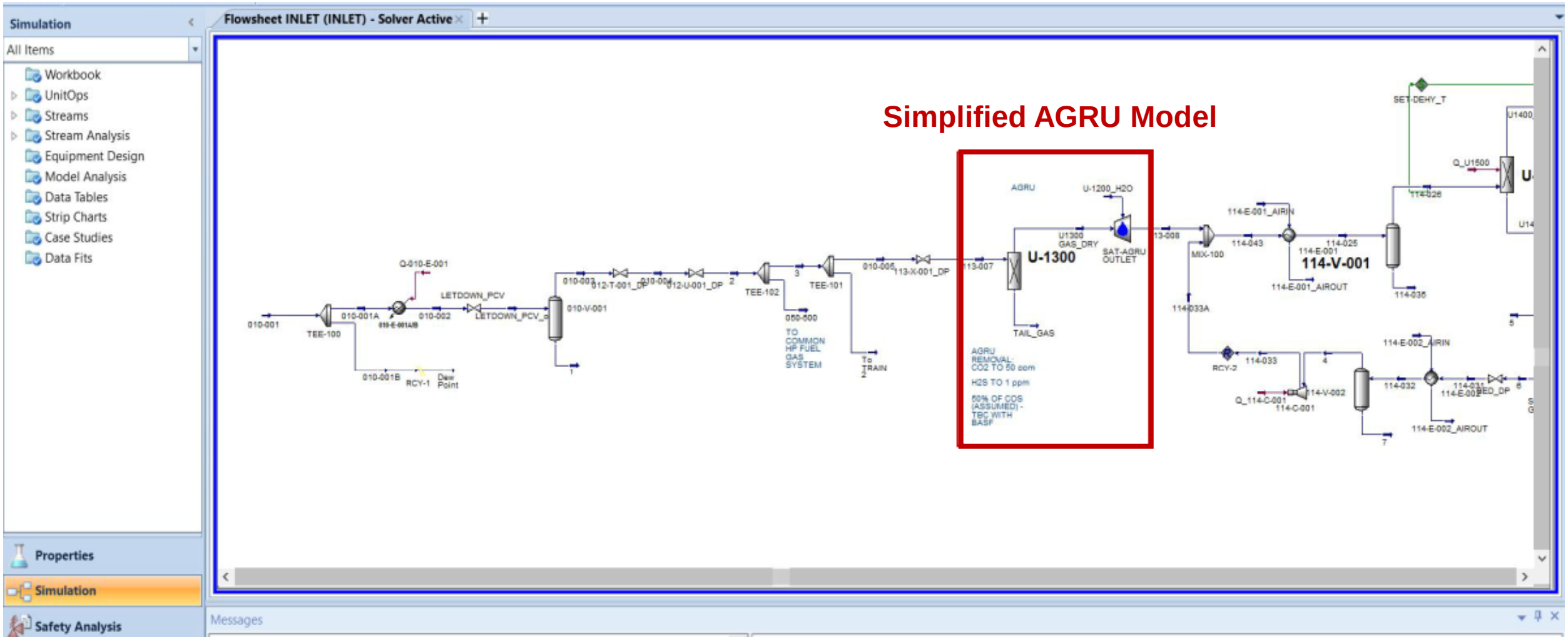

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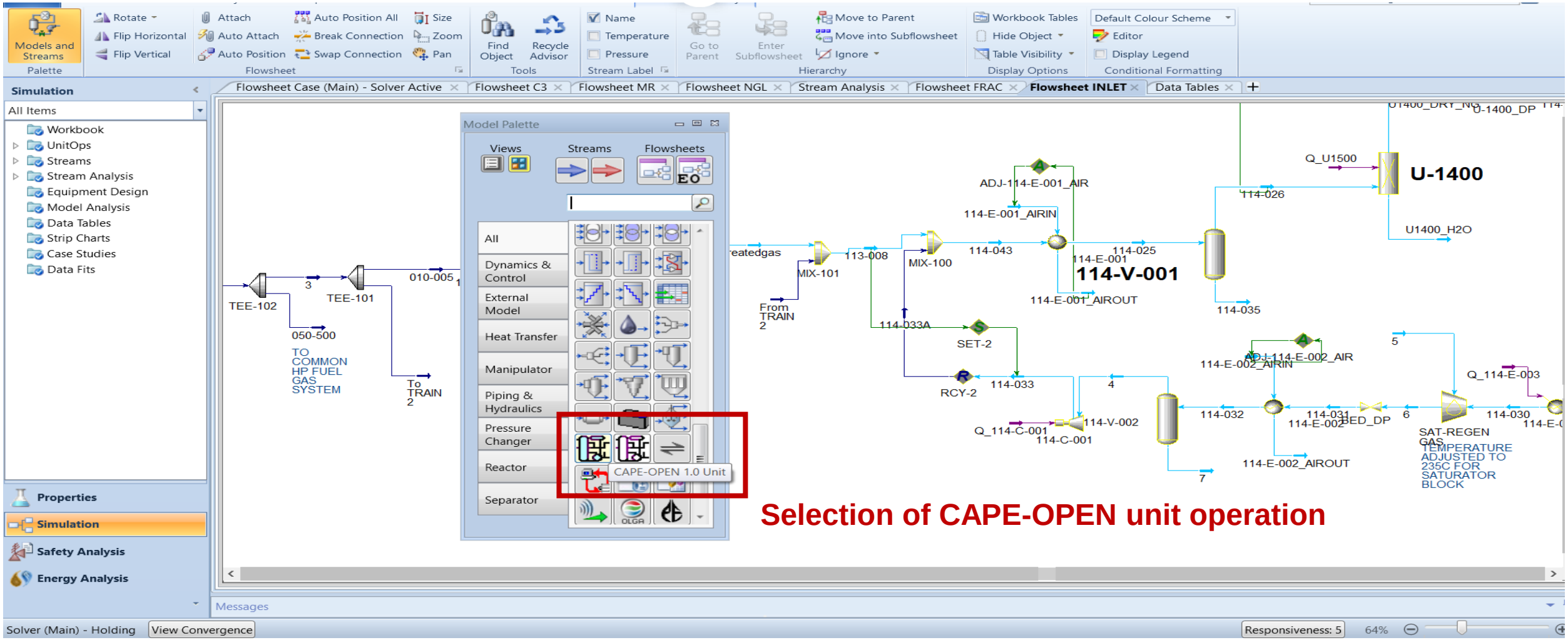

Selection of CAPE-OPEN unit operation

Screenshot from Aspen HYSYS®

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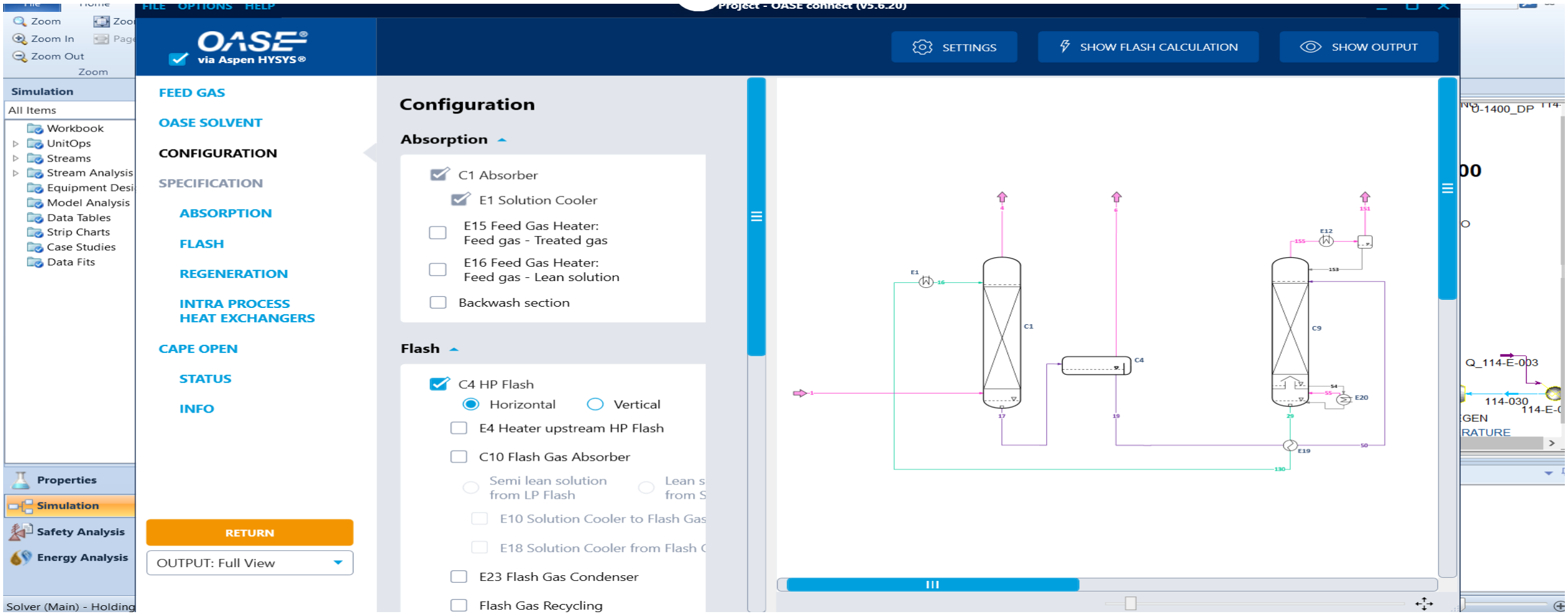

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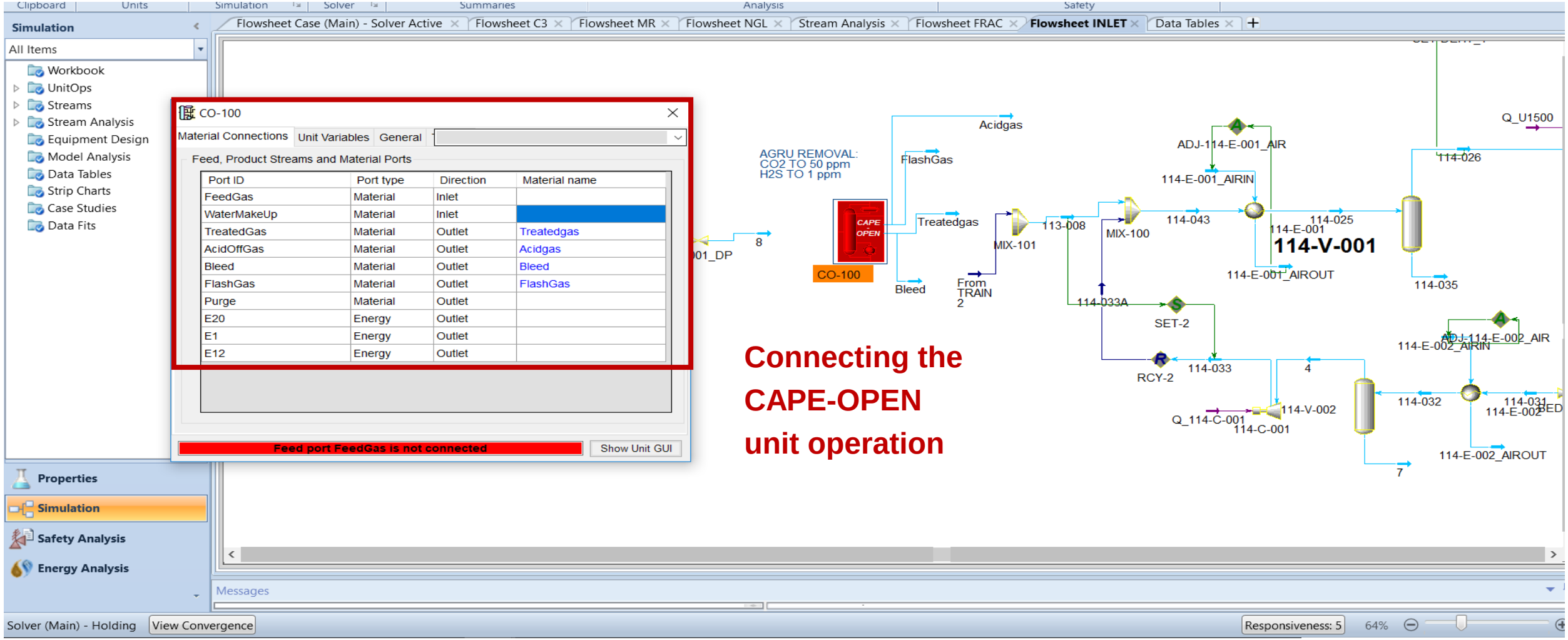

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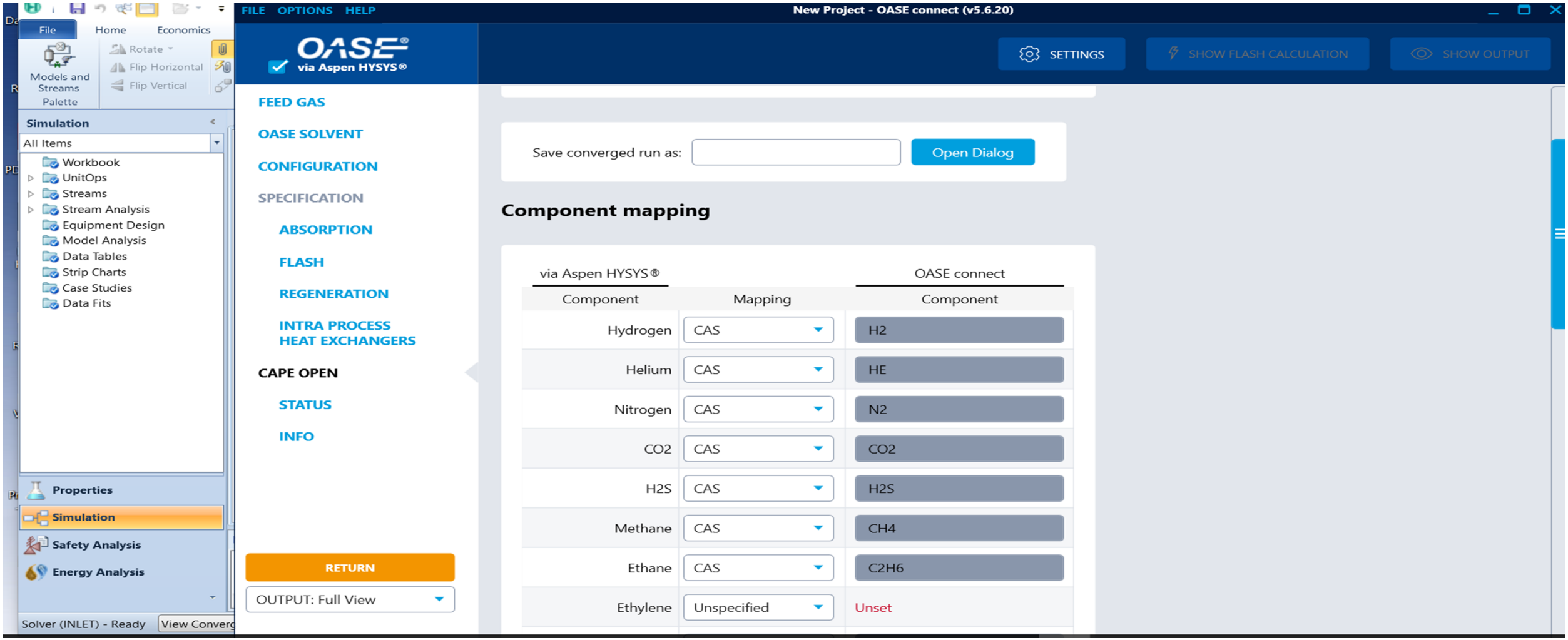

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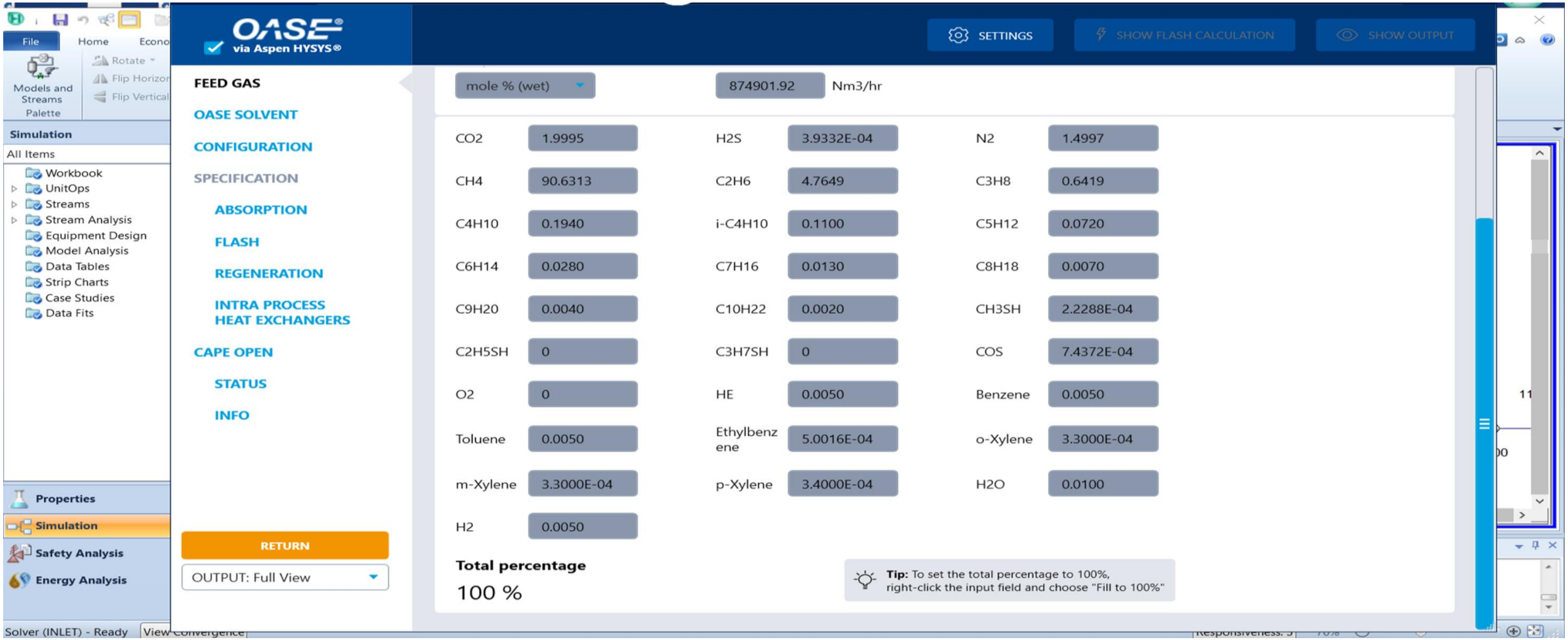

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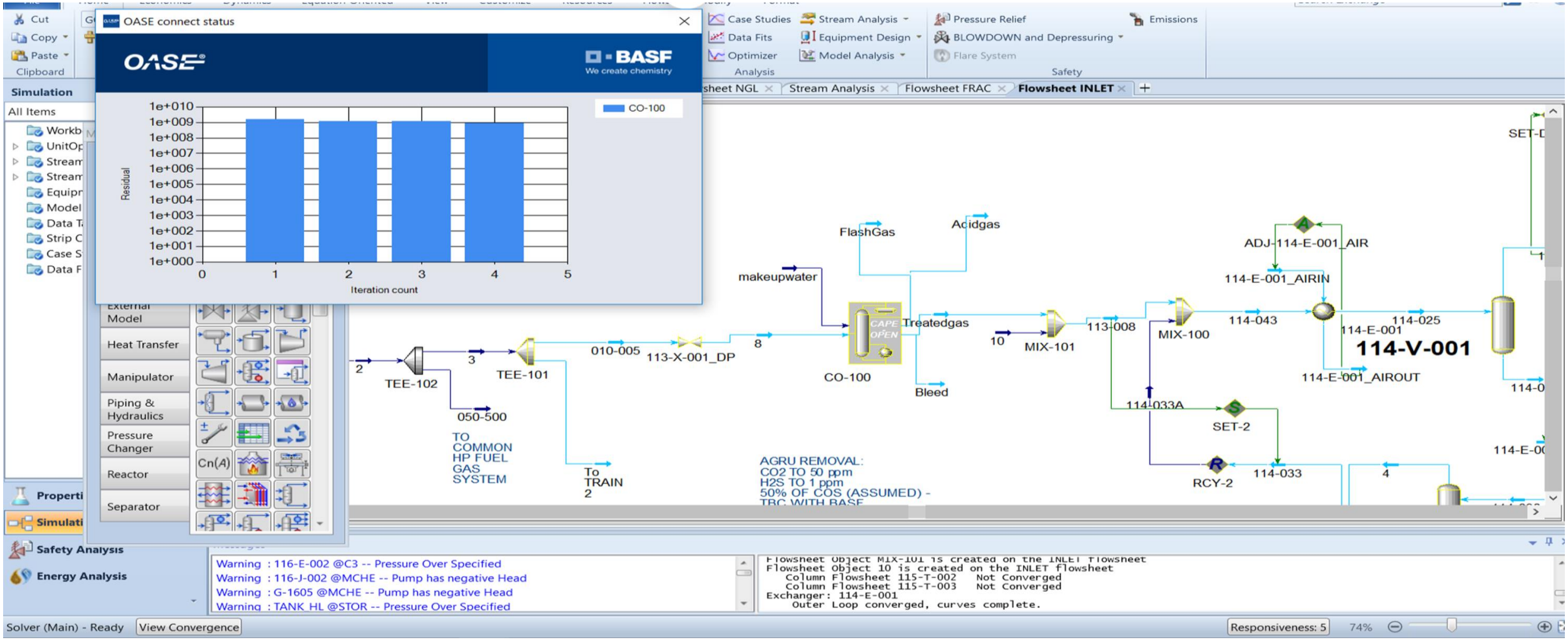

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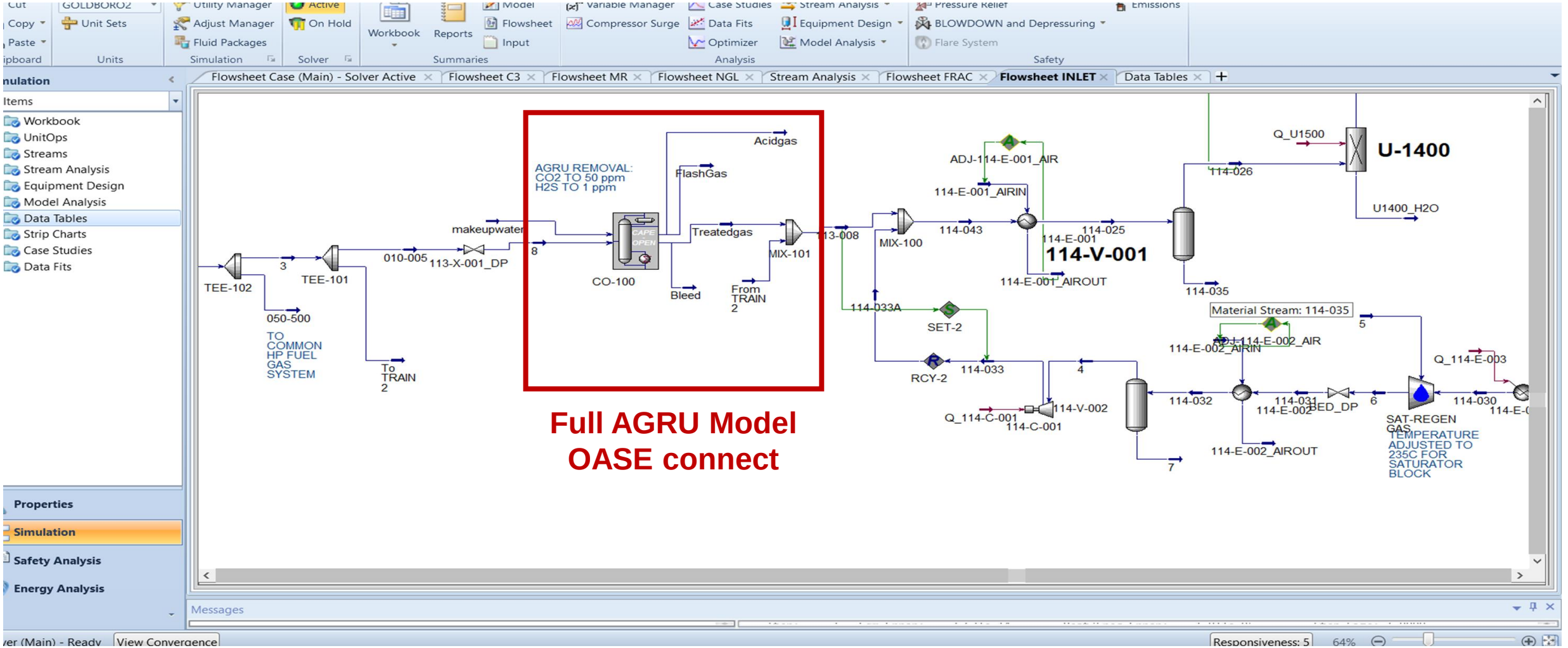

Full AGRU Model OASE connect

Screenshot from Aspen HYSYS®

Embedding OASE® connect into a Process Modeling Environment via the CAPE-OPEN interface

Benefits:

Provide a **fully closed heat and material balance** as basis for the **generation of technical datasheets** and **further equipment design**

Changes in operating or design parameters are automatically reflected in all connected downstream engineering steps

Boosts the **efficiency of collaboration** in **teams with a global setup**

Significant savings in

Time

Resources

Money

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