An introduction to

COCO

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Introduction

- Overview of COCO software components
- Overview of how this fits in to CAPE-OPEN framework
- Some details on implemented algorithms
- Interoperability demonstration
- Benefits of having COCO on *your* computer

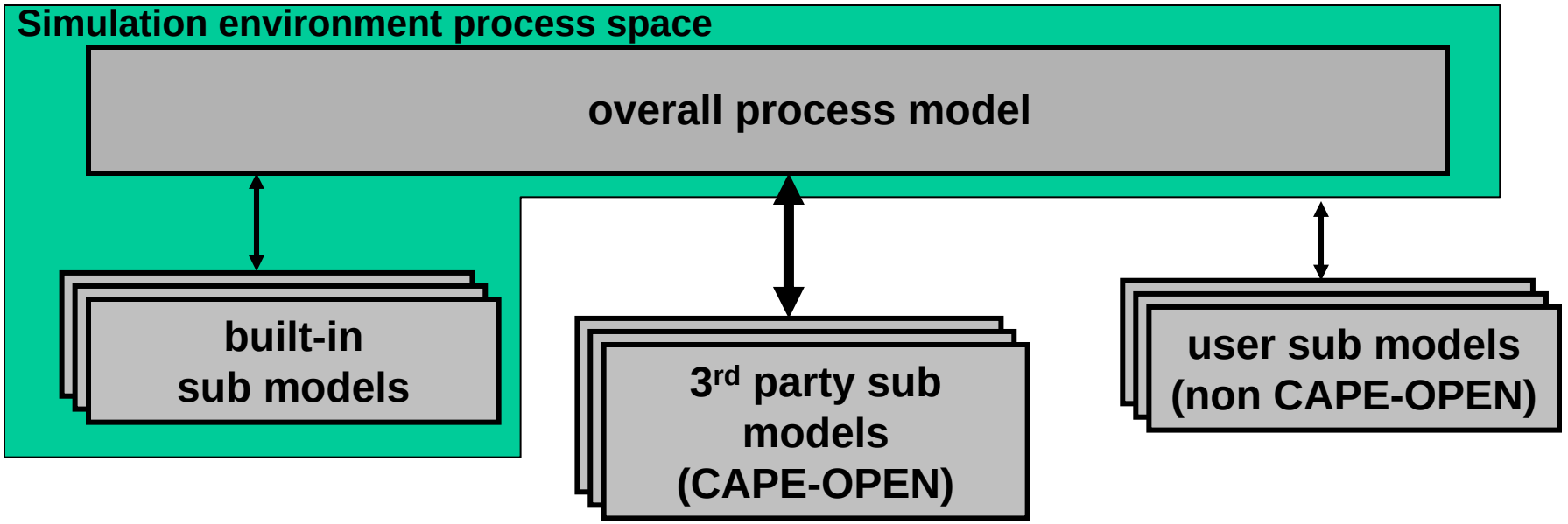
CAPE-OPEN to CAPE-OPEN (COCO):

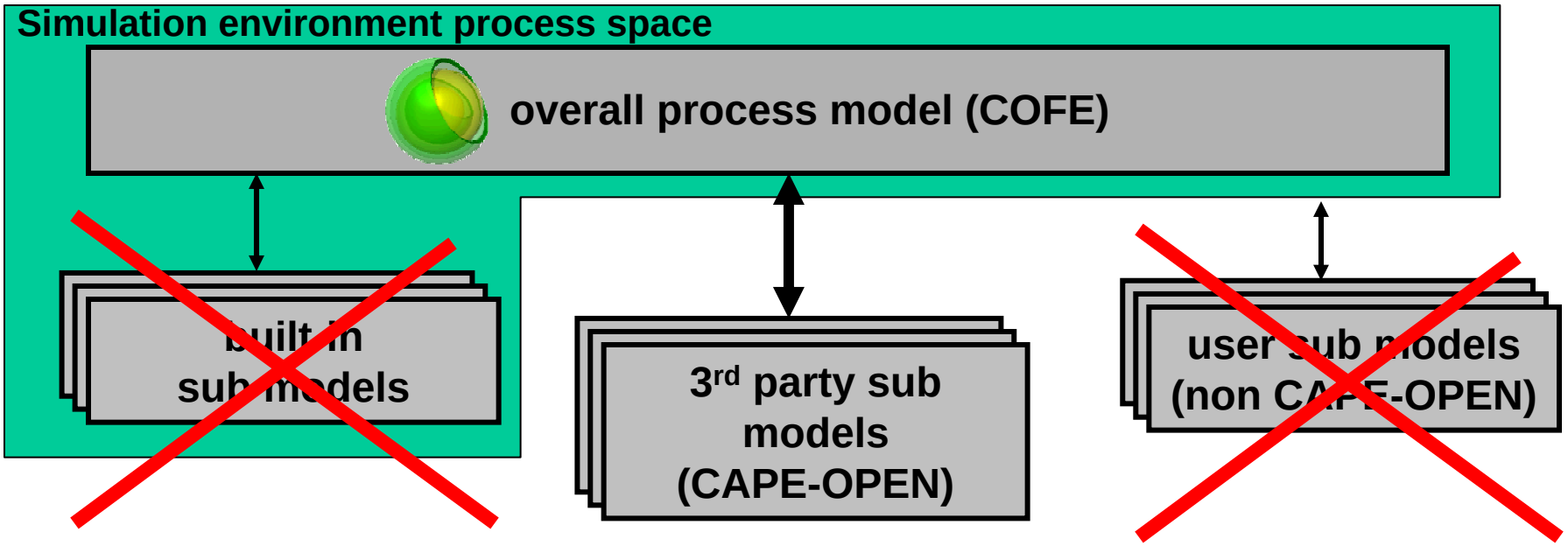
Simulation environment (COFE)

Thermodynamic property package (TEA)

Collection of unit operations (COUSCOUS)

Reaction package (CORN)


Simulation environment process space
overall process model
built-in
sub models
3rd party sub
models
(CAPE-OPEN)
user sub models
(non CAPE-OPEN)


Simulation environment process space
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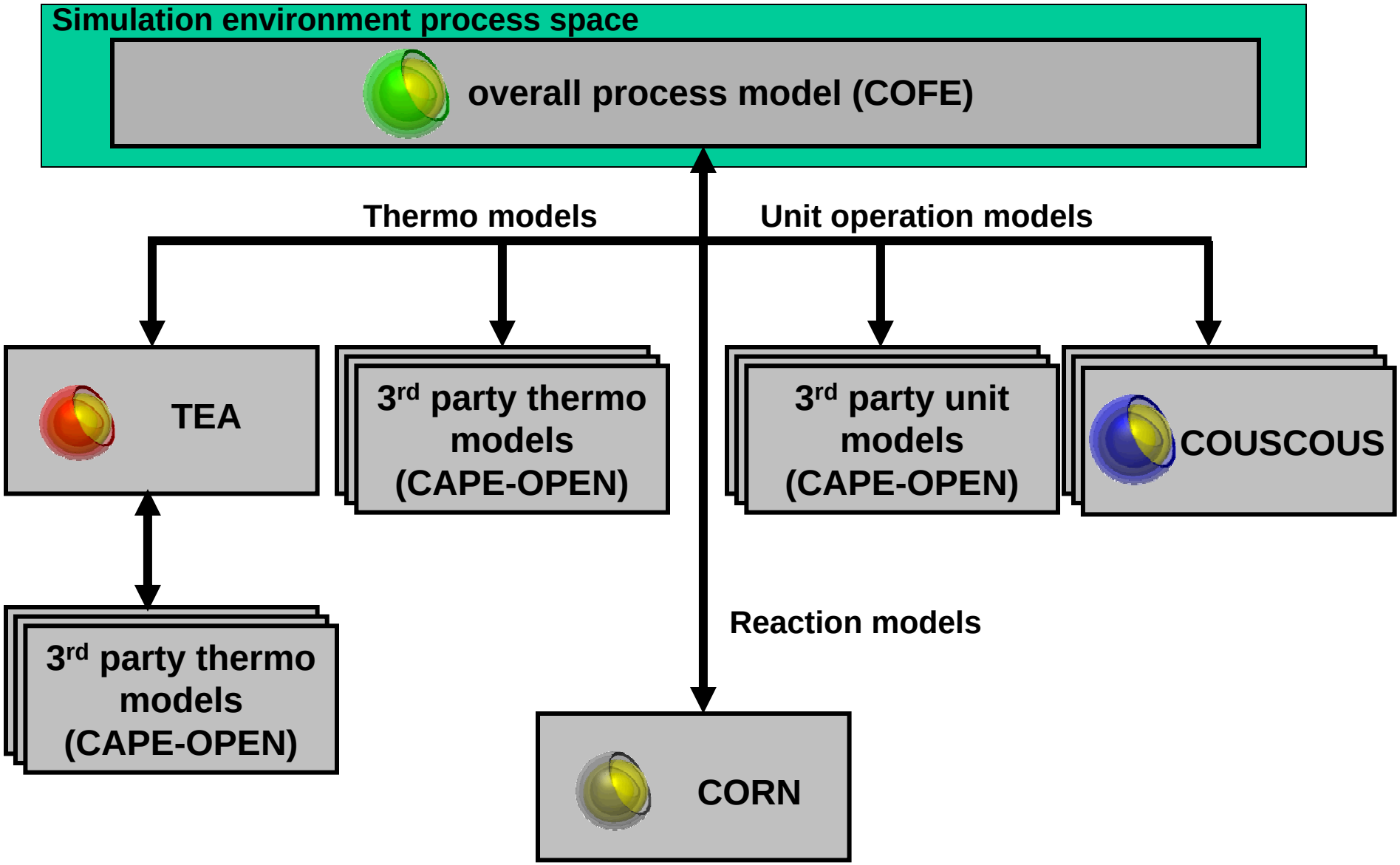
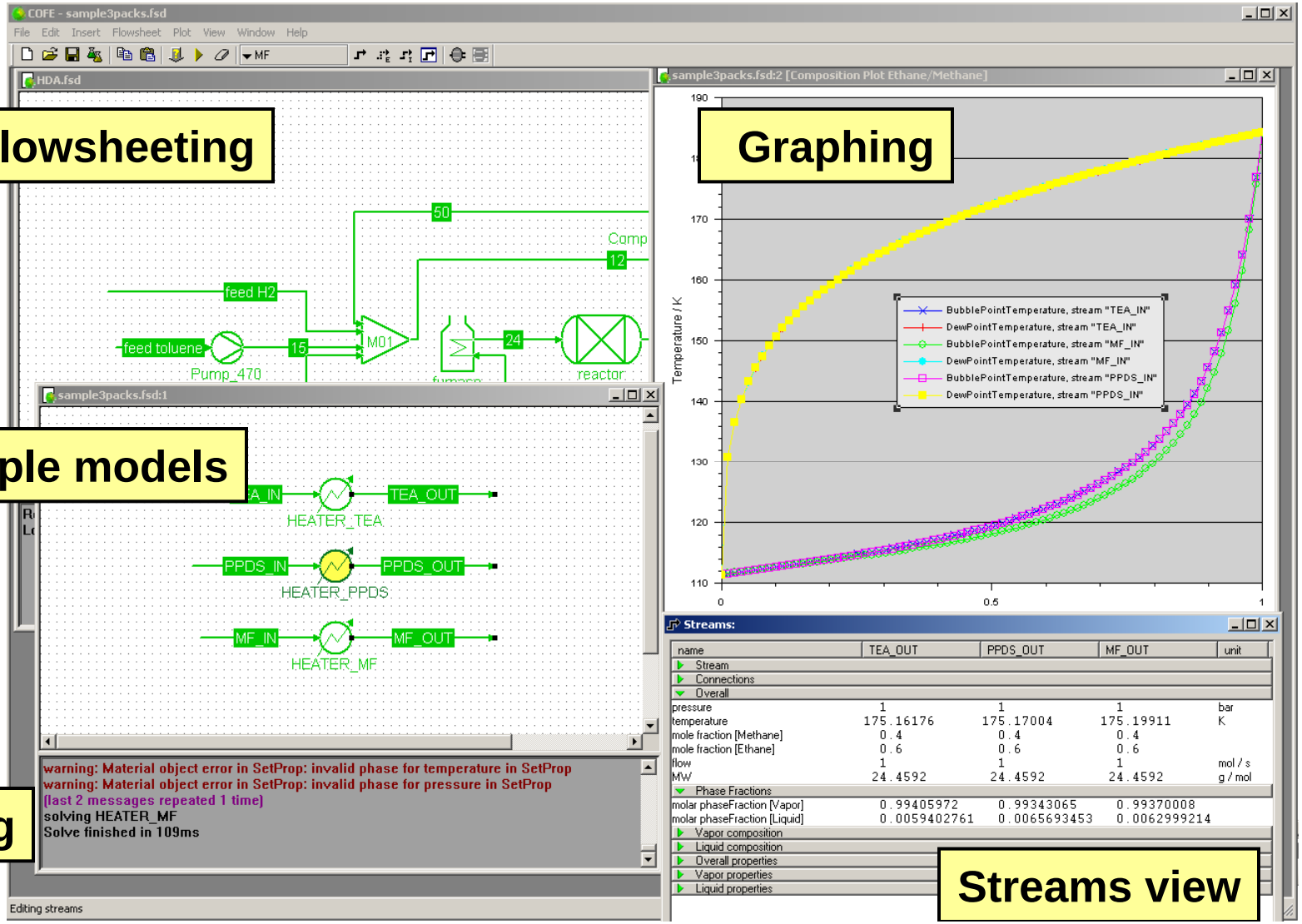

Simulation environment process space
overall process model (COFE)
Thermo models
Unit operation models
TEA
3rd party thermo models (CAPE-OPEN)
3rd party unit models (CAPE-OPEN)
COUSCOUS
3rd party thermo models (CAPE-OPEN)
Reaction models
CORN

COFE: CAPE-OPEN Flowsheeting Environment

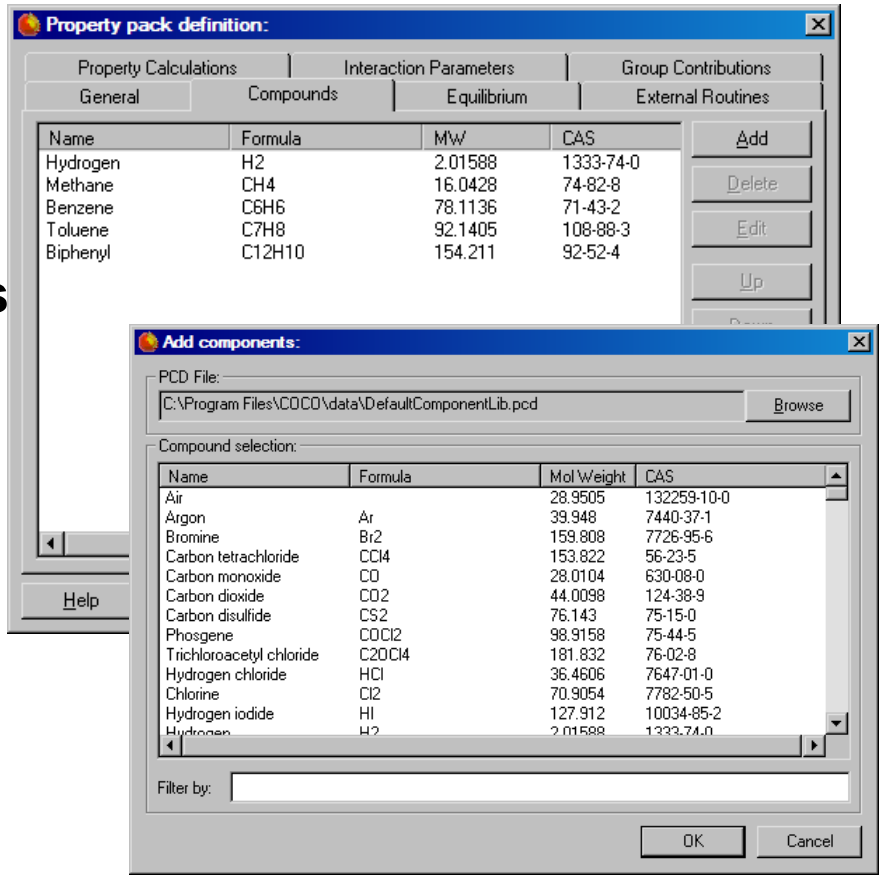


COFE: CAPE-OPEN Flowsheeting Environment

- Breaking recycles by automatic tearing
- Solving recycles by hybrid Newton / Wegstein approach, using reparameterization
- Support for multiple material types, with selection for thermo and sub-set of compounds
- Material, energy and information streams

TEA: Thermodynamics for Engineering Applications

- **Pure compound data library (extendible, or use DIPPR)**
- **100+ Property calculation methods (25+ different properties)**
- **Property derivatives**
- **Support of external property calculation routines and external equilibrium servers**



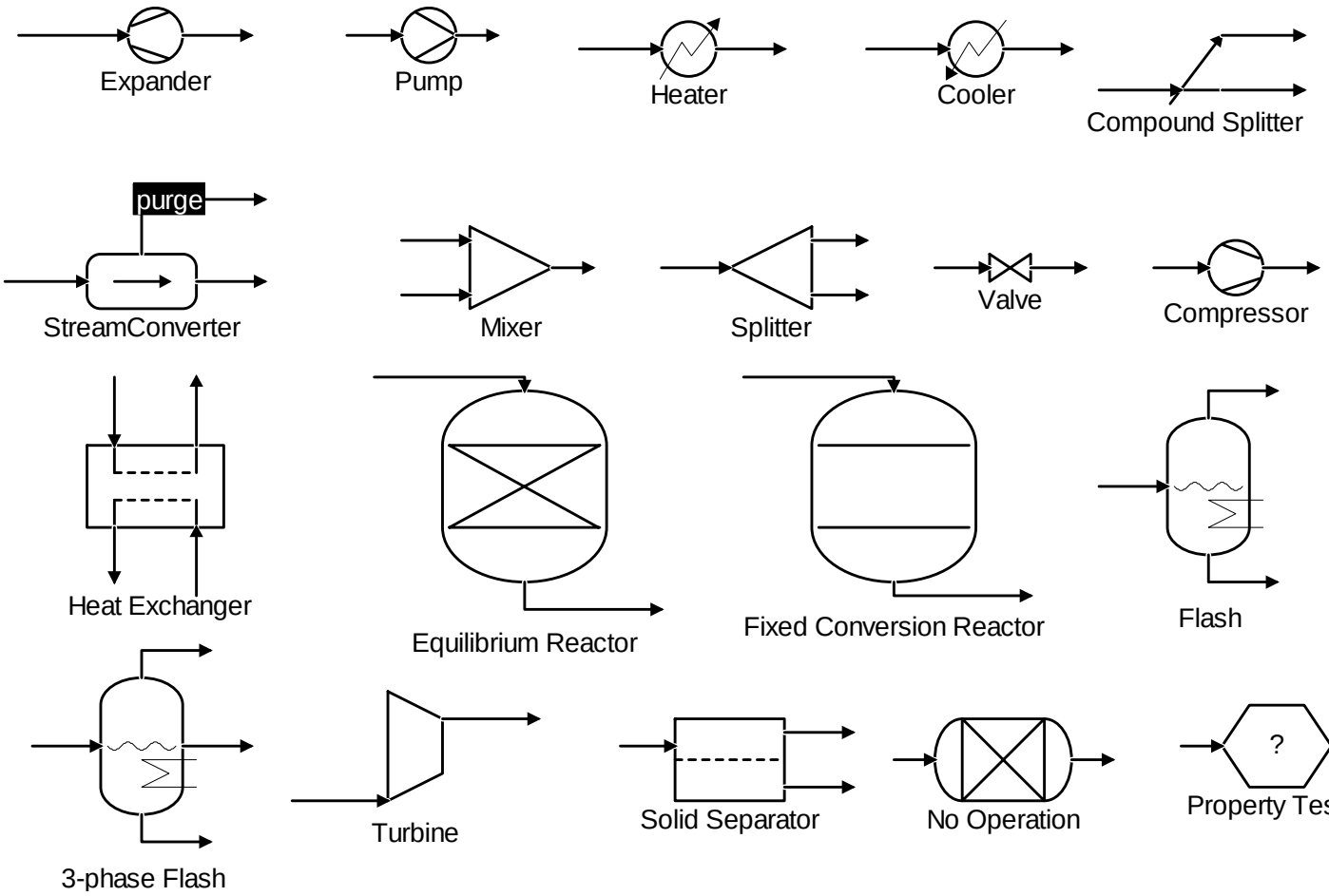
Thermodynamic models and compounds from ChemSep

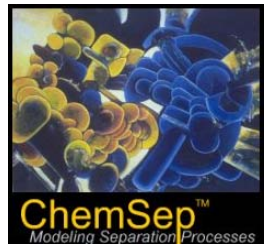
TEA: Thermodynamics for Engineering Applications

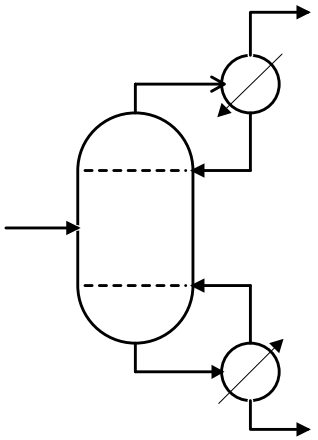
VLE equilibrium calculations

- Large diversity of supported flash specifications
- Inside-out approach
- Post-checking of solution (since version 1.09)
- Back-up full Newton approach

COUSCOUS: Simple unit operations

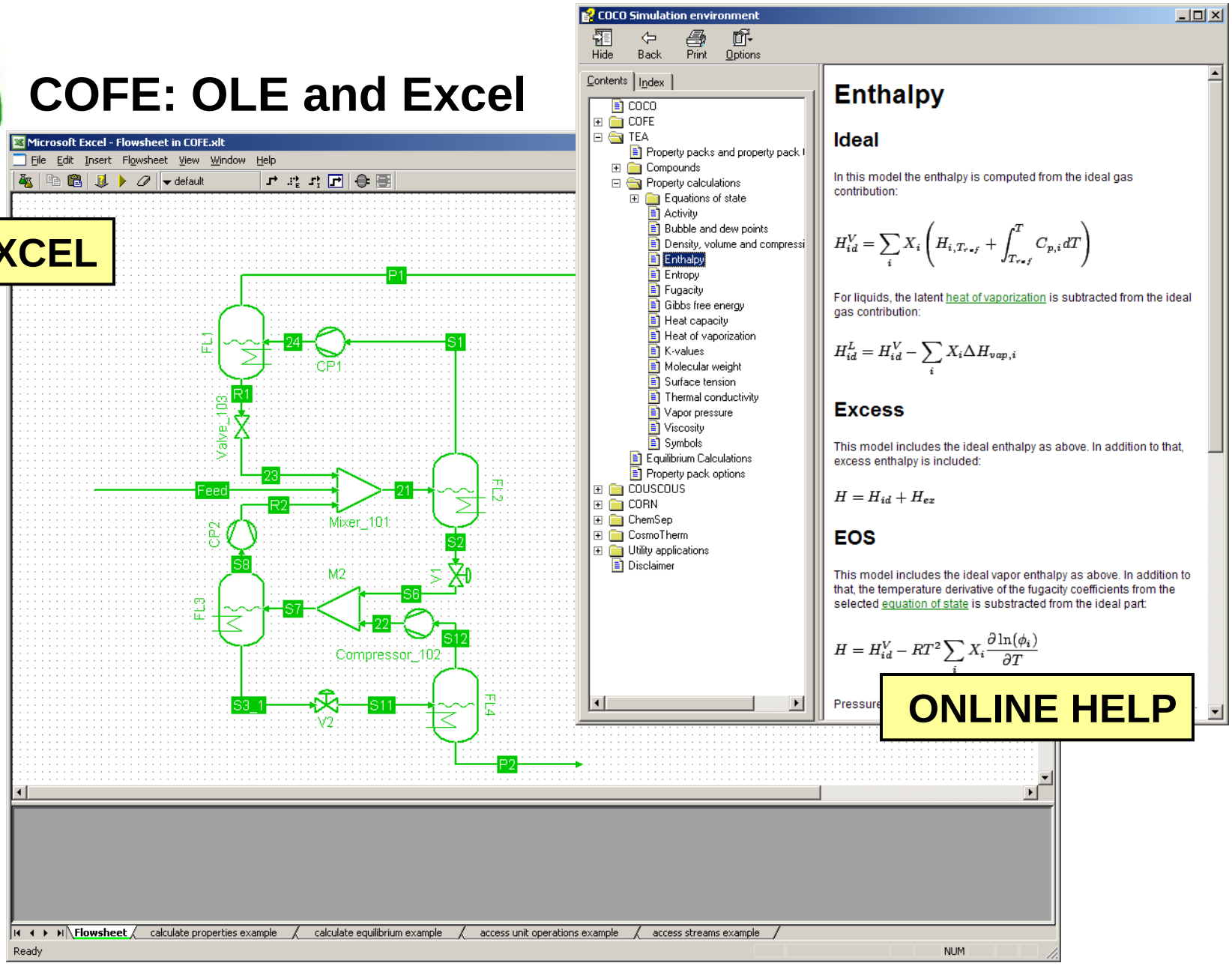






ChemSep Column Model

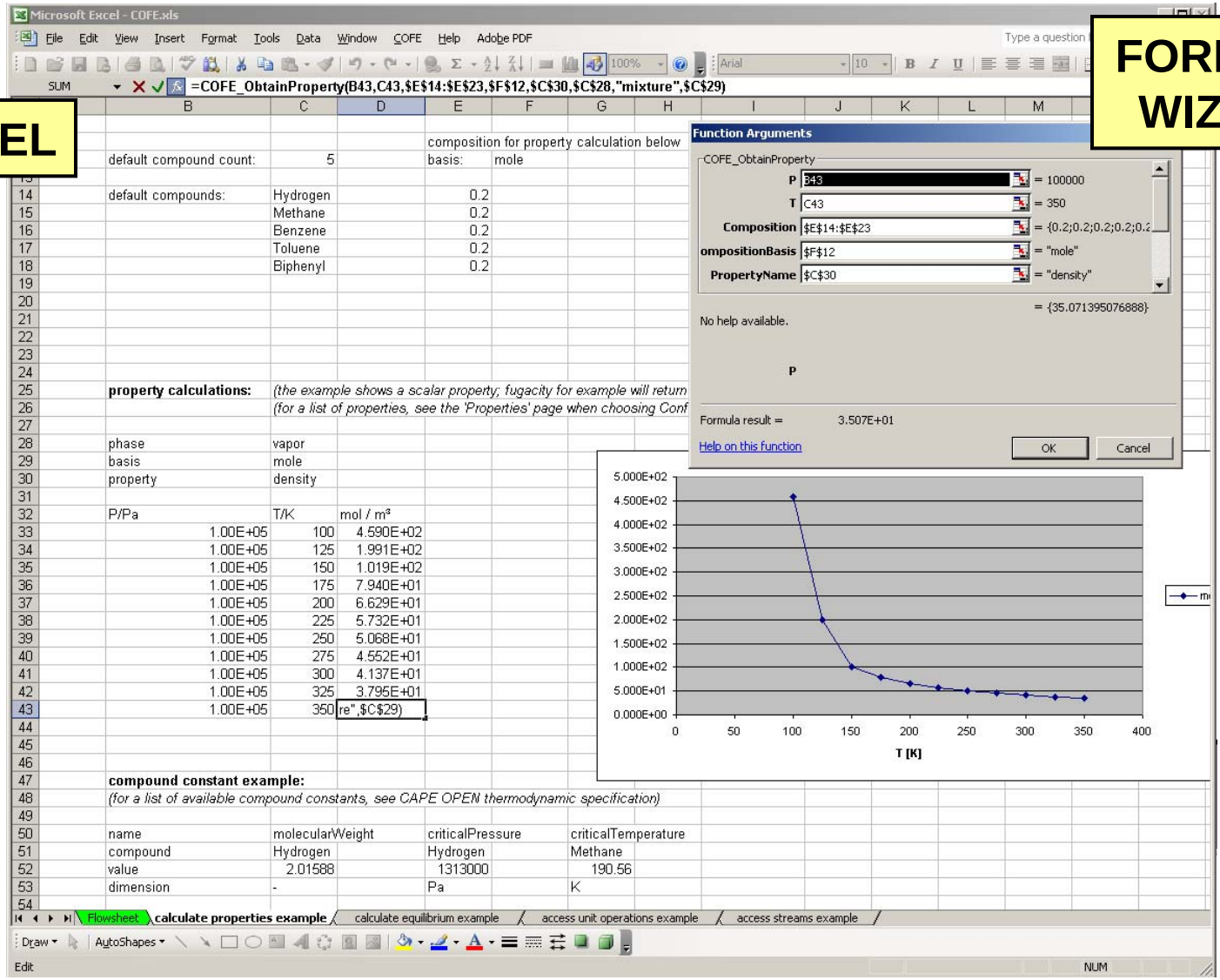
COFE: OLE and Excel



COFE: OLE and Excel

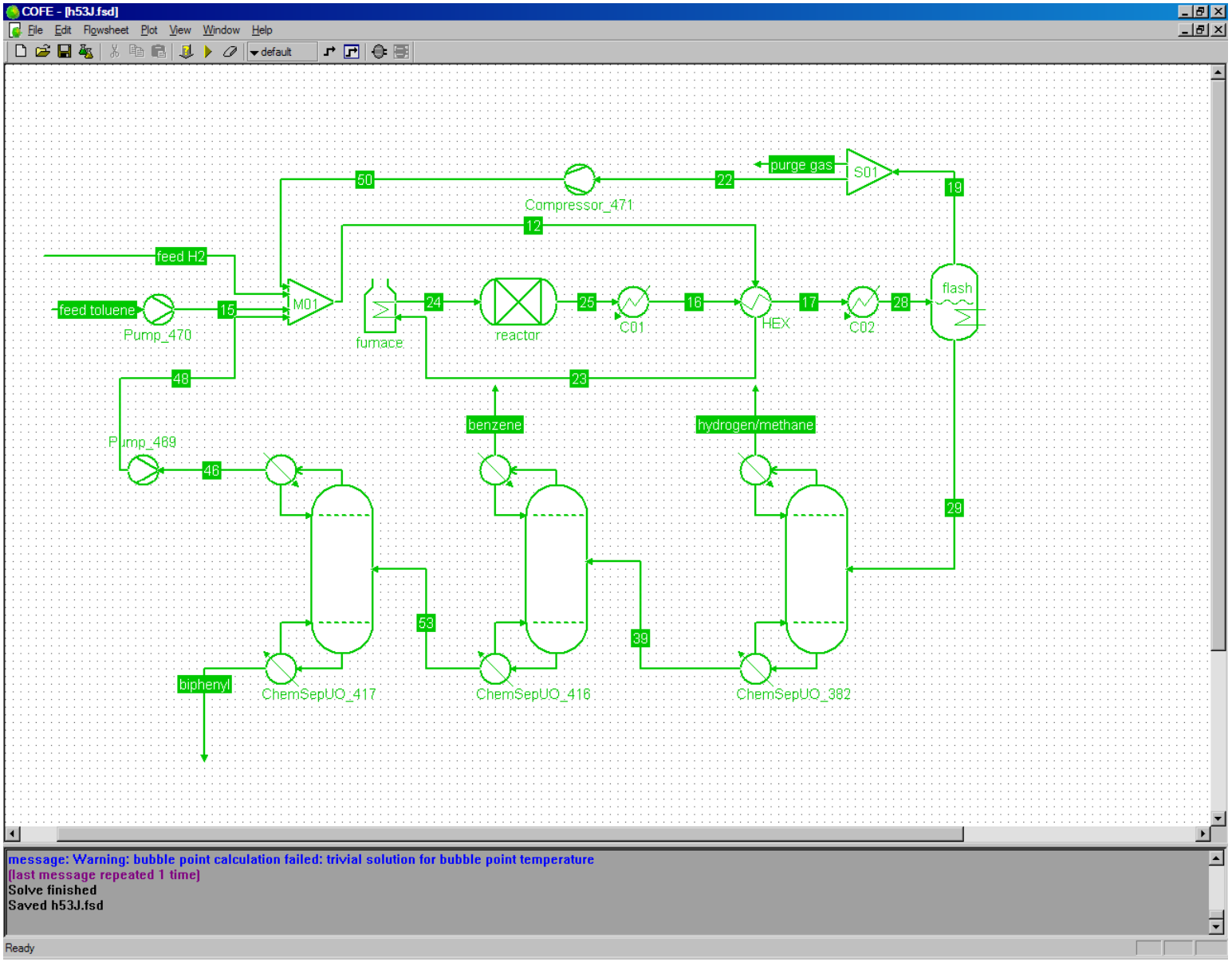
EXCEL

FORMULA WIZARD

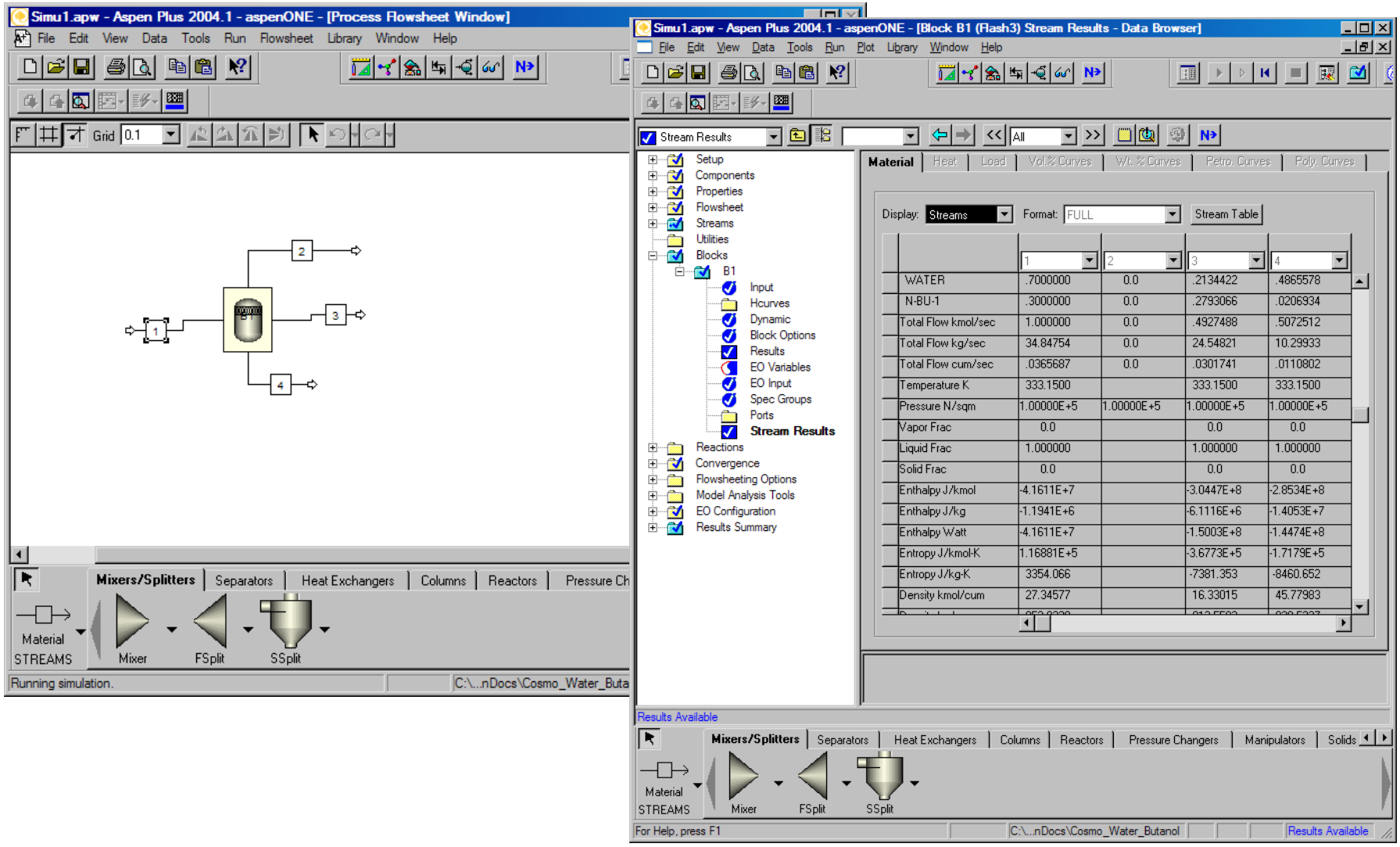


COCO: CAPE-OPEN interface support

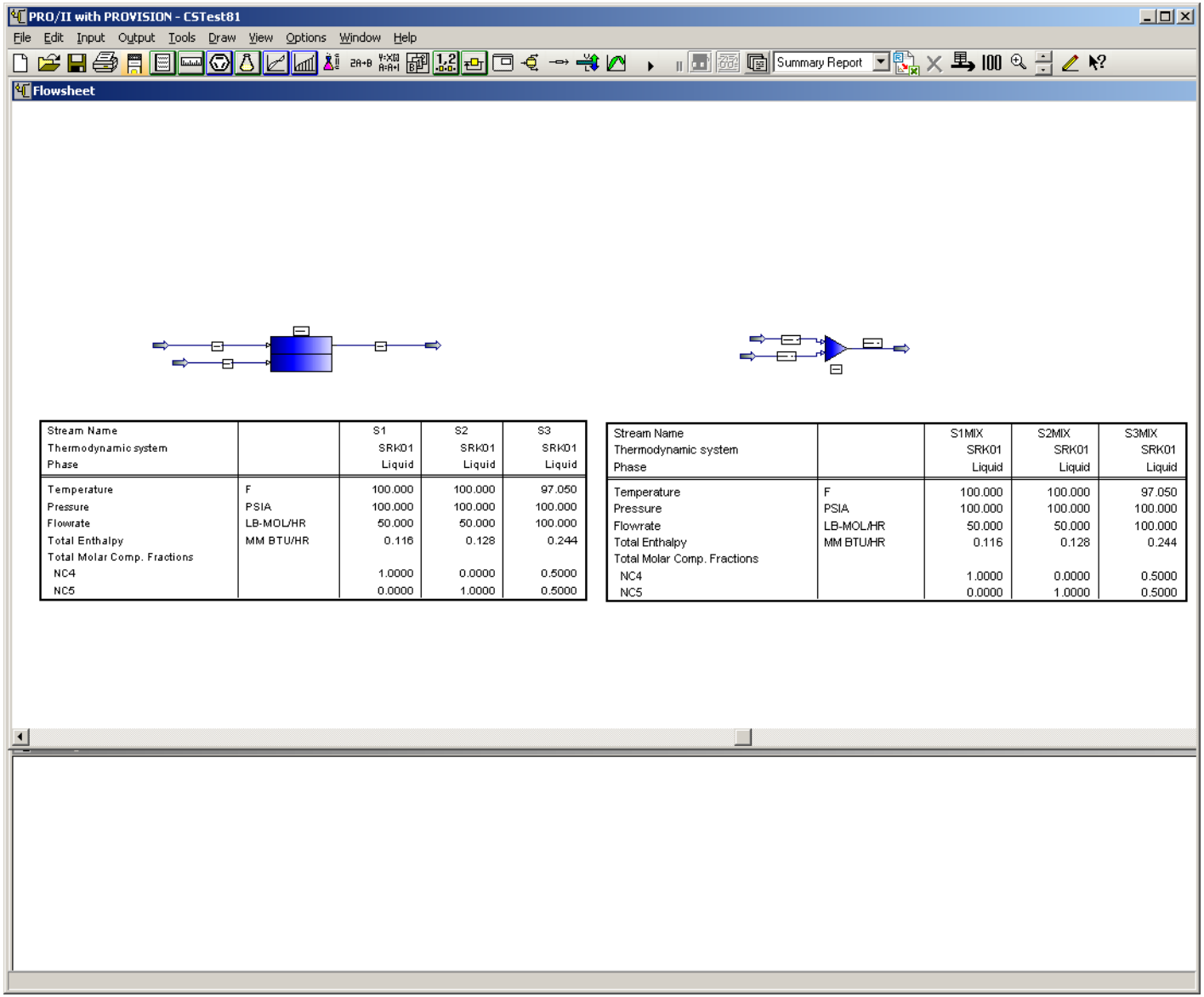
- Full support for thermodynamic standard versions 1.0 and 1.1 in all components
- Unit operation sockets & plugs (steady state)
- Reaction package sockets & plugs
- Full support for all COSE interfaces
- All common interfaces (identification, error handling, utilities, parameters with dimensionality, persistence, …)



COCO stand-alone



Three-phase AspenPlus flash using TEA + Cosmo*Therm*



Stream Name		S1	S2	S3
Thermodynamic system		SRK01	SRK01	SRK01
Phase		Liquid	Liquid	Liquid
Temperature	F	100.000	100.000	97.050
Pressure	PSIA	100.000	100.000	100.000
Flowrate	LB-MOL/HR	50.000	50.000	100.000
Total Enthalpy	MM BTU/HR	0.116	0.128	0.244
Total Molar Comp. Fractions				
NC4		1.0000	0.0000	0.5000
NC5		0.0000	1.0000	0.5000

Stream Name		S1MIX	S2MIX	S3MIX
Thermodynamic system		SRK01	SRK01	SRK01
Phase		Liquid	Liquid	Liquid
Temperature	F	100.000	100.000	97.050
Pressure	PSIA	100.000	100.000	100.000
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Total Enthalpy	MM BTU/HR	0.116	0.128	0.244
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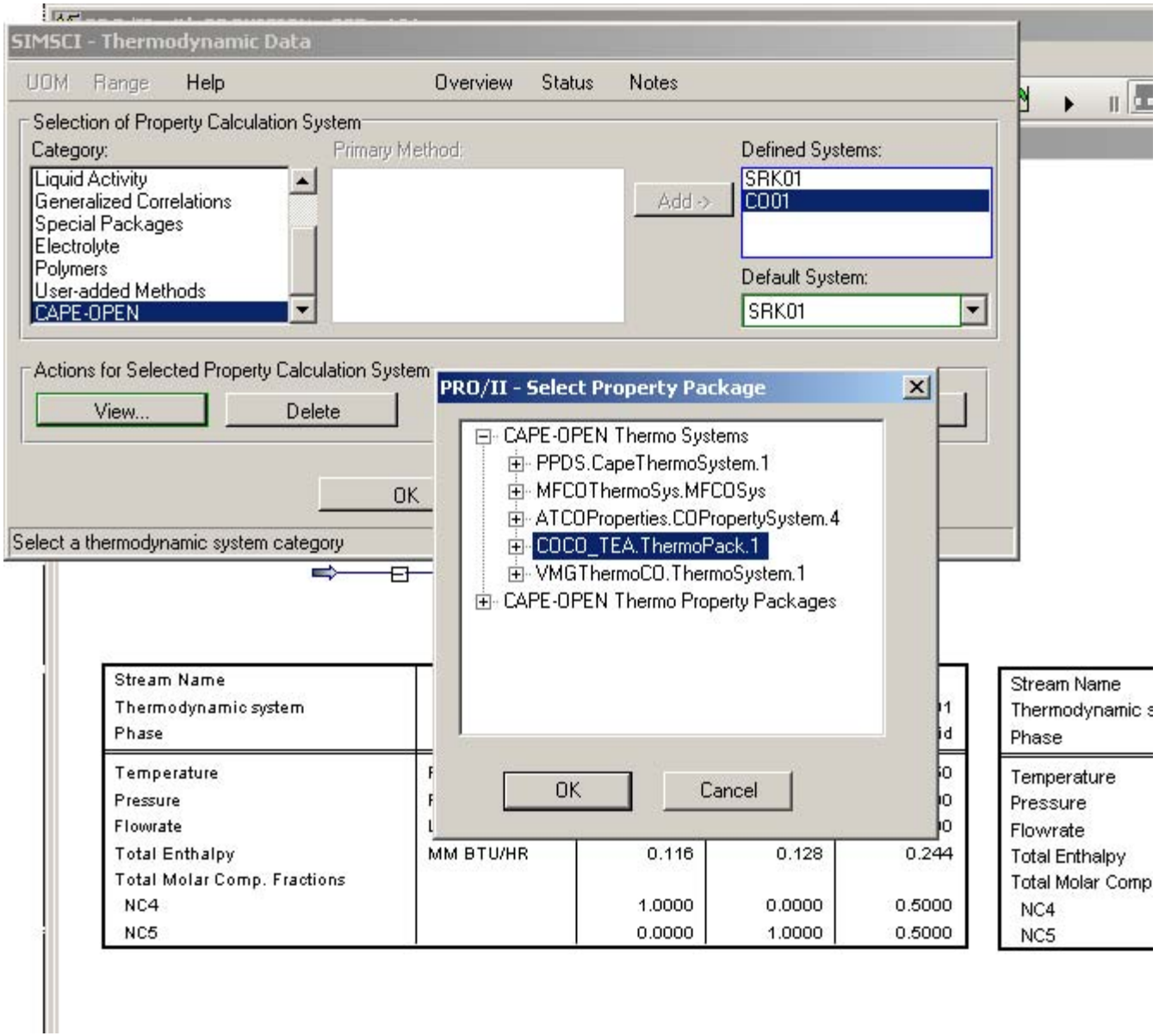
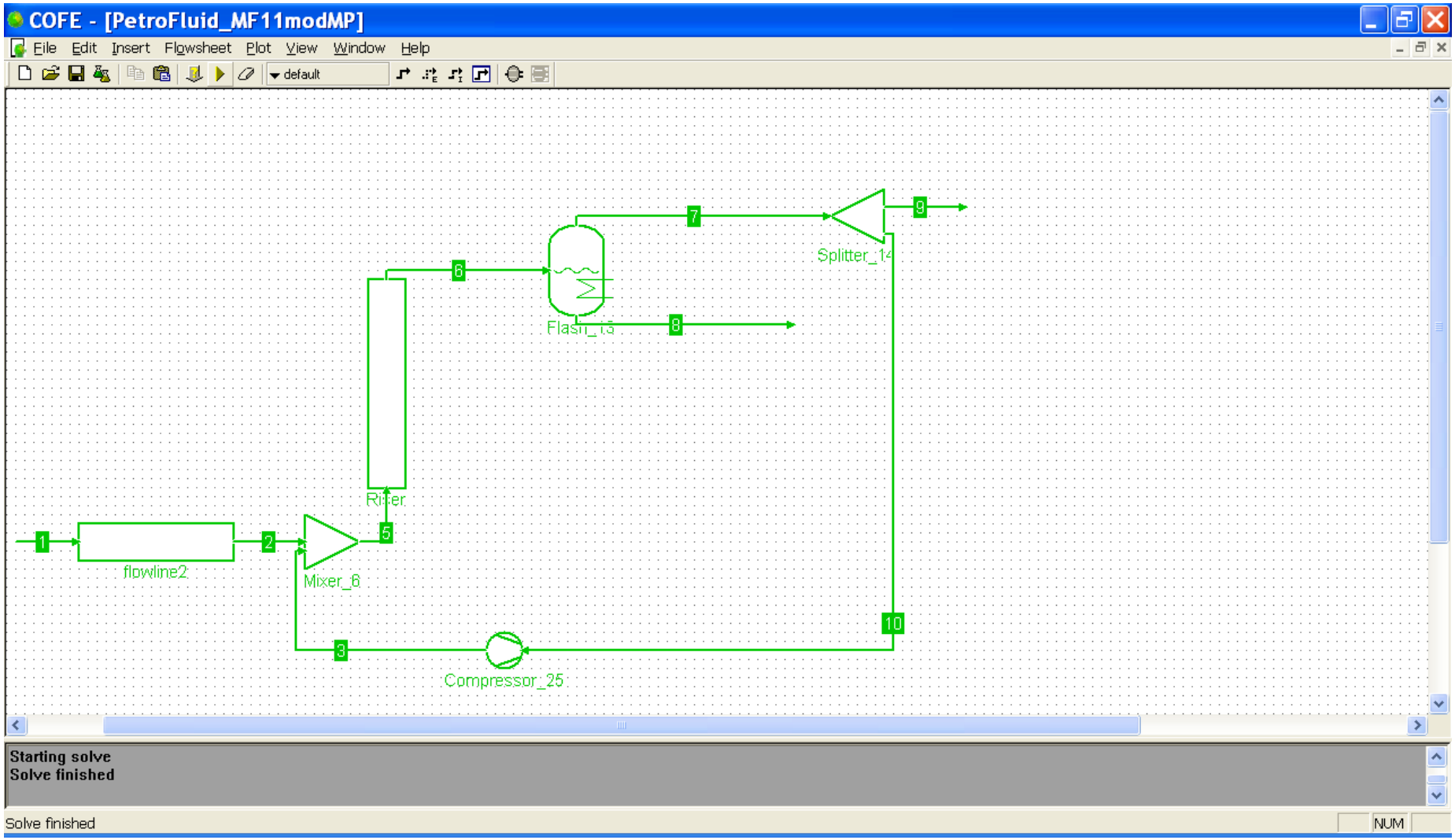
Pro/II showing internal and COUSCOUS mixer



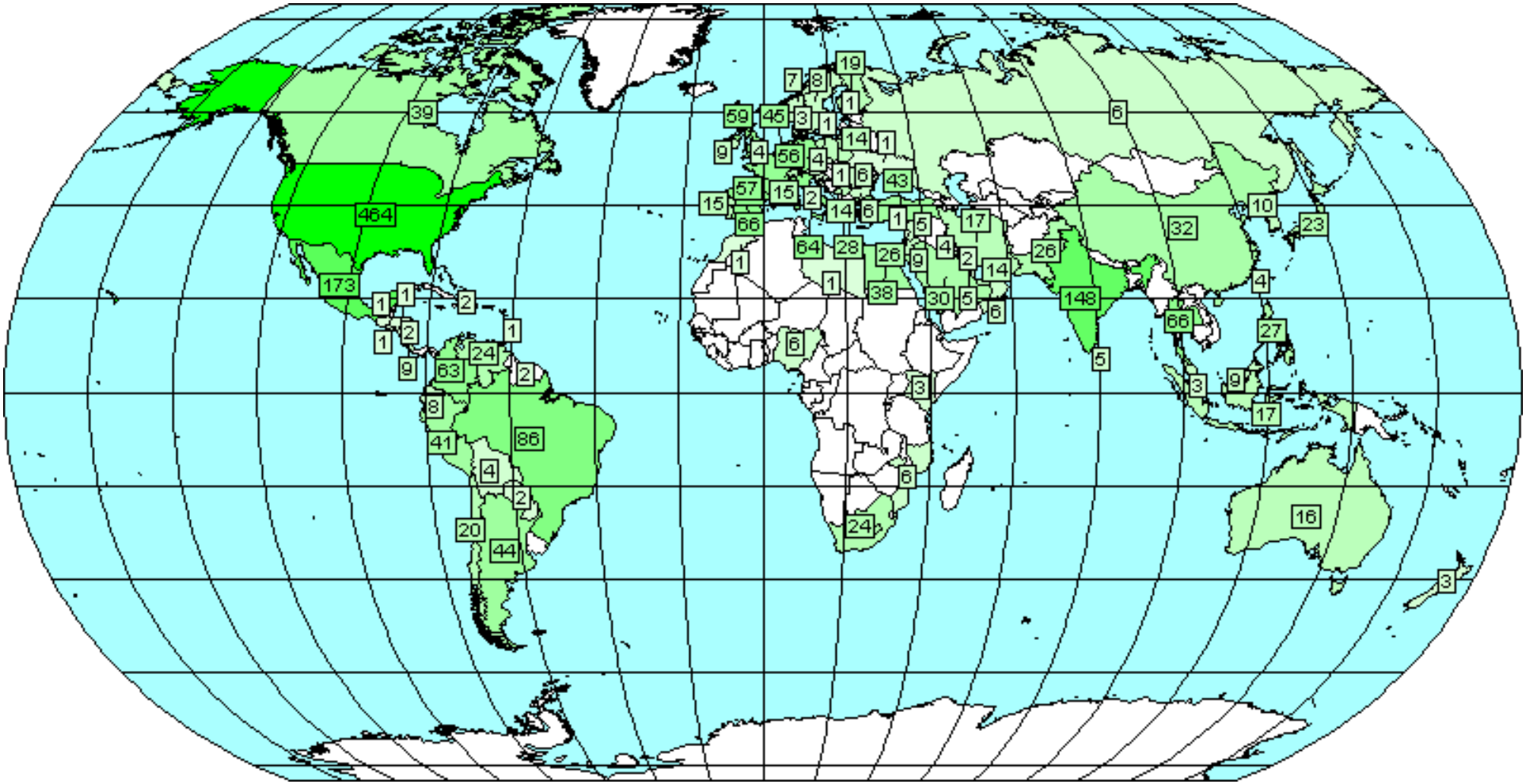
Pro/II using TEA



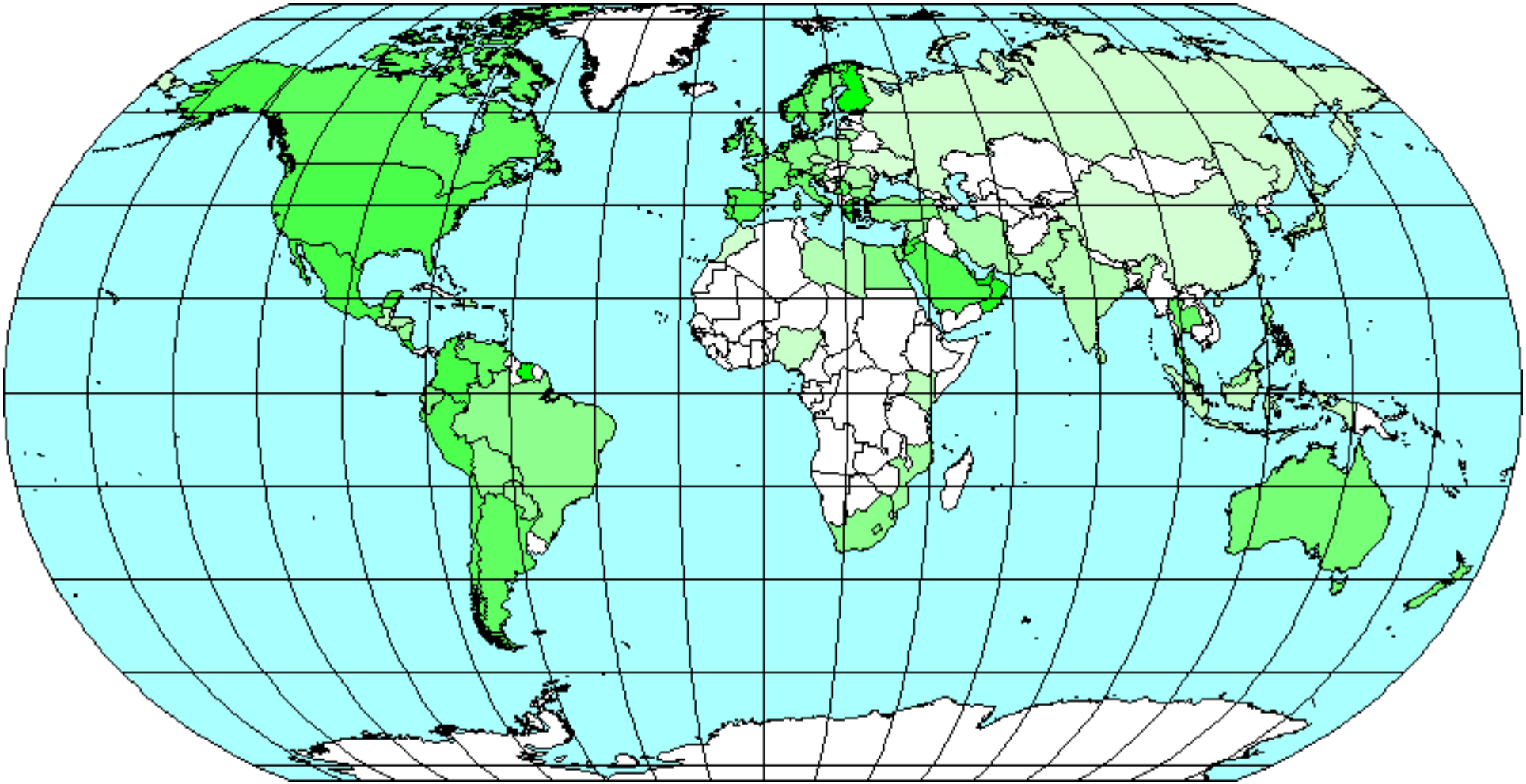
IFP/TOTAL TINA pipe model running in COFE

Why COCO?

- COCO integrates a useful set of thermodynamic property calculations, compound information and unit operation models
- COCO has been awarded the CO-LaN CAPE-OPEN award 2006
- COCO is widely regarded as the CAPE-OPEN interoperability testing platform
- COCO is available free of charge
- COCO is used world-wide



COCO downloads



COCO downloads per capita

- Download COCO: http://www.cocosimulator.org/
  (or ask for a copy during the workshop)

- Contact amster**CHEM** for CAPE-OPEN consulting

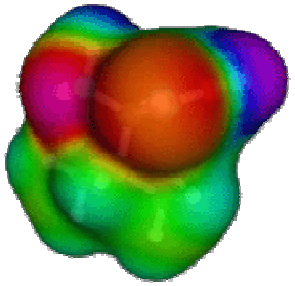
- Interoperability testing program:
  http://www.cocosimulator.org/index_compliancy.html

Acknowledgements:

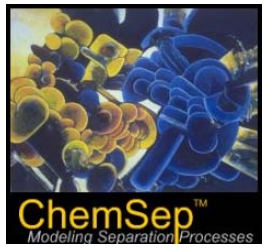
- Richard Baur
- ChemSep: Ross Taylor, Harry Kooijman
- Cosmo*THERM*: Frank Eckert
- Michel Pons

Many Thanks for CAPE OPEN testing licenses:

AspenTech: AspenPlus 2004.1

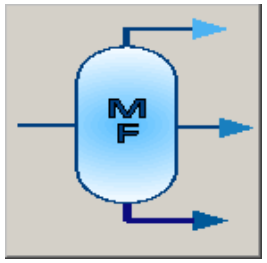


ChemSep: ChemSep 6.05



CosmoLogic: Cosmotherm C21

HTRI: Xchanger Suite 5.0

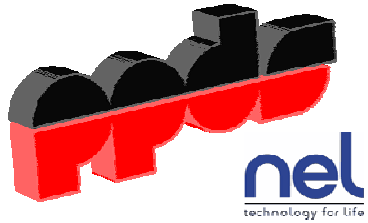


Infochem: Multiflash 3.6

PSE: gPROMS 3.0.3

Simsci-Esscor: PRO/II 8.1

TUV-NEL: PPDS v4.1.0.0



VMG: VMGThermo 5.0