CAPE-OPEN
2018 Annual Meeting

technische universität dortmund

MatLab Unit Operation potential improvements for academic use

Matlab™ into Aspen Plus™ case

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Presentation Overview

- Software solutions within a research project in University
- Overview of current thesis project
- MUO into Aspen examples - limitation
- DAC-UNIT current erros - solutions
- User friendly MUO

Software solutions within a research project in academy

- Development of Mathematical Models novel ideas
- Freedom on choosing the developing software
- Different software tools = different solution approach
  - Equation oriented vs modular modeling
  - Steady vs dynamic
- Integration tools required e.g.: CAPE-OPEN Matlab Unit Operation

Thank you CO-LaN!

Overview of current thesis project

Fakultät Bio- und Chemieingenieurwesen

- General Research Project Topic:

“Adsorptive Direct Air Capture of CO2”

M.Sc. Carsten Drechsler

- Specific thesis Project Topic:

“Optimal cost-based design of a highly integrated thermally coupled DAC-PTG process”

  - Among tasks: Existing Matlab (r2013b) model for the DAC unit should be implemented into Aspen Plus V8.8

Matlab into Aspen Plus case

- CAPE-OPEN Matlab Unit Operation (MUO) Download and installation

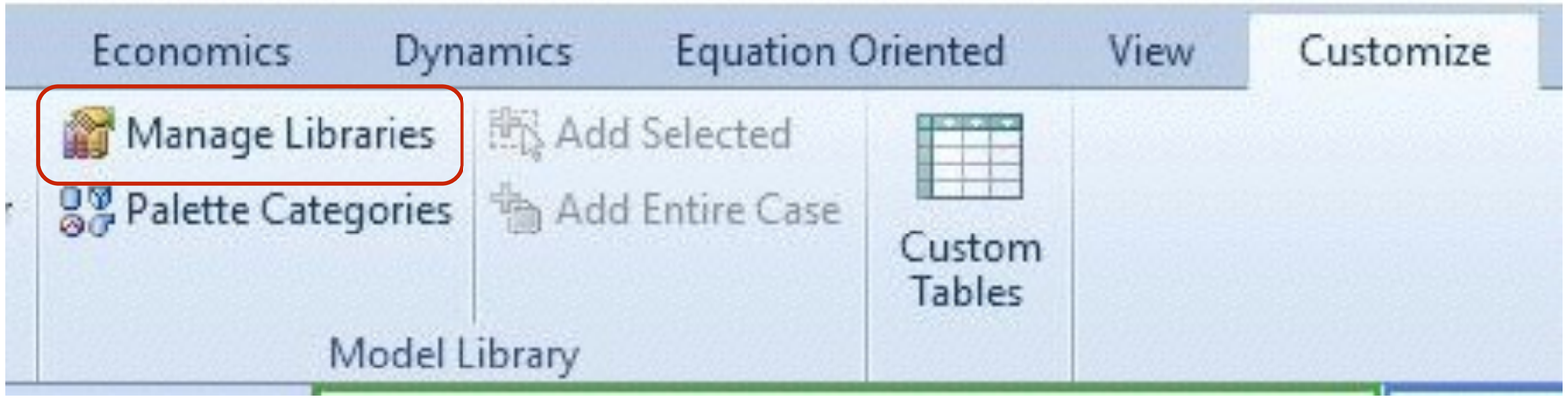
Matlab CAPE-OPEN

file	size	description	platform	last update
MatlabCapeOpenUnitOperation.2.0.0.9.exe	1400 KB	Matlab CAPE-OPEN Unit Operation Windows installer.	Windows, Matlab 7.7 (or higher)	28 aug 2018
MatlabCapeOpenThermoImport.2.0.0.5.exe	943 KB	Matlab CAPE-OPEN Thermo Import installation file.	Windows, Matlab 7.7 (or higher)	28 aug 2018

- Compatibility error - solution given by CO-LaN

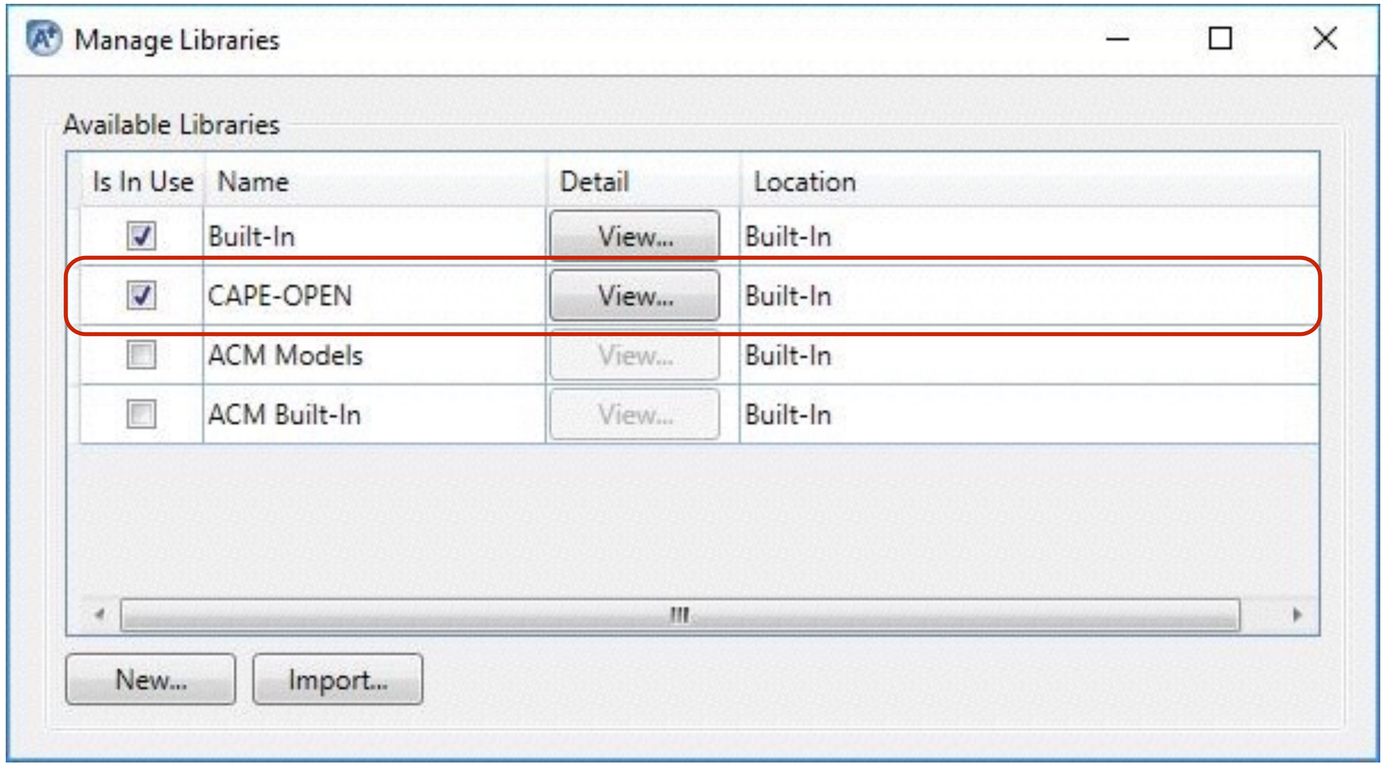
Use of the MUO into Aspen Plus V8.8

- Online help guide https://www.amsterchem.com/matlabunitop.html
- CAPE-OPEN library in Aspen



Use of the MUO into Aspen Plus V8.8

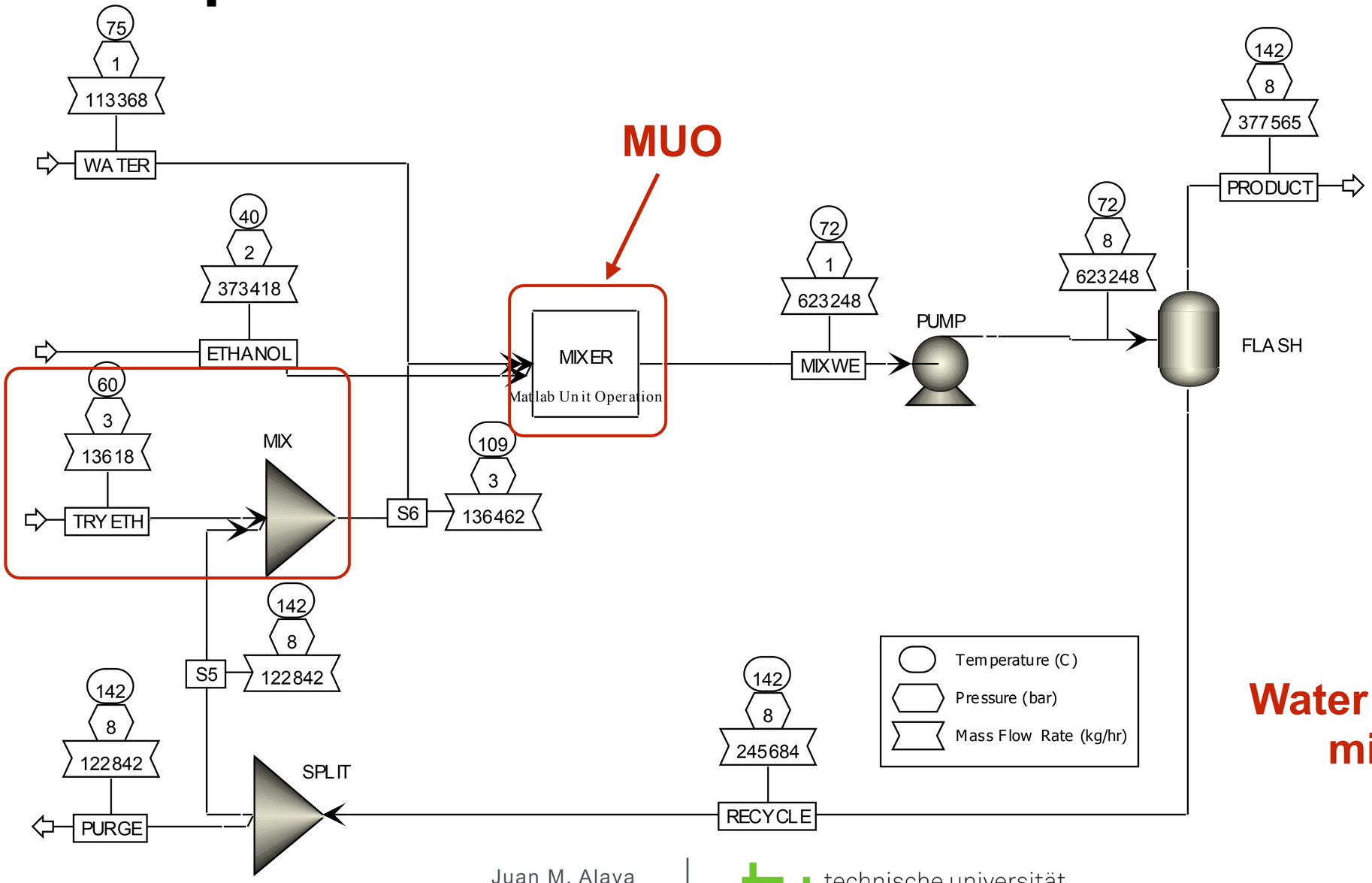
- CAPE-OPEN library in Aspen



Use of the MUO into Aspen Plus V8.8

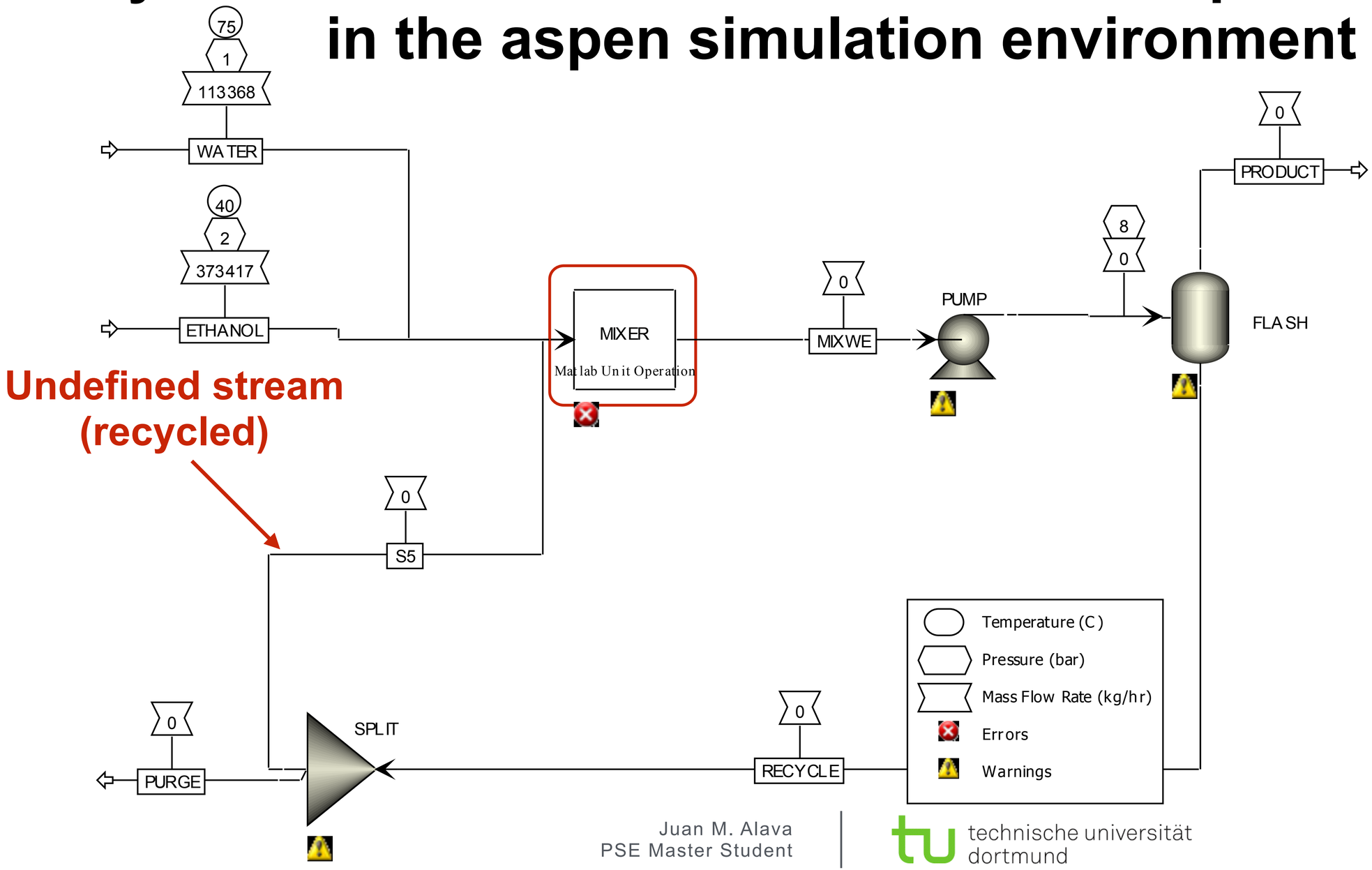
- CAPE-OPEN library in Aspen

Matlab Unit Operation with 3 connected streams. No errors

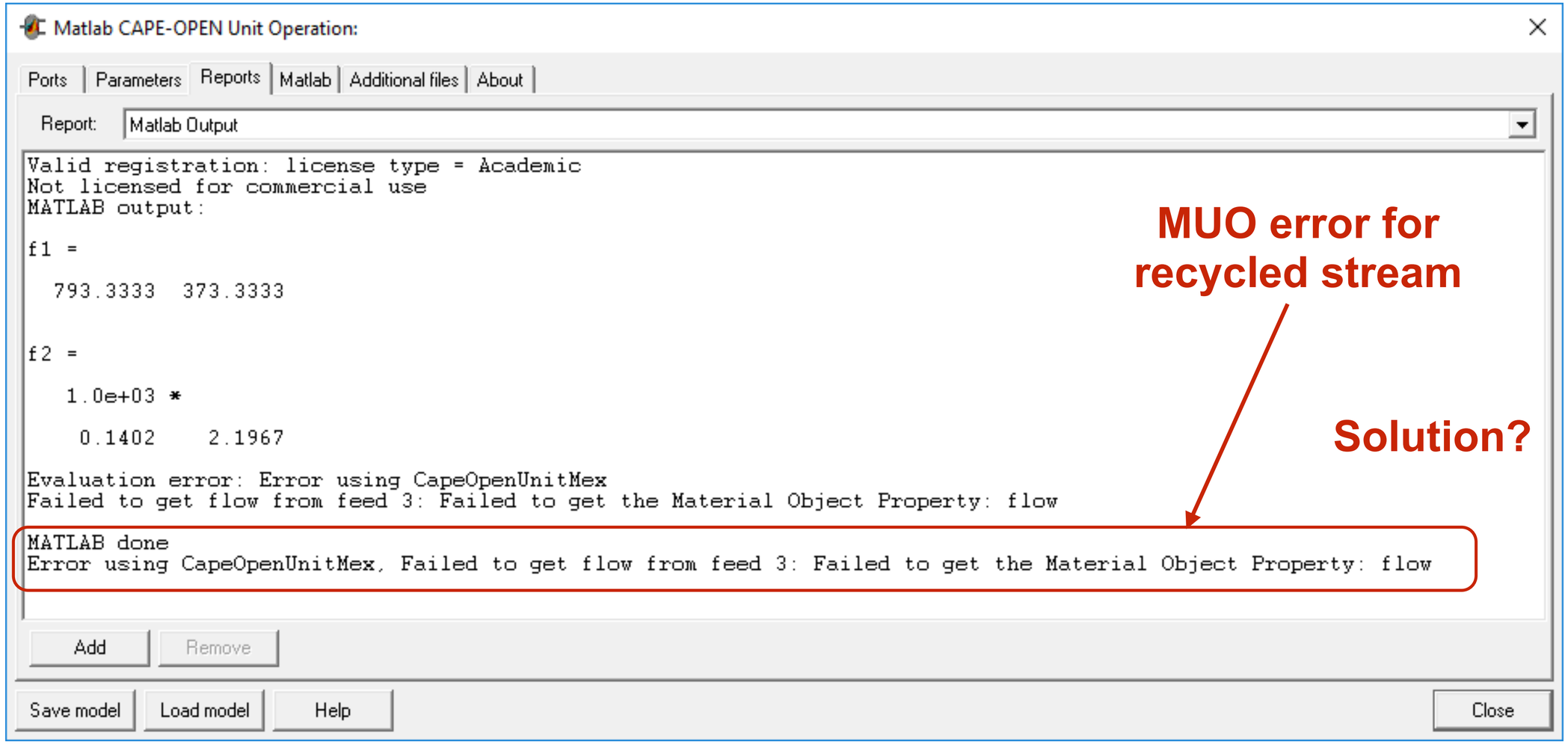


Water / Ethanol mixture

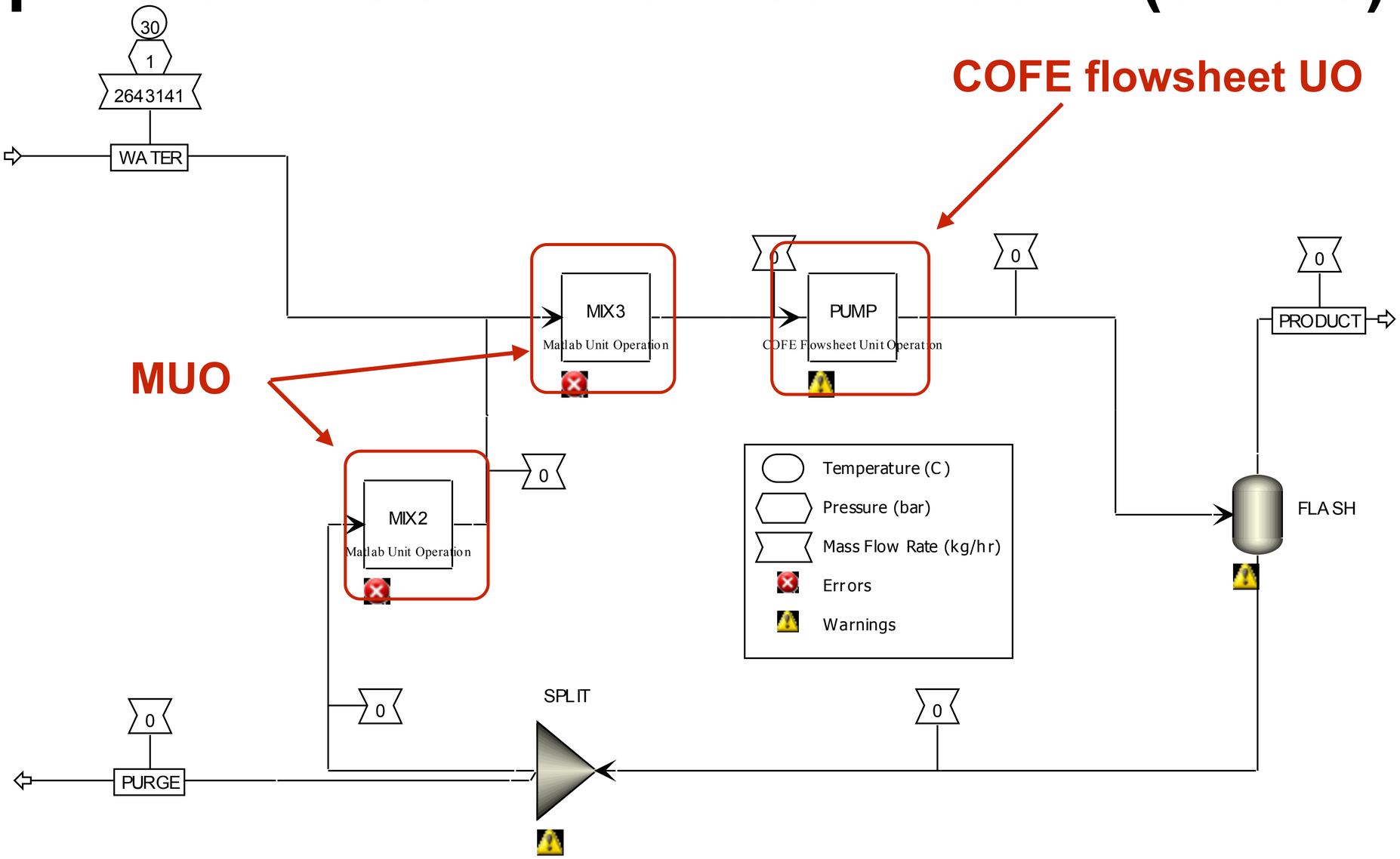
Recycle stream without direct declaration produces errors in the aspen simulation environment



Recycle stream without direct settings produces errors in the aspen simulation



Use of a duplicated MUO with the same code (errors)



Undefined input stream (recycled) or Multiple UO?

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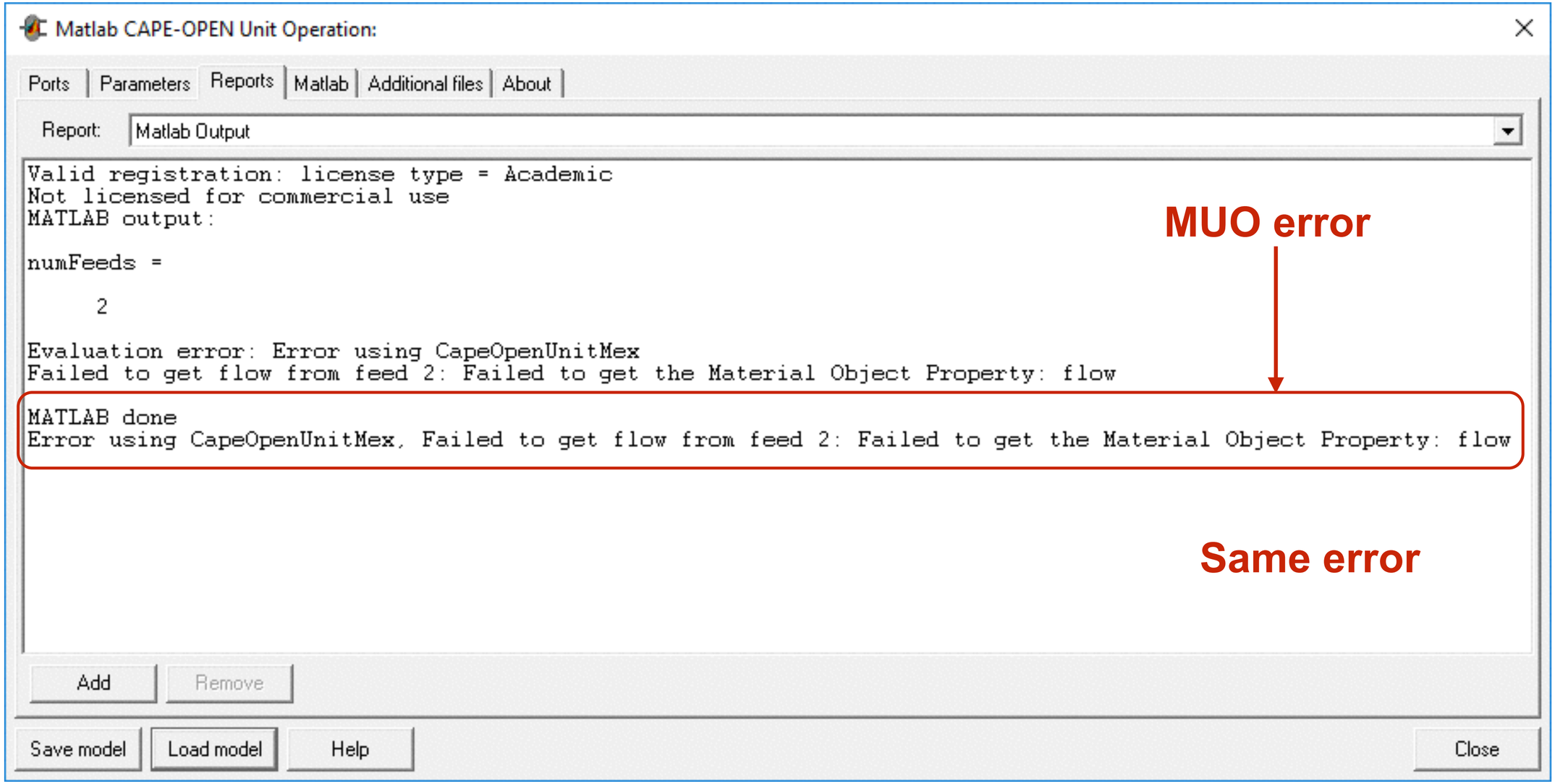
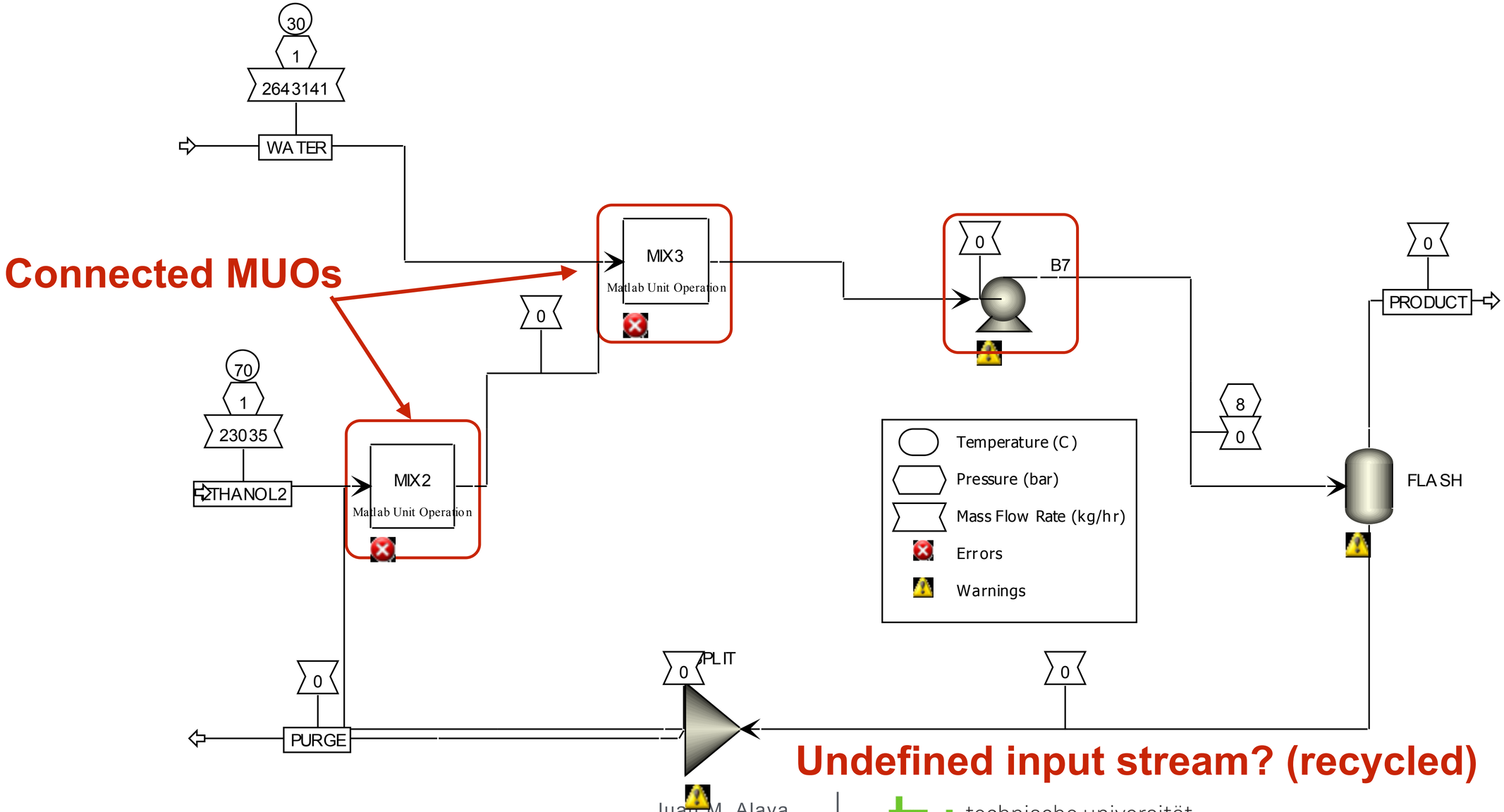
Use of a duplicated MUO with the same code (errors)



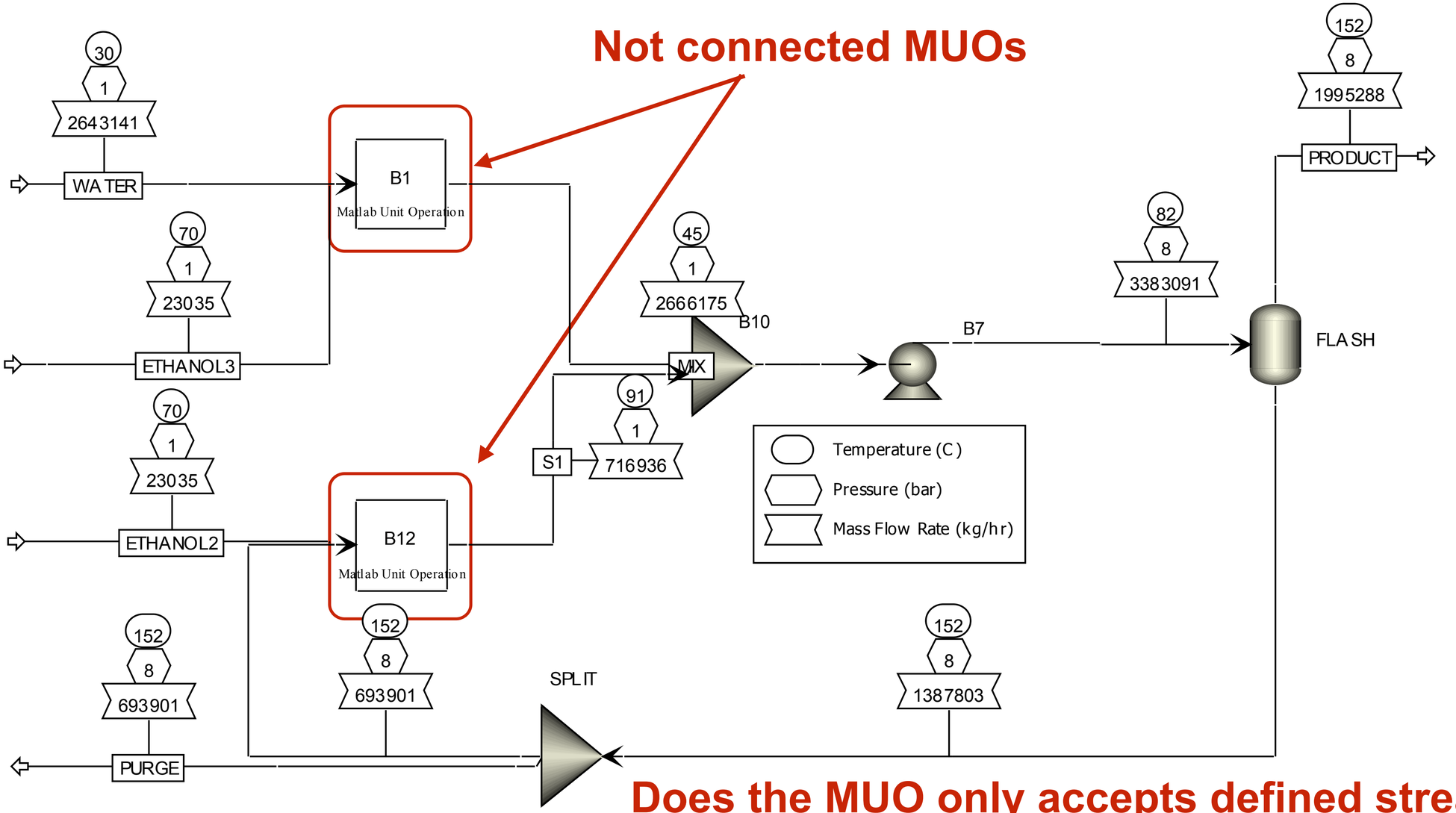
Use of a duplicated cape open Unit with different code (MUO error)



Connected MUOs

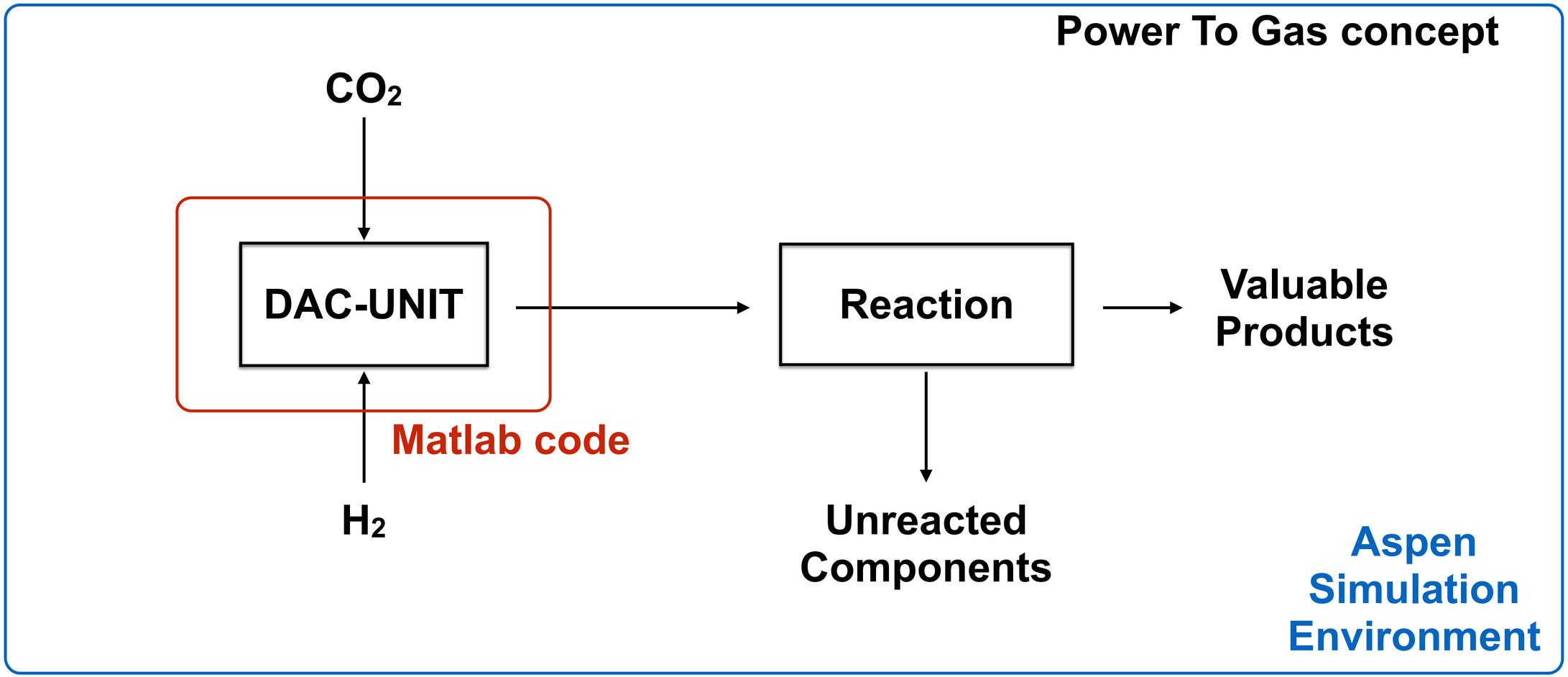
Undefined input stream? (recycled)

Use of a duplicated MUO with the same code (no error)

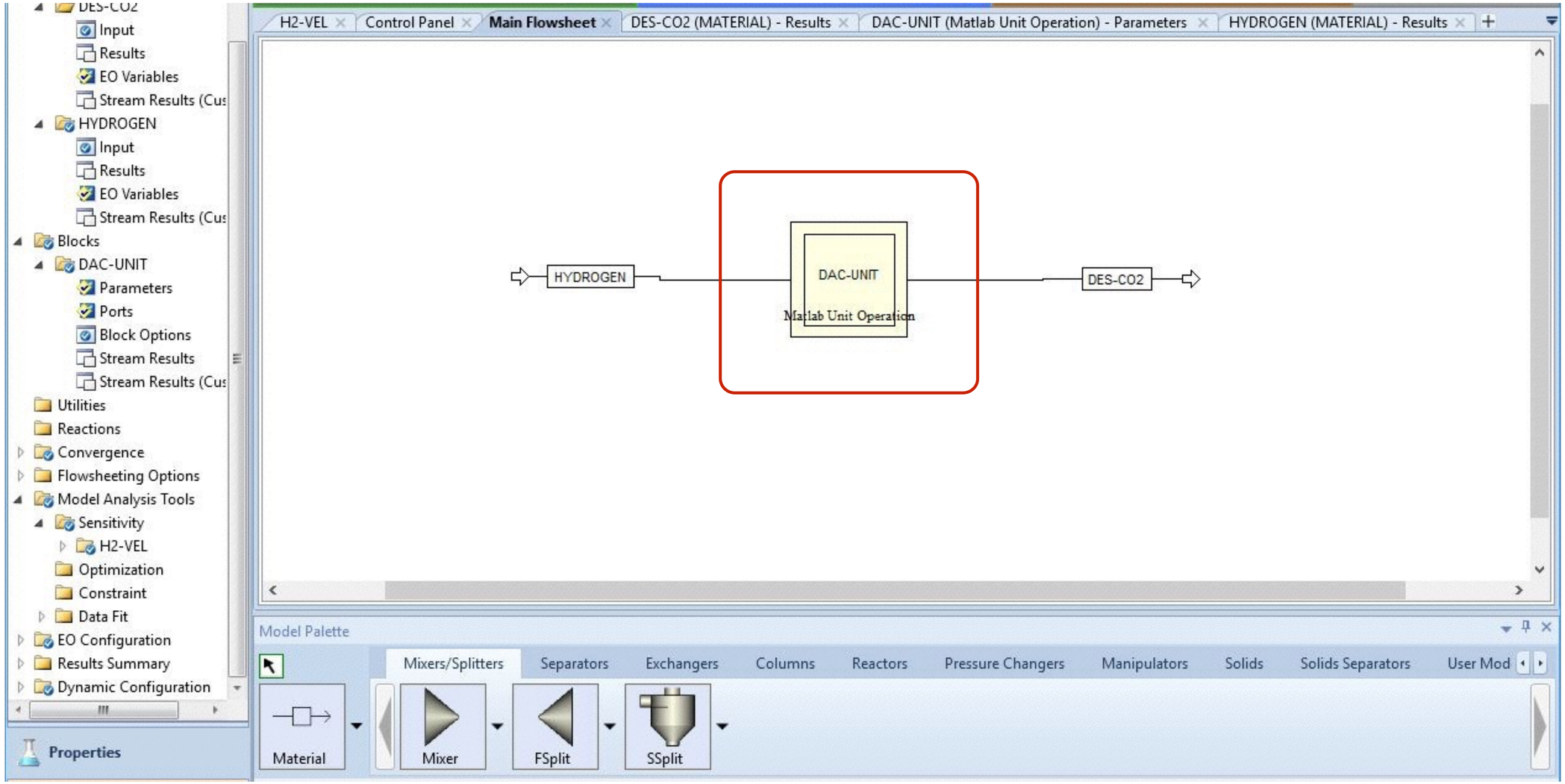


Does the MUO only accepts defined streams?

Behaviour of the MUO (DAC-UNIT) in Aspen



Behaviour of the MUO (DAC-UNIT) in Aspen

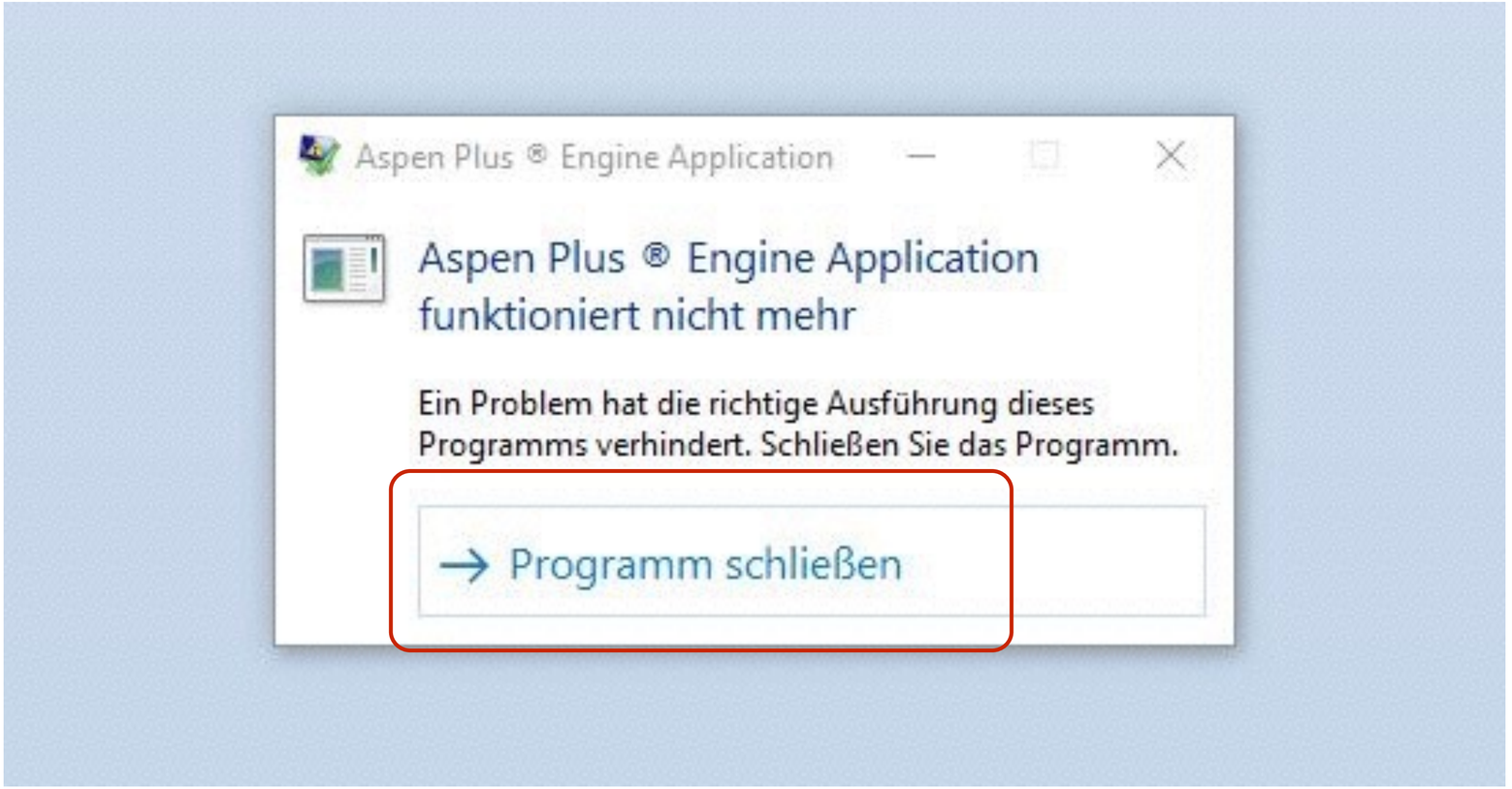


Input specification of the DAC-UNIT in Aspen

- 9 input parameters need to be specified
- So far 7 output parameters and states are obtained from the DAC-UNIT for analysis:
  - Sensitivity analysis
  - Optimisation studies (costs)
  - Design specification

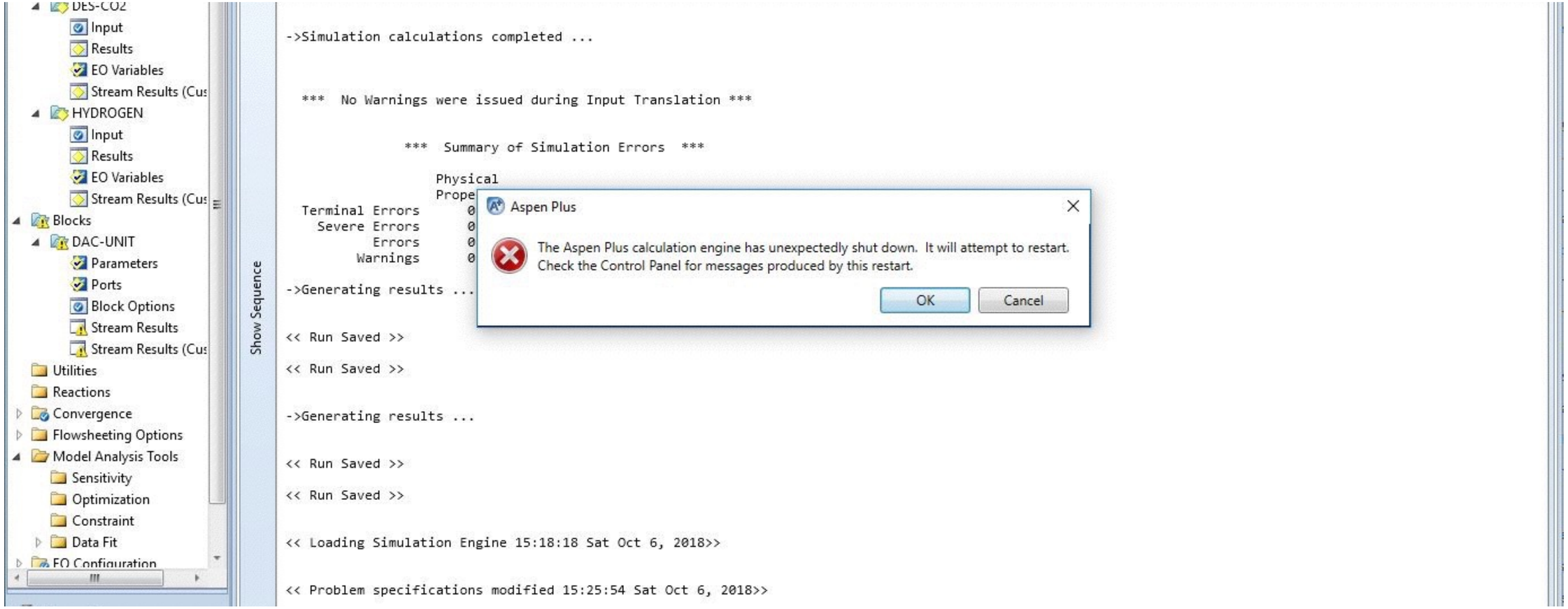
Presented error of the DAC-UNIT in Aspen

- When a simulation error is present the simulation engine stops working
- The streams are disconnected and MUO won’t work



Presented error of the DAC-UNIT in Aspen

- Solution: start over!



Presented error of the DAC-UNIT in Aspen

- Solution: start over!
- Disconnect the input / output streams
- Reset the simulation
- Edit the MUO by loading the .mum file for the DAC-Unit
- Connect the streams
- Run the simulation

Current diagnostic and solution by CO-LaN

- Use the COLTT application to understand the source of the problem
  - COLTT 2.4.0 Controller x64

Improvements on MUO dialog window

- Allow copy and paste of parameters in the parameter declaration tab.
- Allow several Matlab file scripts to be selected and incorporated in the additional files tab.
- Current online help content related to the MUO should be integrated into the MUO dialog window.

General Improvements on MUO

- Allow copy and paste of parameters in the parameter declaration tab.
- Allow several Matlab file scripts to be selected and incorporated in the additional files tab.
- Current online help content related to the MUO should be integrated into the MUO dialog window.
- Improvement on working with recycle streams (undefined stream).
- Improvement on Aspen to MUO communication.

Thanks for your attention