

Thermodynamic Utility

Importance & Potential CAPE-OPEN Standard

by

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Importance of Thermo Utility Interface

Specifications for Stream Utility Component

Thermo Utilities in UniSim Design®

Conclusion

- **What is Thermo Utility ?**

- Thermo Utility is a calculation engine to estimate a (or a set of) special property of a stream such as Hydrate, Asphaltene, CO2 Freezing, Phase envelope, Corrosion Rate etc. which are not typically calculated as default in a simulator

- **Utility is an important feature in process simulator**

In simulator, utility can be used to

- Check stream condition (e.g. can form hydrate or not)

- Adjusting critical process variable (e.g. Add minimum amount of inhibitor)

- Control (e.g. Control T to avoid hydrate formation)

- **Provides choice to users**
 - Same type of utility from different software
e.g. Hydrate from Multiflash, PVTsim, PVTPro etc.
 - Specialty utility from a special software
e.g. Corrosion analyzer from OLI
- **Users may want to integrate specialized utility calculation in a non-intrusive way to process simulator**

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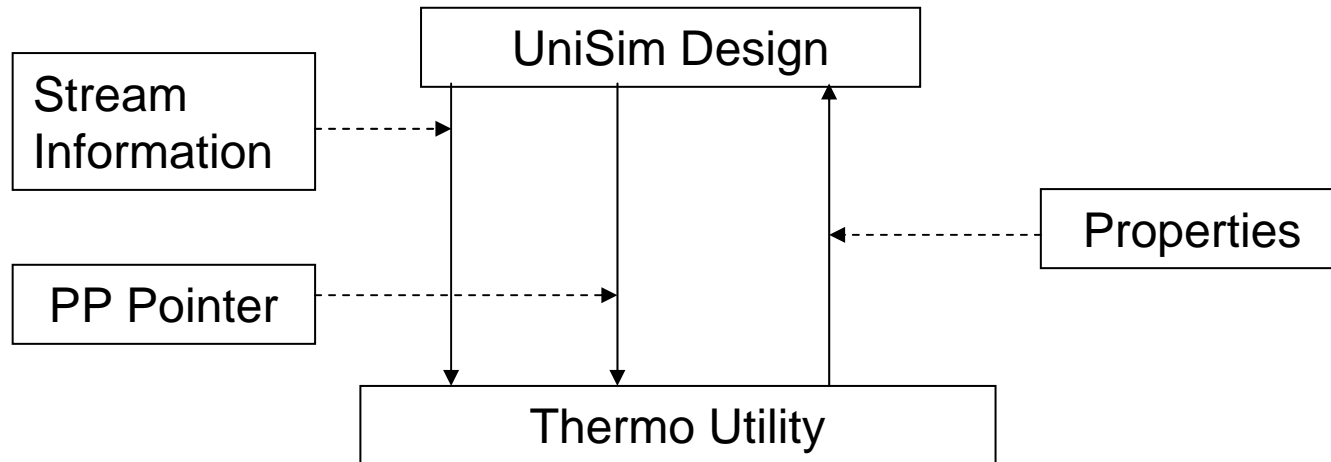
Conclusion

Specifications for Stream Utility Component

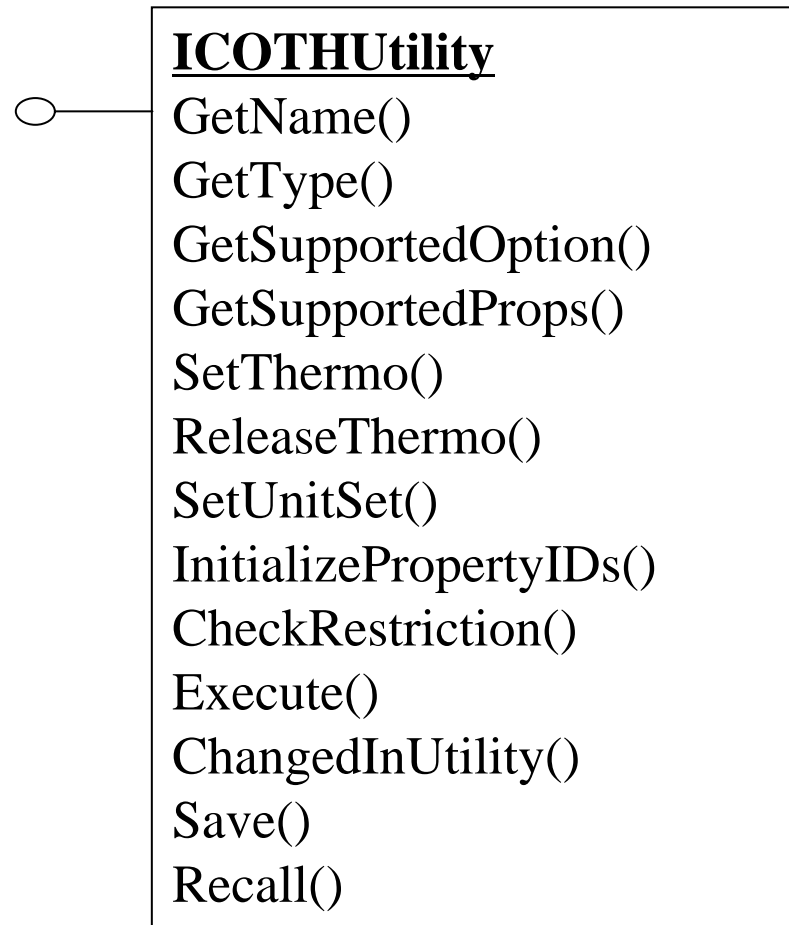
- Identification of the Utility (Utility → Simulator)
- Stream Information (compound list, T, P, composition), including pure compound information (Utility ← Simulator)
- Access to thermo engine for both flash and property calculations
- Input options, such as what kind of phase envelope is needed, need hydrate line or not etc.
- Output properties, such as hydrate temperature
- Store and Recall

Specifications for Stream Utility Component – Contd..

- Structure in UniSim Design Interface



- UniSim Thermo Utility Interface



Specifications for Stream Utility Component – Contd..

An attempt to map UniSim Thermo Utility Function to CO standard:

Get identifies

GetName()

GetType()

Identifier for the utility provided by the Utility component; But in CO, this might be in xml file or through registration

Get supported options and properties

GetSupportedOption()

for input options, such as dry base or wet base

GetSupportedProps()

for output properties, such as Hydrate formation temp and type

Simulator needs this information

Deal with Thermo

SetThermo()

ReleaseThermo()

This part is not necessary for CO, since Material Object in CO can handle it.

Deal with unit

SetUnitSet()

It is not necessary if unit inside Utility is fixed

Need for Stream Utility Component – Contd..

Deal with Property Identification

InitializePropertyIDs()

CO standard for handling properties

Deal with Restrictions

CheckRestriction()

We use this restriction method to provide flexibility to Utility component for checking with its Thermo engine. Need more discussion to see it is necessary or not for CO

Main Calculation Function

Execute()

Notify Change

ChangedInUtility()

Store and Recall

Save()

Recall()

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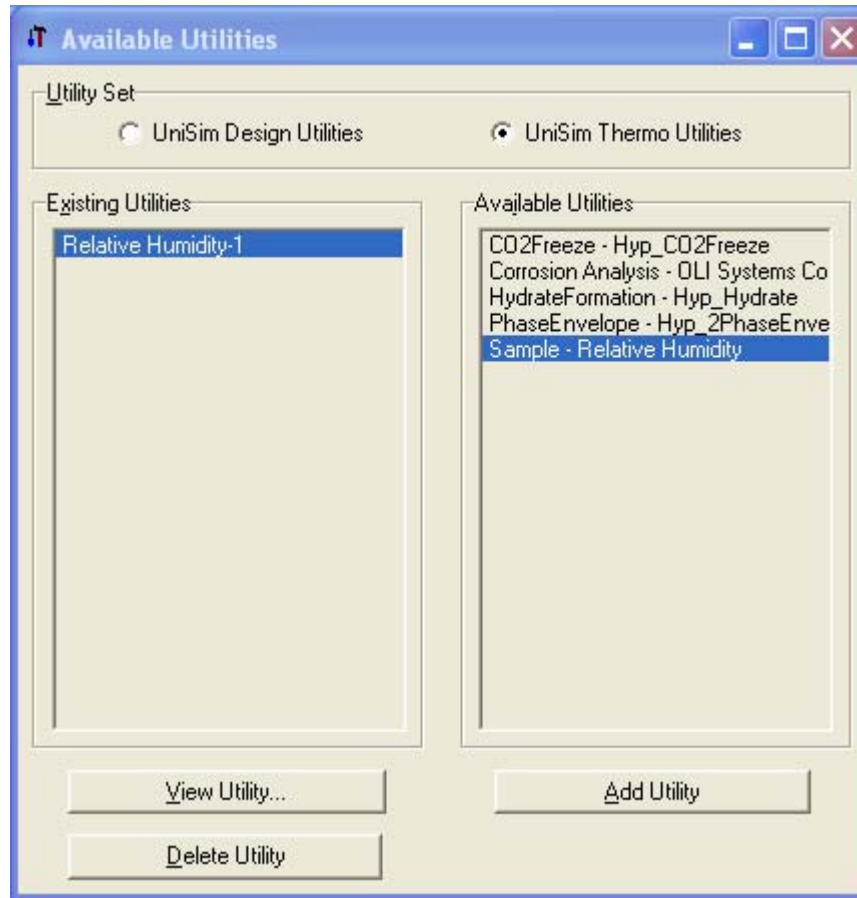
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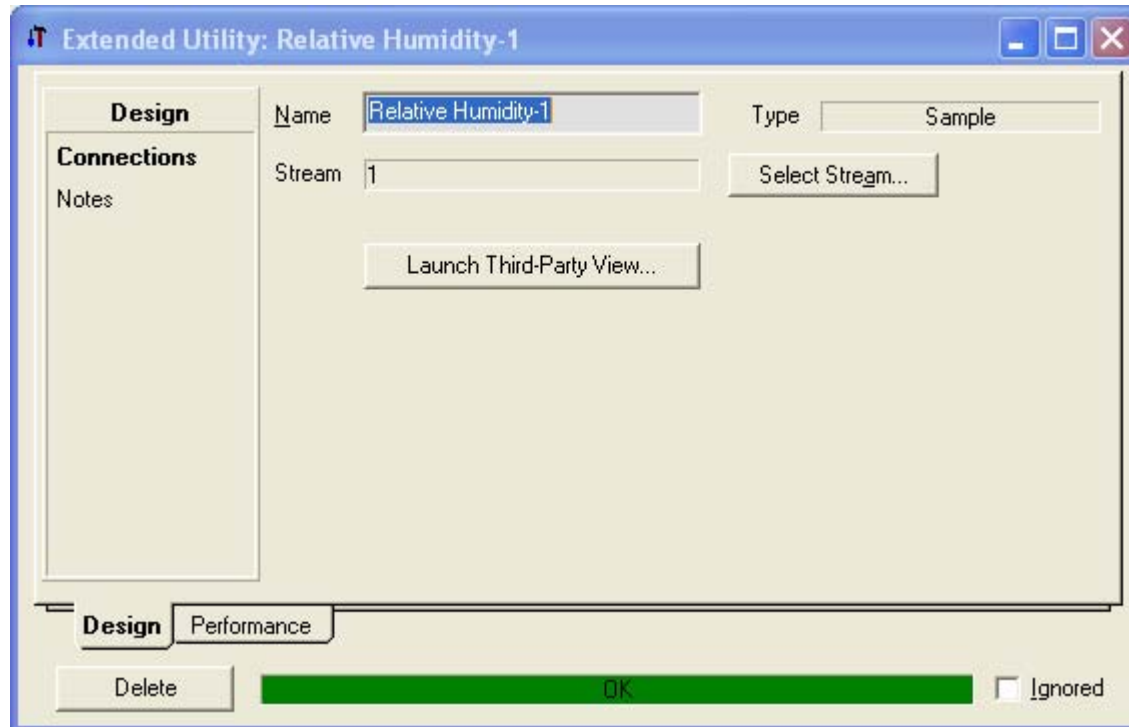
Thermo Utilities in UniSim Design

Select a Utility –



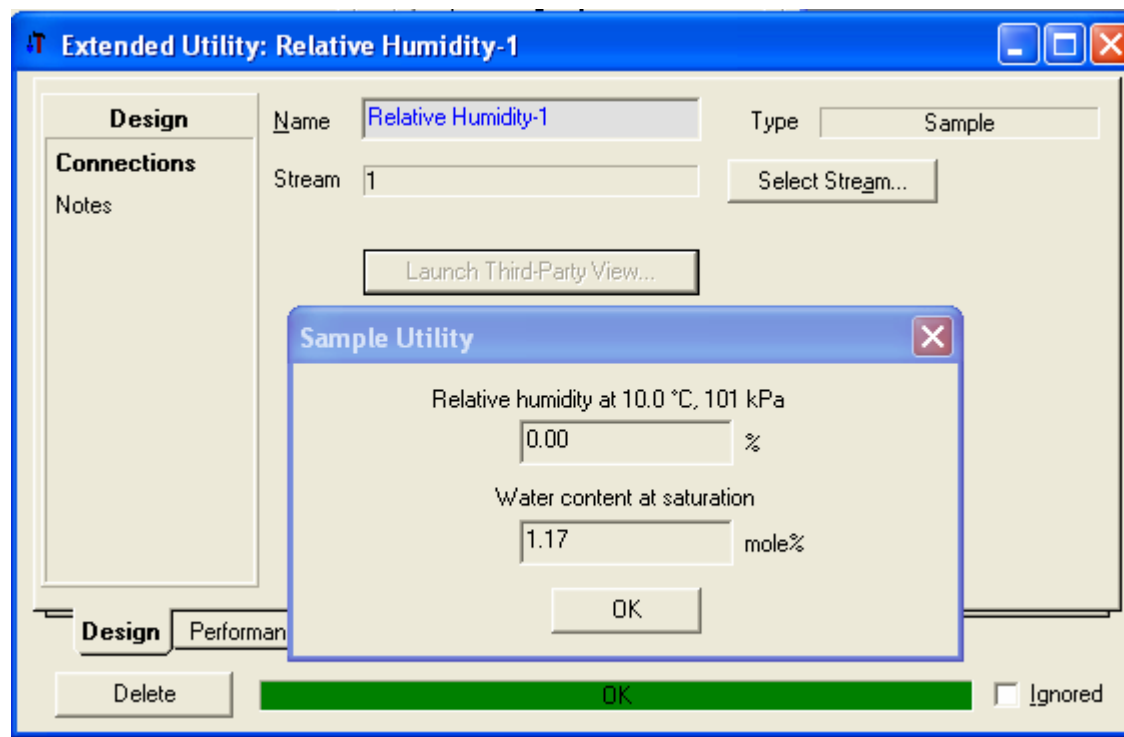
Thermo Utilities in UniSim Design – Demo Contd.

Select a Stream –



Thermo Utilities in UniSim Design – Demo Contd.

Open Utility View –



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- **Thermo Utility (or Stream Utility) is an important tool to flowsheet simulator**
- **An open structure to plug in third party utility will enhance the functionality of simulator and will give end user advantages to chose their preferred utility to use**
- **UniSim Design® successfully implemented a open structure to allow plug in third party utility into simulator and designed a set of sufficient interfaces**
- **If CAPE-OPEN can develop and support this kind of interface, that will bring valuable advantage to the simulator, utility suppliers and most importantly, to the end user of simulator**

Questions ?

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