APEX® Suite

- Digital H-Ex Twin

APEX® Suite - Digital H-Ex Twin

APEX® Suite - Digital H-Ex Twin is a package of proprietary programs which allow the user to access a digital replica of heat exchanger (e.g. an Air Preheater – APH) designed and supplied by *APEX Heat Transfer®.*

APEX® Suite - Digital H-Ex Twin is dedicated to Plant Operators, Assets Managers, Process Engineers and all those professionals who run, maintain, or design process units utilizing our proprietary heat exchangers, and who will benefit from being able to simulate the digital replica of their heat exchanger under diverse operating conditions.

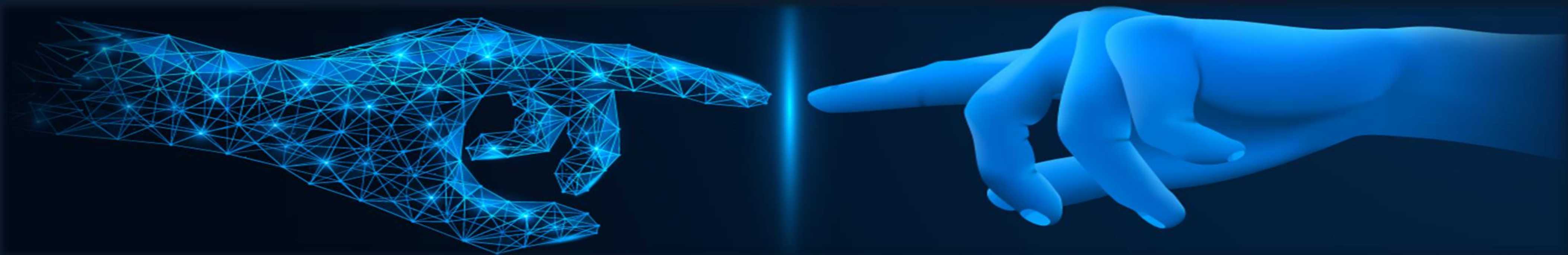
APEX® Suite - Digital H-Ex Twin comprises of the following programs:

- **APEX® Termic** – proprietary heat exchanger design program
- **APEX® Combust** – process stream design program
- **APEX® DewPoint** – dew point calculator
- **APEX® FurnaceEfficiency** – furnace efficiency calculator

APEX® Suite - Digital H-Ex Twin programs are available to the user under our Premium Software Platform, which can be accessed online with use of popular web browsers.

For comprehensive design or assessment of complete process unit, **APEX® Suite - Digital H-Ex Twin** can be easily integrated with such simulation programs as:

- AspenTech
- AspenPlus
- AspenTechHYSYS
- ChemStations ChemCAD
- AVEVA/SimSciPro/II
- BR&E ProMax
- PetroSim
- ProSimPlus
- ProSim
- Honeywell UnisimDesign
- AmsterCHEM COCO Simulator
- Daniel WagnerDWSim



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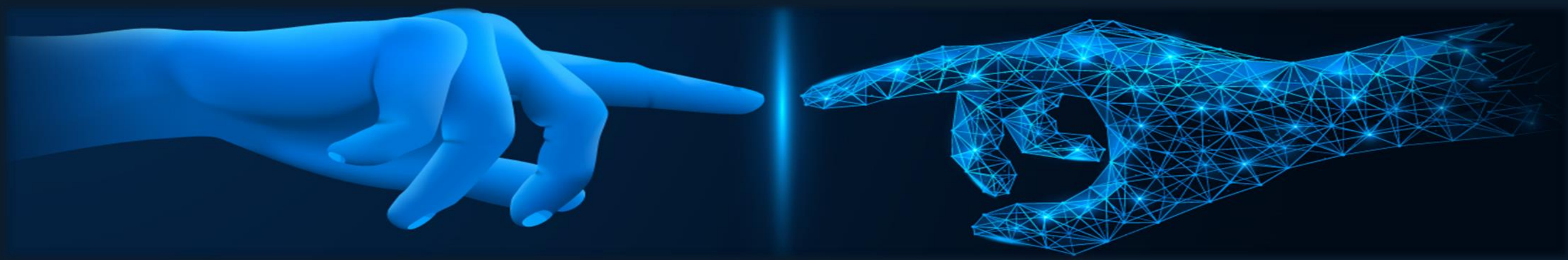
Benefits of Using Digital H-Ex Twin

- Simulate overall performance of the heat exchanger (e.g. metal temperature, pressure drop, flue gas and combustion air outlet temperature) when changing fuel or firing duty, and check how it affects the process unit.
- Plan ahead efficiency of process unit and fuel savings, NOx and CO2 emissions dependent on the APH performance simulated in foreseen operating cases.
- Calculate, verify and plan combustion air stream bypass or recirculation to prevent:
    - cold-end corrosion;
    - excess NOx emissions; and
    - decrease in process unit efficiency or integrity.
- Calculate expected condensation and corrosion rates when operating below the acid dew point, facilitating proactive measures to uphold system integrity and performance.
- Design or redesign the process unit based on performance of the heat exchanger across a diverse range of operating cases.
- Verify influence of the heat exchanger's performance on process unit; radiant and convection duty, flux rates and coil temperatures; NOx emissions; fuel efficiency; CO2 emissions; catalyst operating temperature and efficiency.
- Verify influence of the pressure drop across the heat exchanger on the process unit under varying operational conditions.
- Ensure that temperature of the heat exchanger remains within its metallurgical limits and avoids falling below the acid dew point across range of operating cases.
- Calculate acid dew point for variable fuels and flue gases.
- Check the temperature distribution of streams at the outlet of the heat exchanger to ensure the proper functioning of downstream equipment.
- Avoid costly downtime required for unplanned maintenance or repairs by ensuring proper operation of the heat exchanger within its design parameters.
- Perform troubleshooting, verify the performance of the heat exchanger by comparing simulation results with measurements in field.



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Digital replica in simulations

User defined inputs:

- Firing fuel and flue gas stream by combustion of defined fuel.
- Chemical composition of process streams.
- Inlet pressure of process streams.
- Inlet temperature of process streams (constant value or as a function of time).
- Inlet flow rate of process streams (constant value or as a function of time).
- Fouling factors.
- Heat loss.
- Stream flow rate and temperature in by-pass or recirculation.

Simulation results:

- Temperature of streams at the outlet of the heat exchanger (minimum, maximum, average and, in case of stream by-pass or recirculation, mixed value).
- Graphs of temperature distribution of streams at the outlet of the heat exchanger.
- Pressure drop across the heat exchanger.
- Metal temperature across the heat exchanger (minimum and maximum value).
- Duty (heat transferred) and thermal effectiveness of the heat exchanger.
- Warning of insufficient flow turbulence inside the heat exchanger for effective heat transfer.
- Acid dew point at the inlet and the outlet of the heat exchanger.
- Graph of the acid dew point distribution at the outlet of the heat exchanger.
- Water dew point.
- Condensation calculations (e.g. condensation rate, concentration of acid, condensate volume, corrosion rate).

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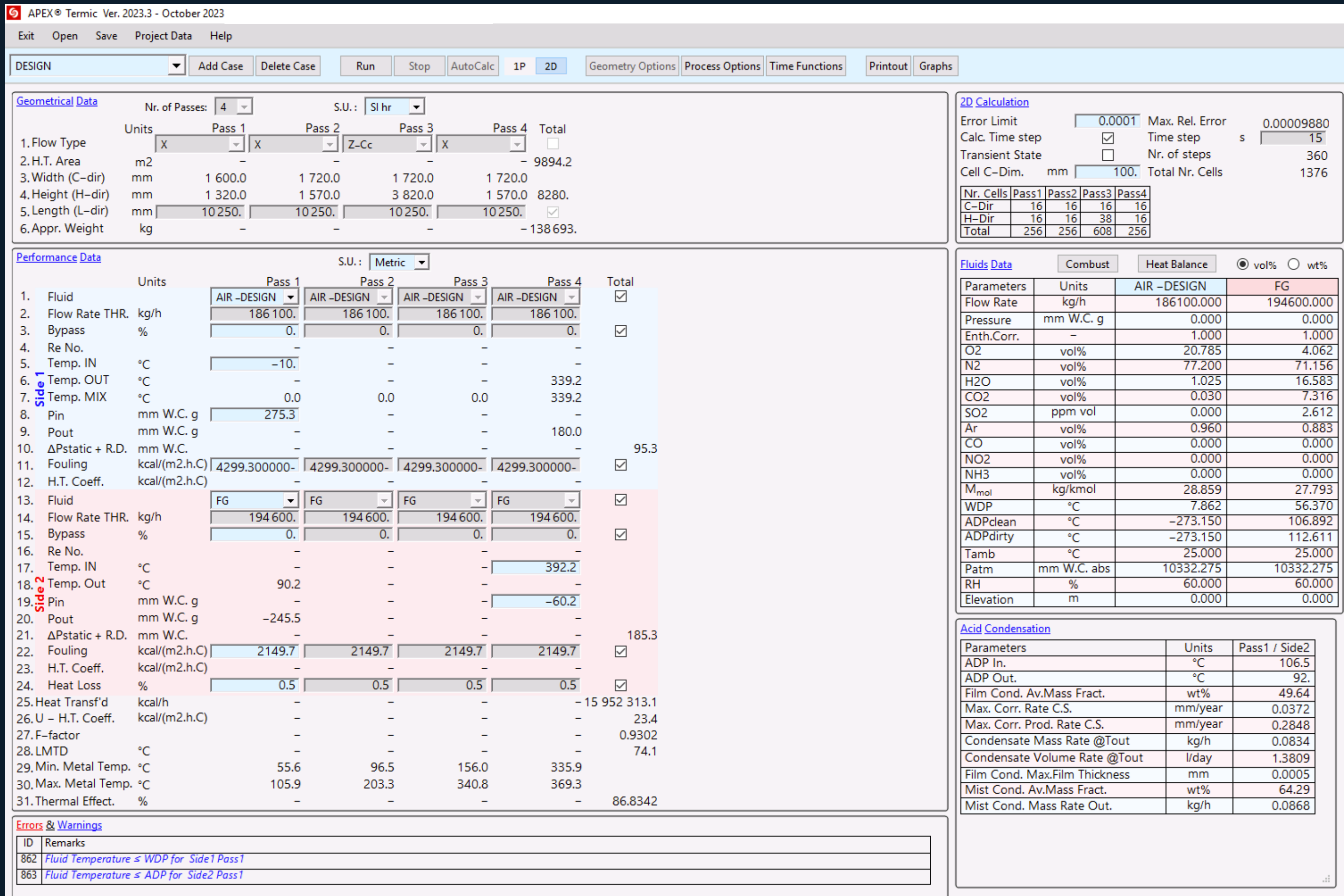
APEX® Termic

This program allows to simulate the performance of CORPEX®, V-FLEX®, CORTEX® and C-PEX® heat exchangers across a wide range of operating conditions. The user can input various parameters, including inlet temperatures, flow rates, pressure, fouling factors, chemical composition of streams, heat loss, and considerations for stream's by-pass or recirculation.

This comprehensive input capability allows for a detailed analysis of heat exchanger behavior under diverse operating scenarios.

The user is enabled to assess how changes in the process may impact the heat exchanger's performance in terms of:

- Stream outlet temperature,
- Pressure drop,
- Metal temperature,
- Dew point,
- Thermal effectiveness,
- Heat transferred, and more.



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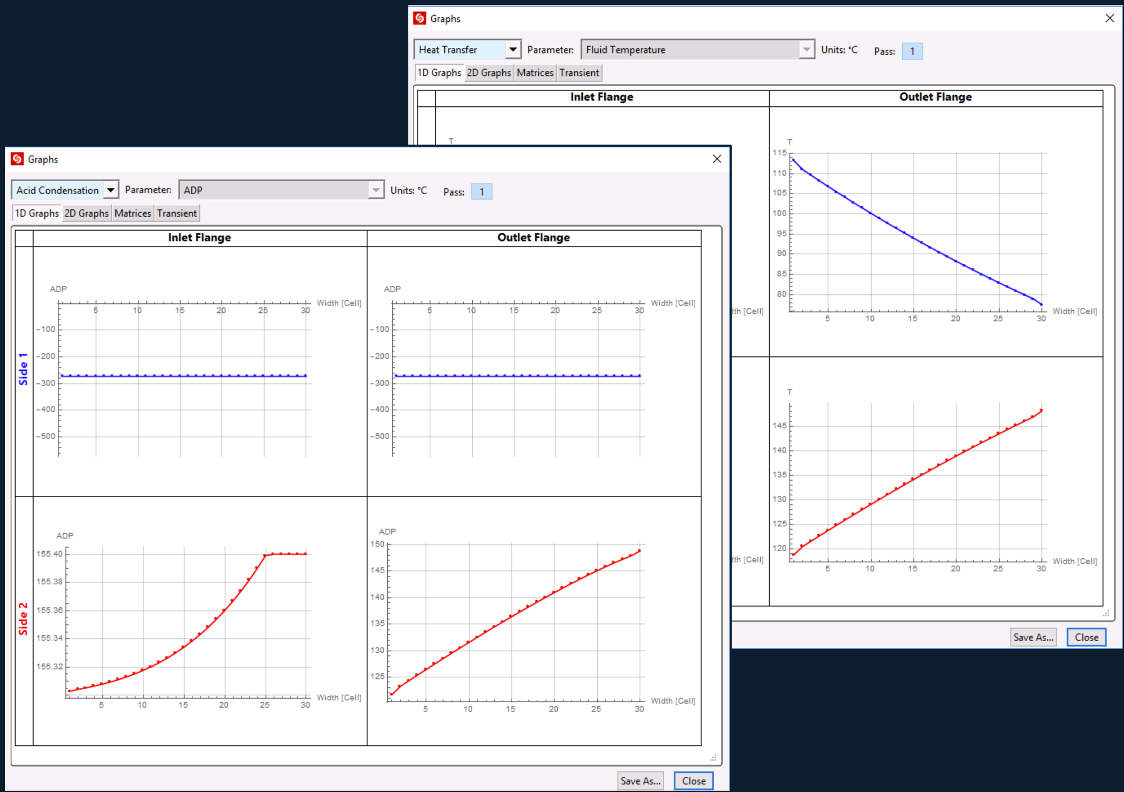
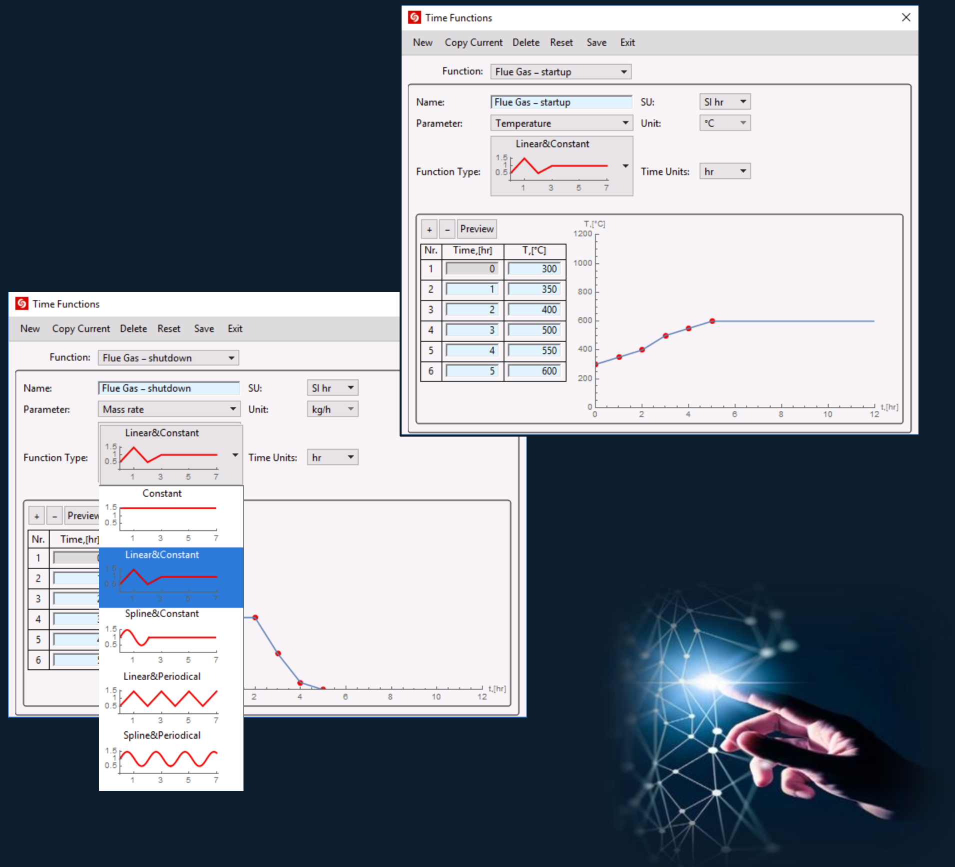
APEX® Termic

The program provides graphical display of the streams' temperature distribution and the Acid Dew Point distribution at the outlet of the heat exchanger. The user can assess how the conditions at the outlet of the heat exchanger may affect their downstream equipment.

APEX® Termic allows the user to perform time-dependent simulations, such us furnace startup or shutdown, which may be essential in troubleshooting the process unit operation, or to assess how such operating cases impact performance or integrity of the heat exchanger.





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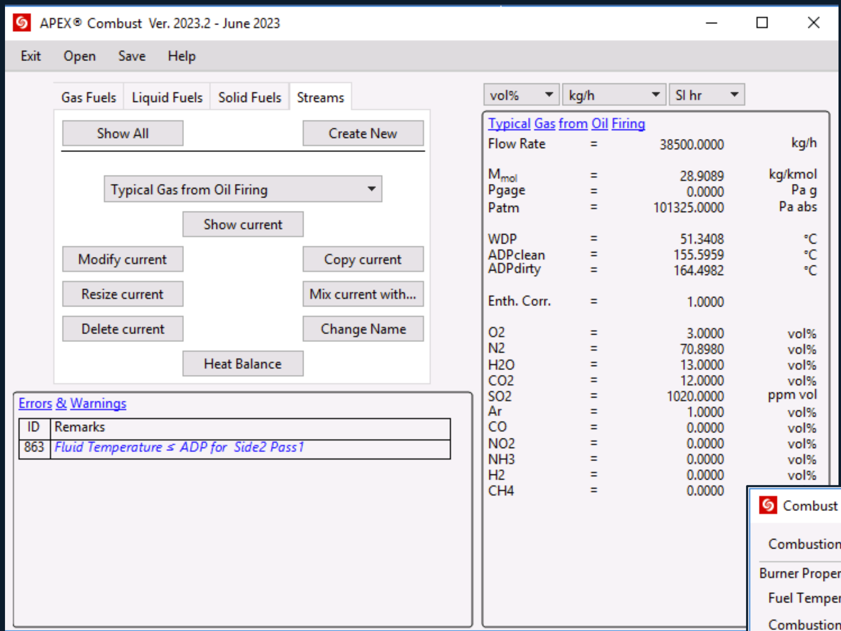
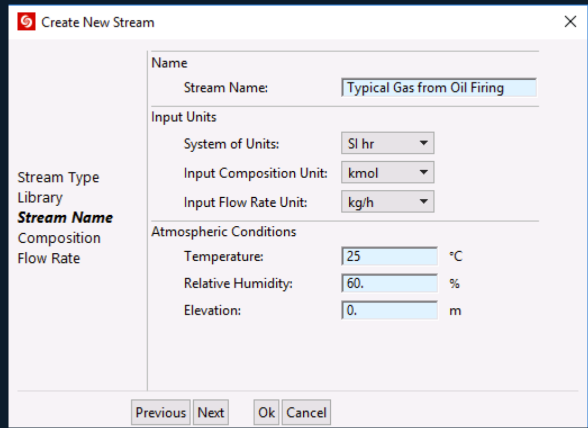
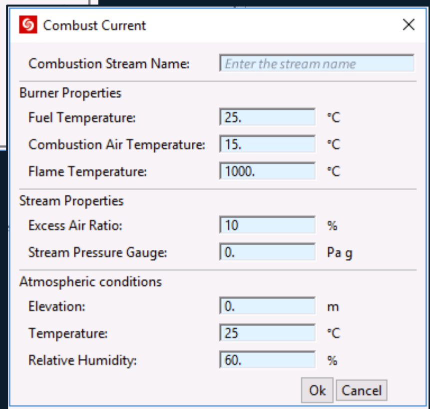
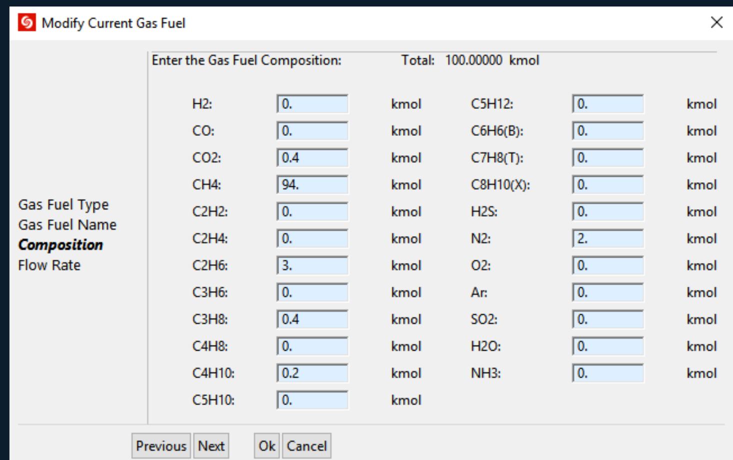
APEX® Combust

This program utilizes chemical composition, pressure, and flow rate to define the process streams used as heat transfer mediums in the heat exchanger (e.g. APH). It allows also to define and combust the fuel to derive the flue gas stream. The user can assess how changes of the fuel or flue gas composition may affect the operation and integrity of the heat exchanger.









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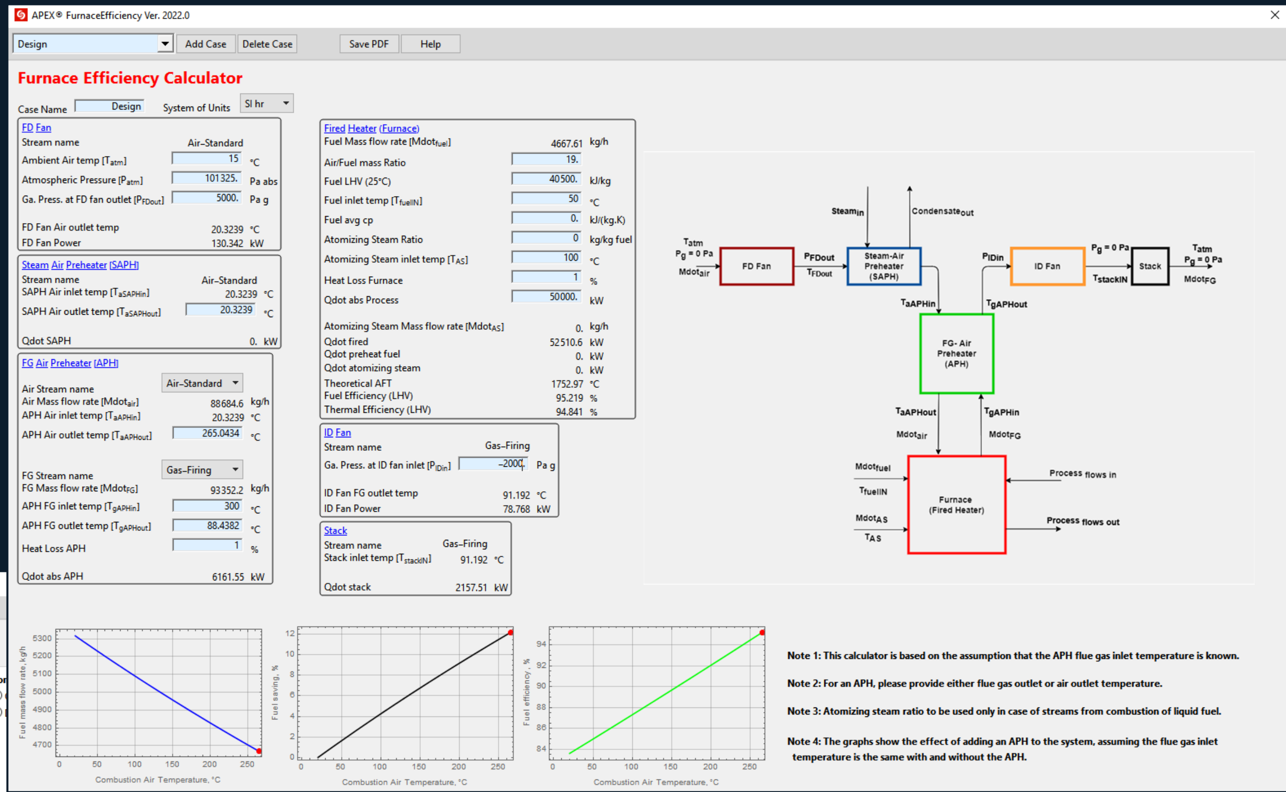
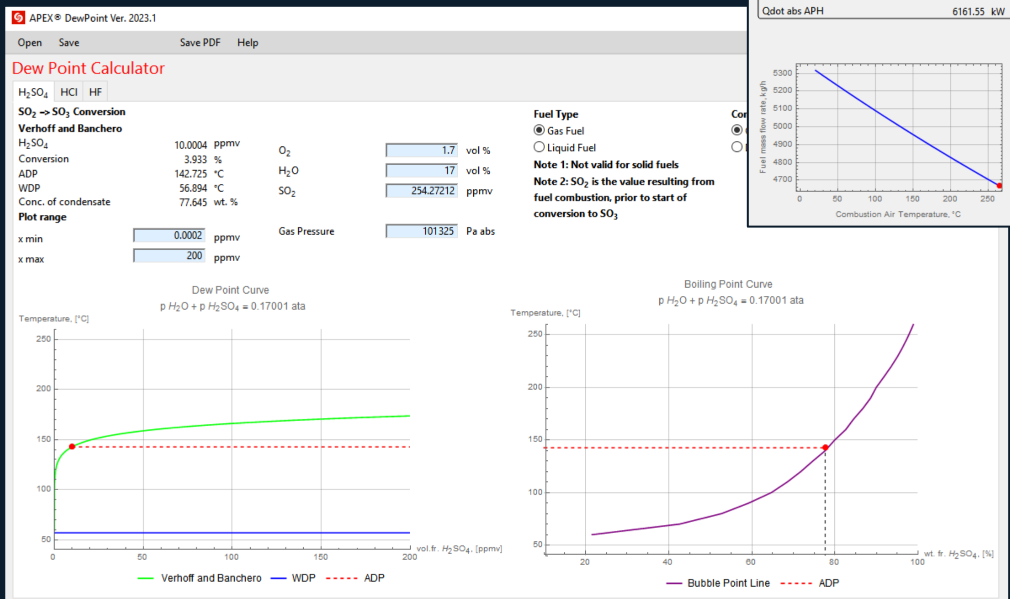
APEX® FurnaceEfficiency

The user can utilize the Air Preheater's performance data to calculate the overall efficiency of the furnace, fuel savings and CO_2 emissions.

APEX® DewPoint

The user can calculate the dew point temperature of Sulfuric, Hydrochloric, and Hydrofluoric acid, as well as water. It allows to assess whether the dew point can lead to corrosion issues in the cold-end of heat exchanger.





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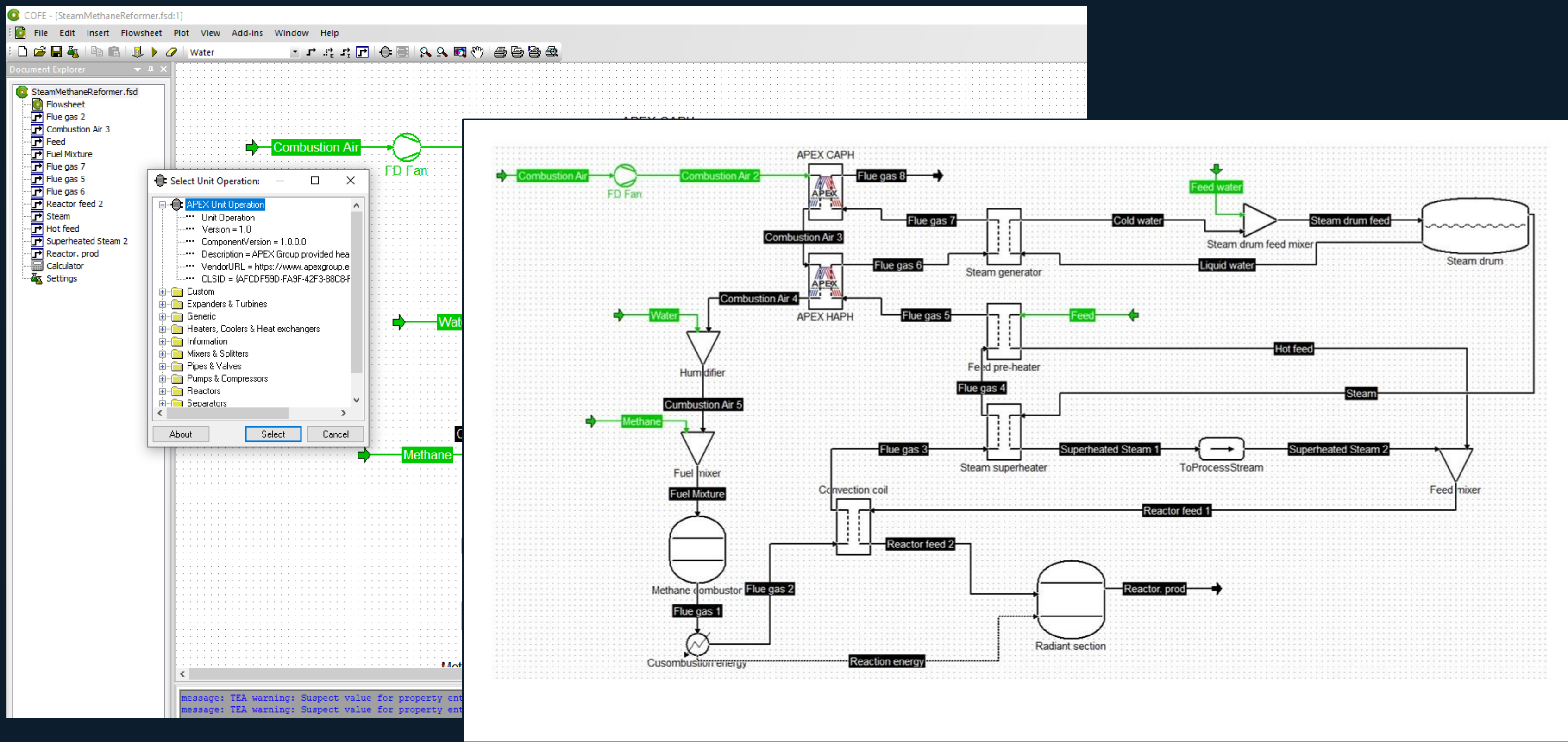
Integration with 3rd party process simulation software

APEX® Suite – Digital H-Ex Twin can easily be integrated with process simulation software such as HYSYS, UniSimDesign, PetroSim and many others.

This integration allows the user to run simulations of the complete process unit under variable operating conditions. Such simulations enable the process industries to optimize their operations in terms of, for example, energy consumption and emissions, system integrity and maintenance planning, production yields and margins. This capability allows a comprehensive assets management, assessment of the process unit design and output, and planning a strategized optimization of its operational performance to meet rigorous environmental or economical goals.



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