July 23, 2024

Dear Customer,

We are pleased to release Version 32 of our software suite, with the new features and improvements summarised below.

Most of the content of this version reflects our continuing multi-year maintenance effort to re-structure our programs to ensure stability, longevity, and maintainability well into the future. The user interfaces for GT PRO, GT MASTER, PEACE and STEAM PRO, STEAM MASTER, PEACE were entirely rewritten using a modern, well-supported programming language that is tightly integrated with current and foreseen versions of MS Windows. To ensure a seamless transition, we maintained the same look-and-feel we've used for over two decades, so all the model inputs you use and all the reports you rely on are in the same place and provide the same functionality.

New features since Version 31 are summarized below, inclusive of those that had been released as revisions to Version 31, optionally downloaded from our online Service Center.

Installed Programs

This version includes **Thermoflow 32**, a launcher that allows you to start any of the primary programs in our suite. You may wish to pin a link to this app on your desktop or taskbar for easy access to the Thermoflow suite.
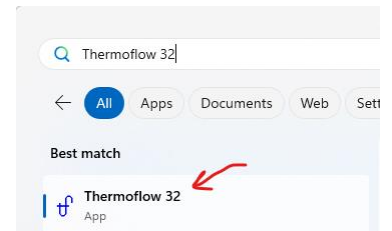
A link to each program is created in the Thermoflow 32 program group as usual. GT PRO, GT MASTER, STEAM PRO, and STEAM MASTER include 'Classic' user interfaces, as shown here for GT PRO. Classic user interfaces are included in this version to ease the transition to the updated interfaces. They will be maintained for the lifetime of Version 32, but will be phased out with the next major release.
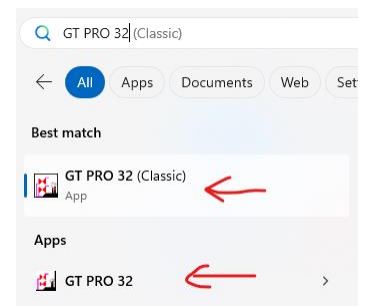
GT PRO, GT MASTER, STEAM PRO, and STEAM MASTER model files are associated with the updated user interfaces, so double-clicking an existing model file will automatically cause it to be opened by the associated program using its updated interface. Contents in model files you create and use are independent of the user interface used to create and compute them.

Updates Affecting Multiple Programs

Gas Turbine Database – The gas turbine database was updated as shown below. Some of these engine models were included in revisions to TFLOW31 available from our online Service Center.

Gas Turbine Database – The gas turbine database was updated with the following additions.

Kawasaki Additions

861: KHI GPB300D

862: KHI GPB180D

863: KHI GPB80D

864: KHI GPB50D

General Electric Additions

775: GE 6B.03 (60Hz, gas fuel)

841: GE 6B.03 (50Hz, gas fuel)

776: GE 6F.03 (60 Hz)

842: GE 6F.03 (50Hz)

777: GE 7E.03 (gas fuel)

778: GE 7FA.04 (gas fuel)

779: GE 7FA.05

780: GE 7HA.01

781: GE 7HA.02 (gas fuel)

782: GE 7HA.03 (gas fuel)

783: GE 9E.03

784: GE 9E.04

785: GE 9FA.04

786: GE 9HA.01

787: GE 9HA.02

788: GE GT13E2 (gas fuel)

789: GE LM6000 PC (50Hz, gas fuel, w/o water injection)

790: GE LM6000 PC (50Hz, gas & liquid fuel, w/ water injection)

791: GE LM6000 PC (60Hz, gas fuel, w/o water injection)

792: GE LM6000 PC (60Hz, gas & liquid fuel, w/ water injection)

793: GE LM6000 PC SPRINT (50Hz, gas fuel, w/o water injection)

794: GE LM6000 PC SPRINT (50Hz, gas & liquid fuel, w/ water injection)

795: GE LM6000 PC SPRINT (60Hz, gas fuel, w/o water injection)

796: GE LM6000 PC SPRINT (60Hz, gas & liquid fuel, w/ water injection)

799: GE LM6000 PF SPRINT-25 (50Hz)

800: GE LM6000 PF SPRINT-25 (60Hz)

801: GE LM6000 PF SPRINT-15 (50Hz)

802: GE LM6000 PF SPRINT-15 (60Hz)

803: GE LM6000 PF1 (50Hz, gas fuel)

804: GE LM6000 PF1 (60Hz, gas fuel)

807: GE LM6000 PF1 SPRINT (50Hz, gas fuel)

808: GE LM6000-PF1SPRINT (60Hz, gas fuel)

811: GE LM6000 PF2 (50Hz, gas fuel)
812: GE LM6000 PF2 (60Hz, gas fuel)

813: GE LM6000 PF2 SPRINT (50Hz, gas fuel)
814: GE LM6000 PF2 SPRINT (60Hz, gas fuel)

815: GE LM6000 PG (50Hz, gas fuel, w/o water injection)
816: GE LM6000 PG (50Hz, gas & liquid fuel, w/ water injection)
817: GE LM6000 PG (60Hz, gas fuel, w/o water injection)
818: GE LM6000 PG (60Hz, gas & liquid fuel, w/ water injection)

819: GE LM6000 PG SPRINT (50Hz, gas fuel, w/o water injection)
820: GE LM6000 PG SPRINT (50Hz, gas & liquid fuel, w/ water injection)
821: GE LM6000 PG SPRINT (60Hz, gas fuel, w/o water injection)
822: GE LM6000 PG SPRINT (60Hz, gas & liquid fuel, w/ water injection)

823: GE LM2500+ DLE (50Hz, gas fuel)
824: GE LM2500+ DLE (60Hz, gas fuel)

825: GE LM2500 +G4 DLE (LSPT) (50Hz)
826: GE LM2500 +G4 DLE (LSPT) (60Hz)

827: GE LM2500 +G4 SAC (LSPT) (50Hz, gas fuel, w/o water injection)
828: GE LM2500 +G4 SAC (LSPT) (50Hz, gas & liquid fuel, w/ water injection)
829: GE LM2500 +G4 SAC (LSPT) (50Hz, gas fuel, w/o water injection)
830: GE LM2500 +G4 SAC (LSPT) (50Hz, gas & liquid fuel, w/ water injection)
831: GE LM2500 +G4 SAC (LSPT) (60Hz, gas fuel, w/o water injection)
832: GE LM2500 +G4 SAC (LSPT) (60Hz, gas & liquid fuel, w/ water injection)

833: GE LM2500 +G4 DLE (UPT) (50Hz)
834: GE LM2500 +G4 DLE (UPT) (60Hz)

835: GE LM2500 +G4 SAC (UPT) (50Hz, gas fuel, w/o water injection)
836: GE LM2500 +G4 SAC (UPT) (50Hz, gas & liquid fuel, w/ water injection)
837: GE LM2500 +G4 SAC (UPT) (60Hz, gas fuel, w/o water injection)
838: GE LM2500 +G4 SAC (UPT) (60Hz, gas & liquid fuel, w/ water injection)

839: GE LM2500 +G5 (UPT) (50Hz, gas fuel)
840: GE LM2500 +G5 (UPT) (50Hz, gas fuel)

Mitsubishi Additions
843: MHPS M501 JAC
844: MHPS 701 JAC (2015)

Siemens Additions
845: Siemens SGT-A35 (GT61)
846: Siemens SGT-A35 (GT61 39MW)
866: Siemens SGT6-5000F (5ee), 9 ppm NOx
867: Siemens SGT6-5000F (5ee), 20 ppm NOx

Solar Turbines Additions
797: Centaur 40-4700S (SoLoNOx)
798: Centaur 50-T6200S (SoLoNOx)
805: Taurus 70-11101S (SoLoNOx)

806: Mars 100-16000S Hi-Amb (SoLoNOx)
809: Titan 130-19501S (SoLoNOx)
810: Titan 130-23001S (SoLoNOx)
847: Titan 250-31900S (SoLoNOx)
848: Titan 350S-34MWe 60 Hz (SoLoNOx)
849: Titan 350S-34MWe 50 Hz (SoLoNOx)
850: Titan 350S-38MWe 60 Hz (SoLoNOx)
851: Titan 350S-38MWe 50 Hz (SoLoNOx)
852: Taurus 70-11101 (Standard)
853: Mars 100-16000 Hi-Amb (Standard)
854: Mars 100-16000 (Standard)
855: Titan 130-19501 (Standard)
856: Titan 250-31900 (Standard)
857: Titan 350-34MWe 60 Hz (Standard)
858: Titan 350-34MWe 50 Hz (Standard)
859: Titan 350-38MWe 60 Hz (Standard)
860: Titan 350-38MWe 50 Hz (Standard)

Reciprocating Engine Database – The piston engine database used by THERMOFLEX and NOVO PRO was updated by the addition of the following engines.
518: INNIO J312-F09
519: INNIO J316-F09
520: INNIO J320-F09
521: INNIO J312-F805
522: INNIO J316-F805
523: INNIO J320-F805
524: INNIO J416-E09
525: INNIO J420-E09
526: INNIO J416-E805
527: INNIO J420-E805
528: INNIO J412-C900
529: INNIO J416-E900
530: INNIO J420-E900
531: INNIO J412-C980
532: INNIO J416-E980
533: INNIO J420-E980
534: INNIO J612-J09 50Hz
535: INNIO J616-J09 50Hz
536: INNIO J620-J09 50Hz
537: INNIO J612-J09 60Hz
538: INNIO J616-J09 60Hz
539: INNIO J620-J09 60Hz

THERMOFLEX

Electric Heat Pump

- An air-source electric heat pump is now included beside the other heat pump Components on the [General] tab.
- At off-design the user may now optionally dictate heat pump COP, Efficiency of Carnot COP, or Efficiency of Lorentz COP.
- An input for heated stream exit enthalpy is included so that, in addition to subcooled liquid, the heated stream exit state can be saturated or superheated.
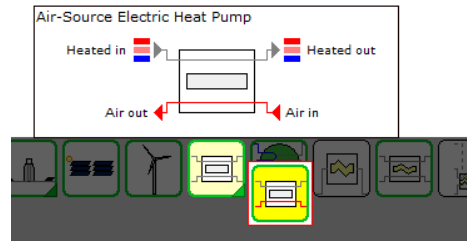
Metal Temperature Diagrams: The HRSG and Fired Boiler Assemblies now include a diagram to display external metal temperatures (fin or tube) for each heat exchanger as a function of prevailing gas temperature. The diagram includes the water and sulphur dewpoint temperatures as well.

Plate Heat Exchanger: In addition to current method for heat transfer and pressure drop calculations, a new method is included. This method has better estimates for heat transfer coefficients and pressure drops.

Valve Specification: For liquid fluids, off-design valve wide-open pressure drop may now be characterized by a dimensional characteristic known as 'flow coefficient' (*Cv* in British units, and *Kv* in SI units). This value is often tabulated by vendors.
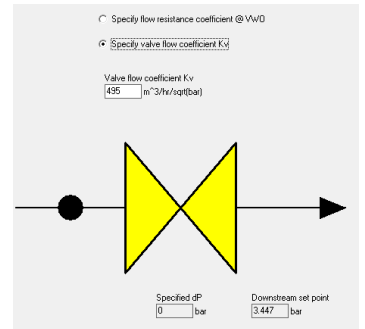

New Methanol Production Component:
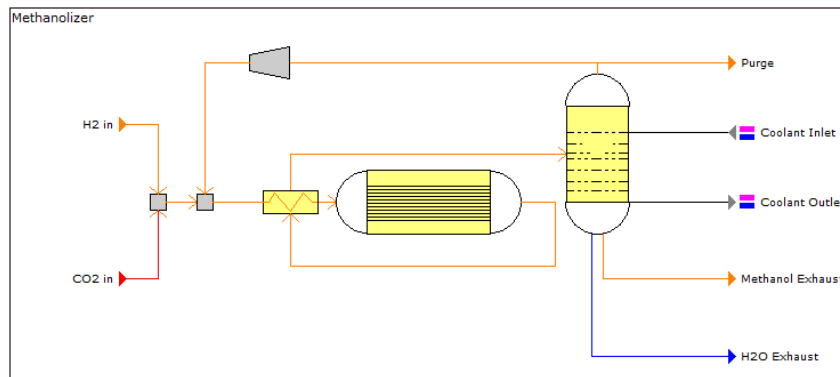
A component that models a process to produce Methanol was added to the [Other Fluids] tab of the Icon Selector. This component implements a grey-box process-model that produces methanol, CH_3OH, from CO_2 & H_2 by an exothermic reaction in the presence of a catalyst. A number of reciprocating engine vendors sell units that can burn Methanol, and some are proposing this as a way to reduce the carbon footprint of large ships ferrying goods around the world.

Air-transported Dry FGD:

A new 'Dry FGD (Dry Injection)' component was added to model situations where the reagent is transported to the reactor by an air stream. This new icon can use either sodium bicarbonate (baking soda), or hydrated lime as the reagent.

The original icon was renamed 'Dry FGD (Lime Spray)' to distinguish it from the new visage using the updated desulphurization model. It delivers reagent using a lime slurry sprayed into the reactor vessel.
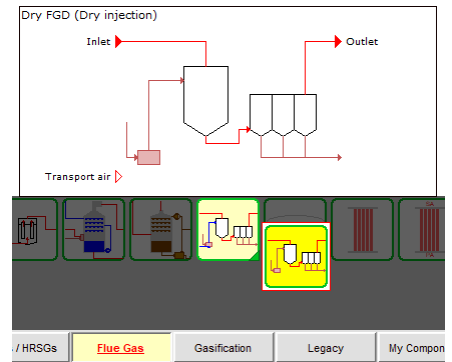
STEAM PRO / STEAM MASTER

Multiple Boilers per Steam Turbine: As has been the case for CFBs, the program now allows multiple boilers per steam turbine when the plant uses the Conventional Boiler.

PEACE

Cost multipliers were revised, mostly upwards, relative to Version 31. Gas turbine pricing was revised to reflect recent market trends. Changes to estimated costs will depend on the particular plant configuration. EPC prices for gas turbine plants from simple cycle peakers to GT+WHB CHP plants to baseload F-class reheat GTCC with and without CO_2 capture will be anywhere from 5 to 15% higher in Version 32 relative to Version 31. EPC estimate for steam plants will be approximately 7 to 8% higher in Version 32.

Reference currency exchange rates, relative to the USD, and regional cost multipliers were revised.