FLOWNEX®
SIMULATION ENVIRONMENT

Flownex® SE Version 8.6.1 Release Notes

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1. Enhancements

1.1 MAJOR ENHANCEMENTS

1.1.1 Shared Company Database

Flownex® now allows companies, departments or users to have a shared re-usable repository for components, fluids, charts, compounds and default settings. In order to achieve this, the library and database functionality in Flownex® has been reworked.

A database contains libraries of components, charts, compounds, solvers, and component defaults. The databases are explained below:

- The External library that was used in previous Flownex® versions has been renamed as the Master Database in the new version and is "read only".
- The Project Database is editable and part of every Flownex® project.
- The Shared Database allows users to create and connect to any number of databases that can also be shared amongst colleagues in a company.

The different databases, namely the Master Database, Project Database and Shared Database are described in more detail in Chapter 6 of the General User Manual. The Project and Master Database can be seen in Figure 1.
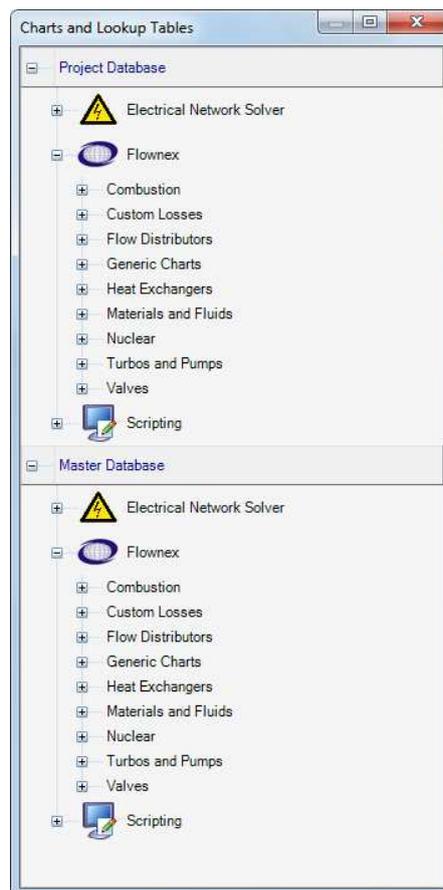

Figure 1: Project and Master Database in Flownex®

1.1.2 Static Pressure Boundary Conditions

A new option has been added to the Boundary Conditions which enables users to specify a static pressure boundary condition rather than a total pressure boundary condition. This option is useful where static pressures are measured and therefore known on a plant or system. In order to obtain static inlet pressure boundary conditions previously, the user needed to use the Designer. The static pressure is also a known boundary condition in typical rotational flow fields in turbo machinery secondary flows. Static pressure boundary conditions are explained in more detail in Chapter 13 of the Flownex® Library Help Manual and an example of how to specify the static pressure can be seen in Figure 2.
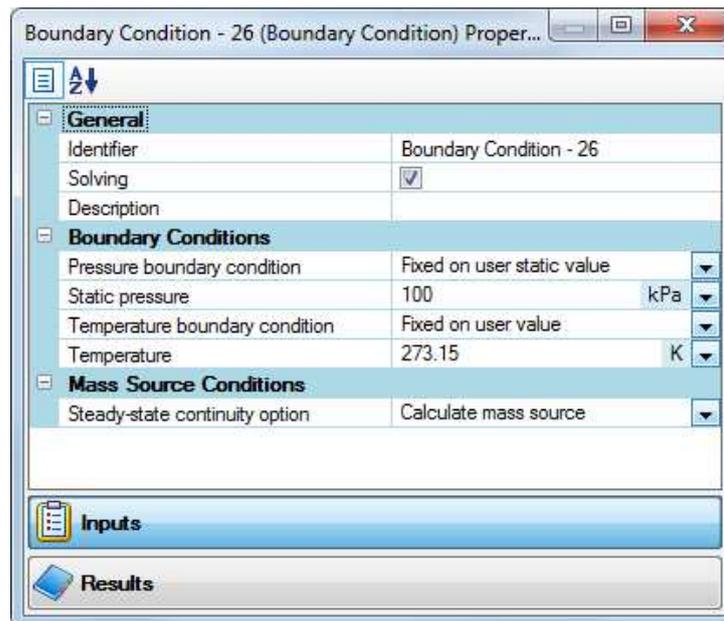
Figure 2: Specification of Static Boundary Conditions in Flownex®

1.1.3 Subdivided Cavities

Rotor-Rotor and Rotor-Stator cavities in turbo machinery secondary flow applications can now be incremented in the radial direction. The moment balance in each increment is treated individually resulting in a core swirl ratio unique to each increment. As a result the pressure distribution throughout the cavity is therefore better known. The subdivided cavities are described in more detail in Chapter 17 of the Flownex® Library Help Manual and an example of the discretisation of the Rotor-Stator Cavity can be seen in Figure 3.
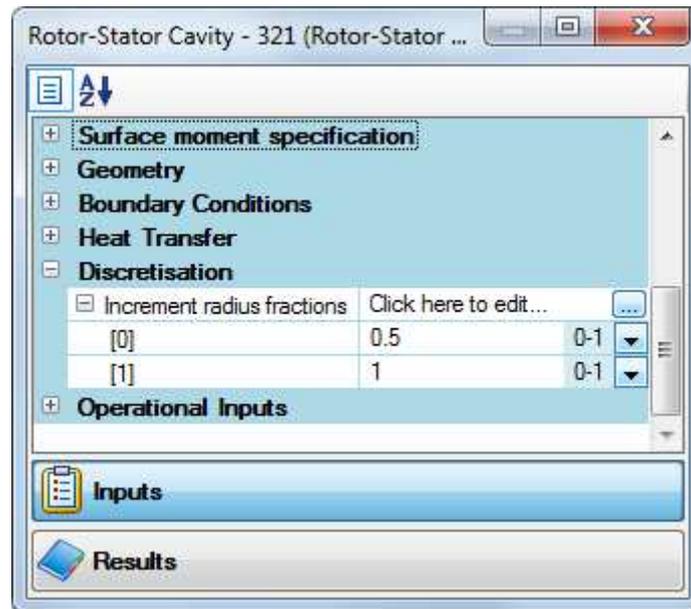
Figure 3: Subdivided cavities in Flownex®

1.1.4 Excel Input Sheets

It has become common for users to use Excel® components as an overview and input sheet for a simulation. In order to simplify and speed up this process a dedicated Excel® Input Sheet functionality has been added where inputs can be linked to any combination of properties without Data Transfer Links. The Excel® Input Sheets are described in more detail in Chapter 11 of the Flownex® General User Manual and an example of an Excel® Input Sheet can be seen in Figure 4.

Figure 4: Excel® Input Sheet in Flownex®

1.1.5 Excel® Parameter Tables

In order to parameterize a simulation and quickly switch between a set of parameters, the functionality has been added to specify parameter tables in Excel®. Each parameter in the table can be linked to any number of inputs. Parametric studies can run through all parameter definitions in the tables. The Excel® Parameter Tables are described in more detail in Chapter 11 of the Flownex® General User Manual and an example of an Excel® Parameter Table can be seen in Figure 4.

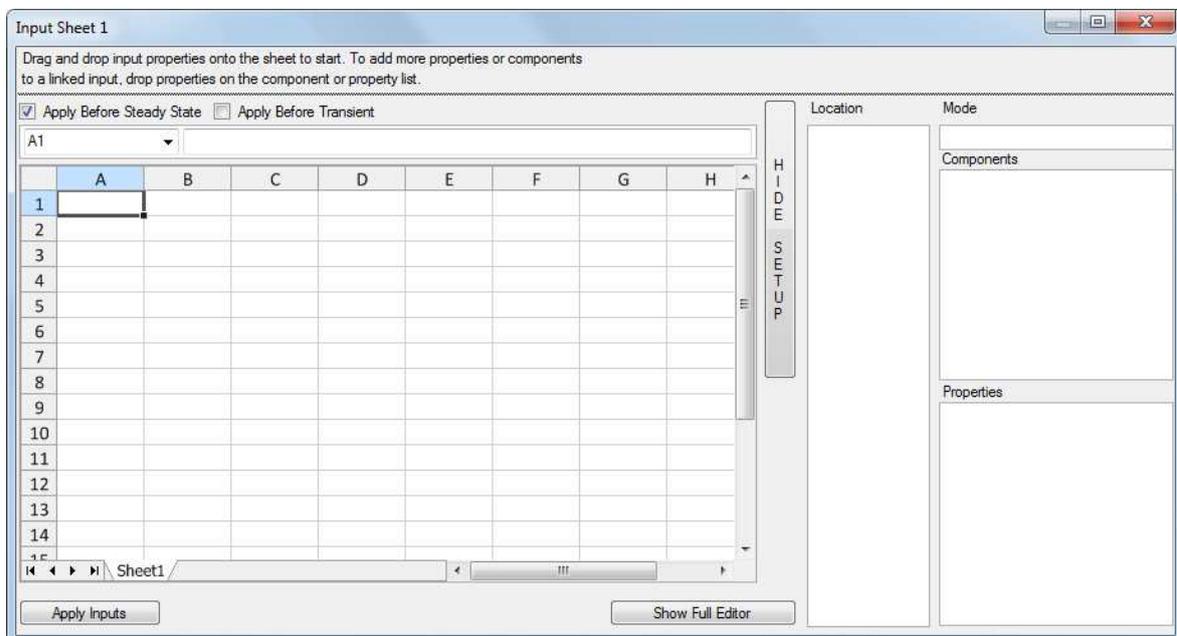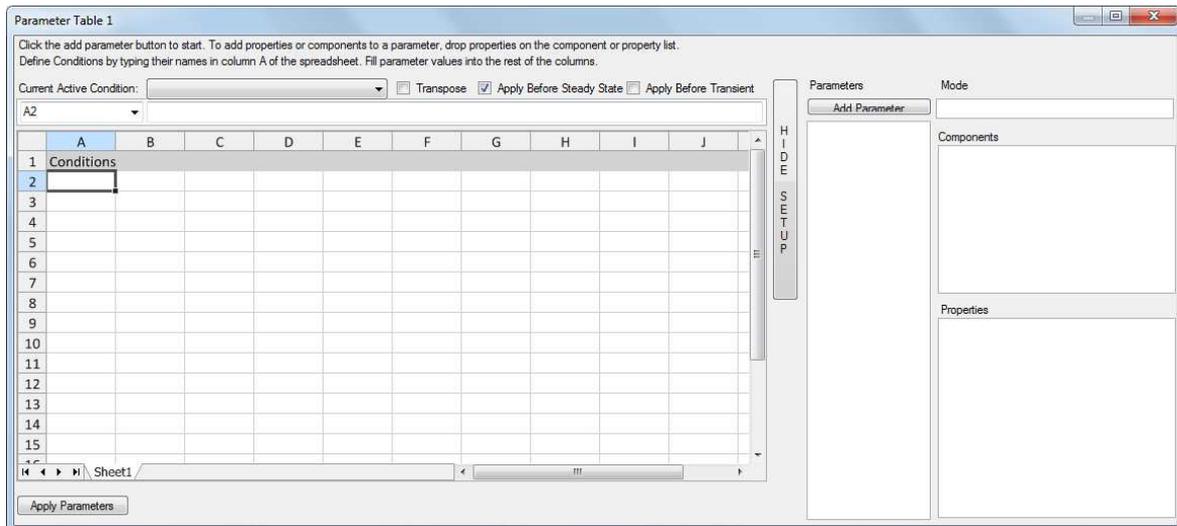**Figure 5: Excel® Parameter Table in Flownex®**

1.1.6 Copying of Charts and Fluids

Charts and Fluids are not automatically copied to the Project Database anymore, which will save space in projects and ensure that the user is always working with latest versions.

1.1.7 Component Defaults

User creatable component defaults were added. The user can save a default component by dragging and dropping it onto a library on the tree. This component with its current inputs can then be easily re-used in the project and other projects.

1.1.8 Compound Component Enhancements

The compounds functionality was updated so that Flownex® doesn't have to restart when compounds are moved, exported or imported.

1.1.9 Find Based on Property Values

In the find dialog the user can now perform searches based on property values. The user can search all properties for values or select a specific type of property to search, for example the user can type "> 50" into the search box to search all of the components with properties with values bigger than 50, as seen in Figure 6.
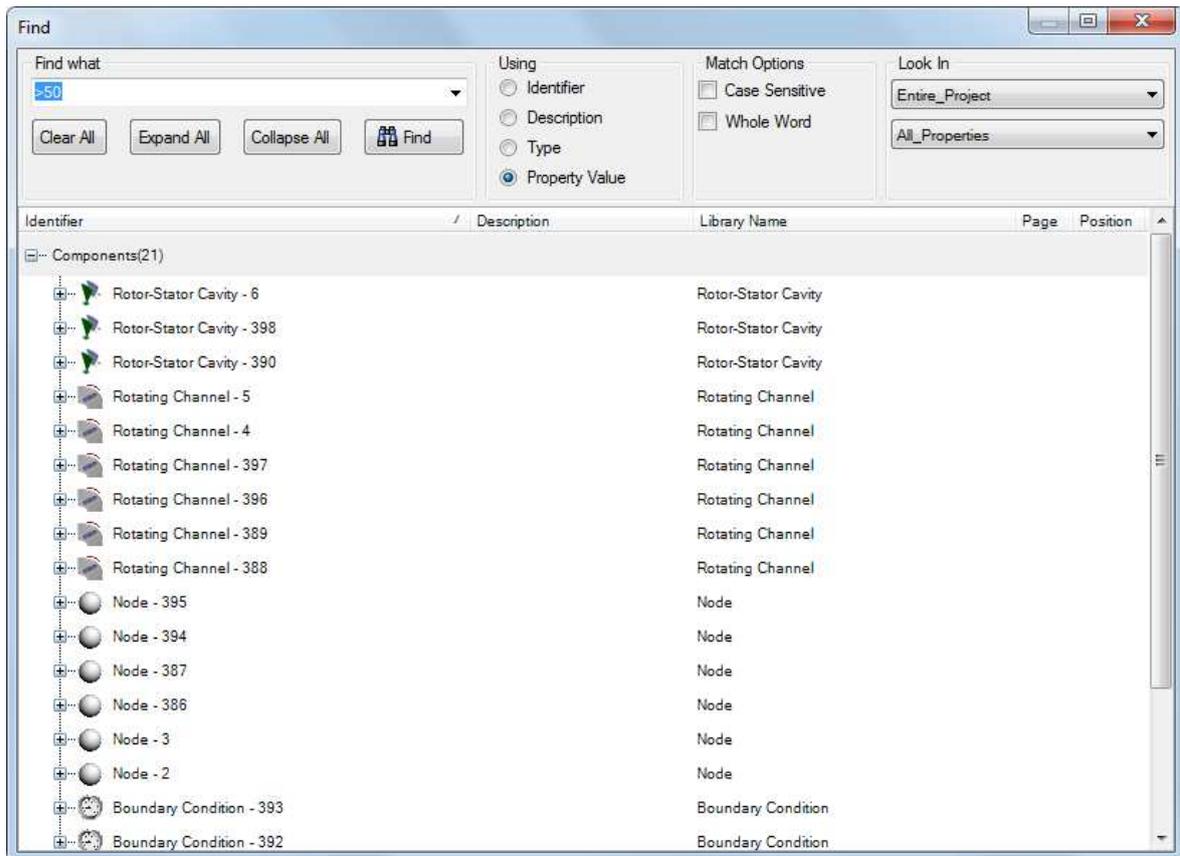
Figure 6: Find Dialog in Flownex®

1.1.10 Network Building via API

The API has been updated so that a user can now build and connect a network through the API. The user can also build and connect a network with scripts in Flownex®.

1.1.11 Automatic Elevation Importing in GIS

The GIS importing and map drawing functionality was improved so that the user has the option to retrieve surface elevations from the internet for imported and newly drawn components.

1.1.12 Flow Interface Component

A new component, namely the Flow Interface Component, has been added to the Nodes and Boundaries category in the Components Library. The Flow Interface Component enables the coupling of two networks with different individual fluids and/or fluid types, whilst maintaining a mass balance over the coupling and also calculating the resulting pressure at the interface.

A typical example of a system that requires the use of different fluid types is the modelling of liquid fuelled rockets where both two-phase and compressible flow applications are important. The Flow Interface Primary and Flow Interface Secondary components are described in more detail in Chapter 13 of the Flownex® Library Help Manual and are available in the Nodes and Boundaries Library as seen in Figure 7.
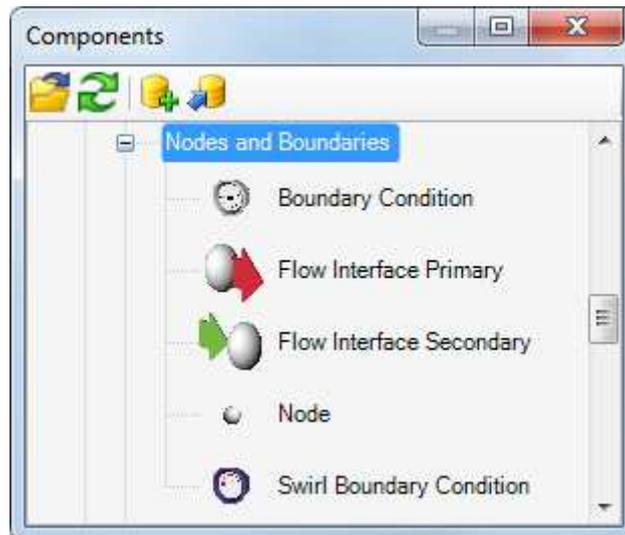
Figure 7: Example of the Flow Interface Primary and the Flow Interface Secondary Components in the Components Library in Flownex®

1.1.13 Additional Static Condition Calculations

For many cases the set point of components, for example for pressure relief valves is in static pressure. For these cases the upstream and downstream areas and correct piping diameters are important. The user now has the option to specify the upstream and downstream area for many additional components including Restrictors and Nozzles in order for Flownex® to calculate upstream and downstream static properties. The option to specify these areas can be seen in Figure 8.
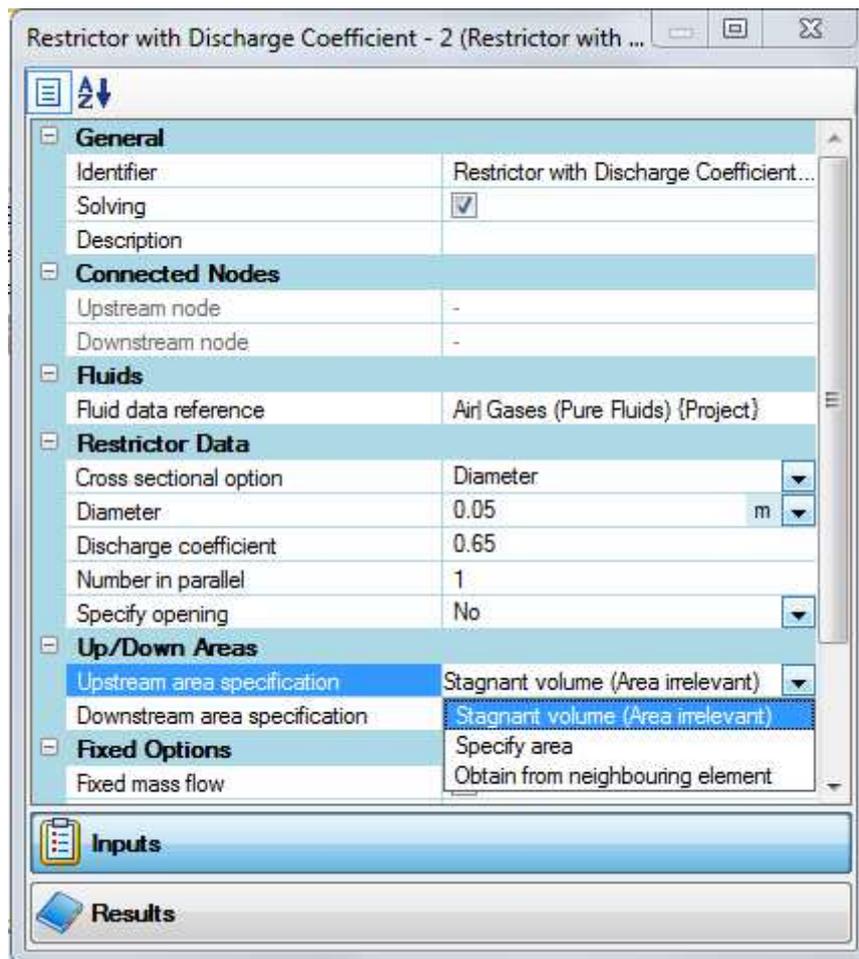
Figure 8: Upstream and Downstream Area Specification for the Restrictor with Discharge Coefficient in Flownex®

1.1.14 Scale Drawings

The ability to create a scale 2-Dimensional drawing has been added to Flownex®. The user can easily draw onto an existing drawing that is used as a background in Flownex® and then he Pipes etc. will automatically detect lengths from the drawing. The "Generate Scale Drawing" option is available on the Import tab as seen in Figure 9.

Figure 9: Import Tab in Flownex®

1.1.15 Shorten Paths and Names in Project

Path names and file names in the project was shortened significantly in order to prevent "path too long" problems if the user uses Flownex® in deep subfolders.

1.2 MINOR ENHANCEMENTS AND FIXES

1.2.1 Grid Editor

- The option "Copy with headings" has been added to the Grid Editor and is available on the context menu. When the user selects the option "Copy with headings", the headings together with the selected cells will be copied.
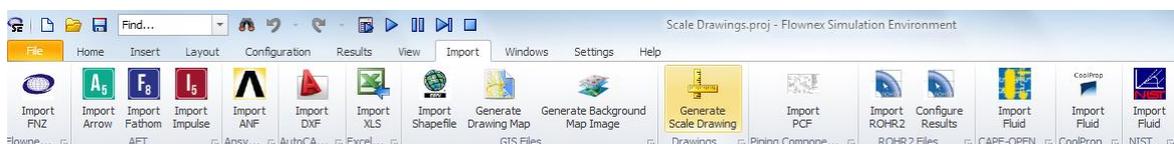- Sorting is allowed in the Grid Editor.
- The application of inputs has been optimized as inputs are now applied as the user types into the grid, which saves time and is more intuitive.

1.2.2 Styles

- Changed image picker width in order for the user to see the whole picture file names when the names are long in the style editor form.
- The application of style settings to visualisation components from project settings has been fixed. The user can set up defaults for new IO boxes and other visualization components in the project settings.

1.2.3 Reporting and Graphs

- Added "Ctrl + page up" and "Ctrl + page down" navigation to the Excel Report Editor.
- Added the option to copy graph values under cursor to clipboard. This option is available on the graph context menu.
- The option to show Graph values at cursor is now turned on by default.

1.2.4 Extendibility and API

- Added Extendibility Help Material which is available on the Help tab.
- Added a Python Link example which is available on the Help tab.
- Added the functionality to re-open EES when connection to EES is lost (connection to EES was lost when the user closed EES by hand during a simulation).

1.2.5 Rotating Elements

- Changed the disk friction coefficient correlation for the Rotor-Stator and Rotor-Rotor cavities. The new correlation proves to give better grid independency when using multiple increments in a single cavity and also allows for better flexibility in terms of user inputs. Details regarding the correlation can be found in the Flownex® Library Help Manual in Chapter 17.

1.2.6 Loss Elements

- Changed the default differencing scheme of the Flow Resistance element to Central Difference rather than Upwind Difference. The Central Difference scheme is more consistent with the typical application of the Flow Resistance element.
- Added up and downstream velocity and Mach number results to the Cooling Orifice.
- Added Restrictor throat results to Restrictor type elements. Throat specific results in orifices such as Velocity, Mach number and Static fluid properties are now grouped separately giving a clear indication of these important parameters.
- Prevent crash when opening Help on subdivisions.

1.2.7 Heat Transfer Elements

- Added tooltips for new radiation components.
- Fixed heat input specification on flow nodes when connected to a Heat Transfer element.

- Fixed the updating of elements that are radiated to when Heat Transfer elements are copied and pasted.

1.2.8 Fluid Importers

- The NIST importer is now enabled to work with REFPROP pre-defined mixtures.
- In all of the fluid importers the following was changed:
  - Allow adding fluids by double clicking.
  - Allow deleting of single selected fluid by pressing delete.
  - Fixed sizing of graphs.
  - Allow reorganization of selected components with drag and drop.
  - Added units.
  - Allow specification of moll fractions in relevant importers.
  - Allow user to choose increment sizes in single phase importers.

1.2.9 Materials and Fluids

- Added Vinyl Acetate as two-phase fluid in the fluid library.
- Fixed two-phase CO_2 crash – a new CO_2 fluid was added to the database.
- Fixed the problem with gas mixtures issuing material warnings on account of small user truncation error inputs on Nodes with specified mass fractions.

1.2.10 General

The Upgrade dialog was shown without the mainframe or task bar icon being present. This meant that sometimes the user could "lose" the dialog if the user clicked on other programs before the upgrade was complete. This has been fixed.

1.2.11 Network Importers

Fixed importers for different cultures - in culture settings where numbers contained a comma, some importers did not parse numbers correctly.

1.2.12 Snap Loading/Restarting

Fixed several snap loading issues in order for transient simulations to continue from any point after loading a snap that was taken during the transient simulation.

1.3 MANUAL UPDATES

The following sections in the Flownex® General User Manual have been updated:

- Updated the Introduction of the EES component in the Component Library Chapter.
- Updated the Panes and Windows section in the Graphical User Interface Chapter.
- Updated the Help section in the Graphical User Interface Chapter.
- Renamed Library Chapter to Components Library.
- Created new Databases Chapter.
- Updated the Introduction of the Charts and Lookup Tables Chapter.
- Updated the Ribbon bar section in the Graphical User Interface Chapter.
- Created a new Chapter named Excel Input and Parameter Tables.
- Replaced all External Charts and Lookup Tables Window references with Master Database.
- Created new Advanced Configuration Chapter and moved Hidden Transfer section in API Chapter to this Chapter.

- Added the Backtracker section to the Advanced Configuration chapter.
- Updated the API Chapter to reflect updates.
- Updated the AFT importer section.

The following sections in the Flownex® Theory Manual have been updated:

- Updated Flownex® Governing Equations section.
- Updated the General Conservation Equations section.

The following sections in the Flownex® Library Manual have been updated:

- Updated the Open Container theory.
- Updated the Introduction of the Heat Transfer chapter.
- Updated the Inputs of the Jet Pump.
- Added Flow Interface Primary and Secondary to the Nodes and Boundaries Chapter.
- Updated Compressor Sets section in the Turbo's and Pumps chapter.
- Updated the inputs of the Restrictor with Discharge Coefficient and Restrictor with Loss Coefficient.
- Updated the inputs of the Pressure Relief Valve.
- Updated the results of the British Standard Orifice, Restrictor with Discharge Coefficient, Restrictor with Loss Coefficient, Cooling Orifice and Nozzle.
- Updated the Nozzle inputs.
- Updated the Boundary Condition Inputs and Results.
- Changed all references to the External Charts and Lookup Tables to the Master Database.
- Updated theory section of Container Interface.
- Updated the Rotor-Stator Cavity Theory section.
- Updated the Rotor-Rotor Cavity and Rotor-Stator Cavity Inputs and Results.

The following section in the Flownex® Electrical Library Manual has been updated:
- Updated the Charts and Lookup Tables chapter.

The following section in the Flownex® Component Basics Manual has been updated:
- Added the Flow Interface component to the Nodes and Boundaries chapter.
- Updated the input sections of the Rotor-Rotor and Rotor-Stator components.

1.4 TUTORIAL UPDATES

The following tutorial has been modified:
- The results of Tutorial 37 were updated, as the disk friction coefficient correlation for the Rotor-Stator and Rotor-Rotor cavities changed.