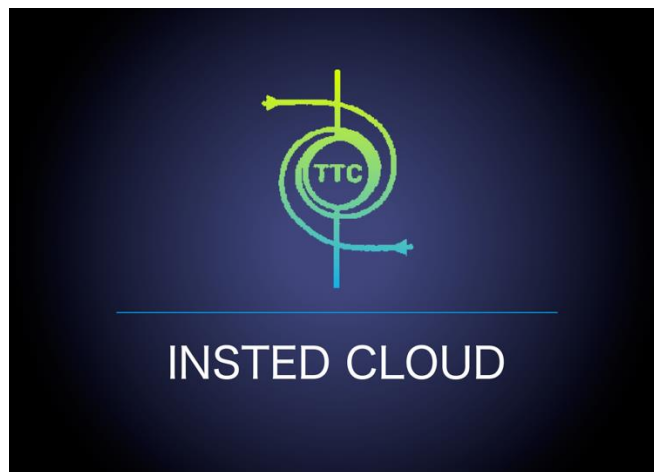


Release Notes

INSTED CLOUD Ver. 8.1



TTC TECHNOLOGIES, INC.

March 2, 2016

Release Features

INSTED CLOUD Ver. 8.1

INSTED is your one-stop software suite for empirical thermal and hydraulic analysis of engineering systems and components, with a focus on finned and un-finned heat exchangers, flow over tube banks, performance of isolated fins and fin arrays, analysis of heat conduction in composite solids, internal and external flow and heat transfer, performance analysis of flows in piping systems, design analysis of pipe flows, and power calculations for pump selection. INSTED calculations are very fast, leading to fast turnaround in the analysis cycle. The interface is easy and fun to use. With the CLOUD deployment of INSTED, you can carry out your thermal-hydraulic analysis of heat exchangers and other engineering systems/components anytime, anywhere, and even on your smartphones or tablets.

The most recent version of INSTED (Ver. 8.1) includes significant enhancements, changes, and bug fixes, to further improve your experience on INSTED CLOUD. The new features include the following:

Improved Plate-Fin Solver

- An option to use a “Bulk” or “Discrete” method for rating calculations is now available.
- “REFPROP” and “Custom Fluids” can now be used for “Bulk” calculations!
- Warning messages for temperatures that are outside the range of REFPROP support are now displayed.
- The search schemes in “Sizing” and “Optimization” calculations have been improved to reduce the incidence of “No Realization Found” situations.

Bugs Fixed in the Plate-Fin Module

- Can now pass back fluid properties from “REFPROP Tool” to “INSTED” when using the Internet Explorer browser.
- The “No Fluid Found” message displayed in certain Multiple Rating tasks has been fixed.
- Fixed the bug relating to copying the plate-fin Sample Problem "Che.510 (with custom j/f data)" to user account.
- The "Lost Connection" warning message displayed after 20 minutes of inactivity, has been removed.

New Features in Plate-Fin

- The "Calculation Method" input tab has been added. You can now choose the "Default," "Bulk," or "Discrete" method for rating calculations.
- You can now plot the distribution of "Density," "Specific Heat," "Thermal Conductivity," and "Viscosity" along the streams for the rating projects.
- You can now save one of the “Multiple-Rating” calculation points into a separate, regular, rating project.
- You can now save a realization of the “Sizing” calculations into a separate, regular, rating project.
- You can now save a realization of the “Optimization” calculations into a separate, regular, rating project.

- You can now export an existing project into a plain XML text file and mail out to another INSTED user.
- You can now import an XML project file back to INSTED from another INSTED user.
- In “Project Management,” you can now open an INSTED project directly by just clicking on the project name.

Improvements to the user interface (UI)

- In the “Recent Projects” list under “Start Page,” if the project name is too long to fit into the edit box, by placing the mouse on the project’s name, more text will automatically scroll from right to left, to show additional information.
- You can now choose “REFPROP” and “Custom Fluids” directly from the “Rating Details” tab.

Changes to Other Modules in INSTED

- The “Preliminary Design” task is now supported in the CLOUD version of the Shell and Tubes HEX.
- The “Length Calculation” task is now supported in the CLOUD version of the Concentric Tubes HEX.
- The “Multiple Rating” tasks task is now supported in the CLOUD version of the Plate-Frame HEX.
- The “Bulk/Discrete” options are now supported in the CLOUD version of the Shell & Tubes and Concentric Tubes HEXs.
- You can now plot the stream-wise distributions of "Density," "Specific Heat," "Thermal Conductivity," and "Viscosity" from the rating results in all HEX modules.
- You can now save a “Preliminary Design” realization into a regular rating project for the Shell & Tubes HEX.
- You can now save a “Length Calculation” result into a regular rating project for the Concentric Tubes HEX.
- You can now save one point of a “Multiple Rating” analysis into a regular rating project for Plate-Frame HEX.
- Additional warning/error messages have been added for the Plate-Frame solver.
- For all INSTED modules, you can now “Export”/“Import” an existing INSTED project in an XML file format to/from other INSTED users.

More details on the release features can be found in the following sections.

New Features

Many new features have been added to INSTED in this new version.

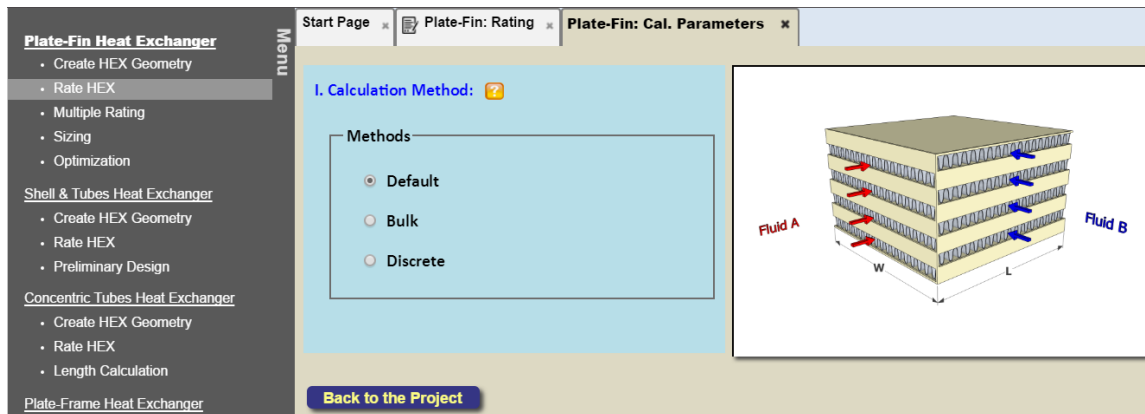
#1. You can now choose either “Bulk” or “Discrete” methods for rating calculations.

In the Bulk method, fluid properties are held constant. In the Discrete method, they are allowed to vary stream-wise, depending on the local temperature and pressure. These options can be accessed from the “Calculation Method” button.

The screenshot shows the 'Plate-Fin: Rating' window in the INSTED software. The interface is organized as follows:

- Left Menu:** A vertical navigation menu with categories like 'Plate-Fin Heat Exchanger', 'Shell & Tubes Heat Exchanger', 'Concentric Tubes Heat Exchanger', 'Plate-Frame Heat Exchanger', 'Piping System', 'Fin & Fin Array', 'Heat Conduction', 'Tube Banks', 'Sample Problems', 'Custom Fluid Properties', 'Project Management', 'INSTED Database', 'Unit Conversion', 'Math Calculator', and 'Preferences'.
- Main Panel (I-VI):** A series of input sections:
 - I. Project Name:** A text input field.
 - II. Choose Heat Exchanger Geometry to Rate:** A dropdown menu with a 'View Details' button.
 - III. Flow Assignment:** Radio buttons for 'Fluid A is hot' and 'Fluid B is hot'.
 - IV. Flow Direction:** Radio buttons for 'Co-Current' and 'Counter-Current'.
 - V. Two Phase Flow?:** A dropdown menu set to 'No Phase Change'.
 - VI. Flow Conditions:** A table for inputting 'Hot' and 'Cold' fluid properties:

	Hot	Cold	Unit
Inlet Flow Rate:	<input type="text"/>	<input type="text"/>	kg/s
Inlet Temperature:	<input type="text"/>	<input type="text"/>	K
Inlet Pressure:	<input type="text"/>	<input type="text"/>	Pa
Fouling Resistance:	<input type="text"/>	<input type="text"/>	m ² K/W
K-Factor In	<input type="text"/>	<input type="text"/>	
K-Factor Out	<input type="text"/>	<input type="text"/>	
- Right Panel:**
 - Diagram:** A 3D perspective view of a plate-fin heat exchanger with 'Fluid A' and 'Fluid B' flow directions indicated by red and blue arrows. Dimensions 'W' and 'L' are shown.
 - VII. Fluid Properties:**
 - Hot Fluid Properties:** Radio buttons for 'Fixed', 'Variable/Custom', and 'REFPROP'.
 - Cold Fluid Properties:** Radio buttons for 'Fixed', 'Variable/Custom', and 'REFPROP'.
 - Density:** Input fields for Hot and Cold, unit kg/m³.
 - Specific Heat:** Input fields for Hot and Cold, unit J/(kg·K).
 - Viscosity:** Input fields for Hot and Cold, unit kg/(m·s).
 - Conductivity:** Input fields for Hot and Cold, unit W/(m·K).
 - VIII. Calculation Method (Optional):** A red-bordered box containing a green 'Set Calculation Method' button.
- Bottom:** A row of buttons: 'New', 'Save', 'Load', 'Close', and a yellow 'Compute' button.



There are three available options:

- **Default:** INSTED will automatically choose the calculation method based on your input. If the calculation is single phase and fixed thermal-physical fluid properties are used for both hot and cold streams, the bulk calculation method will be chosen, otherwise the discrete method will be chosen.
- **Bulk:** In this method, the thermal-physical properties of the fluids will be fixed. If “REFPROP” or “Custom Fluid” is selected, the average temperature of the stream is used to obtain the constant thermal-physical properties.
- **Discrete:** In this method, the thermal-physical properties of the fluids will be allowed to vary with the local temperature of the streams.

Note that:

- The Bulk calculation method cannot be used if “two-phase” is selected for a rating calculation.

#2. You can now use REFPROP for single-phase rating calculations.

In previous versions of INSTED, REFPROP was used mainly for two-phase flows (boiling and condensation). In the new version, a “REFPROP Fluids” selection box is available for single phase calculations as well.

Plate-Fin Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Multiple Rating
- Sizing
- Optimization

Shell & Tubes Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Preliminary Design

Concentric Tubes Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Length Calculation

Plate-Frame Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Multiple Rating
- Sizing
- Optimization

Piping System

- Design & Rate

Fin & Fin Array

- Thermal Analysis

Heat Conduction

- Thermal Analysis & Design

Tube Banks

- Thermal & Hydraulic Analysis

Sample Problems

Custom Fluid Properties

Project Management

INSTED Database

Unit Conversion

Math Calculator

Preferences

I. Project Name:

II. Choose Heat Exchanger Geometry to Rate:

Please choose

III. Flow Assignment:

Fluid A is hot Fluid B is hot

IV. Flow Direction:

Co-Current Counter-Current

V. Two Phase Flow?

No Phase Change

VI. Flow Conditions:

	Hot	Cold	
Inlet Flow Rate:	<input type="text"/>	<input type="text"/>	kg/s
Inlet Temperature:	<input type="text"/>	<input type="text"/>	K
Inlet Pressure:	<input type="text"/>	<input type="text"/>	Pa
Fouling Resistance:	<input type="text"/>	<input type="text"/>	m ² K/W
K-Factor In	<input type="text"/>	<input type="text"/>	
K-Factor Out	<input type="text"/>	<input type="text"/>	

VII. Fluid Properties:

Hot Fluid Properties:

Fixed Variable/Custom REFPROP

Choose Hot Fluid: acetone

Cold Fluid Properties:

Fixed Variable/Custom REFPROP

Choose Cold Fluid: carbon dioxide

VIII. Calculation Method (Optional)

#3. Plot “Density,” “Specific Heat,” “Viscosity,” and “Thermal Conductivity” curves from the rating calculations.

You can now plot these thermal-physical properties curves along the streams to visually assess their stream-wise variation patterns. The units of the thermal-physical properties in the plots can also be changed depending on your preference.

Start Page | Plate-Fin: Rating | Plate-Fin: Cal. Parameters | Plate-Fin: Rating Results

Plate-Fin Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Multiple Rating
- Sizing
- Optimization

Shell & Tubes Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Preliminary Design

Concentric Tubes Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Length Calculation

Plate-Frame Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Multiple Rating
- Sizing
- Optimization

Piping System

- Design & Rate

Fin & Fin Array

- Thermal Analysis

Heat Conduction

- Thermal Analysis & Design

Tube Banks

- Thermal & Hydraulic Analysis

Sample Problems

Custom Fluid Properties

Project Management

INSTED Database

Unit Conversion

Math Calculator

Preferences

Calculation Result:

Hot Flow | Cold Flow | Overall

Inlet Temperature:	733.16	K
Outlet Temperature:	609.809232017	K
Pressure Loss:	7.839522e+3	Pa
Inlet Quality:	0.	
Outlet Quality:	0.	
Mass Flow Rate:	25.4	kg/s
Mass Flux:	18.324630937	kg/(s·m ²)
Flow Velocity:	56.750548746	m/s
Fouling Resistance:	0.	m ² K/W
Equivalent Diameter:	0.002775	m
Reynolds Number:	2.053138e+3	
Heat Coefficient:	158.22892741	W/(m ² ·K)
Effective hA:	2.291704e+5	W/K
Colburn Factor j:	0.00405992	
Friction Factor f:	0.012983016	
Fin Type:	rectangular	
Fin Profile:	plain	
Fin Efficiency %:	0.735442321	
Fin Height:	0.0057	m
Fin Pitch:	0.002	m
Fin Thickness:	0.00015	m
Fin Offset Pitch:	0.	m
Flow Length:	0.9	m
Flow Width:	1.8	m
Power:	5.520232e+5	W
Specific Heat:	2.032376e+3	J/(kg·K)
Heat Capacity:	5.162235e+4	W/K

Choose Plot Variable: Density

- Temperature
- Pressure Drop
- Quality
- Heat Transfer Coefficient
- Fin Efficiency
- Density
- Specific Heat
- Thermal Conductivity
- Viscosity

show discrete data?

Download ALENIA Sheet

Back to the Project

#4. You can now save “Multiple Rating,” “Sizing,” and “Optimization” calculation result into a regular “Rating” project directly.

Multiple-Rating: Choose a rating point and click the “Save Selected Rating Data to a Regular Rating Project” button.

Start Page x Plate-Fin: Multiple Rating x Plate-Fin: Multi-Rate Result x

Plate-Fin Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Multiple Rating
- Sizing
- Optimization

Shell & Tubes Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Preliminary Design

Concentric Tubes Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Length Calculation

Plate-Frame Heat Exchanger

- Create HEX Geometry
- Rate HEX
- Multiple Rating
- Sizing
- Optimization

Piping System

- Design & Rate

Fin & Fin Array

- Thermal Analysis

Heat Conduction

- Thermal Analysis & Design

Tube Banks

- Thermal & Hydraulic Analysis

Sample Problems

Custom Fluid Properties

Project Management

INSTED Database

Unit Conversion

Math Calculator

Preferences

Calculation Result:

Choose One Rating Data Point:
1: Hot flow mass flow rate = 0.89616 [kg/s]

Hot Flow	Cold Flow	Overall
Inlet Temperature:	513.16	K
Outlet Temperature:	336.991914379	K
Pressure Loss:	413.774238139	Pa
Inlet Quality:	0.	
Outlet Quality:	0.	
Mass Flow Rate:	0.89616	kg/s
Mass Flux:	4.142904054	kg/(s.m²)
Flow Velocity:	5.547541582	m/s
Fouling Resistance:	0.	m²KW
Equivalent Diameter:	0.001898591	m
Reynolds Number:	326.376851798	
Heat Coefficient:	72.929950812	W/(m².K)
Effective hA:	9.83594e+3	W/K
Colburn Factor j:	0.013410636	
Friction Factor f:	0.055038723	
Fin Type:	wavy	
Fin Profile:	plain	
Fin Efficiency %:	0.984011224	
Fin Height:	0.00635	m
Fin Pitch:	0.0012776	m
Fin Thickness:	0.000152	m
Fin Offset Pitch:	0.	m
Flow Length:	0.3	m
Flow Width:	0.6002	m

Choose Plot Variable: Outlet Temperat

show discrete data? **Not available for this calculation**

Set Reynolds number as x-coordinate?
 Draw Points?
 Log Scale Axis?

Save Selected Rating Data to a Regular Rating Project

Back to the Project

Sizing: Click the “Save to a Regular Rating Project” button.

The screenshot displays the 'Plate-Fin: Sizing Result' window. On the left is a navigation menu with categories like 'Plate-Fin Heat Exchanger', 'Shell & Tubes Heat Exchanger', 'Concentric Tubes Heat Exchanger', 'Plate-Frame Heat Exchanger', 'Piping System', 'Fin & Fin Array', 'Heat Conduction', 'Tube Banks', 'Sample Problems', 'Custom Fluid Properties', 'Project Management', 'INSTED Database', 'Unit Conversion', 'Math Calculator', and 'Preferences'. The main area is split into two panels: 'Sizing Result' and 'Detail Result'.

Sizing Result:

Plate Length:	1.007424035	m
Plate Width:	2.399739799	m
Hot Flow Rate:	25.4	kg/s
Cold Flow Rate:	25.0	kg/s
Total No. of Plates:	288	
No. of Hot Passes:	1	
No. of Cold Passes:	1	
Hot Fin Type:	rectangular	
Hot Fin Profile:	plain	
Hot Fin Efficiency %:	0.828352032	
Hot Fin Height:	0.0057	m
Hot Fin Pitch:	0.002	m
Hot Fin Thickness:	0.00015	m
Hot Fin Offset Pitch:	0.	m
Cold Fin Type:	rectangular	
Cold Fin Profile:	plain	
Cold Fin Efficiency %:	0.689983371	
Cold Fin Height:	0.0057	m
Cold Fin Pitch:	0.002	m
Cold Fin Thickness:	0.00015	m
Cold Fin Offset Pitch:	0.	m
Heat Transfer Rate:	3.19941e+6	W
Heat Transfer Area:	696.255998601	m ²
Hot Pressure Loss:	3.609087e+3	Pa
Cold Pressure Loss:	4.301144e+3	Pa

Detail Result:

Hot Flow	Cold Flow	Overall
Inlet Temperature:	733.16	K
Outlet Temperature:	614.328845512	K
Pressure Loss:	3.609087e+3	Pa
Inlet Quality:	0.	
Outlet Quality:	0.	
Mass Flow Rate:	25.4	kg/s
Mass Flux:	14.317670199	kg/(s·m ²)
Flow Velocity:	26.514204073	m/s
Fouling Resistance:	0.	m ² ·K/W
Equivalent Diameter:	0.002775	m
Reynolds Number:	1.24161e+3	
Heat Coefficient:	89.753654792	W/(m ² ·K)
Effective hA:	2.014525e+5	W/K
Colburn Factor j:	0.004565891	
Friction Factor f:	0.012542931	
Fin Efficiency %:	0.828352032	
Flow Length [m]:	1.007424035	m
Flow Width:	2.399739799	m
Power:	1.697607e+5	W
Specific Heat:	1.06e+3	J/(kg·K)
Heat Capacity:	2.6924e+4	W/K

At the bottom of the 'Sizing Result' panel, there is a yellow button labeled 'Save to a Regular Rating Project' and a blue button labeled 'Back to the Project'. A red arrow points to the 'Save to a Regular Rating Project' button.

Optimization: Click the “Save to a Regular Rating Project” button.

The screenshot shows the 'Plate-Fin: Opt. Realization' window. On the left is a 'Menu' with categories like 'Plate-Fin Heat Exchanger', 'Shell & Tubes Heat Exchanger', etc. The main area is split into 'Optimization Result' and 'Detail Result'.

Plate Length:	0.6037	m
Plate Width:	1.000875	m
Hot Flow Rate:	25.4	kg/s
Cold Flow Rate:	25.0	kg/s
Total No. of Plates:	1000	
No. of Hot Passes:	1	
No. of Cold Passes:	1	
Heat Transfer Rate:	2.980151e+6	W
Heat Transfer Area:	604.2282375	m ²
Hot Pressure Loss:	808.420300934	Pa
Cold Pressure Loss:	461.276121957	Pa

A yellow button labeled 'Save to a Regular Rating Project' is highlighted with a red box and a red arrow points to it from the 'Detail Result' table.

Hot Flow	Cold Flow	Overall
Inlet Temperature:	733.16	K
Outlet Temperature:	620.714745591	K
Pressure Loss:	1.486029e+3	Pa
Inlet Quality:	0.	
Outlet Quality:	0.	
Mass Flow Rate:	25.4	kg/s
Mass Flux:	9.886649887	kg/(s·m ²)
Flow Velocity:	18.308610903	m/s
Fouling Resistance:	0.	m ² K/W
Equivalent Diameter:	0.002775	m
Reynolds Number:	857.357919928	
Heat Coefficient:	86.601593143	W/(m ² ·K)
Effective hA:	1.693869e+5	W/K
Colburn Factor j:	0.006380026	
Friction Factor f:	0.017949045	
Fin Type:	rectangular	
Fin Profile:	plain	
Fin Efficiency %:	0.833180432	
Fin Height:	0.0057	m
Fin Pitch:	0.002	m
Fin Thickness:	0.00015	m
Fin Offset Pitch:	0.	m
Flow Length:	0.6037	m
Flow Width:	1.000875	m
Power:	6.98984e+4	W
Specific Heat:	1.06e+3	J/(kg·K)
Heat Capacity:	2.6924e+4	W/K

In all cases, a dialog box will be presented to you; input the names of the project and click the "Save" button.

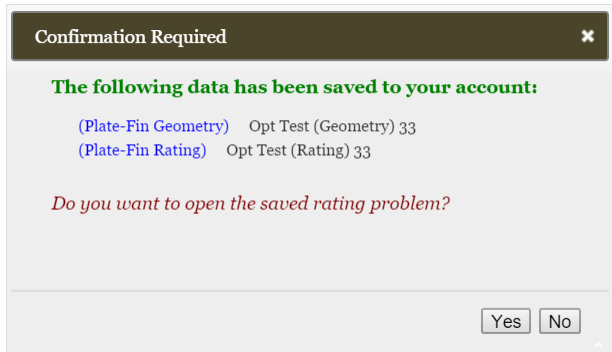
The dialog box is titled 'Save to a Regular Rating Project'. It contains a text area with the following text:

```

Project to Save:
Geometry Project
Opt Test (Geometry) 33
Rating Project
Opt Test (Rating) 33
    
```

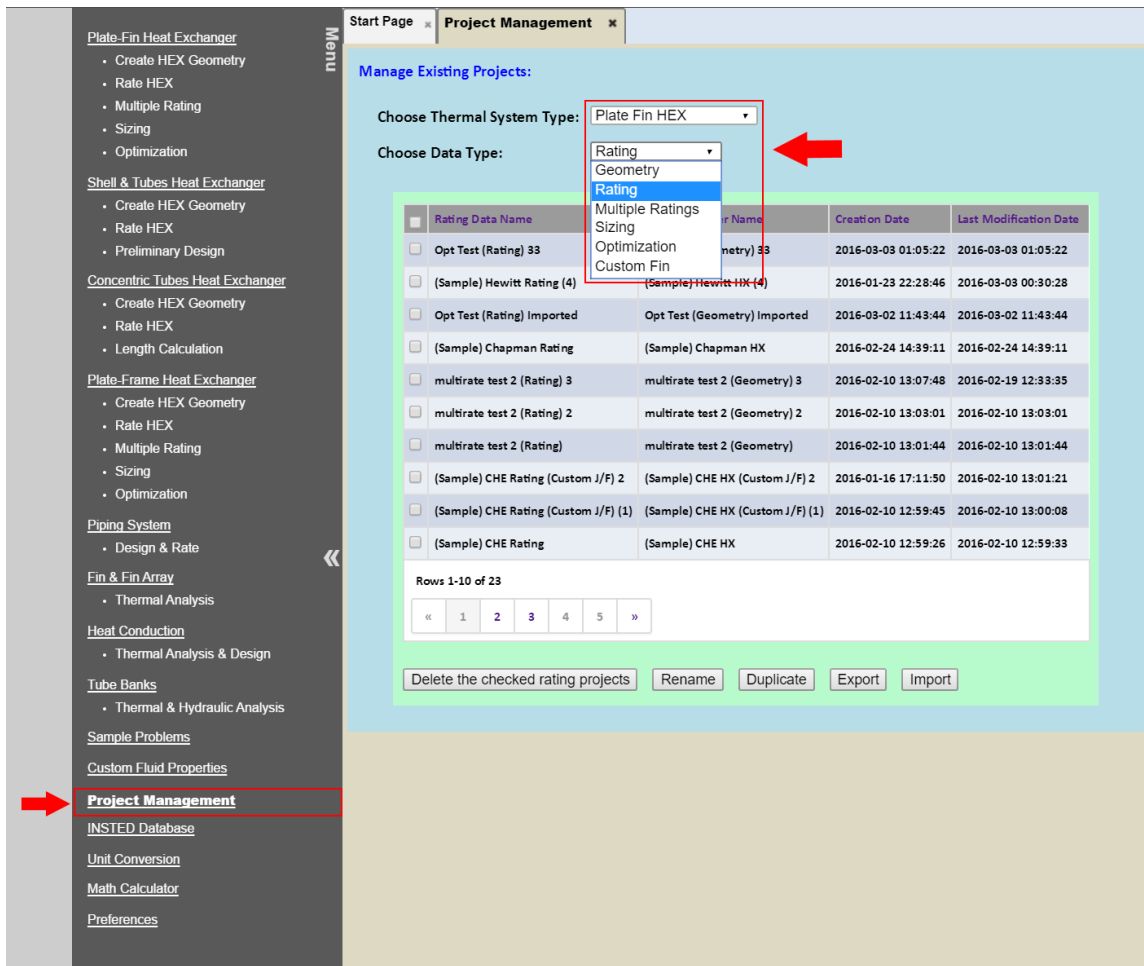
At the bottom of the dialog are 'Save' and 'Cancel' buttons.

A confirmation dialog will be shown.

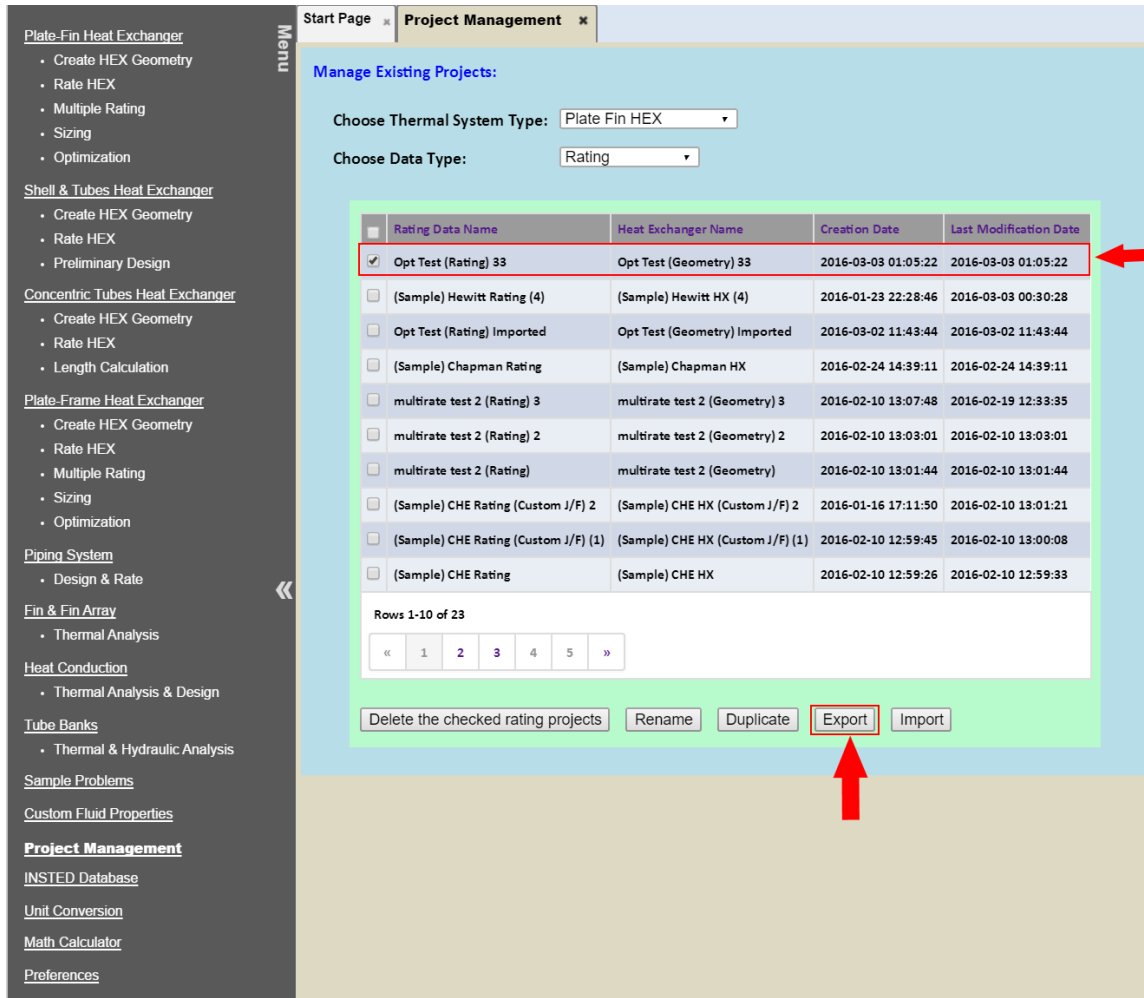


#5. Export an Existing Project into an XML File

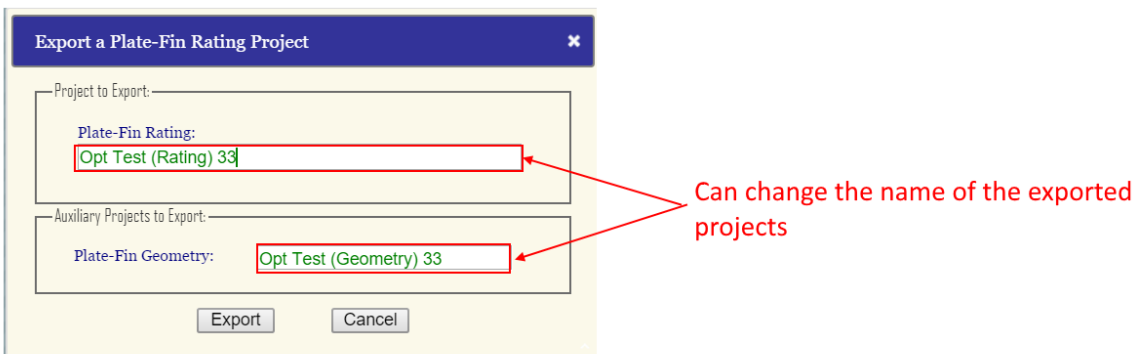
Under “Projects Management,” choose the task for the project.



Check the “checkbox” for the project (file) you want to export and click the “Export” button.



A dialog box will be displayed to show the names of the rating project to be exported and its associated “geometry.” To give the project and/or its geometry a different name, simply write over the name of the project and/or its geometry, as shown below.



Click the “Export” button and a project file will be generated and downloaded in your browser.

Project Management

Manage Existing Projects:

Choose Thermal System Type: Plate Fin HEX

Choose Data Type: Rating

Rating Data Name	Heat Exchanger Name	Creation Date	Last Modification Date
<input checked="" type="checkbox"/> Opt Test (Rating) 33	Opt Test (Geometry) 33	2016-03-03 01:05:22	2016-03-03 01:05:22
<input type="checkbox"/> (Sample) Hewitt Rating (4)	(Sample) Hewitt HX (4)	2016-01-23 22:28:46	2016-03-03 00:30:28
<input type="checkbox"/> Opt Test (Rating) Imported	Opt Test (Geometry) Imported	2016-03-02 11:43:44	2016-03-02 11:43:44
<input type="checkbox"/> (Sample) Chapman Rating	(Sample) Chapman HX	2016-02-24 14:39:11	2016-02-24 14:39:11
<input type="checkbox"/> multirate test 2 (Rating) 3	multirate test 2 (Geometry) 3	2016-02-10 13:07:48	2016-02-19 12:33:35
<input type="checkbox"/> multirate test 2 (Rating) 2	multirate test 2 (Geometry) 2	2016-02-10 13:03:01	2016-02-10 13:03:01
<input type="checkbox"/> multirate test 2 (Rating)	multirate test 2 (Geometry)	2016-02-10 13:01:44	2016-02-10 13:01:44
<input type="checkbox"/> (Sample) CHE Rating (Custom J/F) 2	(Sample) CHE HX (Custom J/F) 2	2016-01-16 17:11:50	2016-02-10 13:01:21
<input type="checkbox"/> (Sample) CHE Rating (Custom J/F) 1	(Sample) CHE HX (Custom J/F) 1	2016-02-10 12:59:43	2016-02-10 13:00:08
<input type="checkbox"/> (Sample) CHE Rating	(Sample) CHE HX	2016-02-10 12:59:26	2016-02-10 12:59:33

Rows 1-10 of 23

« 1 2 3 4 5 »

Delete the checked rating projects | Rename | Duplicate | Export | Import

#6. Import (an exported XML project file) back into INSTED

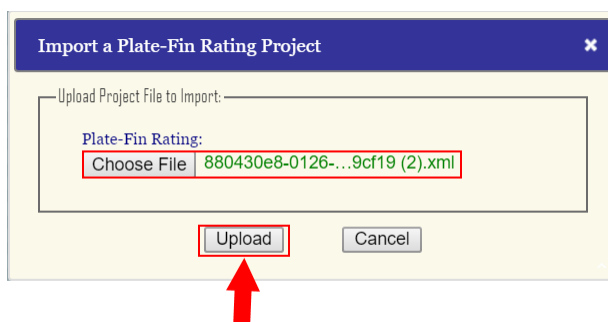
Under “Projects Management,” choose the type of task for which you want to import a project and click the “Import” button.

The screenshot shows the 'Project Management' section of the software. On the left is a navigation menu with categories like 'Plate-Fin Heat Exchanger', 'Shell & Tubes Heat Exchanger', etc. The main area is titled 'Manage Existing Projects:' and contains two dropdown menus: 'Choose Thermal System Type:' set to 'Plate Fin HEX' and 'Choose Data Type:' set to 'Rating'. Below these is a table with the following data:

<input type="checkbox"/>	Rating Data Name	Heat Exchanger Name	Creation Date	Last Modification Date
<input type="checkbox"/>	Opt Test (Rating) 33	Opt Test (Geometry) 33	2016-03-03 01:05:22	2016-03-03 01:05:22
<input type="checkbox"/>	(Sample) Hewitt Rating (4)	(Sample) Hewitt HX (4)	2016-01-23 22:28:46	2016-03-03 00:30:28
<input type="checkbox"/>	Opt Test (Rating) Imported	Opt Test (Geometry) Imported	2016-03-02 11:43:44	2016-03-02 11:43:44
<input type="checkbox"/>	(Sample) Chapman Rating	(Sample) Chapman HX	2016-02-24 14:39:11	2016-02-24 14:39:11
<input type="checkbox"/>	multirate test 2 (Rating) 3	multirate test 2 (Geometry) 3	2016-02-10 13:07:48	2016-02-19 12:33:35
<input type="checkbox"/>	multirate test 2 (Rating) 2	multirate test 2 (Geometry) 2	2016-02-10 13:03:01	2016-02-10 13:03:01
<input type="checkbox"/>	multirate test 2 (Rating)	multirate test 2 (Geometry)	2016-02-10 13:01:44	2016-02-10 13:01:44
<input type="checkbox"/>	(Sample) CHE Rating (Custom J/F) 2	(Sample) CHE HX (Custom J/F) 2	2016-01-16 17:11:50	2016-02-10 13:01:21
<input type="checkbox"/>	(Sample) CHE Rating (Custom J/F) (1)	(Sample) CHE HX (Custom J/F) (1)	2016-02-10 12:59:45	2016-02-10 13:00:08
<input type="checkbox"/>	(Sample) CHE Rating	(Sample) CHE HX	2016-02-10 12:59:26	2016-02-10 12:59:33

Below the table is a pagination control showing 'Rows 1-10 of 23' and a set of navigation buttons. At the bottom of the table area are several action buttons: 'Delete the checked rating projects', 'Rename', 'Duplicate', 'Export', and 'Import'. A red arrow points to the 'Import' button.

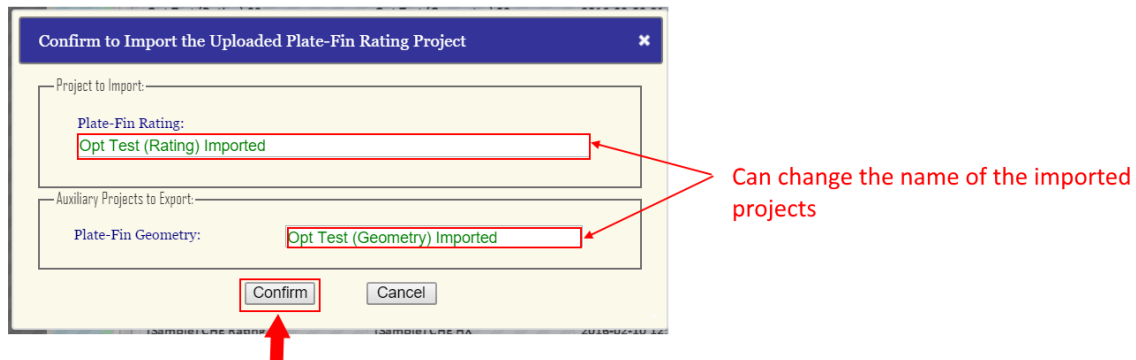
A dialog box will be displayed.



Choose the file you want to upload and click the "Upload" button.

A dialog box containing the details of the imported project will be displayed. You also have the option of changing the name (descriptions) of the imported projects.

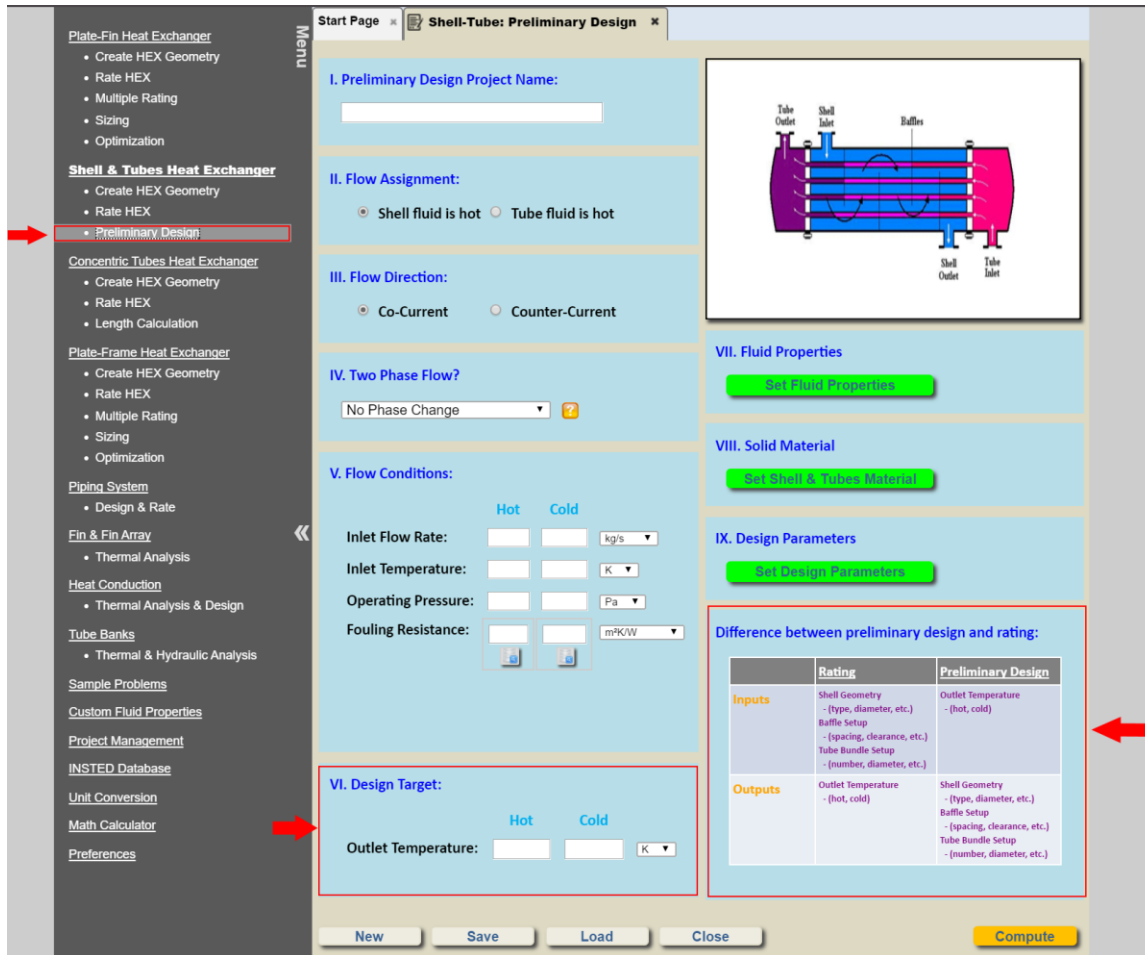
Important Information: Please note that your project files are downloaded into your browser default download folder. This is where to look when you want to export the file to other INSTED users.



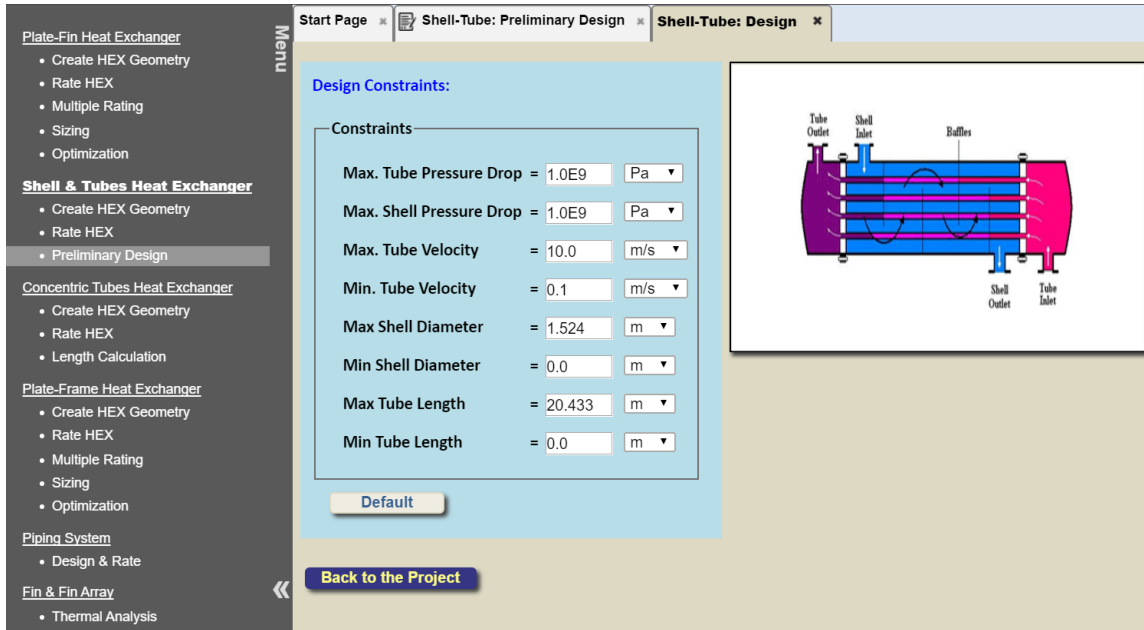
Click the “Confirm” button to import the project.

#7. “Preliminary Design” Module is added to “Shell & Tubes HEX”

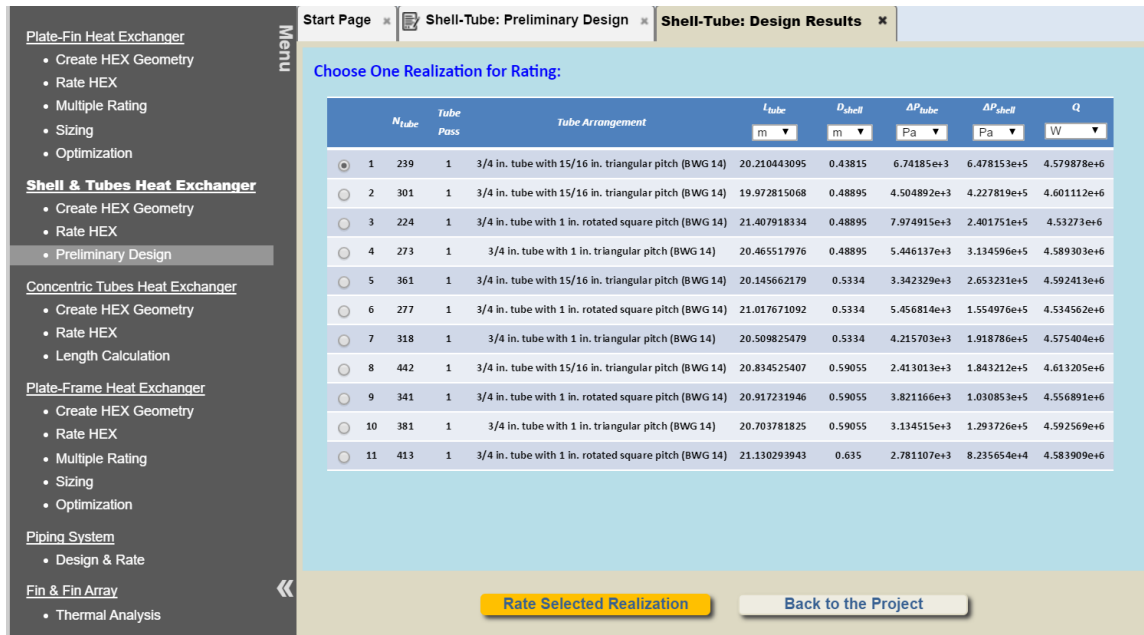
In “Preliminary Design”, the geometry information of the shell & tubes heat exchanger is unknown, such as the shell geometry (shell type, inner diameter, etc.), baffle setup (spacing, clearance, etc.) and tube bundle setup (bundle arrangement, number of tubes, tube diameter, etc.). User only need to provide the “Design Target”, which is the outlet temperature of the hot and cold streams, and with the additional data of the flow conditions and solid material, INSTED can try to find a geometry design for the Shell & Tube HEX to achieve the design target.



Note that a search scheme is used in the INSTED solver, so that user need to provide a reasonable “Design Parameters”



By clicking “Compute” button, a series of possible realizations will be listed



Check the radio button of one realization and click “Rate Selected Realization” button will view the details of the realization.

The screenshot displays the 'Shell-Tube: Design Realization' window. On the left is a 'Menu' sidebar with categories like Plate-Fin Heat Exchanger, Shell & Tubes Heat Exchanger, Concentric Tubes Heat Exchanger, Plate-Frame Heat Exchanger, Piping System, Fin & Fin Array, Heat Conduction, Tube Banks, Sample Problems, Custom Fluid Properties, Project Management, INSTED Database, and Unit Conversion. The main area is split into two panels: 'Preliminary Design Result' and 'Calculation Result'.

Preliminary Design Result:

Shell Type:	generic	
Number of Shell Passes:	1	
Shell Diameter:	0.43815	m
Shell Partitioner Thickness:	2.0	m
Shell Orientation:	0.	
Sealing Strip Pairs:	0	
Tube Arrange Type:	triangular	
Tube Pitch:	0.0238125	m
Number of Tubes:	239	
Number of Tube Passes:	1	
Tube Length:	20.210443095	m
Tube Bundle Diameter:	0.4064	m
Tube Inner Diameter:	0.0148336	m
Tube Outer Diameter:	0.01905	m
Number of Baffles:	50	
Baffle Spacing:	0.713463615	m
Baffle Thickness:	0.	m
Baffle Cut:	25.0	%

Calculation Result:

Shell Flow	Tube Flow	Overall
Inlet Temperature:	324.8267	K
Outlet Temperature:	358.985799018	K
Pressure Loss:	5.020457e+5	Pa
Inlet Quality:	0.	
Outlet Quality:	0.	
Mass Flow Rate:	75.2215	kg/s
Power:	4.604774e+4	W
Flow Velocity:	1.467034997	m/s
Fouling Resistance:	0.	m ² K/W
Reynolds Number:	5.631472e+3	
Heat Coefficient:	1.37515e+3	W/(m ² K)
Efficiency:	100.0	
Friction Coefficient:	0.344774754	
Specific Heat:	2.13514e+3	J/(kg K)
Heat Capacity:	1.606084e+5	W/K

At the bottom of the design results panel, there is a button labeled 'Save to a Regular Rating Project' highlighted with a red box and a red arrow pointing to it. Below this is a 'Back to the Project' button.

The design results are shown and user can also save this realization result into a separate, regular, rating project.

Note that:

- Two-phase calculation is currently not supported for the preliminary design calculation in Shell & Tubes module.

#8. “Length Calculation” Module is added to “Concentric Tubes HEX”

In “Length Calculation”, the length of the concentric tubes heat exchanger is unknown. User only need to provide the “Design Target”, which is the outlet temperature of the hot and cold streams, INSTED can try to calculate the length of the concentric tubes to achieve the design target.

The screenshot shows the 'Concentric Tubes: Length Cal.' window in the INSTED software. The interface is divided into several sections:

- I. Length Calculation Project Name:** A text input field.
- II. Flow Assignment:** Radio buttons for 'Annulus fluid is hot' and 'Tube fluid is hot'.
- III. Flow Direction:** Radio buttons for 'Co-Current' and 'Counter-Current'.
- IV. Two Phase Flow?:** A dropdown menu set to 'No Phase Change'.
- V. Flow Conditions:** Fields for 'Inlet Flow Rate' (kg/s), 'Inlet Temperature' (K), 'Operating Pressure' (Pa), and 'Fouling Resistance' (m²KW).
- VI. Design Target:** Fields for 'Outlet Temperature' (K) for both 'Hot' and 'Cold' streams.
- VII. Heat Exchanger Geometry:** Input fields for 'Tube Inner Diameter', 'Tube Outer Diameter', and 'Annulus Inner Diameter' (all in meters).
- VIII. Fluid Properties:** A 'Set Fluid Properties' button.
- IX. Solid Material:** A 'Set Annulus & Tubes Material' button.
- Difference between length calculation and rating:** A table comparing 'Rating' and 'Preliminary Design'.

At the bottom of the window, there are buttons for 'New', 'Save', 'Load', 'Close', and a prominent yellow 'Compute' button. A red arrow points to the 'Compute' button in the original image.

	Rating	Preliminary Design
Inputs	Tube Length	Outlet Temperature - (hot, cold)
Outputs	Outlet Temperature - (hot, cold)	Tube Length

By clicking “Compute” button, the calculation result will be shown. User can also save the calculation result into a separate, regular, rating project.

The screenshot displays the 'Concentric Tubes: Length Results' window. On the left is a 'Menu' sidebar with categories like 'Plate-Fin Heat Exchanger', 'Shell & Tubes Heat Exchanger', 'Concentric Tubes Heat Exchange', 'Plate-Frame Heat Exchanger', 'Piping System', 'Fin & Fin Array', 'Heat Conduction', and 'Tube Banks'. The 'Concentric Tubes Heat Exchange' category is expanded, showing 'Length Calculation' as the active option. A red arrow points to a yellow button labeled 'Save to a Regular Rating Project' in the 'Length Calculation Result' section. Below this is a 'Back to the Project' button. The 'Calculation Result' section contains a table with the following data:

	Tube Flow	Annulus Flow	Overall
Inlet Temperature:	363.706		K
Outlet Temperature:	359.835438414		K
Pressure Loss:	320.161637763		Pa
Inlet Quality:	0.		
Outlet Quality:	0.		
Mass Flow Rate:	0.629996		kg/s
Flow Velocity:	0.757445124		m/s
Fouling Resistance:	0.		m ² K/W
Reynolds Number:	5.207221e+4		
Heat Coefficient:	4.62768e+3		W/(m ² K)
Efficiency:	100.0		
Friction Coefficient:	0.020587		
Specific Heat:	4.18404e+3		J/(kg K)
Heat Capacity:	2.635928e+3		W/K

Note that:

- Two-phase calculation is currently not supported for the length calculation in Concentric Tubes module.