Getting started with Simulis® Pinch

Energy module

Use Case 1: Energy integration of an esterification process – First steps with Simulis Pinch Energy

Release Simulis Pinch 2.0.0

Software & Services In Process Simulation

We guide You to efficiency

ProSim

Introduction

This getting started shows you the basics of Simulis Pinch Energy in order to perform an energy integration of a process.

This example is linked with the ProSimPlus application example named "Energy analysis of an esterification process from vegetable oil."

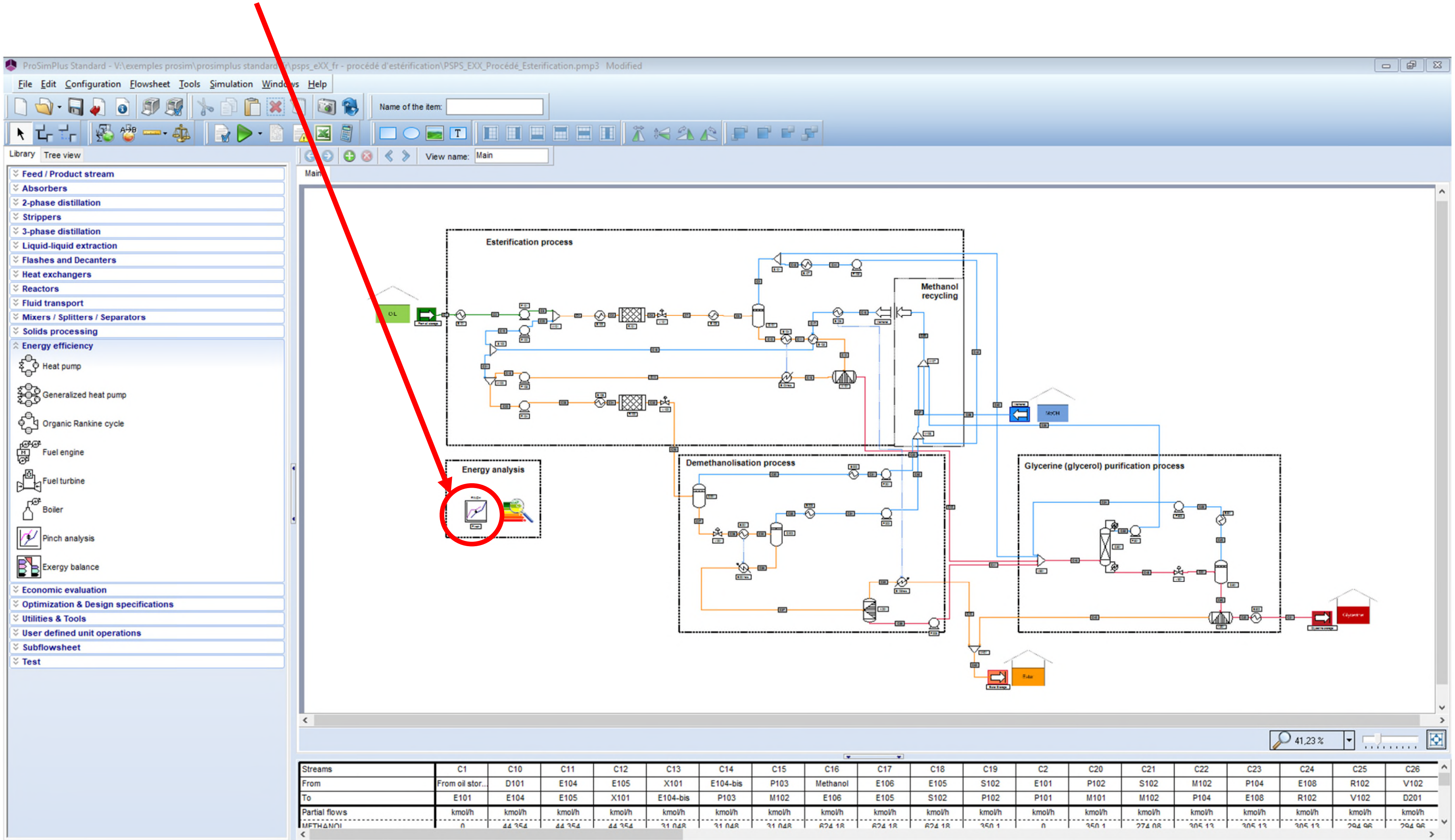
This guide presents the following parts:

- Step 1: Data generation in MS-Excel
- Step 2: Definition of the energy target
- Step 3: Design of a heat exchanger network

Step 1: Data generation in MS-Excel

The data, necessary to perfom the analysis, can be generated directly from a ProSimPlus simulation.
In ProSimPlus, open the file **PSPS_E30_Esterification Process.pmp3**

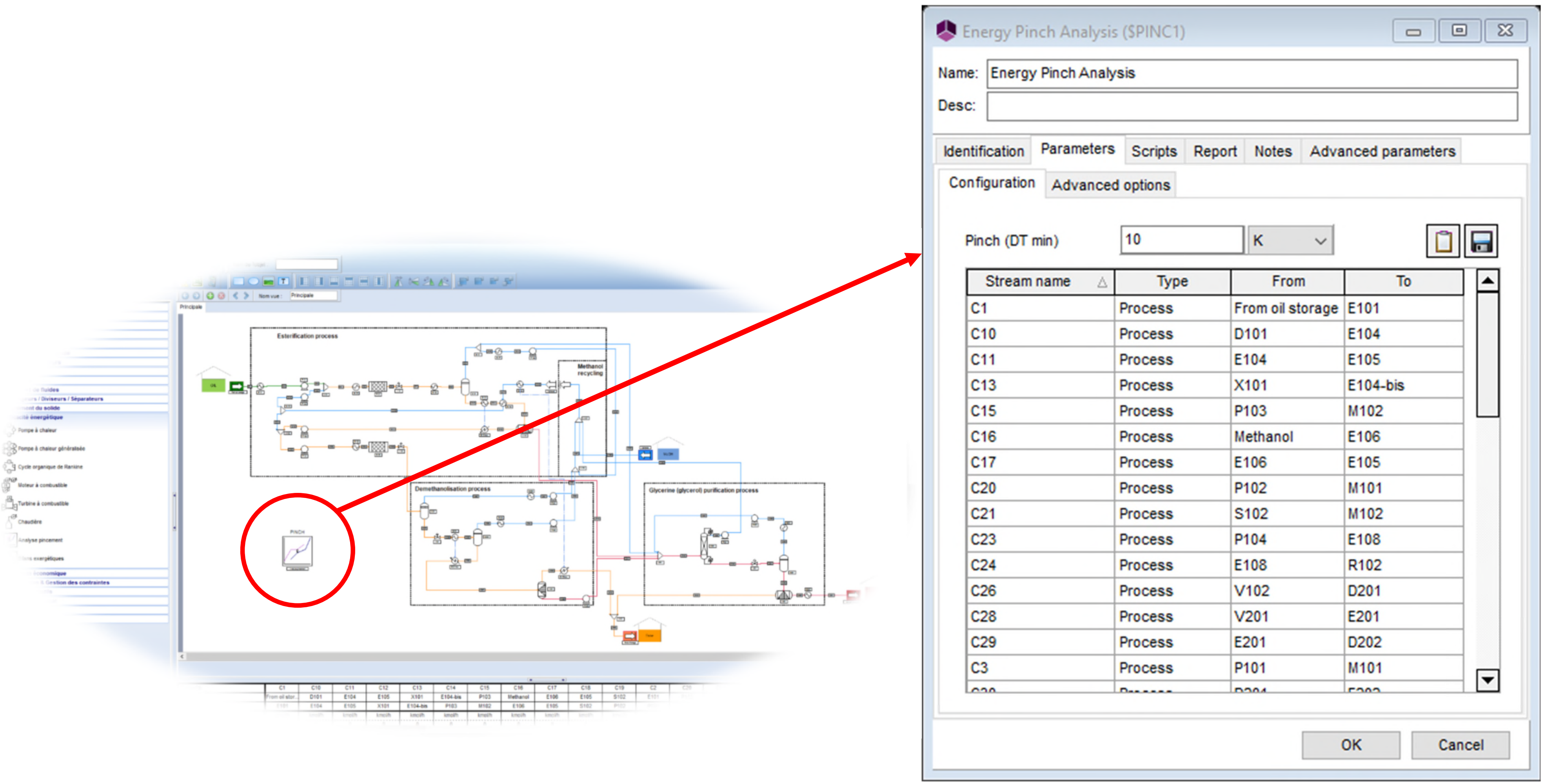
Add a module « **Energy pinch analysis** »



Step 1: Data generation in MS-Excel

Configure the module **Energy pinch analysis**

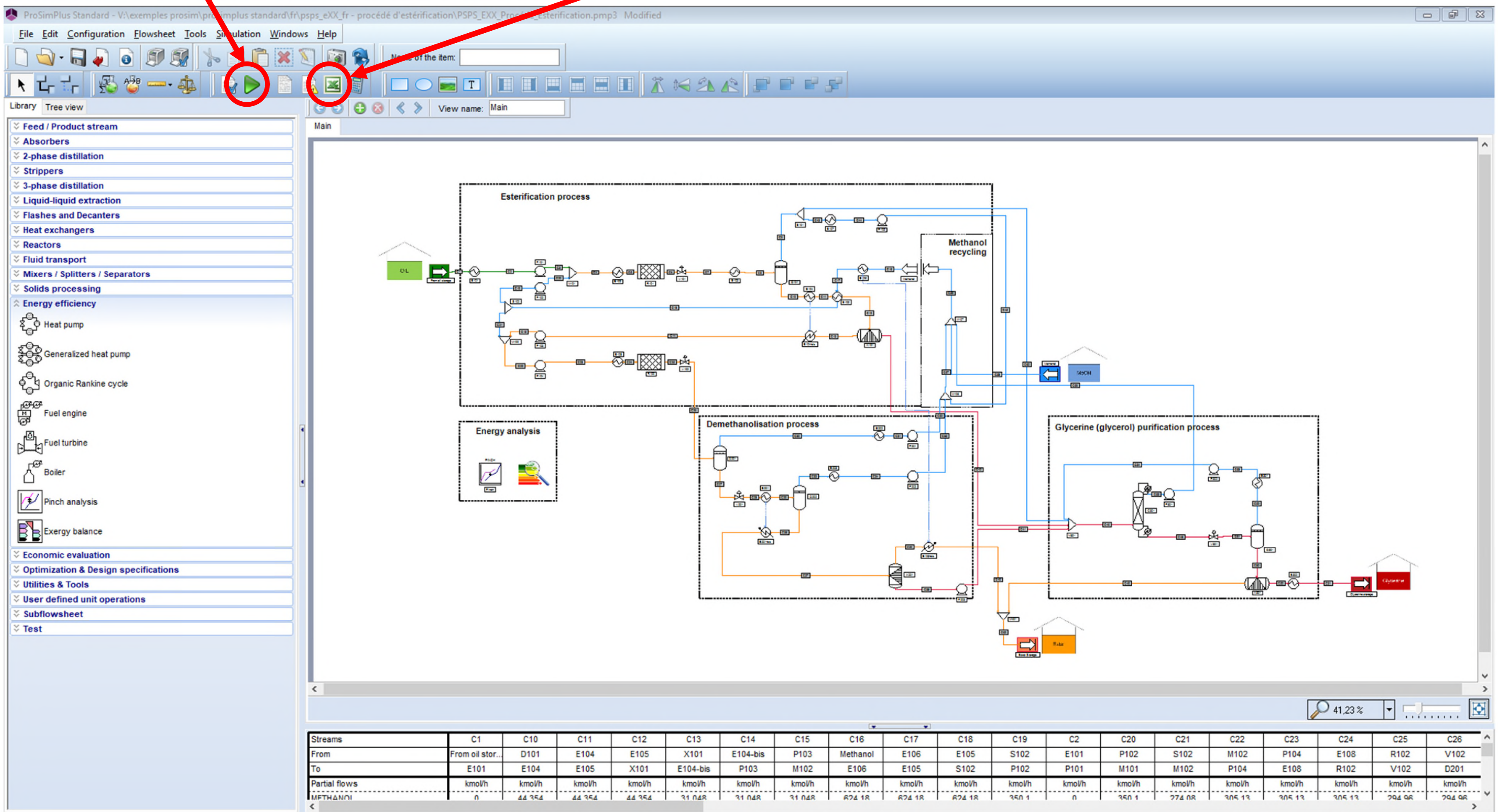
The configuration of the module is detailed in a ProSimPlus dedicated getting started document



Step 1: Data generation in MS-Excel

Click on the ***Start simulation*** button

At the end of the simulation, click on the ***Excel workbook*** button of the last simulation



Step 1: Data generation in MS-Excel

The data needed to do the energy analysis are automatically generated at the end of the MS-Excel report.

The column ***Stream*** presents the names of the streams involving in a heat transfer in the simulation. These streams can be for example:

- A stream entering into a heat exchanger
- A stream entering into the condenser or into the reboiler of a column
- A stream entering into a separation tank and for which a heat exchange is carried out

PINC

Stream	Physical state	F*Cp (KCAL/HR/K)	T In (C)	T Out (C)
C1	L	5598,5	25,0	135,0
C16	L	12863,6	45,0	54,0
C4	L	17535,5	96,0	200,0
C7	LV	53389,9	90,8	100,0
C17	L	13172,4	54,0	61,8
C13	L	6140,5	65,0	88,0
C23	L	15527,9	76,6	200,0
C28	LV	12990,1	38,6	70,0
C29	LV	6902,6	70,0	150,0
Rebo.C301	L	12420,4	83,9	136,2
C61	LV	865,0	116,9	140,0
C10	L	7064,3	100,0	80,0
C11	L	6859,1	80,0	65,0
C43	V	86842,1	100,0	82,1
C26	LV	225,0	76,7	76,7
C30	V	42039,9	76,7	25,0
C33	V	5143,6	150,0	25,0
C36	L	5811,4	150,0	79,8
C39	L	5149,4	79,8	57,3
Cond.C301	V	152710,2	48,4	38,5
C52	V	189,7	140,0	11,0
C62	L	4952,8	57,7	20,0
C51	L	623,5	70,0	20,0
C50	L	701,4	140,0	70,0

These automatically generated data are available in the last MS-Excel results file

According to the definition of the decimal separator of your computer, it will be or not necessary to replace points "." by comma "," so that these values are well interpreted in MS-Excel.

Step 1: Data generation in MS-Excel

The column **Physical state** of the stream indicates :

- **L** for liquid
- **V** for vapor
- **LV** for liquid-vapor (condensation or evaporation)

PINC

Stream	Physical state	F*Cp (KCAL/HR/K)	T In (C)	T Out (C)
C1	L	5598,5	25,0	135,0
C16	L	12863,6	45,0	54,0
C4	L	17535,5	96,0	200,0
C7	LV	53389,9	90,8	100,0
C17	L	13172,4	54,0	61,8
C13	L	6140,5	65,0	88,0
C23	L	15527,9	76,6	200,0
C28	LV	12990,1	38,6	70,0
C29	LV	6902,6	70,0	150,0
Rebo.C301	L	12420,4	83,9	136,2
C61	LV	865,0	116,9	140,0
C10	L	7064,3	100,0	80,0
C11	L	6859,1	80,0	65,0
C43	V	86842,1	100,0	82,1
C26	LV	225,0	76,7	76,7
C30	V	42039,9	76,7	25,0
C33	V	5143,6	150,0	25,0
C36	L	5811,4	150,0	79,8
C39	L	5149,4	79,8	57,3
Cond.C301	V	152710,2	48,4	38,5
C52	V	189,7	140,0	11,0
C62	L	4952,8	57,7	20,0
C51	L	623,5	70,0	20,0
C50	L	701,4	140,0	70,0

Step 1: Data generation in MS-Excel

The column **F*Cp** shows the heat duty exchanged divided by ΔT (temperature difference between the inlet and the outlet of the heat exchange), expressed in kcal/hr/K.
The "**F*Cp**" of a stream corresponds to the mass flowrate (F) multiplied by the specific heat capacity at constant pressure (Cp).
In other words, the heat duty exchanged to heat or cool the stream (denoted Q) is equal to:

$$Q = F * Cp * \Delta T = F * Cp * (T_{out} - T_{in})$$

The "**F*Cp**" represents thus the enthalpy difference between the inlet and the outlet divided by ΔT for a single phase fluid (name used in the pinch analysis, although not appropriate to the phase change).

PINC

Stream	Physical state	F*Cp (KCAL/HR/K)	T In (C)	T Out (C)
C1	L	5598,5	25,0	135,0
C16	L	12863,6	45,0	54,0
C4	L	17535,5	96,0	200,0
C7	LV	53389,9	90,8	100,0
C17	L	13172,4	54,0	61,8
C13	L	6140,5	65,0	88,0
C23	L	15527,9	76,6	200,0
C28	LV	12990,1	38,6	70,0
C29	LV	6902,6	70,0	150,0
Rebo.C301	L	12420,4	83,9	136,2
C61	LV	865,0	116,9	140,0
C10	L	7064,3	100,0	80,0
C11	L	6859,1	80,0	65,0
C43	V	86842,1	100,0	82,1
C26	LV	225,0	76,7	76,7
C30	V	42039,9	76,7	25,0
C33	V	5143,6	150,0	25,0
C36	L	5811,4	150,0	79,8
C39	L	5149,4	79,8	57,3
Cond.C301	V	152710,2	48,4	38,5
C52	V	189,7	140,0	11,0
C62	L	4952,8	57,7	20,0
C51	L	623,5	70,0	20,0
C50	L	701,4	140,0	70,0

Step 1: Data generation in MS-Excel

The inlet temperature (**Tin**) and the outlet temperature (**Tout**) are expressed in degrees Celsius.

If temperature increases (Tout > Tin), the stream will be considered as a cold stream (needs to be heated).

If the temperature decreases (Tout < Tin), the stream will be considered as a hot stream (needs to be cooled).

During condensation, evaporation or heat exchange at constant temperature (phase change of a pure substance, for example), the ΔT is automatically set to ± 0.01°C and the F*Cp is calculated consequently.

PINC

Stream	Physical state	F*Cp (KCAL/HR/K)	T In (C)	T Out (C)
C1	L	5598,5	25,0	135,0
C16	L	12863,6	45,0	54,0
C4	L	17535,5	96,0	200,0
C7	LV	53389,9	90,8	100,0
C17	L	13172,4	54,0	61,8
C13	L	6140,5	65,0	88,0
C23	L	15527,9	76,6	200,0
C28	LV	12990,1	38,6	70,0
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C61	LV	865,0	116,9	140,0
C10	L	7064,3	100,0	80,0
C11	L	6859,1	80,0	65,0
C43	V	86842,1	100,0	82,1
C26	LV	225,0	76,7	76,7
C30	V	42039,9	76,7	25,0
C33	V	5143,6	150,0	25,0
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C39	L	5149,4	79,8	57,3
Cond.C301	V	152710,2	48,4	38,5
C52	V	189,7	140,0	11,0
C62	L	4952,8	57,7	20,0
C51	L	623,5	70,0	20,0
C50	L	701,4	140,0	70,0

Step 1: Data generation in MS-Excel

Data can come from external sources. For example, the user can generate the Cp missing for one or more streams by using **Simulis Thermodynamics** (the thermodynamic properties calculation server provided by ProSim) directly in MS-Excel environment.

In all cases, the user must ensure to maintain the same format:

- 1st column: Stream name
- 2th column: Physical state
- 3th column: F*Cp
- 4th column: Tin
- 5th column: Tout

PINC

Stream	Physical state	F*Cp (KCAL/HR/K)	T In (C)	T Out (C)
C1	L	5598,5	25,0	135,0
C16	L	12863,6	45,0	54,0
C4	L	17535,5	96,0	200,0
C7	LV	53389,9	90,8	100,0
C17	L	13172,4	54,0	61,8
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C61	LV	865,0	116,9	140,0
C10	L	7064,3	100,0	80,0
C11	L	6859,1	80,0	65,0
C43	V	86842,1	100,0	82,1
C26	LV	225,0	76,7	76,7
C30	V	42039,9	76,7	25,0
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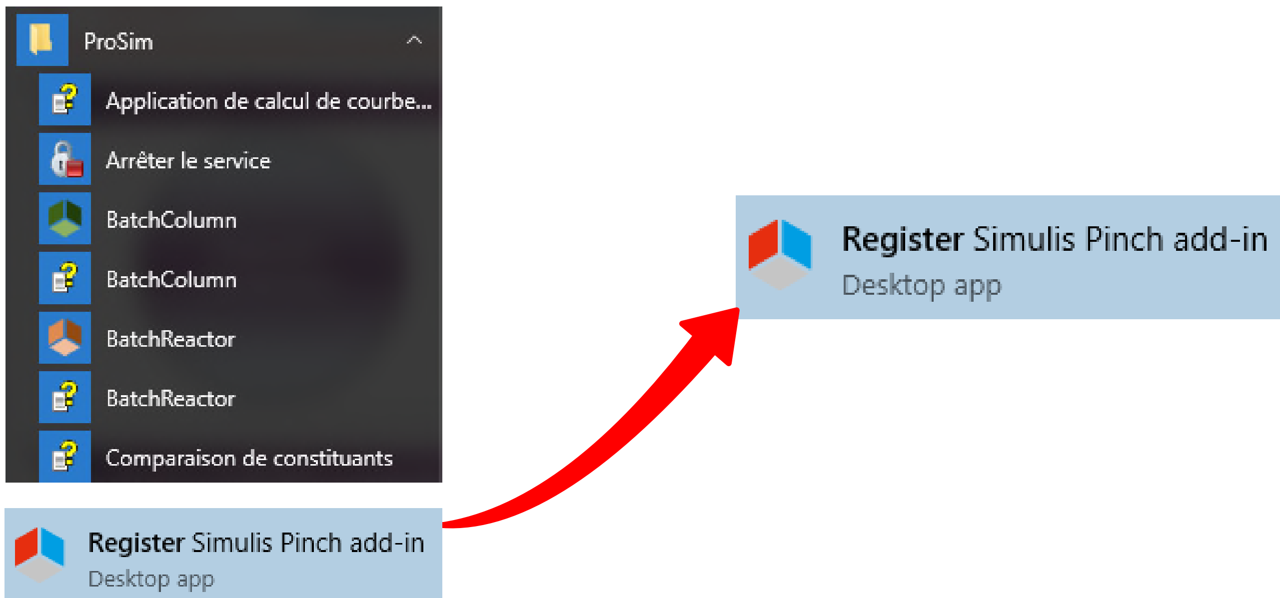
C39	L	5149,4	79,8	57,3
Cond.C301	V	152710,2	48,4	38,5
C52	V	189,7	140,0	11,0
C62	L	4952,8	57,7	20,0
C51	L	623,5	70,0	20,0
C50	L	701,4	140,0	70,0

Step 2: Definition of the energy target

After installing Simulis Pinch, the tool has to be registered in MS-Excel® using the dedicated ProSim tool with one of the two following methods:

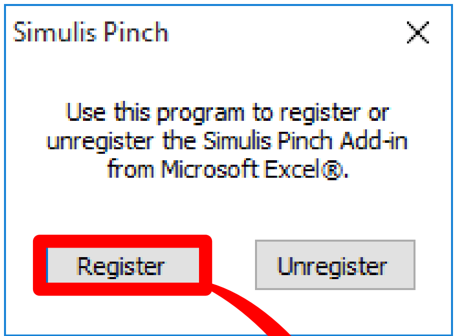
1. In the "ProSim" application folder, click on "Register Simulis Pinch add-in"

2. Find directly the tool "Register Simulis Pinch add-in" on your computer (using the search bar)

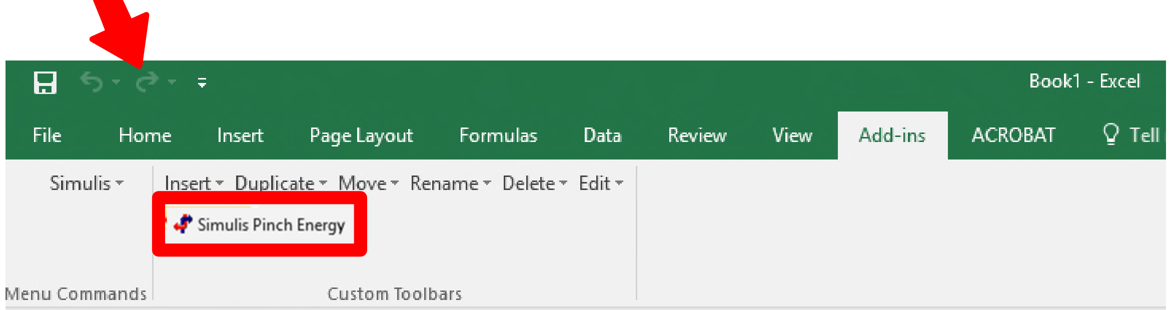


Step 2: Definition of the energy target

Register Simulis Pinch by clicking on “Register”:



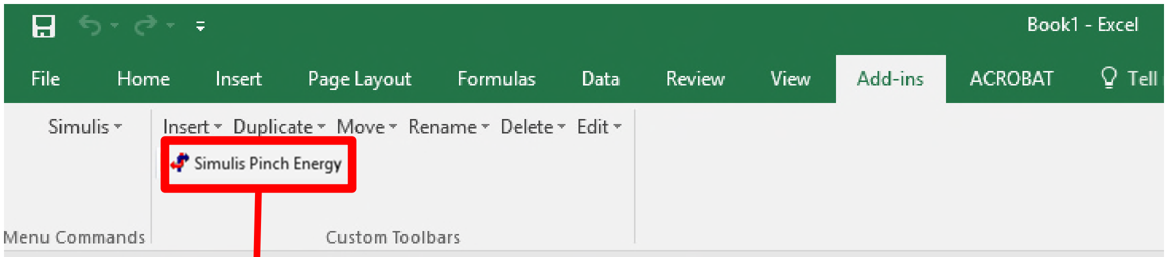
When Simulis Pinch is registered, it’s available in MS-Excel® in the “Add-Ins” tab

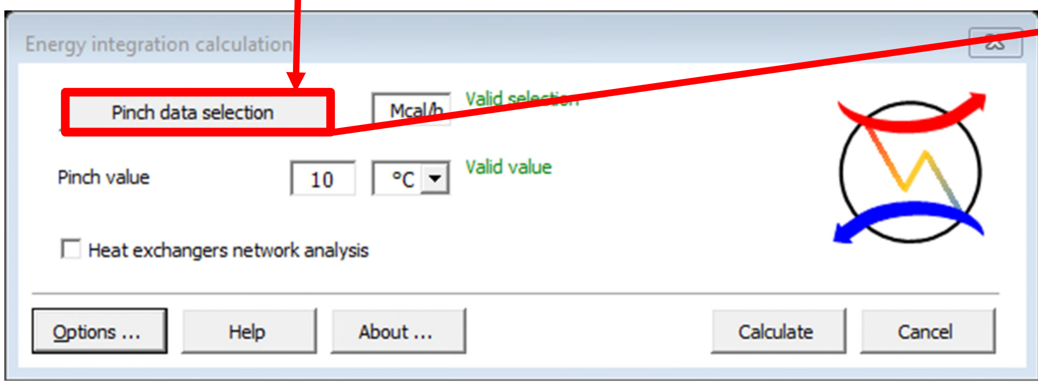


Step 2: Definition of the energy target

1. Run Simulis Pinch Energy

2. Select the columns F*Cp, Tin and Tout (only numerical values, not the column headings, as shown in the screenshots below)





PINC

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Rebo.C301	L	12420,4	83,9	136,2
C61	LV	865,0	116,9	140,0
C10	L	7064,3	100,0	80,0
C11	L	6859,1	80,0	65,0
C43	V	86842,1	100,0	82,1
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C30	V	42039,9	76,7	25,0
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C39	L	5149,4	79,8	57,3
Cond.C301	V	152710,2	48,4	38,5
C52	V	189,7	140,0	11,0
C62	L	4952,8	57,7	20,0
C51	L	623,5	70,0	20,0
C50	L	701,4	140,0	70,0

Step 2: Definition of the energy target

Simulis Pinch Energy can also be run from the context menu (right click) after you select the input data:

1. Select the 3 columns F*Cp, Tin and Tout (only numerical values, not the column headings, as shown in the screenshots below)
2. Right-click to access the context menu

PINC

Stream	Physical state	F*Cp (KCAL/HR/K)	T In (C)	T Out (C)
C1	L	5598,5	25,0	135,0
C16	L	12863,6	45,0	54,0
C4	L	17535,5	96,0	200,0
C7	LV	53389,9	90,8	100,0
C17	L	13172,4	54,0	61,8
C13	L	6140,5	65,0	88,0
C23	L	15527,9	76,6	200,0
C28	LV	12990,1	38,6	70,0
C29	LV	6902,6	70,0	150,0
Rebo.C301	L	12420,4	83,9	136,2
C61	LV	865,0	116,9	140,0
C10	L	7064,3	100,0	80,0
C11	L	6859,1	80,0	65,0
C43	V	86842,1	100,0	82,1
C26	LV	225,0	76,7	76,7
C30	V	42039,9	76,7	25,0
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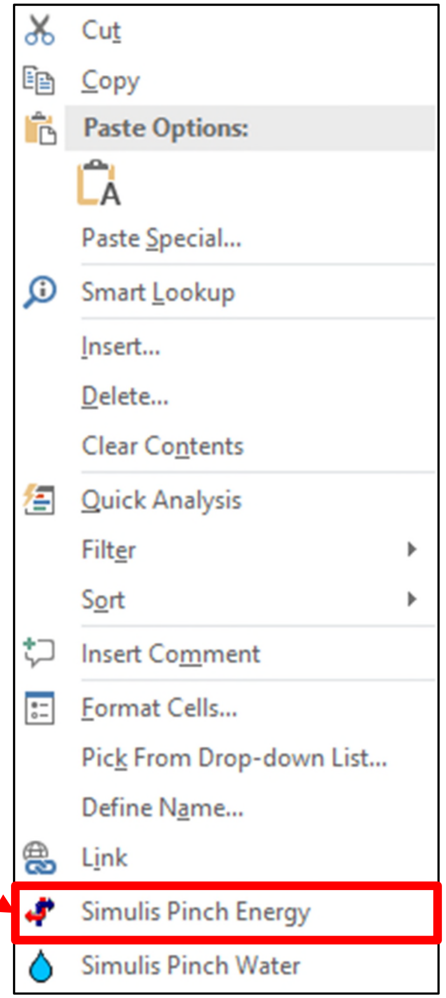
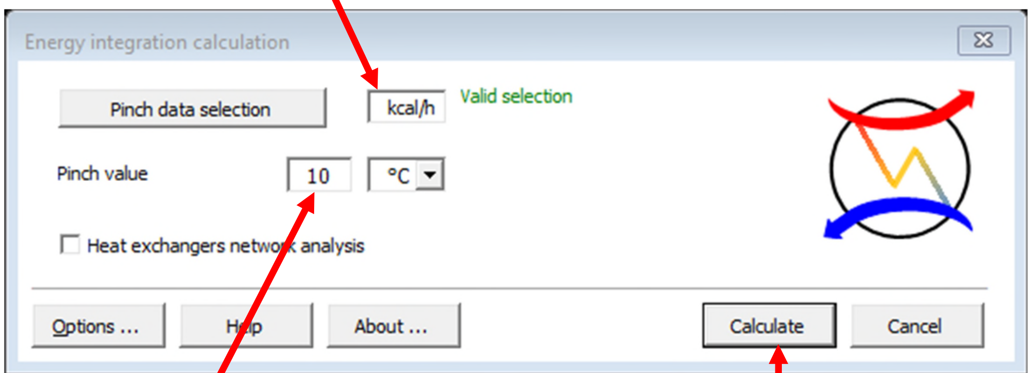
C62	L	4952,8	57,7	20,0
C51	L	623,5	70,0	20,0
C50	L	701,4	140,0	70,0



Step 2: Definition of the energy target

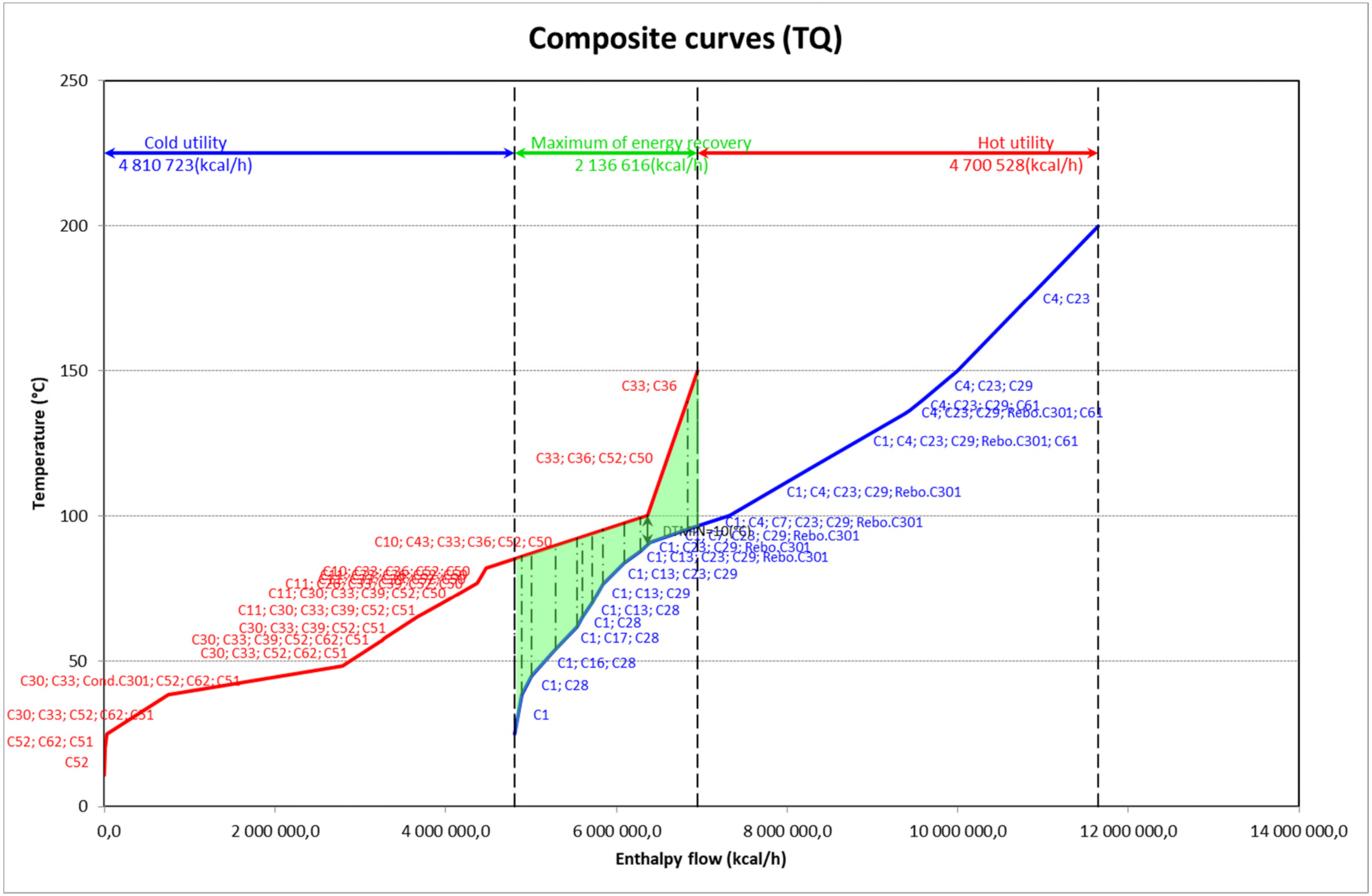
1. Change the unit to match the specified unit in the MS-Excel workbook (kcal/h in this case)



2. Provide the value of the pinch (that is to say the temperature difference at the pinch)

3. Click on ***Calculate***

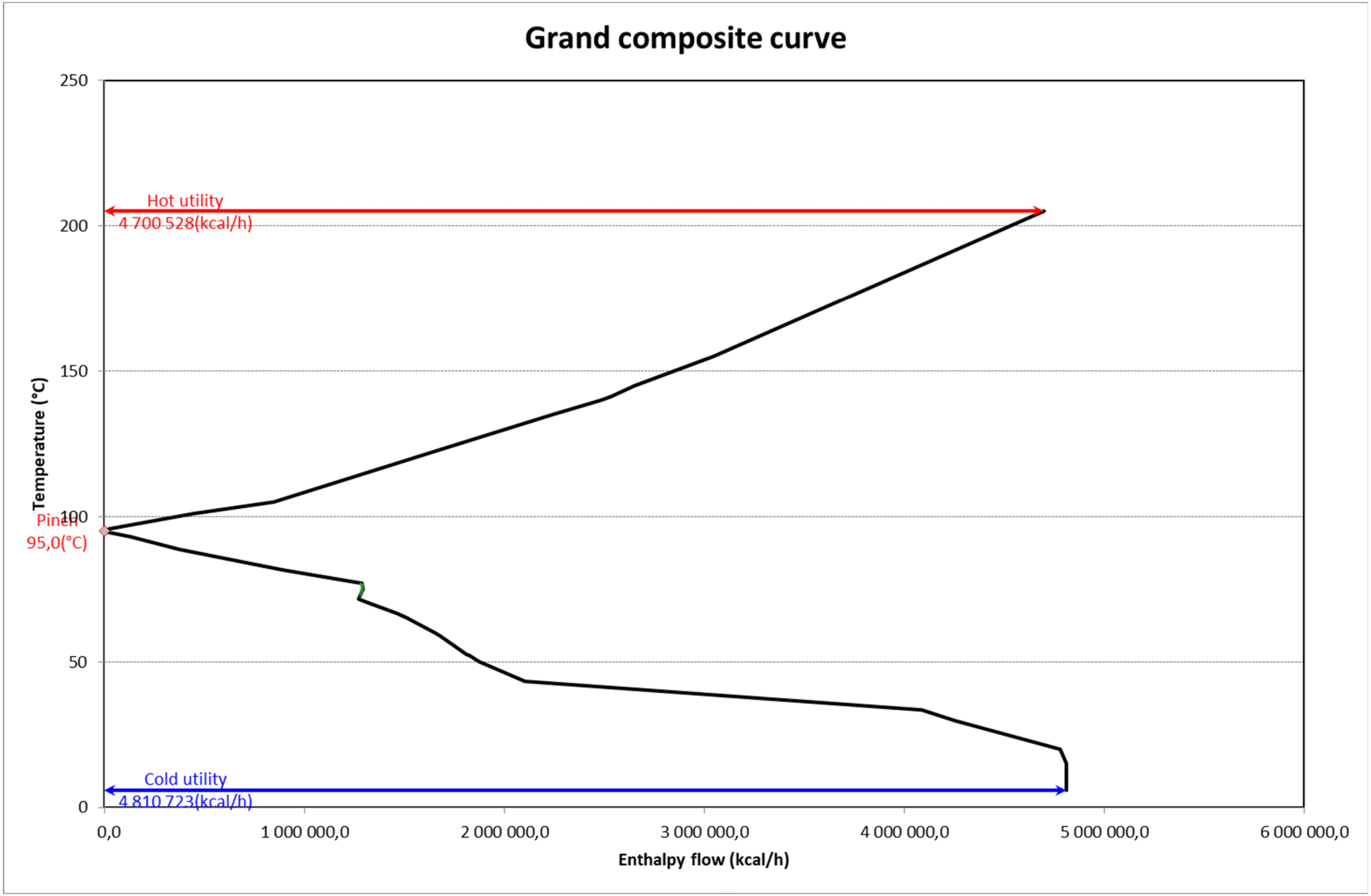
Step 2: Definition of the energy target



4 sheets are generated for the energy audit:

1. The grand composite curve
2. The hot and cold composite curves
3. The streams (hot streams and cold streams)
4. The results of the energy pinch analysis (data and summary of results)

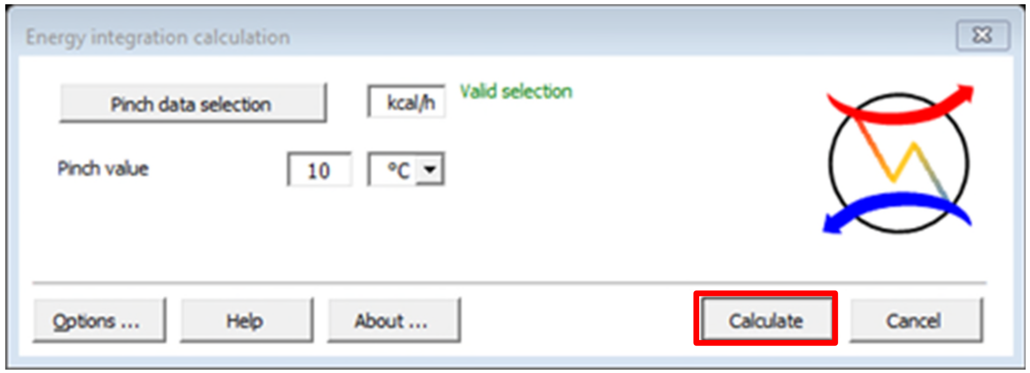
Step 2: Definition of the energy target



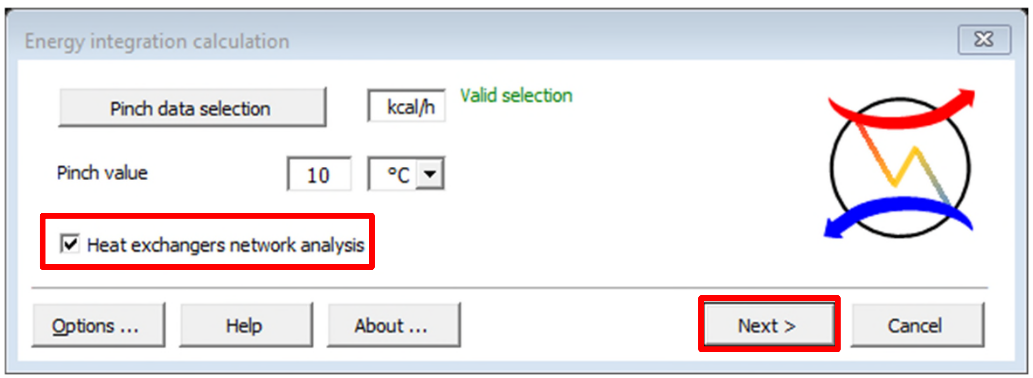
Step 3: Design of a heat exchanger network

If the user has a license for the use of Simulis Pinch, the tool can generate a heat exchanger network which the purpose is to recover a maximum internal energy in the process

Interface **without** Simulis Pinch licence



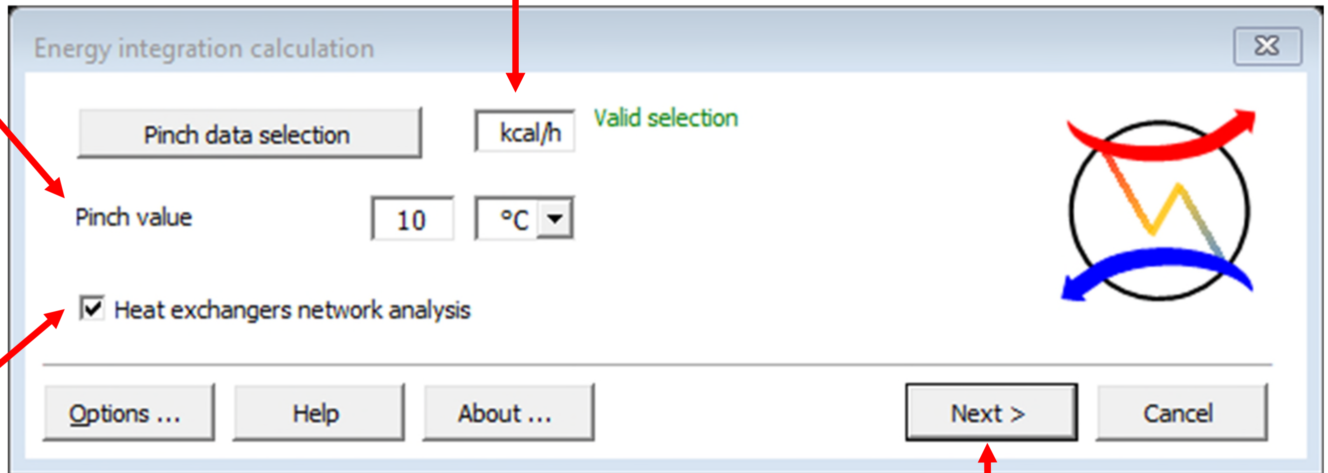
Interface **with** Simulis Pinch licence



Step 3: Design of a heat exchanger network

1. Change the unit to match the unit specified in the MS-Excel workbook (kcal/h in this case)

2. Provide the value of the pinch (i.e. the temperature difference at the pinch)



3. Check the ***Heat exchanger network analysis*** box

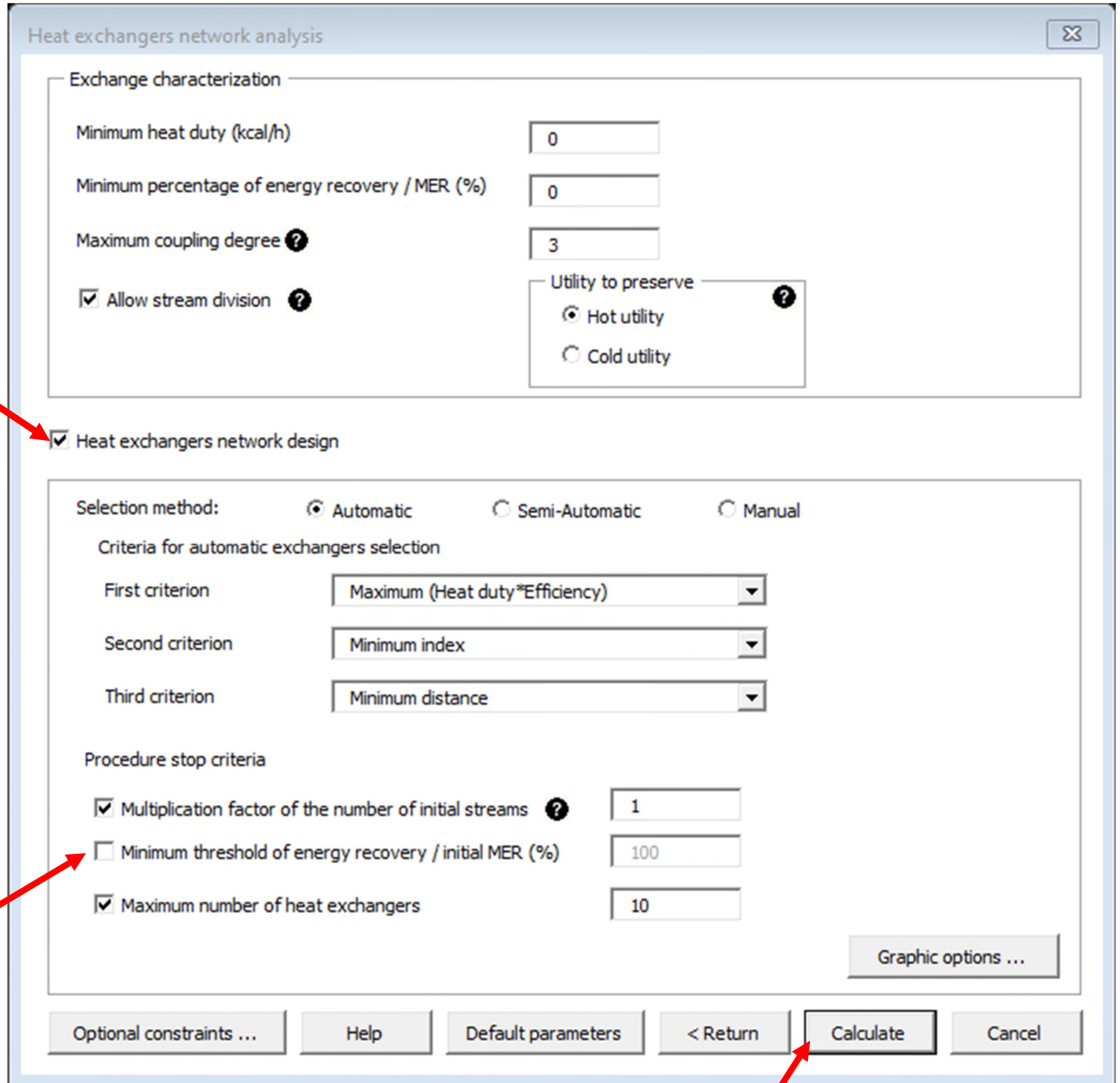
4. Click on ***Next***

Step 3: Design of a heat exchanger network

1. Check the box ***Heat exchanger network design***

*Firstly, the default values will be kept (**Automatic selection of the heat exchangers**)*

2. Uncheck the box ***Minimum threshold of energy recovery (%)***. When this option is unchecked, the software attempts to reach the MER i.e. the Maximum Energy Recovery.

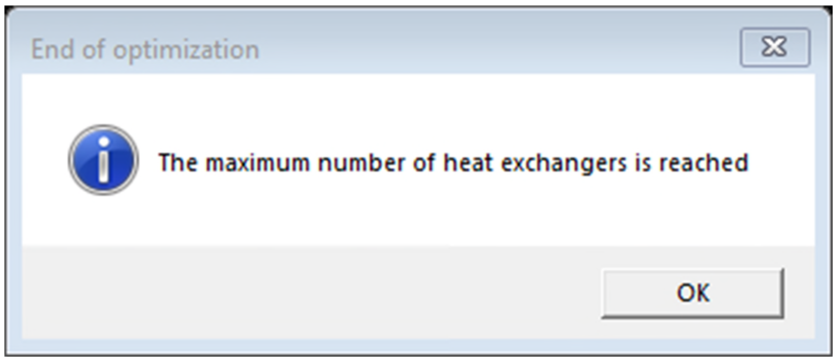


3. Click on ***Calculate***

Step 3: Design of a heat exchanger network

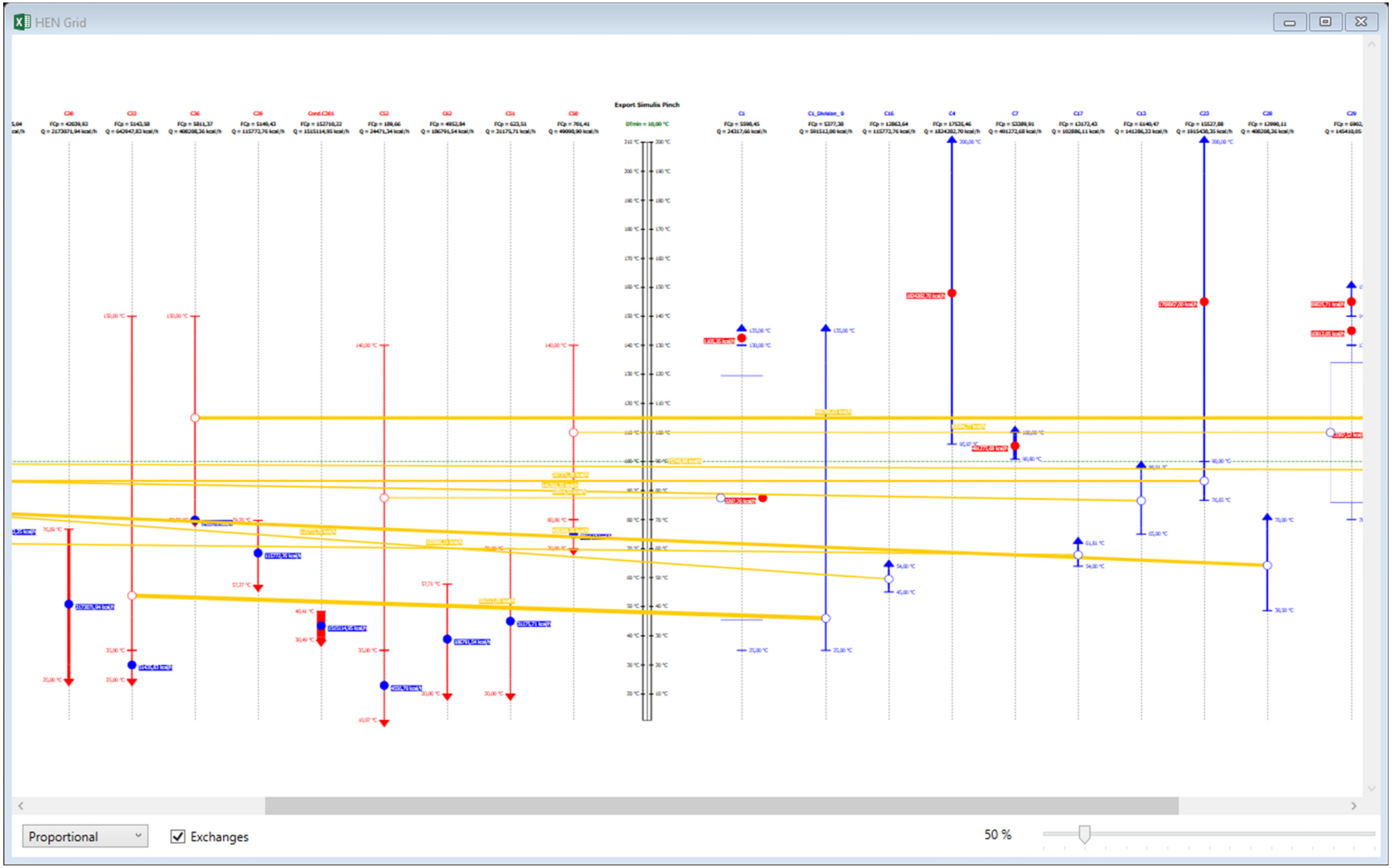
A message will indicate the end of the calculations (when a stop criterion is met)

For this example, the maximum number of heat exchangers defined by the user (10 heat exchangers by default) is reached



Step 3: Design of a heat exchanger network

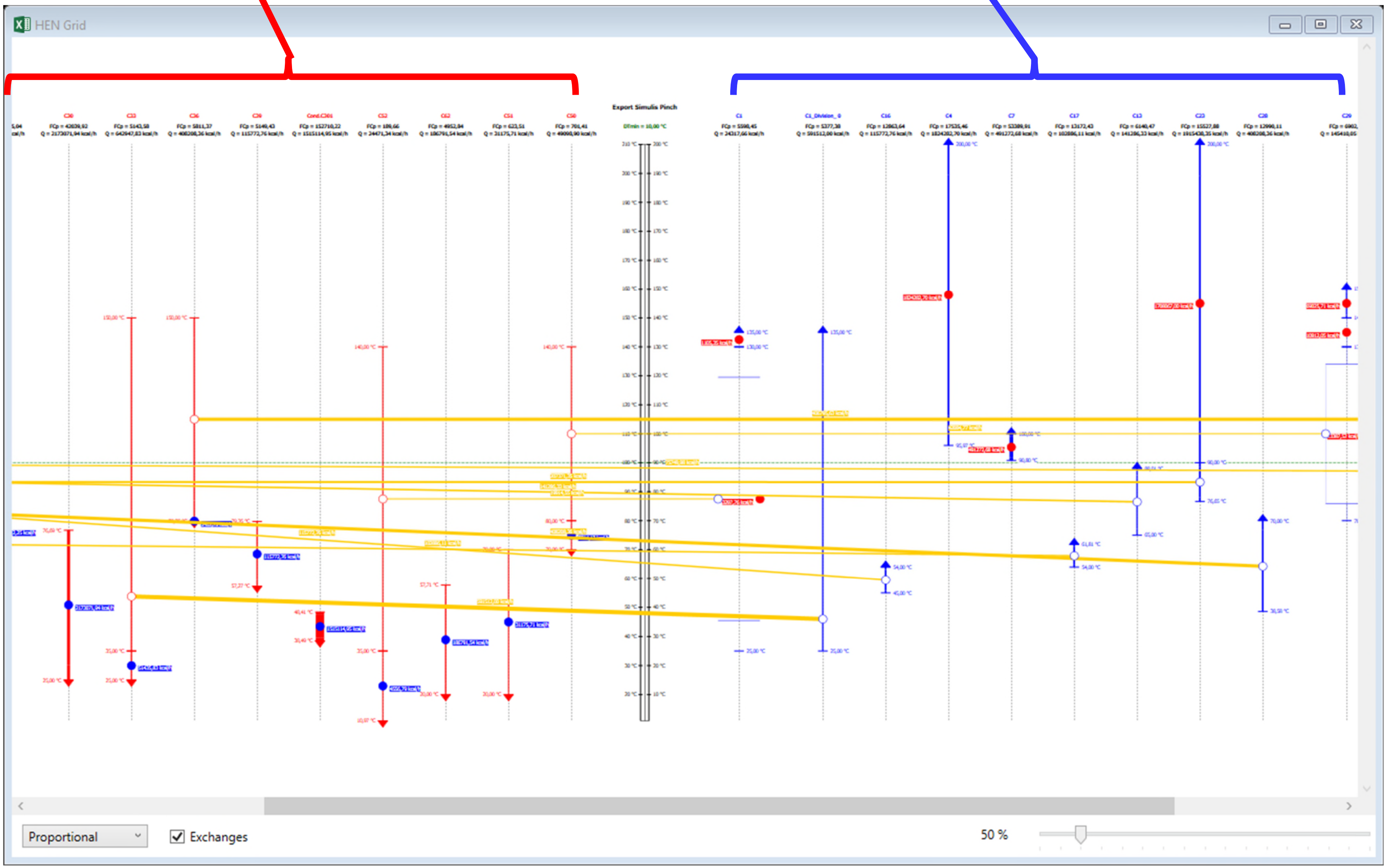
The heat exchanger network is then displayed:



Step 3: Design of a heat exchanger network

Names, F*Cp and Q of hot streams

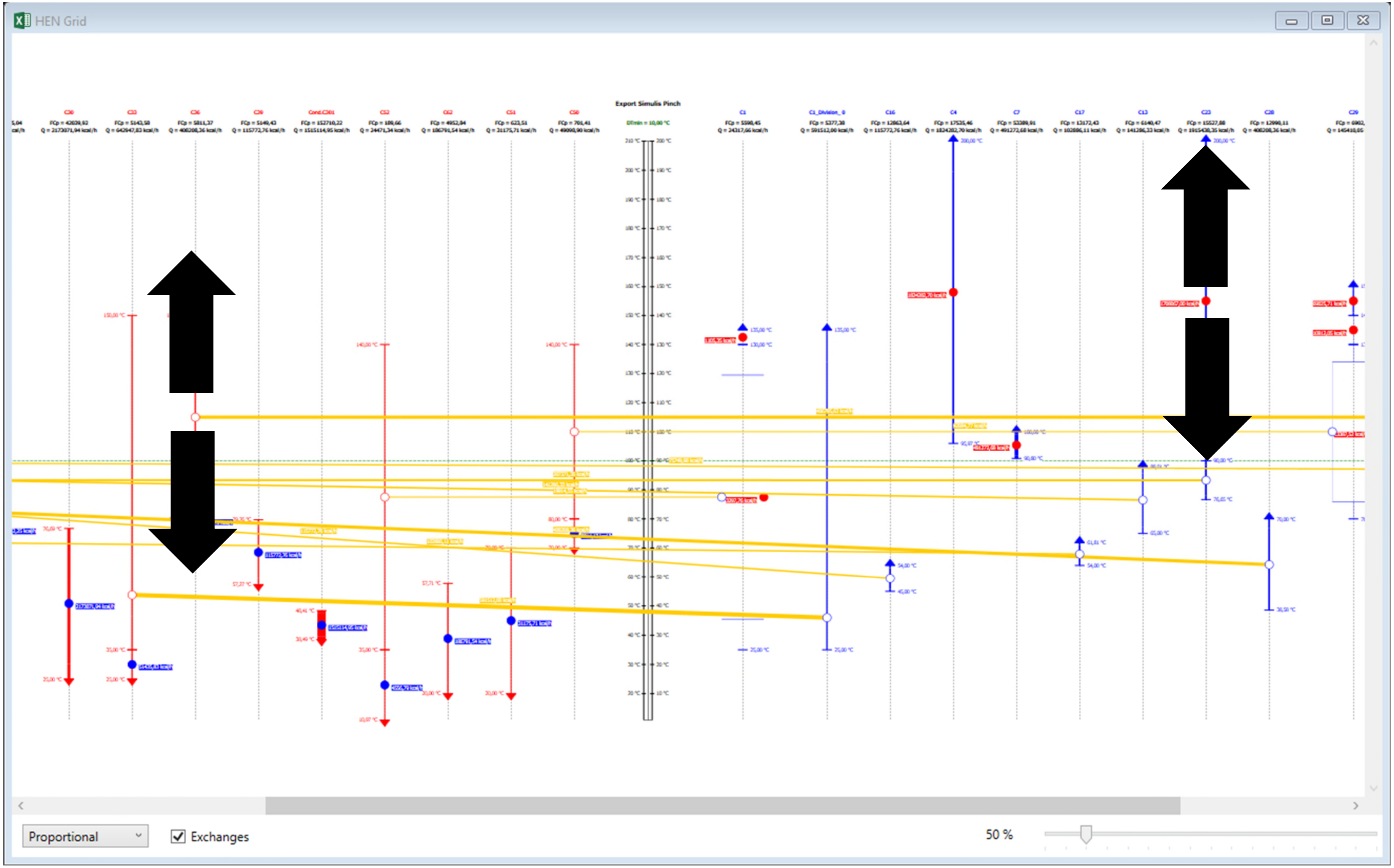
Names, F*Cp and Q of cold streams



Step 3: Design of a heat exchanger network

Each circle represents a cold utility exchanger (blue circle by default), a hot utility (red circle by default) or an integration heat exchanger (white circle by default)

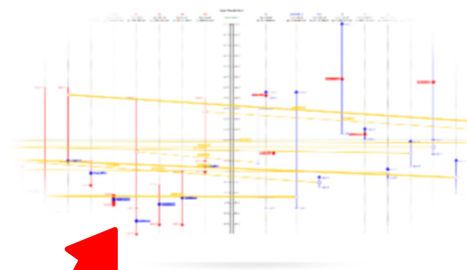
It is possible to change the position of the heat exchangers and change the colors of different information



Step 3: Design of a heat exchanger network

Two additional sheets were generated:

1. ***Energy integration results***
2. ***Input data***



This button lets you display the heat exchanger network

Display exchangers network

SUMMARY FOR THE HEAT EXCHANGER NETWORK

Initial number of possible exchanges:	40
Multiplication factor for the initial number of streams:	1,0
Cumulative percentage of energy recovery:	98,83
Number of heat exchangers:	10
Total energy recovery (kcal/h):	2 111 581,8
Energy to recover (kcal/h):	9 837,3
Additional required amount of cold utility (kcal/h):	4 835 756,9
Additional required amount of hot utility (kcal/h):	4 725 562,0
Hot utility exchangers number:	10
Cold utility exchangers number:	13

RESULTS FOR THE AUTOMATIC DESIGN OF THE HEAT EXCHANGER NETWORK

Exchanger Item	INPUT DATA								Cold
	Cold Stream				Hot Stream				
	Name	Input T (°C)	Target T (°C)	Target Q (kcal/h)	Name	Input T (°C)	Target T (°C)	Target Q (kcal/h)	Input T (°C)
1	C1	25,0	135,0	615 829,7	C33	150,0	25,0	642 947,8	25,0
2	C28	38,6	70,0	408 208,4	C43	100,0	82,1	1 556 510,7	38,6
3	C29	70,0	150,0	552 205,7	C36	150,0	79,8	408 208,4	70,0
4	C23	76,6	200,0	1 915 438,4	C43	100,0	86,8	1 148 302,4	76,6
5	C13	65,0	88,0	141 286,3	C43	100,0	86,8	940 931,0	65,0
6	C16	45,0	54,0	115 772,8	C10	100,0	80,0	141 286,3	45,0
7	C17	54,0	61,8	102 886,1	C11	80,0	65,0	102 886,1	54,0
8	Rebo.C301	83,9	136,2	650 000,0	C43	100,0	86,8	799 644,7	83,9
9	C29	70,0	140,0	76 384,3	C50	140,0	70,0	49 098,9	70,0
10	C1	25,0	135,0	24 317,7	C52	140,0	11,0	24 471,3	25,0

EXCHANGERS STILL REMAINING AFTER THE HEAT EXCHANGER NETWORK SYNTHESIS

Exchanger Item	INPUT DATA								Cold
	Cold Stream				Hot Stream				
	Name	Input T (°C)	Target T (°C)	Target Q (kcal/h)	Name	Input T (°C)	Target T (°C)	Target Q (kcal/h)	Input T (°C)
1	C29	70,0	130,0	23 387,5	C10	100,0	96,4	25 513,6	70,0
2	C29	70,0	130,0	23 387,5	C10	100,0	96,4	25 513,6	70,0

Energy Integration results | Input data | Grand composite curve | Composite curves (TQ) | Streams | Pinch results | PSPS_EXX_Procédé_Esterificatior ...

Step 3: Design of a heat exchanger network

The first part of the "Energy integration Results sheet" summarizes the global information on energy integration and on the heat exchanger network

SUMMARY FOR THE HEAT EXCHANGER NETWORK

Initial number of possible exchanges:	40
Multiplication factor for the initial number of streams:	1,0
Cumulative percentage of energy recovery:	98,83
Number of heat exchangers:	10
Total energy recovery (kcal/h):	2 111 581,8
Energy to recover (kcal/h):	9 837,3
Additional required amount of cold utility (kcal/h):	4 835 756,9
Additional required amount of hot utility (kcal/h):	4 725 562,0
Hot utility exchangers number:	10
Cold utility exchangers number:	13

In the present case, with 10 integration heat exchangers, the heat exchanger network proposed by Simulis Pinch Energy recovers 98.83% of MER (**M**aximum of **E**nergy **R**ecovery)

Step 3: Design of a heat exchanger network

The 10 heat exchangers are described in a table showing their characteristics:

RESULTS FOR THE AUTOMATIC DESIGN OF THE HEAT EXCHANGER NETWORK

Exchanger Item	INPUT DATA							
	Cold Stream				Hot Stream			
	Name	Input T (°C)	Target T (°C)	Target Q (kcal/h)	Name	Input T (°C)	Target T (°C)	Target Q (kcal/h)
1	C1	25,0	135,0	615 829,7	C33	150,0	25,0	642 947,8
2	C28	38,6	70,0	408 208,4	C43	100,0	82,1	1 556 510,7
3	C29	70,0	150,0	552 205,7	C36	150,0	79,8	408 208,4
4	C23	76,6	200,0	1 915 438,4	C43	100,0	86,8	1 148 302,4
5	C13	65,0	88,0	141 286,3	C43	100,0	86,8	940 931,0
6	C16	45,0	54,0	115 772,8	C10	100,0	80,0	141 286,3
7	C17	54,0	61,8	102 886,1	C11	80,0	65,0	102 886,1
8	Rebo.C301	83,9	136,2	650 000,0	C43	100,0	86,8	799 644,7
9	C29	70,0	140,0	76 384,3	C50	140,0	70,0	49 098,9
10	C1	25,0	135,0	24 317,7	C52	140,0	11,0	24 471,3

EXCHANGER CHARACTERISTICS							INFORMATION ON ENERGY INTEGRATION					
Cold Stream		Hot Stream		Heat duty exchanged (kcal/h)	UA Factor (kcal/h/°C)	LMTD (°C)	% of energy recovery /	Degree of coupling	Index	Efficiency	Splitting ratio	Heat duty* efficiency
Input T (°C)	Output T (°C)	Input T (°C)	Output T (°C)									
25,0	135,0	150,0	35,0	591 512,0	47 967,5	12,3	27,7	2	222	0,99	0,96	587 304,8
38,6	70,0	86,8	82,1	408 208,4	14 553,5	28,0	26,7	1	111	1,00	1,00	408 208,4
70,0	140,0	150,0	80,0	406 795,6	40 679,6	10,0	36,3	3	322	1,00	0,84	406 795,6
76,6	90,0	100,0	86,8	207 371,3	20 601,6	10,1	29,0	2	212	1,00	0,18	207 371,3
65,0	88,0	100,0	86,8	141 286,3	8 614,9	16,4	27,8	1	112	1,00	0,15	141 286,3
45,0	54,0	96,4	80,0	115 772,8	3 001,1	38,6	31,6	1	111	1,00	1,00	115 772,8
54,0	61,8	80,0	65,0	102 886,1	7 197,6	14,3	41,1	1	111	1,00	1,00	102 886,1
83,9	90,0	100,0	98,7	75 750,0	6 176,6	12,3	51,3	2	213	1,00	1,00	75 750,0
70,0	130,0	140,0	80,0	42 084,8	4 208,5	10,0	58,6	3	322	1,00	0,64	42 084,8
25,0	130,0	140,0	35,0	19 914,6	1 991,5	10,0	66,9	3	322	1,00	0,86	19 914,6

Step 3: Design of a heat exchanger network

The first result shows that ≈100% of energy (MER) have been recovered using 10 heat exchangers.

Is this solution the most suitable? Is there a more interesting configuration?

From the energy recovery point of view, ≈100% of the heat have been recovered, it seems hard to go further!

From the design point of view, there may be site constraints:

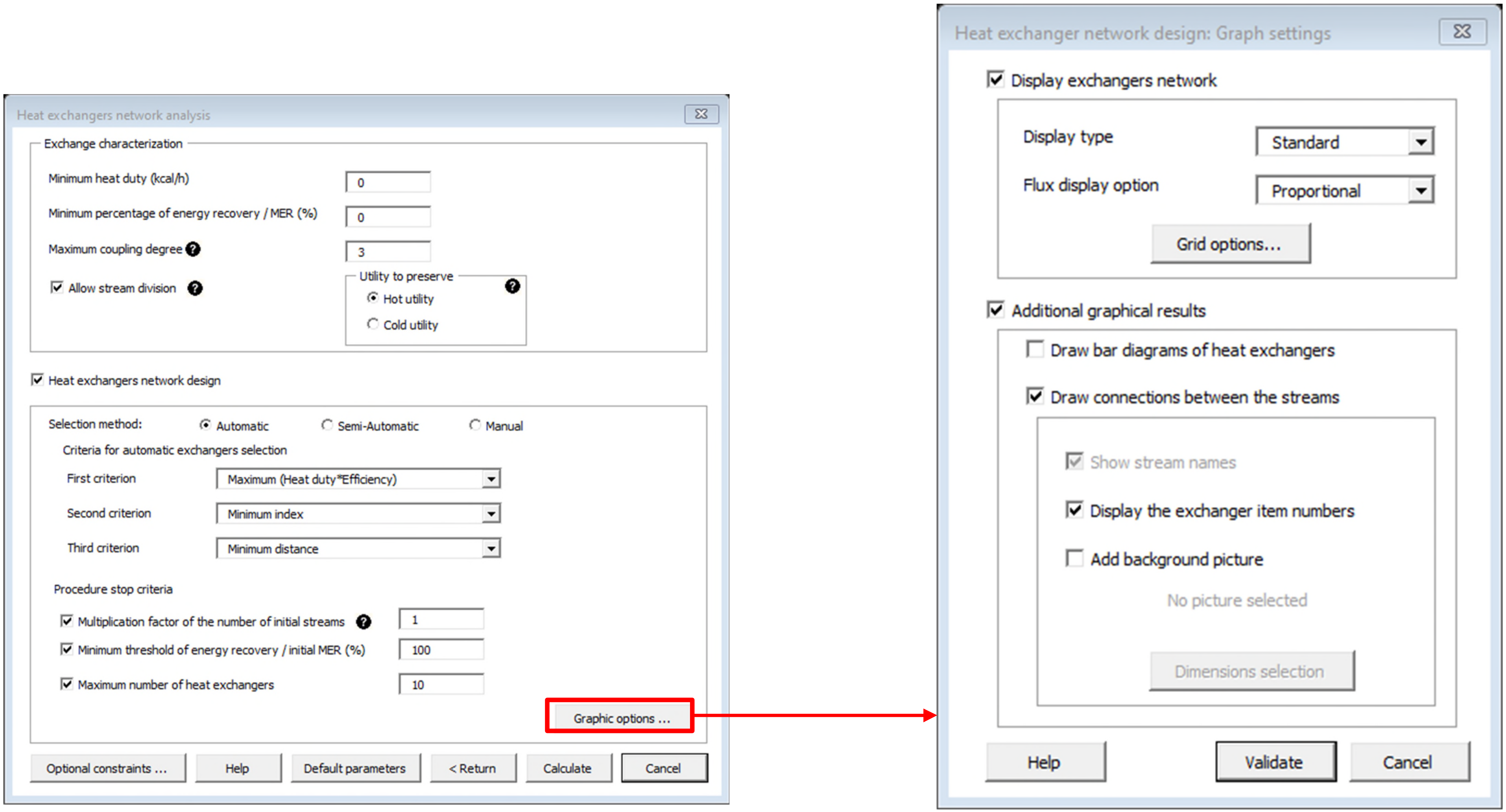
- Two streams can not exchange because they are too viscous (heat exchangers design problem)
- Two streams can not exchange because they are too far from each other
- The user prefers a local integration
- The user does not want stream division
- The user wants to reduce the capital cost of heat exchangers
- ...

It will be cheaper to promote heat exchangers with a logarithmic mean temperature difference (LMTD) between the hot and cold streams as high as possible in order to minimize the exchange surface area and thus reduce capital costs of heat exchangers.

At this stage, it is possible to choose another specification for heat exchangers, or modify criteria to find the best suitable solution.

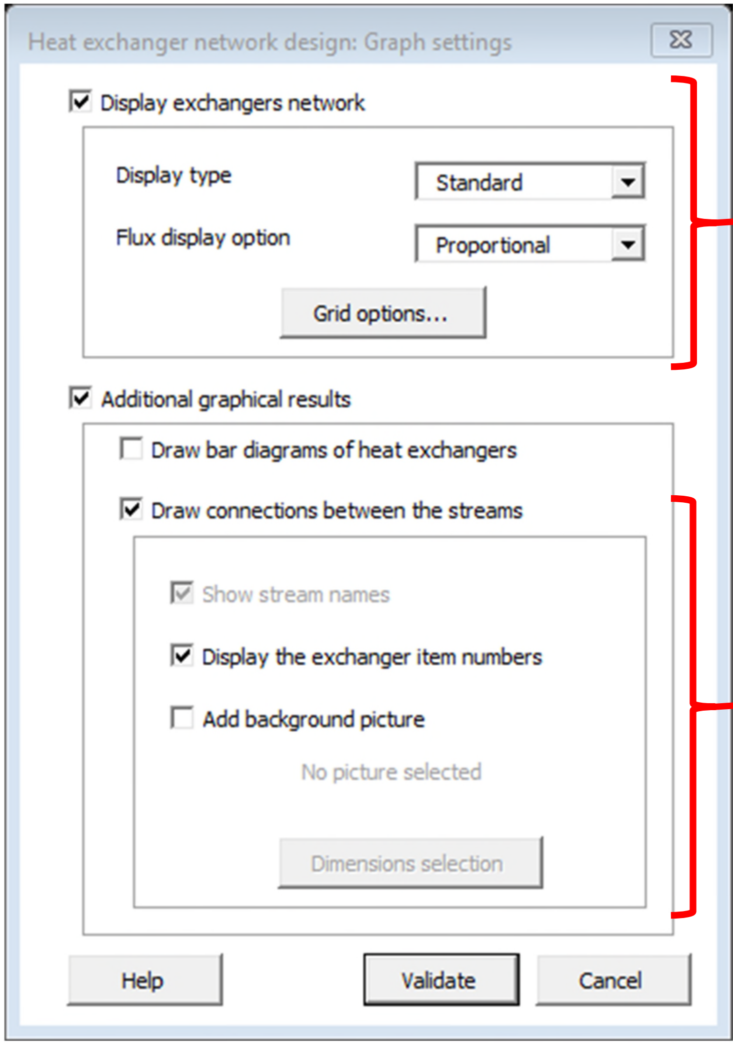
Step 3: Design of a heat exchanger network

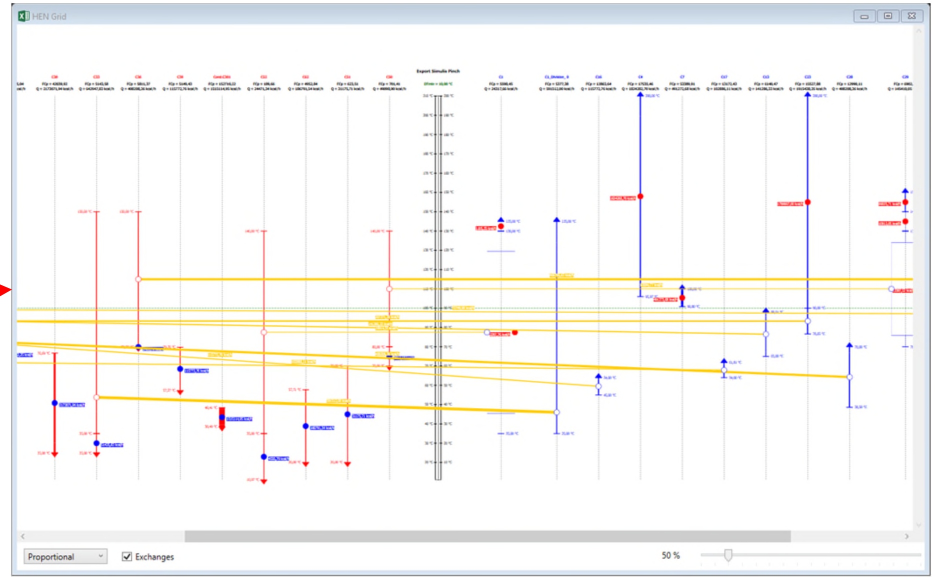
The **Graphic options** of Simulis Pinch Energy :

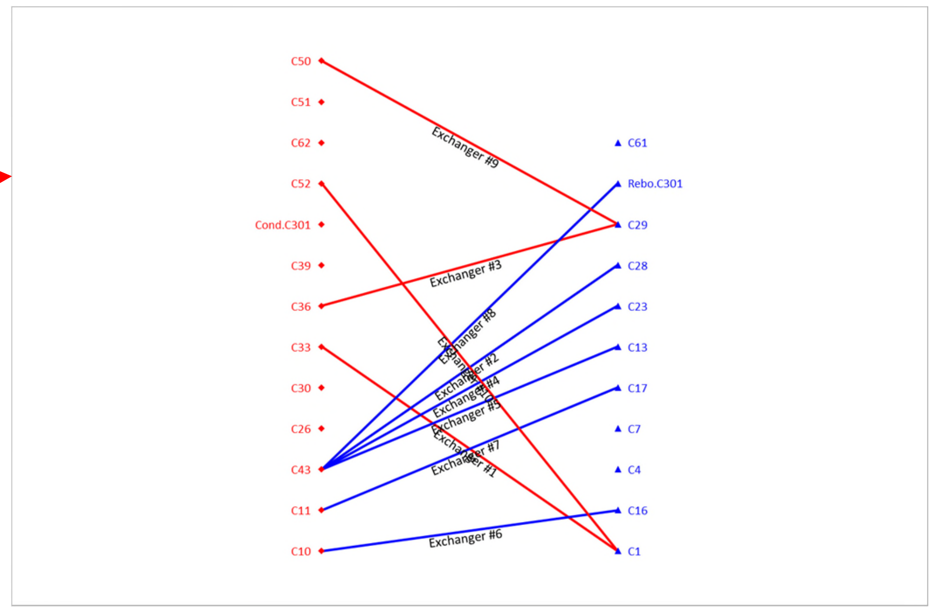


Step 3: Design of a heat exchanger network

The **Graphic options** of Simulis Pinch Energy :







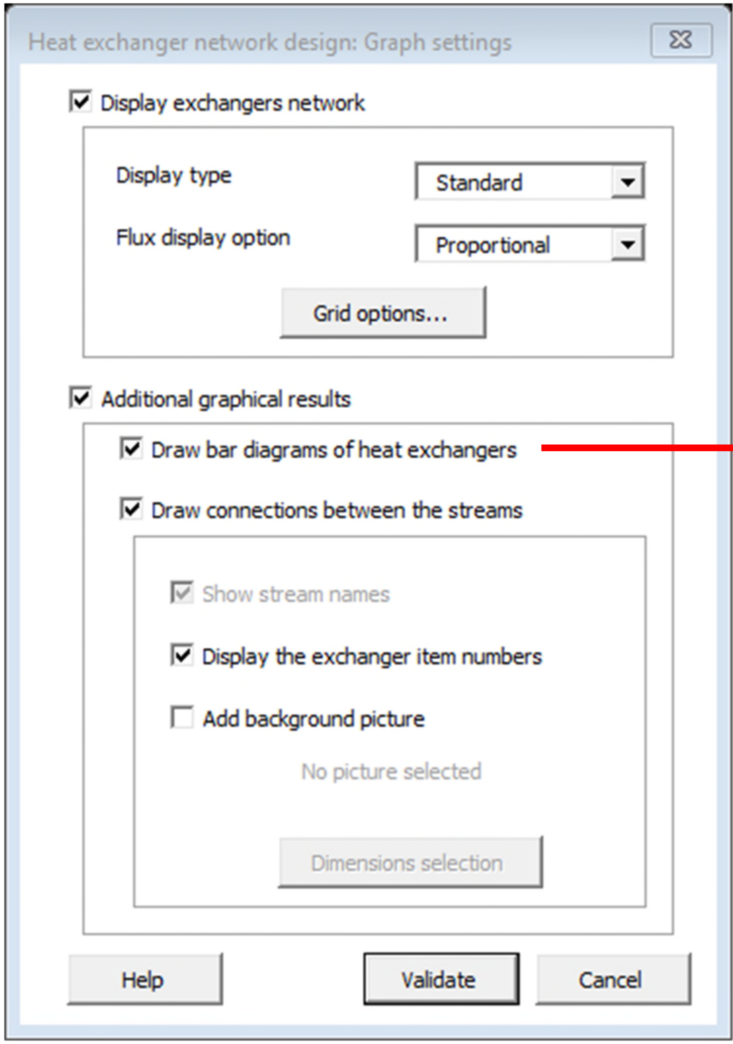
*Colors used for network exchangers can be modified by clicking on the button **Grid options***

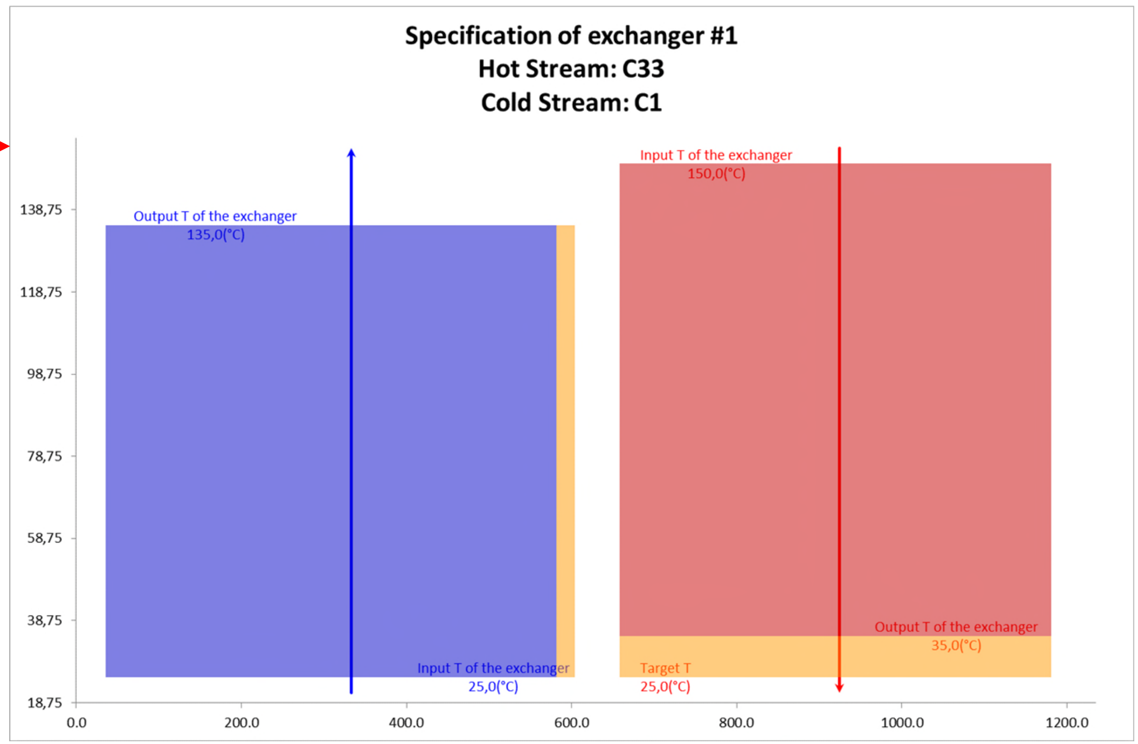
Step 3: Design of a heat exchanger network

The **Graphic options** of Simulis Pinch Energy :

A diagram display for each heat exchanger is possible by checking the next box.

Simulis Pinch Energy generates at the calculation end a MS-Excel sheet for each heat exchanger with the diagram depending on temperature.

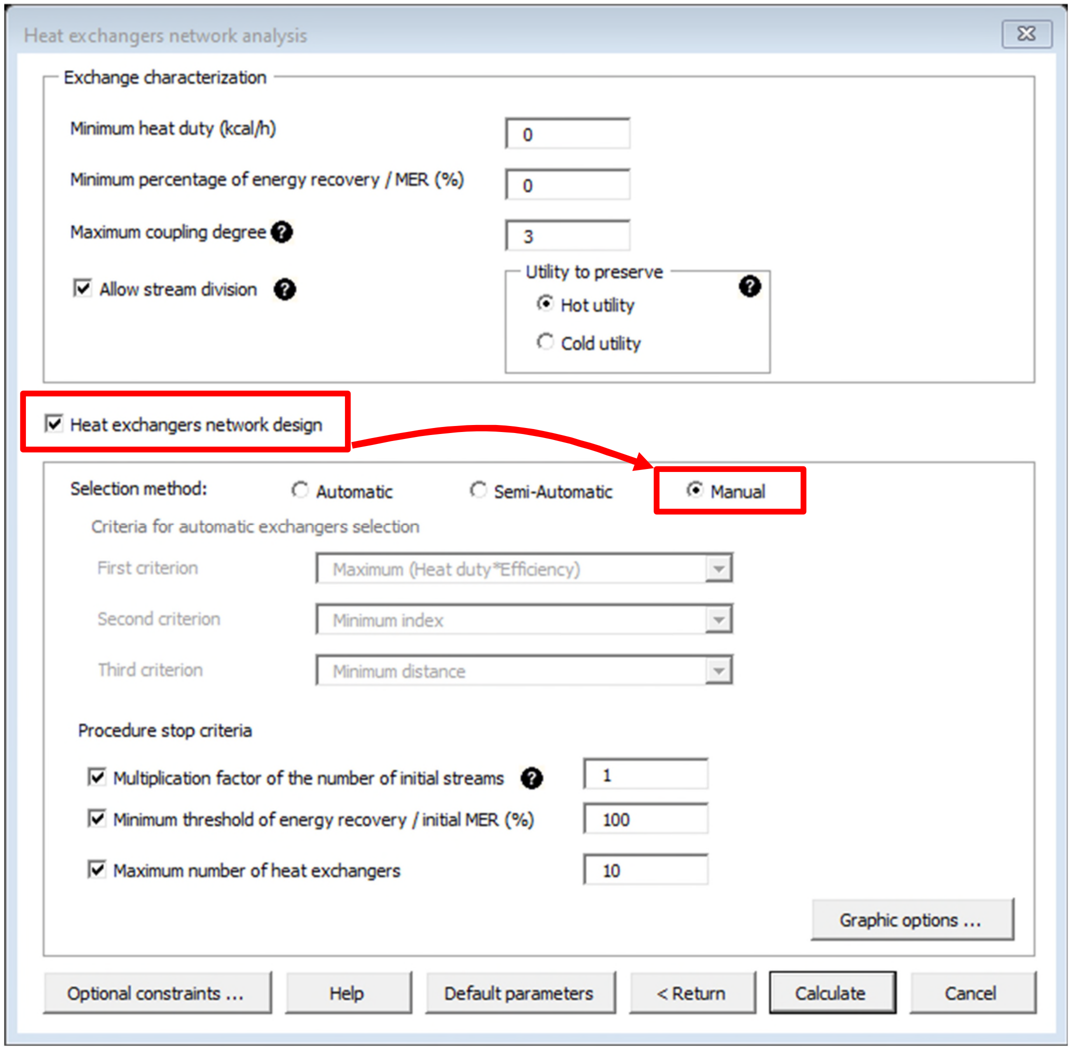




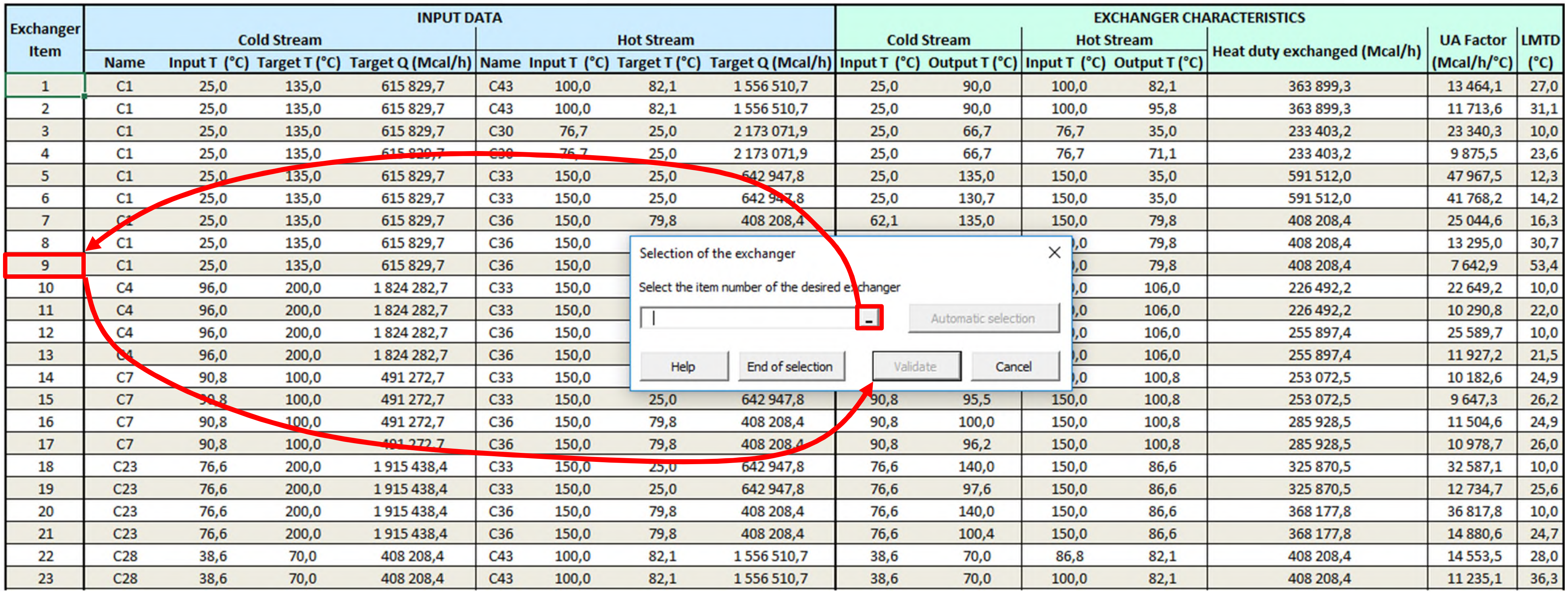
Step 3: Design of a heat exchanger network

Simulis Pinch Energy proposes **Manual** or **Semi-Automatic** selection modes:

1. Select the data and find the next window
2. Check the **Heat exchanger network design**
3. Selection method: **Manual**



Step 3: Design of a heat exchanger network



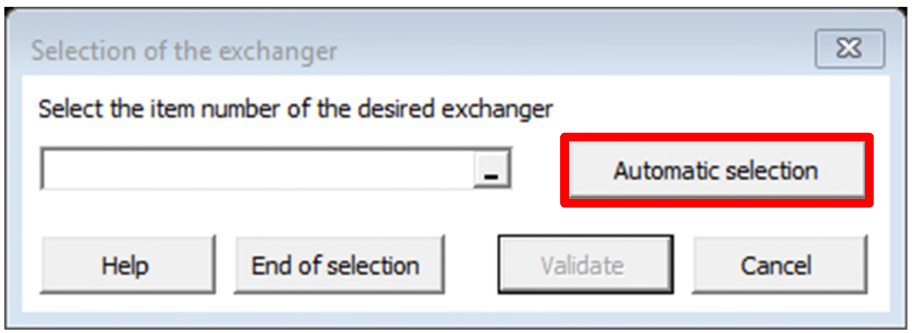
Exchanger Item	INPUT DATA								EXCHANGER CHARACTERISTICS						
	Cold Stream				Hot Stream				Cold Stream		Hot Stream		Heat duty exchanged (Mcal/h)	UA Factor (Mcal/h/°C)	LMTD (°C)
	Name	Input T (°C)	Target T (°C)	Target Q (Mcal/h)	Name	Input T (°C)	Target T (°C)	Target Q (Mcal/h)	Input T (°C)	Output T (°C)	Input T (°C)	Output T (°C)			
1	C1	25,0	135,0	615 829,7	C43	100,0	82,1	1 556 510,7	25,0	90,0	100,0	82,1	363 899,3	13 464,1	27,0
2	C1	25,0	135,0	615 829,7	C43	100,0	82,1	1 556 510,7	25,0	90,0	100,0	95,8	363 899,3	11 713,6	31,1
3	C1	25,0	135,0	615 829,7	C30	76,7	25,0	2 173 071,9	25,0	66,7	76,7	35,0	233 403,2	23 340,3	10,0
4	C1	25,0	135,0	615 829,7	C30	76,7	25,0	2 173 071,9	25,0	66,7	76,7	71,1	233 403,2	9 875,5	23,6
5	C1	25,0	135,0	615 829,7	C33	150,0	25,0	642 947,8	25,0	135,0	150,0	35,0	591 512,0	47 967,5	12,3
6	C1	25,0	135,0	615 829,7	C33	150,0	25,0	642 947,8	25,0	130,7	150,0	35,0	591 512,0	41 768,2	14,2
7	C1	25,0	135,0	615 829,7	C36	150,0	79,8	408 208,4	62,1	135,0	150,0	79,8	408 208,4	25 044,6	16,3
8	C1	25,0	135,0	615 829,7	C36	150,0					,0	79,8	408 208,4	13 295,0	30,7
9	C1	25,0	135,0	615 829,7	C36	150,0					,0	79,8	408 208,4	7 642,9	53,4
10	C4	96,0	200,0	1 824 282,7	C33	150,0					,0	106,0	226 492,2	22 649,2	10,0
11	C4	96,0	200,0	1 824 282,7	C33	150,0					,0	106,0	226 492,2	10 290,8	22,0
12	C4	96,0	200,0	1 824 282,7	C36	150,0					,0	106,0	255 897,4	25 589,7	10,0
13	C4	96,0	200,0	1 824 282,7	C36	150,0					,0	106,0	255 897,4	11 927,2	21,5
14	C7	90,8	100,0	491 272,7	C33	150,0					,0	100,8	253 072,5	10 182,6	24,9
15	C7	90,8	100,0	491 272,7	C33	150,0	25,0	642 947,8	90,8	95,5	150,0	100,8	253 072,5	9 647,3	26,2
16	C7	90,8	100,0	491 272,7	C36	150,0	79,8	408 208,4	90,8	100,0	150,0	100,8	285 928,5	11 504,6	24,9
17	C7	90,8	100,0	491 272,7	C36	150,0	79,8	408 208,4	90,8	96,2	150,0	100,8	285 928,5	10 978,7	26,0
18	C23	76,6	200,0	1 915 438,4	C33	150,0	25,0	642 947,8	76,6	140,0	150,0	86,6	325 870,5	32 587,1	10,0
19	C23	76,6	200,0	1 915 438,4	C33	150,0	25,0	642 947,8	76,6	97,6	150,0	86,6	325 870,5	12 734,7	25,6
20	C23	76,6	200,0	1 915 438,4	C36	150,0	79,8	408 208,4	76,6	140,0	150,0	86,6	368 177,8	36 817,8	10,0
21	C23	76,6	200,0	1 915 438,4	C36	150,0	79,8	408 208,4	76,6	100,4	150,0	86,6	368 177,8	14 880,6	24,7
22	C28	38,6	70,0	408 208,4	C43	100,0	82,1	1 556 510,7	38,6	70,0	86,8	82,1	408 208,4	14 553,5	28,0
23	C28	38,6	70,0	408 208,4	C43	100,0	82,1	1 556 510,7	38,6	70,0	100,0	82,1	408 208,4	11 235,1	36,3

1. Select the heat exchanger in the column ***Exchanger item***
2. Click on ***Validate***

Step 3: Design of a heat exchanger network

In ***Manual*** selection mode, Simulis Pinch Energy offers the user a list of heat exchangers. The user selects the heat exchangers until one of the stop criteria is reached.

In ***Semi-Automatic*** selection mode, the user starts to select the heat exchangers like for ***Manual*** method. With this method, the user can at all time request Simulis Pinch to select automatically heat exchangers (***Automatic*** method) by clicking on the ***Automatic selection*** button.



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