

Project card

 Project card

Project number: 24040001

Project phase: Search for a solution to improve performance ▼

Customer: Energy Corporation

Installation title: Network water heaters

Apparatus data

Type: Heat exchanger ▼

Position: E-101

Purpose: Heating of network water

Planned equipment purchase date: 05/20/2026 

+ Add

Project number:

- This field is filled in automatically.

Project phase:

- Select the current stage of the project from the list:
 - **Search for a solution to improve performance** – if the project is at the discussion stage.
 - **Replacement of existing equipment** – if you are replacing old equipment.
 - **Feasibility study of project** – if the project is at the evaluation stage.
 - **New design** – if you are developing new equipment.
 - **Project implementation** – if the project is already in progress.

Customer:

- Enter the company name (for example, "Energy Corporation").

Installation title:

- Briefly describe what this equipment is (for example, "Network water heaters").

Apparatus data

Type:

- Select from the list:
 - **Heat exchanger**
 - **Heater**
 - **Cooler**
 - **Reboiler**
 - **Condenser**

Position:

- Name of the heat exchanger on the process diagram (for example, "E-101").

Purpose:

- What this equipment is needed for (for example, "Heating of network water").

Planned equipment purchase date:

- Specify when you plan to purchase the equipment. Enter the date in the format **mm/dd/yyyy** (for example, "05/20/2026").
-

Saving data

- Click the "**Add**" button to save the data. After that it will be replaced by the "**Update**" button.
 - If you make a mistake, correct it and then press "**Update**".
-

Important!

- If you want to make changes, do it and then press "**Update**".
 - In case of difficulties contact us.
-

Done! The form is filled out.

Operating modes

Choose a method to compile a new heat balance

☐ By LOTUS experts

☐ By myself

By LOTUS experts:

- Select it if you want to entrust the heat balance equation to our company's experts. You will need to attach files.

☒ By LOTUS experts

Attach data for compiling the heat balance:

1. Temperatures, flows, and pressures for all operating modes
2. Component compositions of fluids or their thermo-physical properties (inlet and outlet and saturation points)

[Select file \(ZIP, RAR, 7Z\)](#)

[Send request](#)

By myself:

- Select it if you want to calculate heat balance by yourself.
- Click the **“New mode”** button.

☒ By myself

[+ New mode](#)

 **Cold side**

Describe the medium manually:

☒ By compositions ☐ By properties

 **Hot side**

Describe the fluid manually:

☒ By compositions ☐ By properties

- Name a cold and a hot side media.
- If the medium is one of these: water, air or ethylene glycol, - select it in this list:

If your medium is air or ethylene glycol, after choosing it in this list you should make sure that its components concentrations are related with concentrations you need. See the tables below.

For air:

No.	Component	Concentration		
1	Nitrogen / N2 / N2	0.78		
2	Oxygen / O2 / O2	0.22		

For ethylene glycol:

No.	Component	Concentration		
1	EGlycol / EG / C2H6O2	0.6		
2	H2O / Water / H2O	0.4		

If concentrations need to be correct – do it pressing  .

EGlycol / EG / C2H6O2

0.6

+ Add

No.	Component	Concentration		
1	EGlycol / EG / C2H6O2	0.6		
2	H2O / Water / H2O	0.4		

- In case your medium isn't in this list ("Water" / "Air" / "Ethylene glycol"), - describe it manually.

- **By composition (preferably):** if you know all the components of the medium and their mass or molar concentrations (or fractional composition).

Choose mass or molar concentration.

Describe the medium manually:

☒ By compositions

☐ By properties

☒ Mass fractions

☐ Molar fractions

✓ **With a known component composition:**

Find all the components of the media, typing their names in the field **“Find component”** and their concentrations in the field **“Concentration”**.

Typing the name of the component in the field **“Find component”** you can see the list of all components, where this name is referred and choose the one you need (see an example):

With known component composition:

methane

Methane / C1 / CH4 0.8

Methane / C1 / CH4

Methane / Fire_Damp / CH4

Methane / Marsh_Gas / CH4

Methane / Methane / CH4

Press **“Add”** after describing each component.

If you want to change the name of the component or its concentration or delete it at all, you should do it pressing  or .

✓ **With a known fractional composition (cumulative total):**

If you know fractional composition of the medium, specify it according to this example (in the case of cumulative total).

With known fractional composition (cumulative total):

Temperature, °C Concentration ?

100 0.1

150 0.2

200 0.4

250 0.6

300 0.8

350 1

Convert to cumulative total

Or according to this example when you have data like this (without cumulative total).

Then press the button **“Convert to cumulative total”**.

With known fractional composition (cumulative total):

Temperature, °C Concentration ?

100 0.1

150 0.1

200 0.2

250 0.2

300 0.2

350 0.2

Convert to cumulative total

You'll see the sum of components mass (molar) concentrations in the "Sum" field (it is "1" in our example).

Sum: 1

Select property package for calculation according to medium composition.

Select property package:

Organic compounds

Specify property package

Organic compounds

Organic compounds (Peng-Robinson)

Inorganic compounds

Water and steam

Glycol-containing compounds

- **By properties:** select it if you don't know the components of the medium but know all the thermophysical properties and mass flow rates of vapour and liquid phases under design pressure and inlet/outlet temperature (enthalpy, heat capacity, density, dynamic viscosity, thermal conductivity, surface tension).

Describe the fluid manually:

☐ By compositions ☒ By properties

No.	P, MPa abs.	T, °C	Number of points
1	0	0 ÷ 0	2

To describe the medium with this way, press .

You should fill in the table which contains at least 2 points. For entering data press .

If you have more points select the number (maximum 10).

The more points you take, the more accurate the subsequent calculation will be. This is relevant for media with phase transitions, as well as for highly viscous media.

Number of points:

Gauge, MPa

4

2

3

4

5

6

7

8

9

10

✈ Specify conditions

❄ Cold side

🔥 Hot side

Inlet pressure

0,6

50

Gauge, MPa

Pressure drop, kPa: ⓘ

1,2

50

One of the six parameters from the list below must remain unfilled.
It is recommended to fix the parameters (temperature and flow rate) for the medium that is primarily based on the purpose of the heat exchanger.

50

70

60000

Set by volumetric flow rate

Inlet temperature, °C:

Outlet temperature, °C:

Mass flow rate, kg/h:

250

90

Это поле должно остаться незаполненным

Set by volumetric flow rate

Now you should fill in this form with values for inlet pressure (gauge or absolute), pressure drop (not necessary but preferably for media with phase transition or low inlet pressure), and 5 of 6 other parameters – inlet / outlet temperatures and mass flows (one of them program will calculate).

If you don't know the mass flow but only volume flow and your medium is described by composition, you can convert it. Don't forget to choice volumetric flow units (m³/hour at inlet temperature and pressure, standard or normal).

In the example, 55 m³ / h of water is recalculated at a temperature (t = 50 °C) and pressure (0.6 MPa excess) at the inlet:

54357

Set by volumetric flow rate

55

☒ m³/hour (at t and p of inlet)
 ☐ standard m³/hour (at t=20°C, p=1 atm. (abs.))
 ☐ normal m³/hour (at t=0°C, p=1 atm. (abs.))

↻ Convert to kg/hour

 Calculate heat balance

Heat load (Q), MW:

Temperature difference under pure counterflow conditions (dT), °C

Click “**Calculate heat balance**”.

50,0

Inlet temperature, °C:

250,0

70,0

Outlet temperature, °C:

90,0

60000,0

Mass flow rate, kg/h:

1980,0

Set by volumetric flow rate

Set by volumetric flow rate

 Calculate heat balance

1.39

Heat load (Q), MW:

124.0

Temperature difference under pure counterflow conditions (dT), °C

Presence of phase transitions:

 Cold side

 Absent

 Hot side

 Present

 Generate report

After 1-2 minutes, the program will calculate the missing sixth parameter from the form above (in our example, this is the hot medium flow rate - 1980 kg/hour), the amount of heat (1.39 MW), the temperature difference between the media under pure counterflow conditions (124.0 °C), as well as the presence of phase transitions on both sides (in our example, it is absent from the cold side, but present from the hot side).

At this stage, you can generate a report on the properties of the media involved in heat exchange by clicking on the **"Generate report"** button. [Download report](#)
After that, it will be possible to download it in Excel format (**"Download report"**).

More about the current balance

+

Or click on the "+" in the form below (*"More about the current balance"*), a large table with the properties and expenses of the environment will open.

More about the current balance

-

▲ Streams

❄️ Cold side			🔥 Hot side	
⬇️ Inlet	Outlet ⬆️		⬇️ Inlet	Outlet ⬆️
-15760.37	-15676.77	Enthalpy, kJ/kg	-13038.5	-15592.42
1.393252		Heat load, MW	-1.404652	

▲ Mass flow rate, kg/hour

❄️ Cold side			🔥 Hot side	
⬇️ Inlet	Outlet ⬆️		⬇️ Inlet	Outlet ⬆️
0	0	Vapour phase	1980.0	0
0	0	Liquid phase A	0	0
60000.0	60000.0	Liquid phase B	0	1980.0

▲ Density, kg/m³

❄️ Cold side			🔥 Hot side	
⬇️ Inlet	Outlet ⬆️		⬇️ Inlet	Outlet ⬆️
		Vapour phase	5.66	
		Liquid phase A		

Saving data

 Save operating mode

 + Add

 Update

Name the balance (for example, *"Winter"*). Click the **"Add"** button for adding the operating mode to database or **"Update"** for updating its name.

Important!

- If you want to make changes, do it and then press **"Update"**.
 - In case of difficulties contact us.
-

Done! The form is filled out.

Instructions for filling out

Requirements for new design

 Saved requirements

Filter

+ New requirements

Click “**New requirements**”.

 Main requirements for design * - mandatory fields

Tube side medium: ⓘ cold

 Shell side

  Tube side

Cleaning: not required

Fouling resistance, (m²·°C)/W: ⓘ 0

Allowable pressure drop, kPa: ⓘ 100

* Design pressure (gauge), MPa: 1,6

* Design temperature, °C: 250

* Nominal pressure (gauge), MPa: 1,6

Corrosion allowance, mm: ⓘ 2

* Corrosion cracking: ☐ Yes ☒ No

* Minimum allowable wall temperature of the vessel under calculated pressure, °C: -32

mechanical

0,000176

100

0,6

250

1

2

☐ Yes ☒ No

Fill in all the mandatory fields and other fields you want to specify.

Choose medium of tube side:

Tube side medium: ⓘ

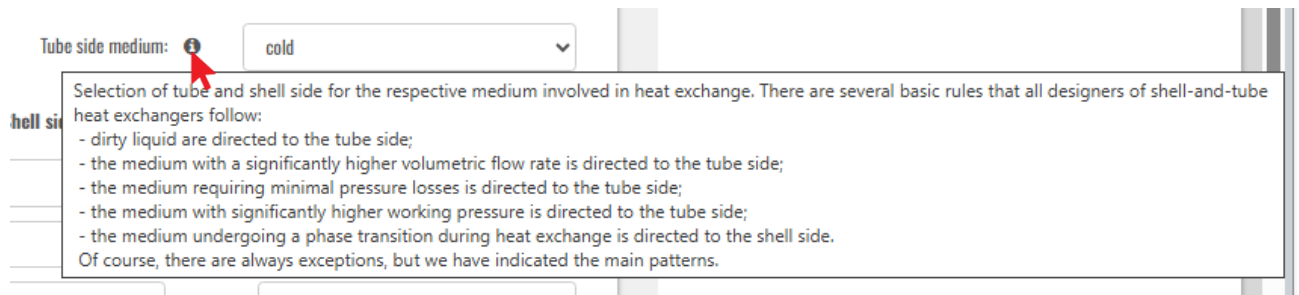
 Shell side



cold

hot

cold



Please note our recommendations, which become visible when you hover over the "i" icon.

To switch the location of media between shell and tube sides click  .

Cleaning: if the heat exchanger needs to be cleaned, set the type of cleaning ("*mechanical*" or "*chemical*"). Or leave default ("*not required*").

Fouling resistance: you can fill in this field according to the international standard TEMA (Tubular Exchanger Manufacturers Association), but be aware that these values affect the size of heat surface and exchanger measurements.

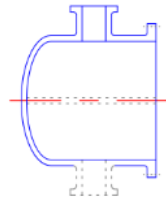
Allowable pressure drop: set these values in kPa and be aware that they are a key resource to decrease exchanger measurements, to design it more effective due to increasing speeds of media (and heat transfer coefficient) and staying it clean.

Set design temperature and pressure, and nominal pressure (it could be more or equal to design pressure).

Indicate corrosion probability and its allowance: take attention that values in these fields don't apply to exchanger tubes.

Set minimum allowable wall temperature of the vessel under calculated pressure.

Select types for: front cover, shell and rear cover according to the international standard TEMA (Tubular Exchanger Manufacturers Association):



Front cover type:

B



Shell type:

E

Rear cover type:

-

Excess surface, %:

0

Orientation:

horizontal

Maximum length of the straight section of tubes, mm:

9000

Maximum diameter of the shell, mm:

3200

M

U

S

L

N

P

T

Choose the front cover / shell / rear cover type (or stay "-" in case you admit different variants).

Set the required excess surface or leave this field unfilled.

Select orientation of the heat exchanger ("horizontal" or "vertical").

You can fill in the fields "Maximum length of the straight section of tubes" and "Maximum diameter of the shell" or program set them as 9000 and 3200 mm by default.

Tube material:

-

Shell material:

-

Tube sheet material:

-

Chamber material:

-

Gr. 55

Gr. 60

Gr. 65

diameter, mm:

Specify materials for tubes, tube sheets, shell and chamber.

Preferred tube diameter, mm:	20
Preferred wall thickness of the tube, mm:	1,5
Minimum spacing between tubes, mm:	
Minimum step between baffles, mm:	

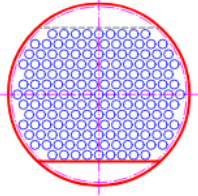
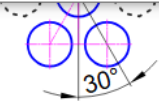
Set preferred tube diameter (it is "20" mm in our example).

Set the wall thickness for tubes ("1.5" mm in our example).

Minimal spacing between tubes must be more than $(1.3 \times \text{preferred tube diameter})$! For tube diameter 20 mm - minimal spacing is 26 mm.

Minimum step between baffles: fill it in if you have any preferences; in other case the program will define the value.

Type of baffles:	Tube pattern:
Segmental	Triangles (30°) - Triangles (30°) - Rotated triangles (60°) - Squares (45°)

Type of baffles: if you choose nothing and leave "-", program will try both types ("Segmental" and "Screw").

Tube pattern: default value is "Triangles (30°)", but if the exchanger needs to be mechanical cleaned from the shell side, - you should set "Squares (45°)" here.

Nozzles			
	🔥 Shell side	❄️ Tube side	
Inlet nozzle diameter, mm:			
Outlet nozzle diameter, mm:			

Fill in these fields if you have any preferences about nozzles diameters. If you leave them unfilled, the program will calculate nozzle diameters and design their placement according to the task.

Saving data

 Save design requirements

+ Add

 Update

Name the requirements for new design (for example, "*BEM, horizontal*"). Click **"Add"** for adding the new requirements to database or **"Update"** for updating the existing ones.

Important!

- If you want to make changes, do it and then press **"Update"**.
- In case of difficulties contact us.

Done! The form is filled out.