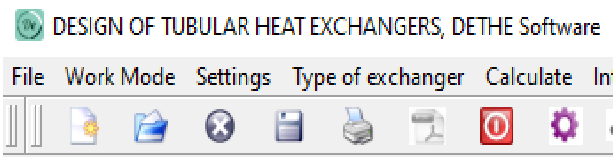
DETHE

f SéNeCa(+)
Agencia de Ciencia y Tecnología Región de Murcia

DETHE | Technical & Educational Software



Software developed for the thermal and mechanical design of tubular heat exchangers. The software allows the complete calculation of this type of devices, indicating the operative limits of operation, the speeds and the loss of pressure of the fluids, the available space in the plant, geometric dimensions, the level of fouling of both fluids (corrosion of fluids), working pressure, convective coefficients of the pipe and shell side.

INDEX

Characteristics

- **Powerful features for detailed design: sensitivity analysis, specifications, fouling, ...**
- **Solid technology**
- **Precision**
- **Easy handling**
- **Intuitive interface**
- **Different design methods**

Software capabilities

- Thermo-hydraulic-mechanical analysis
- Multiple inner tube configurations
- Thermophysical properties database
- Sensitivity analysis
- Modelling and prediction of fouling
- Multiple current empirical correlations

Applications

DETHE has been developed for the thermal and hydraulic design of shell and tube heat exchangers based using different methods, including on the Delaware method. Flow-induced vibration calculations based on the latest TEMA publication have also been incorporated. Its interactive graphics feature allows the selection of exchanger configurations and change of design conditions to be performed with ease.

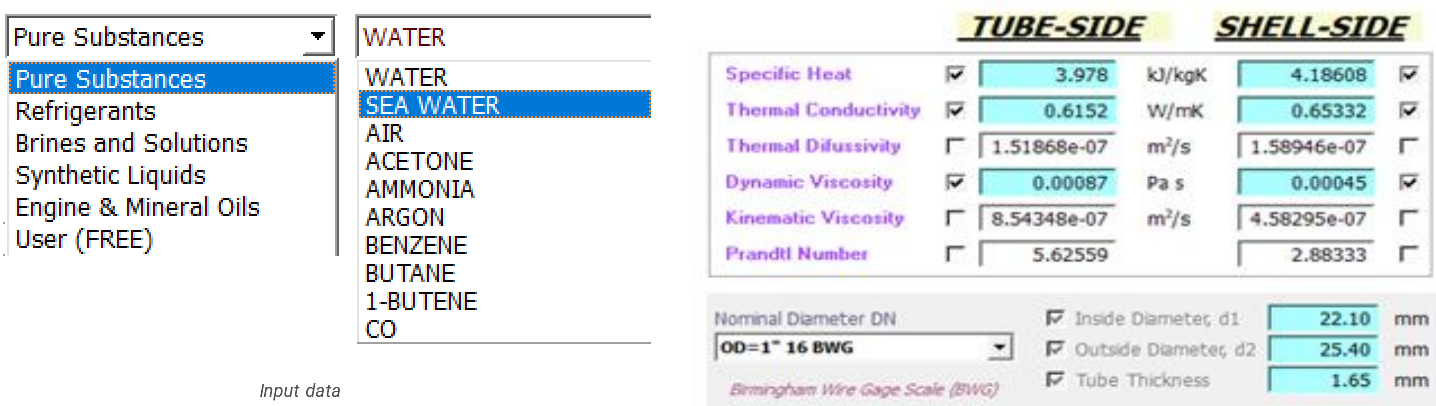
Main application in industry for process optimization or in academia (technical studios).

Characteristics

Software algorithms are based on up-to-date bibliography and the latest mathematical models, which in conjunction result in a **well-defined** and **solid technology**. The software has been set up with an **intuitive interface** that allows **easy handling**.

Input variability

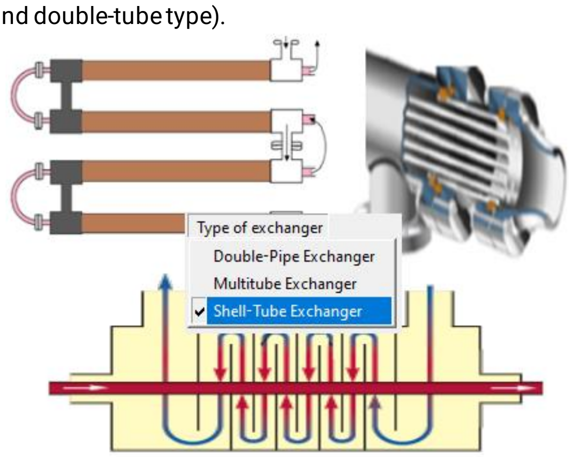
Input variables, including thermophysical properties of the fluids and geometry parameters



Input data

Application in several industrial systems

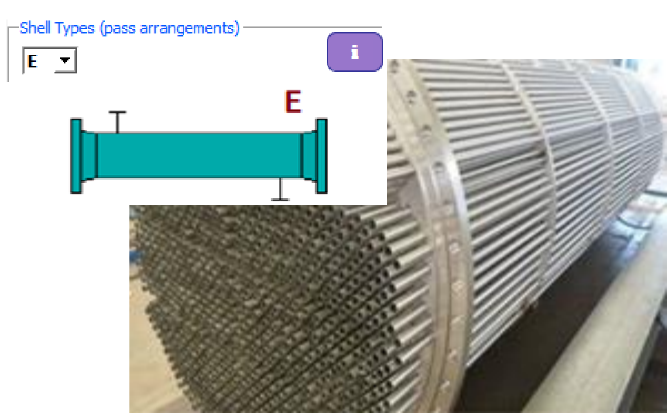
Tubular heat exchangers (shell and tube type, multi-tube type and double-tube type).



Three types of tubular exchangers

Shell and tube heat exchanger

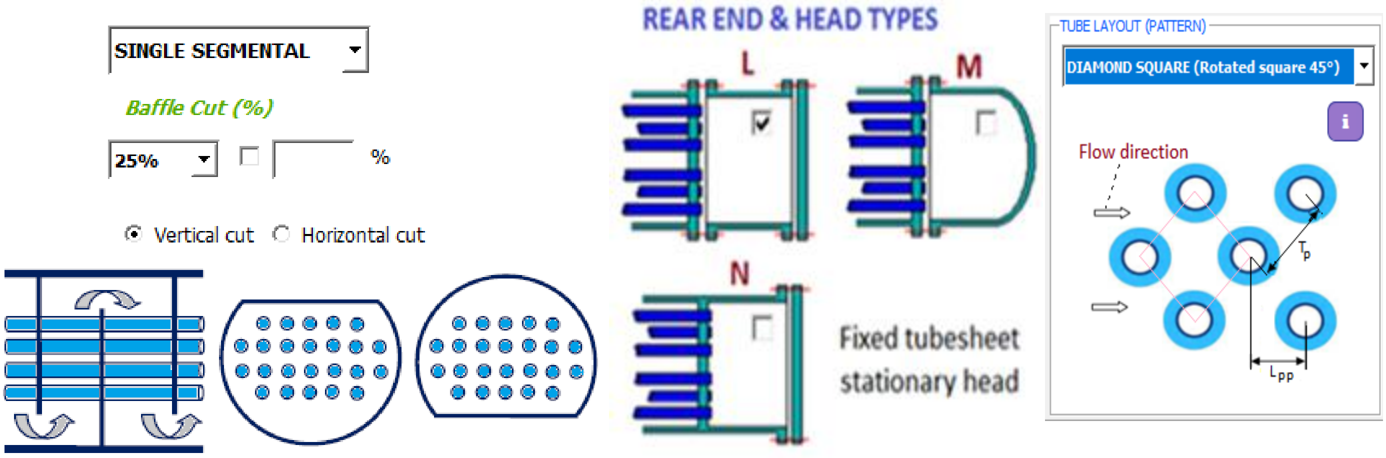
It is the type of heat exchanger most used in the industry. A rigorous and exhaustive design is made from it.



Type E exchangers are the most widely used

Normative

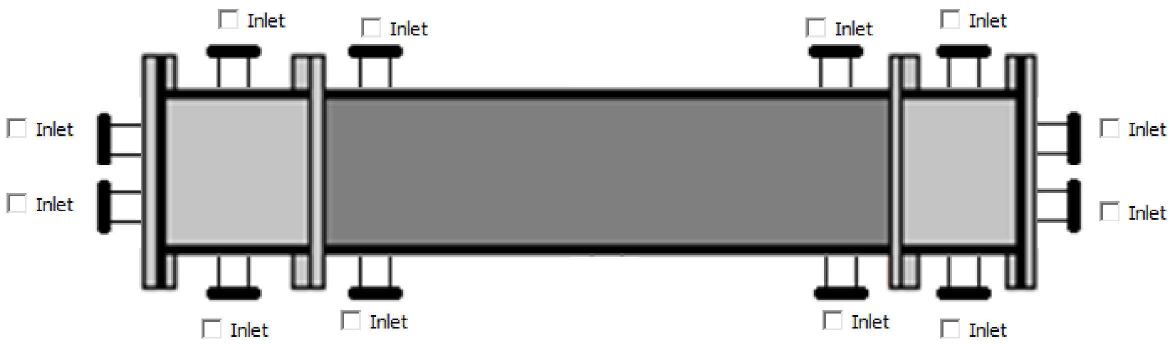
The Tubular Exchanger Manufacturers Association (TEMA) is an association of manufacturers of shell and tube heat exchangers. TEMA has established a set of construction standards for Shell and Tube Heat Exchangers. Tubular heat exchangers (shell and tube type, multi-tube type and double-tube type).



TEMA normative is applicated

Nozzle position

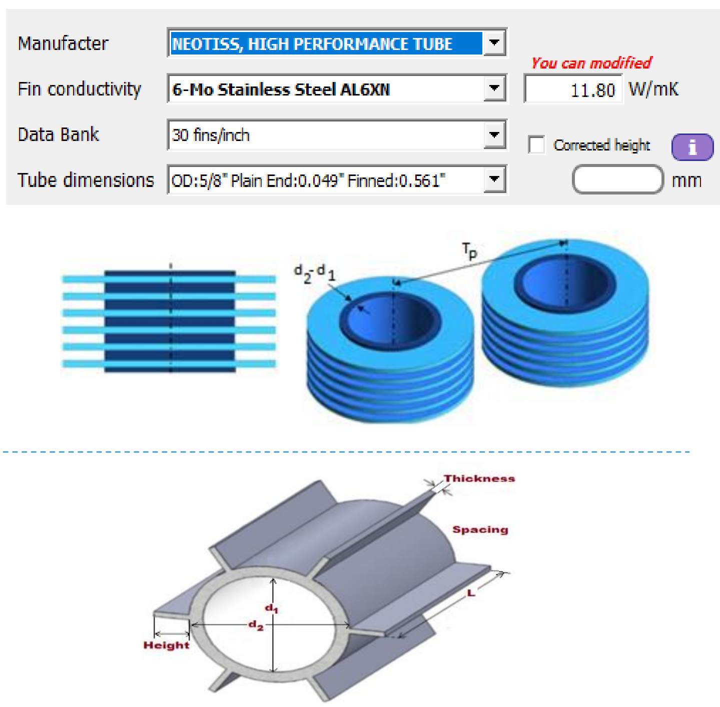
Early in the design or selection of heat exchangers, a engineer in discussion with the heat exchanger engineer can alter the heat exchanger design in some specific areas to have a batter piping layout. Changing the nozzle location by altering the direction of flow through the exchanger.



Design of the position of the nozzles

Exterior finned

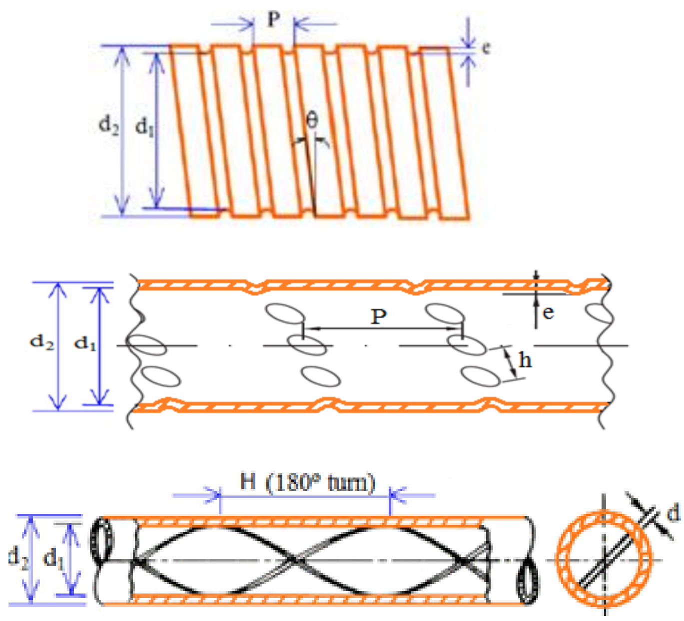
Includes transversal and longitudinal fins.



Effect of the use of finned surfaces

Interior tube

Corrugated, twisted tape insert, wire coil insert, dimpled tube and internally finned.

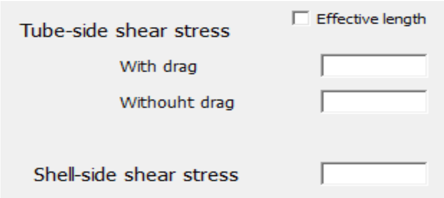


Internal devices to increase the heat transfer

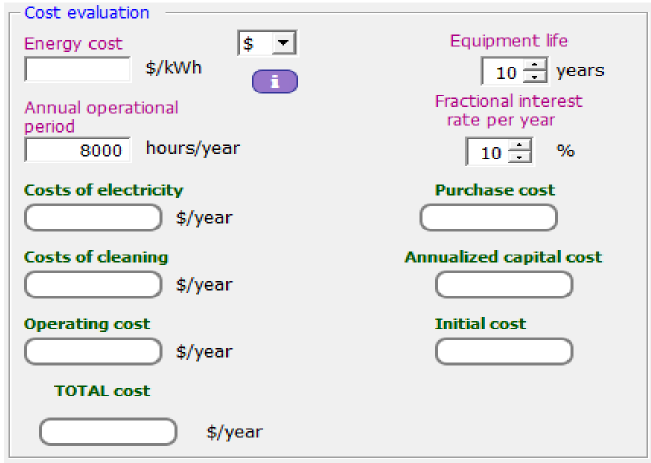
Software capabilities

Mechanical design

Fluid flow, inter-related with heat exchanger geometry, can cause heat exchanger tubes to vibrate. This phenomenon is highly complex and the solution to this problem is difficult to define. Damaging tube vibration can occur under certain conditions of shell side fluid flow relative to baffle configuration and unsupported tube span. Mechanical failure of tubes resulting from flow induced vibration may occur in various forms such as collision damage, baffle damage, tubesheet clamping effect, material defect propagation and acoustic vibration.



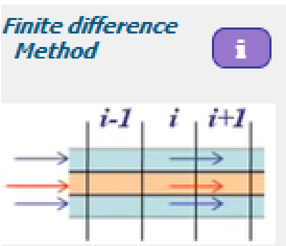
Cost estimation

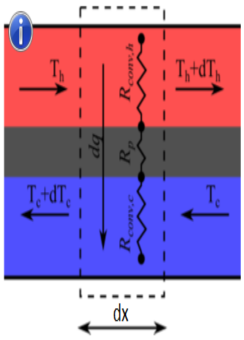


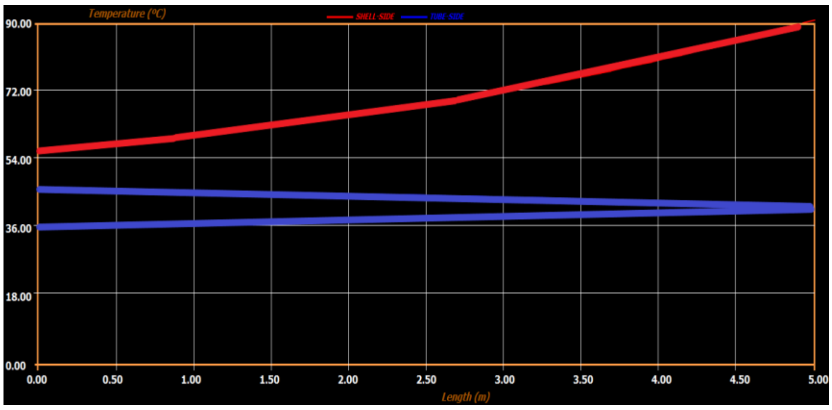
Cost estimation

Sensitivity analysis (using Finite Difference Method)

Analysis of main variables involved in the design processes' study. Temperature, heat duty, effectiveness, NTU, overall coefficient, irreversibility and pressure drop.





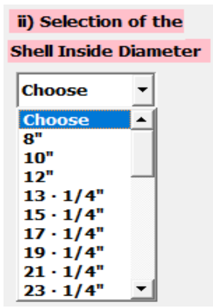


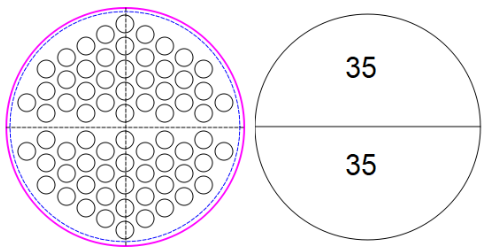
Graphic representations of sensitivity analysis

Tube layout

Shell and tube heat exchangers are complex and more expensive than ordinary pressure vessels. Also, the strength calculation is more difficult.

The number of tubes and the dimensions are required to execute the calculation for the tube sheet. The calculation can be done for four pitch patterns and for seventeen types of passes (up to 16 pass tube).

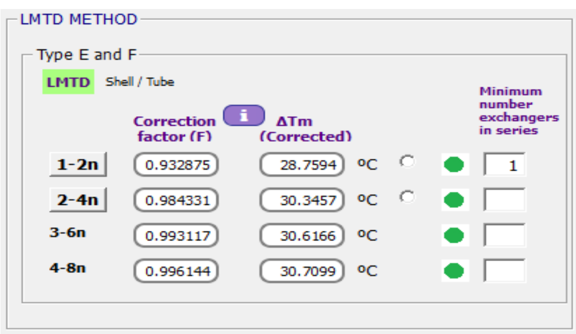




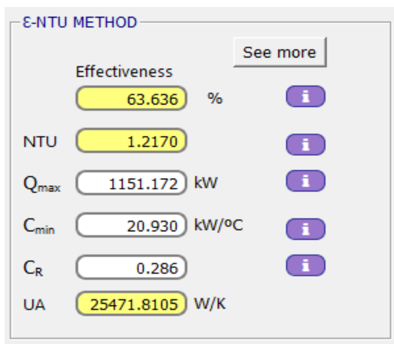
Tube layout previous selection of the shell diameter

Specifications according to solution method type

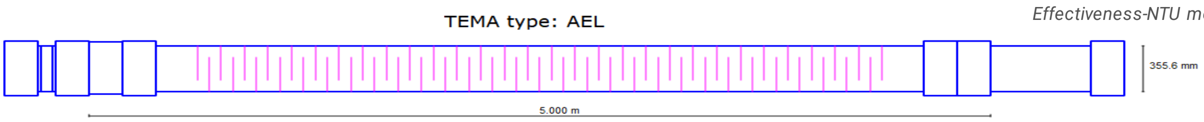
DETHE (Design of Tubular Heat Exchangers) software complements the LTMD and NTU calculation methods, allowing the use of numerous substances, as well as a large number of updated and verified empirical correlations.



LTMD method



Effectiveness-NTU method



Design of a heat exchanger of shell-tube type

Applications

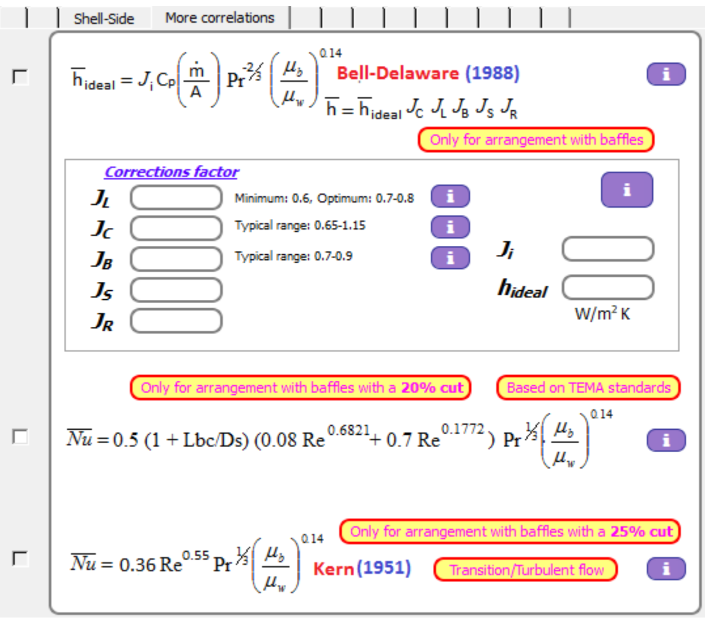
In summary, ***DETHE*** provides a complete solution to the thermal, hydraulic and mechanical design of tubular heat exchangers; analysing the effect of the main variables that participate in the process, through the possibility of performing a graphical sensitivity analysis.

The program is based on the most current bibliography, without forgetting the classic texts of the subject. Note that the program allows the use of the International System and the English Unit Technician. Modeling and prediction of fouling by calculating mean deposit thickness is a highly valued tool today. Finally, a final report (set up by the user) can be submitted, containing graphs and numerical data.

Academia application specifications

This software's capabilities are appropriate for heat transfer studies in academia. ***DETHE*** include **many academic aspects** which can greatly help students to better understand the physical aspects of heat transfer. This software it is a very useful tool to learn the basics of shell and tube heat exchangers (and other types) at their own pace.

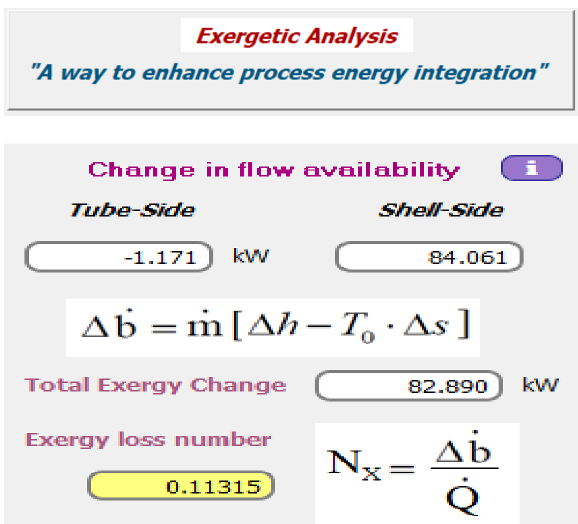
The effect of using multiple empirical correlations to calculate the Nusselt number or coefficient of friction, or the actions to be taken to reduce the pressure loss, or adjust the velocities of both fluids, are some examples.



Empirical correlations to obtain Nusselt number

Exergy analysis

Based on Second Principle, it provides information about **irreversibilities** generated in heat transfer process to determine the degree of irreversibitity of the heat exchanger and from there try to improve its design.



Exergy analysis method

ThermoSuite
Technical Software Suite

For product-related and techical questions:

https://thermosuite.com/dethe

Email: info@thermosuite.com