MT3
solution

MT-EXCH

MECHANICAL DESIGN OF SHELL & TUBES HEAT EXCHANGERS

MT-MECH: MECHANICAL CODES AT YOUR FINGERTIPS

A COMPLETE SUITE OF PROGRAMS FOR MECHANICAL DESIGN IN CHEMICAL ENGINEERING

- MT-EXCH   SHELL & TUBE HEAT EXCHANGERS
- MT-VESS   HORIZONTAL & VERTICAL VESSELS
- MT-COMP   EXCHANGERS & VESSELS COMPONENTS
- MT-LAYOUT   TUBESHEET LAYOUT ANALYSIS

MT-EXCH allows the mechanical design and the stability check of shell & tubes heat exchangers, both in design or rating mode.

The following main functions are provided:
• Calculation of thicknesses and dimensions of all the exchangers components.
• Assembling and geometrical sizing of the exchanger as a whole.

ALLOWED CODES

• ASME VIII division 1 (U.S.A.)
• ASME VIII division 2 (U.S.A.)
• AD2000-MERKBLATT (Germany)
• ISPESL-VSR (Italy)
• EN 13445 (Europe)
• PD5500 (App. G) (U.K.)

TEMA (R, C, B) are applied where calculation is not provided by CODES.

EXCHANGERS TYPES

With reference to the TEMA nomenclature, the program MT-EXCH calculates the following exchangers types:

• Channel	A/B/C/D/N
• Shell	E/F/G/H/J/K/X
• Rear End	L/M/N/S/T/U

Both the channel and the rear end can be conical

ANALYSIS CAPABILITIES

• **Internal pressure calculation**.
All the exchanger components, shell side and tube side, are calculated to the internal conditions of design and hydraulic test. The components in contact with both the shell side and the tube side are automatically checked to the pressure acting on the external side.

• **Geometrical sizing of the exchanger**
The program provides for a comprehensive geometrical sizing including all quotas, distances and dimensions of each component and of the exchanger as a whole.

• **Weight calculation**.
The program calculates the weight of each component and in addition:
- Empty weight of the exchanger
- Weight of the tubes bundle
- Weight of the exchanger full of water

• **Check to the external pressure**.
The program allows for the installation of stiffening rings or for thickness increasing or for a combination of the two possibilities.

• **Stability check**
Stability check takes in account the combined effects of forces and moments generated by the exchanger weight, wind/earthquake loads, and user specified forces and moments. The resultant forces and moments are applied to the supports for checking the stability and calculating the loads acting over the foundations. The wind and earthquake analysis can be carried out according to the following codes:

WIND	EARTHQUAKE
ANSI	ANSI 1982
ASCE 7-10	ASCE 7-10
ASCE 7-16	ASCE 7-16
BSI CP3	
CNR 1982	
CNR 1996	CNR 1986
DM 2005	DM-2005/OPCM-3274
EUROCODE 1	EUROCODE 8
NEIGE ET VENT	PARASISMIQUE PS92
NTC/DM 2018	NTC/DM 2018
UBC 1994	UBC 1994
UBC 1997	UBC 1997
MEXICO V. 2008	MEXICO S. 2008
USER	USER

• **Supports positioning and stability check**

- SADDLES	Check is carried on according to TEMA or EN 13445
- BRACKETS	Check is carried on according to the method of Prof. Bijlaard and to PD5500 / AD2000-MERKBLATT/ EN 13445

INPUT

Data entry quick and easy.

Most of the data are preset and the user simply selects them from a list.

When needed, drawings are associated to the input fields to make the selection even easier
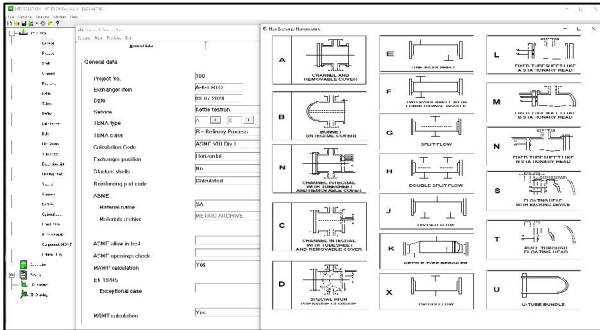
Extended data banks available in the program and customizable by the user:

- MATERIALS
  mechanical properties for over 850 materials (ASME/EUROMARK)
- NOZZLES (PIPES AND FLANGES)
  Tables include data for nominal diameters ranging from 10 mm (3/8") to 1500 mm (60") (ASA and UNI/ISO))
- GASKETS
  Tables include data for 80 gaskets (ASME/VSR/EN/ AD-MERKBLATT)
- ASME CHARTS FOR EXTERNAL PRESSURE
  All the charts provided by the ASME are included
- STANDARD SUPPORTS
  Tables include data for saddle, brackets, legs and skirt
- SHAPES FOR STIFFENING RINGS
  Including EUROPEAN STANDARD and AISC STANDARD
- BOLTS
  - ANSI B18.22
  - UNI/ISO
  - DIN 2510
  - TEMA Tab D5/D5M

All data can be stored and shared by all the exchangers belonging to the same project.

Measurement Units are completely free and customizable. The user can insert new units, define new unit systems or modify on the fly a single unit on the input data sheet.
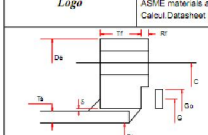
Definition of materials classes avoids the user the need of specifying the materials for all the components of the exchanger.

Import data from thermal rating is available.
The program can read Xist.dbo file from HTRI or neutral file from other programs (Chemstations CC-THERM)

OUTPUT

Report results clear and exhaustive.

• TABULAR REPORT
All relevant data of the exchanger are printed out including the results of numerical calculations and geometrical dimensions.

• BILL OF MATERIAL
All components belonging to the exchanger under design are summarized in a table with dimensions, weights, number of items.
The table can be viewed on screen, printed or exported as Excel file for further processing.

• AUDIT REPORTS BOOK
For all the exchanger components datasheets reporting formulas are shown on the screen and can be printed.
Datasheets can be produced in English or Italian languages, in S.I. or English system of measurement units.

• 2D DRAWINGS

Three or more sheets are automatically generated by the program:

- Tables sheet (Design data, Tubes bundle, Loadings & weights data, Nozzles, General Notes, Standards, Revisions, Materials)
- Setting plan and nozzles positioning. The drawing is scaled in order to show the relative dimensions of the exchanger. The nozzles are shown both in longitudinal and circumferential views.
- Constructive drawing and baffles positioning. All the exchanger components are drawn with quotas and dimensions.
- Cladding details (if any) All the exchanger components with cladding are drawn with the cladding details.

Drawings can be generated in English or in Italian language (additional languages can be easily implemented)

Measurement System Units of drawing are user definable.

Drawings are generated in DXF format and can be imported by the most common and diffused CAD programs (AUTOCAD, MICROSTATION etc.).

• 3D MODEL

A 3D model is automatically generated by the program. Description language and measurement system are user definable.

Both the external and the internal section of the exchanger can be inspected.

Each type of component is built on different layers and can be visible or hidden by a click.

3D model export in DWG format is also available.

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