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## **2007 9TH EDITION TEMA STANDARD AVAILABLE!**

### **PLUS TEMA ENGINEERING SOFTWARE:**

- NEW!** Flexible Shell Elements FEA Method Software (FSE FEA)
- UPDATED!** Fixed Tubesheet Design and Analysis Software (FTS)
- UPDATED!** Flow Induced Vibration Analysis Software (FIV)

### **HIGHLIGHTS OF THE NINTH EDITION STANDARDS OF THE Tubular Exchanger Manufacturers Association**

The 296 page Ninth Edition of the Standards of the Tubular Exchanger Manufacturers Association begins shipping on November 20, 2007. The 9th Edition retains the useful data and features found in the Eighth Edition plus many clarifications and innovations. Several helpful recommendations received from manufacturers, users, the American Petroleum Institute (API), and the American Society of Mechanical Engineers (ASME) were incorporated.

Some noteworthy features of the Ninth Edition include:

- New rules for flexible shell elements (expansion joints), which are based on a Finite Element Analysis (FEA) approach
- Tables for tube hole drilling have been expanded to 3" diameter tubes
- Guidelines for performing Finite Element Analysis (FEA) had been added

- Rules for the design of shell intersections (with large nozzle to cylinder ratios) subjected to pressure and external loadings have been added
- Foreign material cross-reference linking material specifications from various international codes has been added
- Rules for the design of longitudinal baffles have been added

## ***NEW!*** Flexible Shell Elements FEA Method Software (FSE FEA)

The Paulin Research Group worked closely with the Tubular Exchanger Manufacturers Association (TEMA) and the TEMA Flexible Shell Element (FSE) Committee to develop a finite element approach to replace the method in the 8th Edition of the TEMA standard. The revised approach is intended to provide an accurate evaluation of the membrane and bending stresses in FSE geometries for primary and secondary stresses, and to utilize the Fatigue Strength Reduction Factor (FSRF) approach introduced in the 2007 ASME Section VIII Division 2 for fatigue evaluations.

The finite element method recommended in TEMA RCB-8 requires use of two-dimensional axisymmetric, finite elements, and a linearization along predefined Stress Classification Lines (SCLs) to determine membrane and bending components. This approach is implemented in the Flexible Shell Elements FEA Software along with a quick-calculation line-axisymmetric element solution that generally gives results to within 10-to-30% of the two-dimension axisymmetric element solution.

An optimizer is also provided using the line element solution that helps users find expansion joint configurations that are best suited to their particular requirements. Both the elastic and plastic stiffness values can be calculated using the two-dimension axisymmetric element solution. The plastic stiffness is displacement and convergence dependant. The conclusions drawn and the accuracy of all finite element solutions are always the user's responsibility.

## ***UPDATED!***

### Fixed Tubesheet Design and Analysis Software (FTS) and Flow Induced Vibration Analysis Software (FIV)

The Tubular Exchanger Manufacturers Association, Inc. (TEMA) is pleased to announce the development of the latest edition of TEMA Engineering Software. The software utilizes current Windows methodologies and complements the Ninth edition of the TEMA Standards in the areas of:

|     |                                     |
|-----|-------------------------------------|
| FTS | Fixed Tubesheet Design and Analysis |
| FIV | Flow Induced Vibration Analysis     |

### ***What's New?***

- The software has been rewritten in the latest version of VB Net, Microsoft Access, and Crystal Reports in order to fully take advantage of current Windows operating systems.
- Programs have a completely rewritten HTML style help system similar to other standard Windows applications, complete with index, table of contents, keyword search capabilities and context sensitive help topic for every field on each form

(available using the F1 key), complete with specific references to TEMA Standards paragraph numbers.

- Programs now have a typical Windows toolbar and user-friendly input forms.
- New toolbar allows user to start a "New" case, "Open" an existing case, "Save" or "Save As" (in order to copy a case), "Delete" an existing case (in order to keep the database clean), "Print" or "Print Preview". The "File" option of the toolbar maintains a list of the most recently run cases for quick access.
- Multiple cases may be opened at the same time.
- The TEMA Standards 9th Edition has a greatly expanded materials database with values consistent with the ASME Code. These new materials are all built into the program, resulting in over 140 material categories. Each material has built in values for the Modulus of Elasticity and Coefficient of Thermal Expansion over a wide range of temperatures, as well as the material density.
- The programs have a built in maintenance utility for this new expanded materials database, which allows the user to add new materials, modify values of current materials, rename materials, delete materials as well as changing the order in which the materials appear in the drop down list.
- Input and output may be in English units or metric units or either combination.
- Toolbar options allow the user to select the report size (English letter paper or metric A4 size paper). Program remembers previous selection and defaults to that size until changed again.

#### Synopsis of Programs

Fixed Tubesheet (FTS) may be welded to both the shell and channel or may be extended as a flanged and bolted to the channel. The calculations may include the effects of a flexible shell element(s) if present. The program allows for analysis of eight different loading conditions. Calculations include the required tubesheet thickness, the shell and tube stresses in tension and compression and the tube to tubesheet joint load for each loading condition, in both the corroded and uncorroded condition.

Note: The calculations performed in the FTS program are those contained in the TEMA Standards 9th Edition and do not include the ASME UHX calculations.

Flow Induced Vibration (FIV) analyzes one tube span at a time for potential vibration problems. The shell side and tube side process streams may be single phase vapor or liquid, or two phase mixture. Spans may be straight or u-bend spans, with equal or unequal leg lengths. Tubes may be bare or finned. FIV also calculates the effect to the tube natural frequency of a longitudinal load. Users may input a crossflow velocity or the program can calculate a crossflow velocity for single shell pass design with single segmental baffles.

Free Technical Support is available to all registered users.



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Software is licensed to individuals. A copy of the licensing agreement accompanies the software.

**Quantity Discount Information**

Additional copies of the FTS and FIV software are available for 10% of the first-piece price if ordered with the first copy. Volume discounts for the Standard are 10% for orders over 10 pieces, 20% for orders over 25 pieces.

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