"Shell and tube heat exchanger design by VB Language for education purpose"

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ABSTRACT :-

       Shell and Tube heat exchangers are having special importance in boilers ,oil coolers, condensers, pre-heaters . They are also widely used in process applications as well as the refrigeration and air conditioning industry. the robustness and medium weighted shape of Shell and Tube heat exchangers make them well suited for high pressure operations. The basic configuration of shell and tube heat exchangers, the thermal analysis and design of such exchangers form an included part of the mechanical, thermal ,chemical engineering scholars for their curriculum and research activity.

The sophisticated and user-friendly computer software using Visual Basic 6.0 (As a Programming Language) is developed for the hydraulic design of shell and tube heat exchangers based on the D.Q. Kern method by the VB programming language . The use of this software will bridge the gap between engineering practice and teaching of shell and tube heat exchanger design.

Key words : Visual Basic (VB),

1.2 DESCRIPTION OF SOFTWARE

The development of design software for the shell and tube heat exchanger is widely use in the teaching of hydraulic design (Rating module) of shell and tube heat exchangers usually at the senior undergraduate level of a mechanical ,thermal ,chemical engineering course also for post graduate research works. It may also be used for the preliminary design of shell and heat exchangers in actual industrial applications. Developed in Visual Basic 0.6 at front end and access at back end with advanced graphics features, the Microsoft Windows-based software can be implemented on an compatible personal computer with at least a 80386 microprocessor, 4MB of RAM and at least 5MB of free hard disk space.

2. Components of the software: - The software consists of Rating and Tutorial. Basically this software consists of five forms designed in Visual Basic 0.6 at front end. User should fill the relevant information into the forms. The forms are 1) fluid property 2) Shell side property 3) Tube side property 4) form containing different graphs 5) solution . The units option is built into the software in recognition of the fact that a large number of heat exchangers are designed, constructed and used in the different parts of the world. Design results can be printed and saved. This feature enables the student or new engineer to quickly visualize the key constructional features of a shell and tube heat exchangers and its relative dimensions. Database required for calculation is stored at back end in access

3.SHELL & TUBE HEAT EXCHANGER DESIGN SOFTWARE

3.1 INRODUCTION

       Shell and tube heat exchanger design software basically based upon rating module method by D. Q. Kern . This software is designed using Visual Basic 6.0 (As a Programming Language) while MS-Access as a backend. This

module consists of basically five forms designed in VB 1. Start Form 2. Fluid properties Form 3. Shell Side Form 4. Tube Side Form 5. Solution form. Along with this database consists of graph and team tables store in MS-Access.

3.1.1. Start Form enables user to select whether he want to generate the report at last this form also provided with help button to get the information about the project and various unit conversion factors

3.1 2. Fluid Properties Form enables user to enter various fluid properties like mass flow rate ,density , Thermal conductivity , dynamic viscosity , inlet and outlet fluid temperature , fouling resistance , allowable pressure drop and required dirt factor of shell side fluid and tube side fluid. Various unit facility is also provided to select appropriate unit of the quantity.

3.1 3. Shell Side Form enables users to select pitch type i.e. whether triangular or square , pitch dimension , outer diameter of tube , inner diameter of tube and no. of tube passes.

3.1 4. Tube Side Form enables user to select no. of tube , outer diameter of tube , length of tube and BWG. Software automatically enter the corresponding value of thickness , internal diameter , flow area per tube and surface area.

3.1 5. Solution Form enables user to generate the solution. This solution can be print , save in text or HTML format for further use

At back end in MS – Access related Team tables and graphs are stored so whenever required software take the value from it for calculation.

3.2 VB 6.0 A PROGRAMMING LANGUAGE

For the development of this design software VB 6.0 is chosen as a programming language for the following main features

3.2.1. A Visual Development Environment

Visual Basic is essentially a complete visual development environment for client/Server systems. With visual Basic you can create user interfaces for your applications.

3.2.2.An Object Oriented Tool

Visual Basic uses Object Oriented Programming Approach. VB is an event driven programming language. In the event driven model programs are not following the sequential logic. User can press key and click on various controls in a window. Each action of user can cause and event occur , which follows a basic procedure, which is written in the code.

3.2.3. A Powerful Language

Visual Basic provide Graphical User Interface. So Rather than writing many lines of code for the appearance and location of interface element use in a program you can simply add pre built object on the screen.

VB has various control like label, text box, Frame, Command, Check Box, Combo box. etc.

3.2.4. VB 6.0 as a Front End

VB 6.0 provides connection to various back ends. VB 6. 0 provides features like auto quick information and auto list members which informs program events properties and methods related to an object . It helps programs to build custom control with the help of active x technology. VB 6.0 provides advance debugging features to handle various run time errors. VB 6.0 involves modular approach which include breaking large project into manageable modules, each designed to perform a different function.

3.2.5. M.S. ACCESS AS BACKEND

MS-Access provide **a**tomicity ,consistency ,integrating constraints and use concept of primary and foreign keys to co-relate tables. Access can manage large amount of data it also provide security at higher levels as compared to other back end , satisfies by code rule optimization provide data consistency by using integrating constraints. Provides data integrity by not allowing two or more users to access same piece of data.

CHAPTER 4:SCREENS DETAIL

4.1 INPUT SCREEN
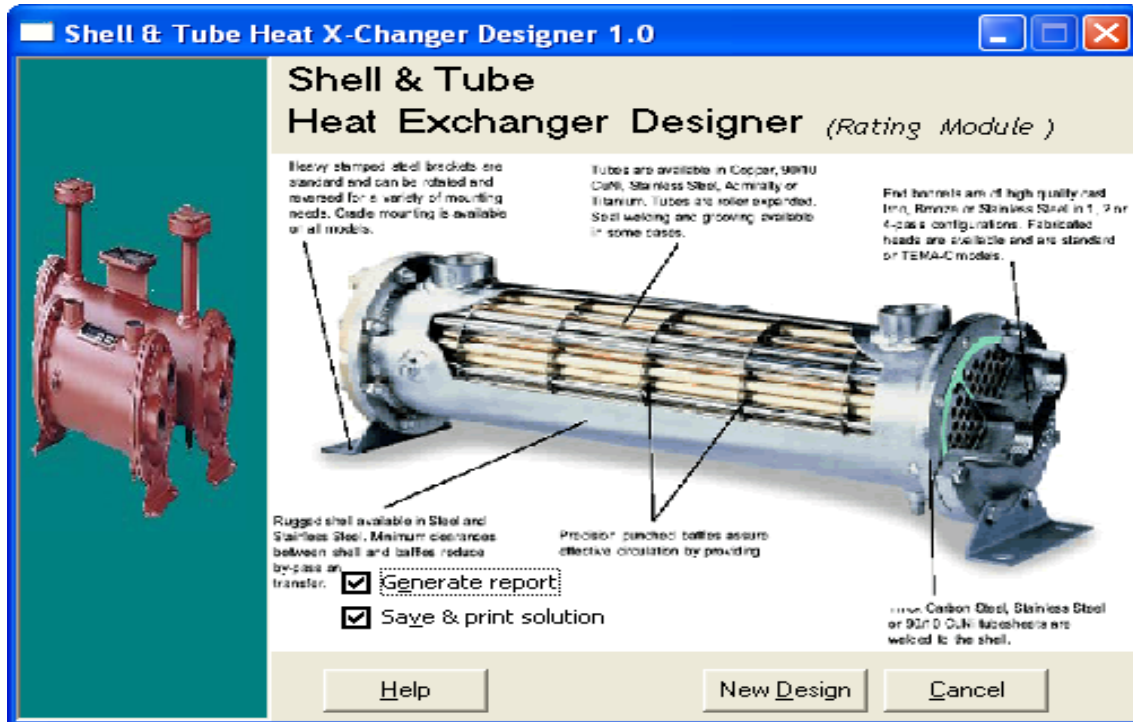
Flash For This is the first form of the project .This form is provided with three command buttons 1. Help 2. New Design 3. Cancel and two check box 1. Generate report 2. Save & print solution. If user click help button, conversion factor
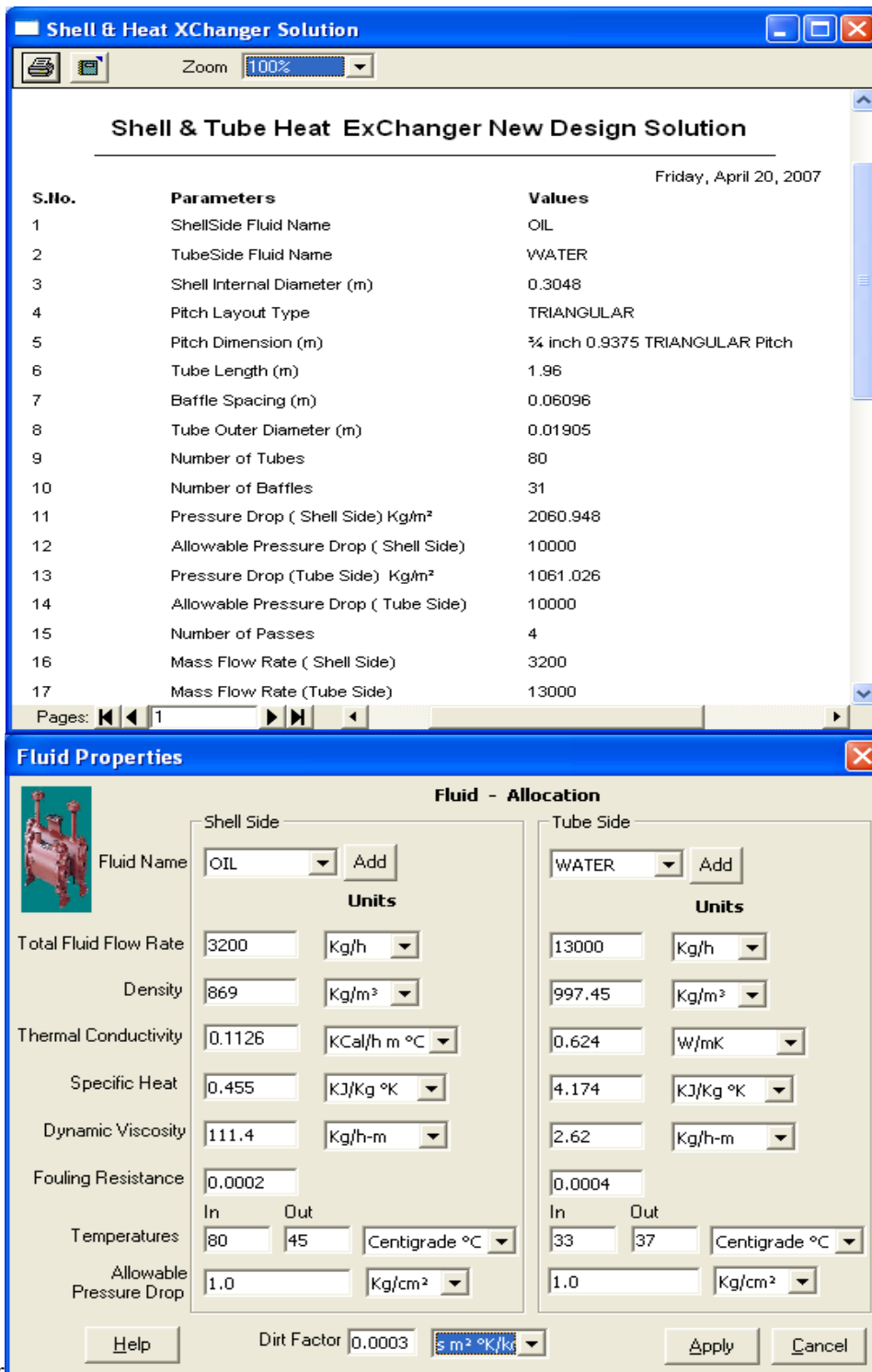
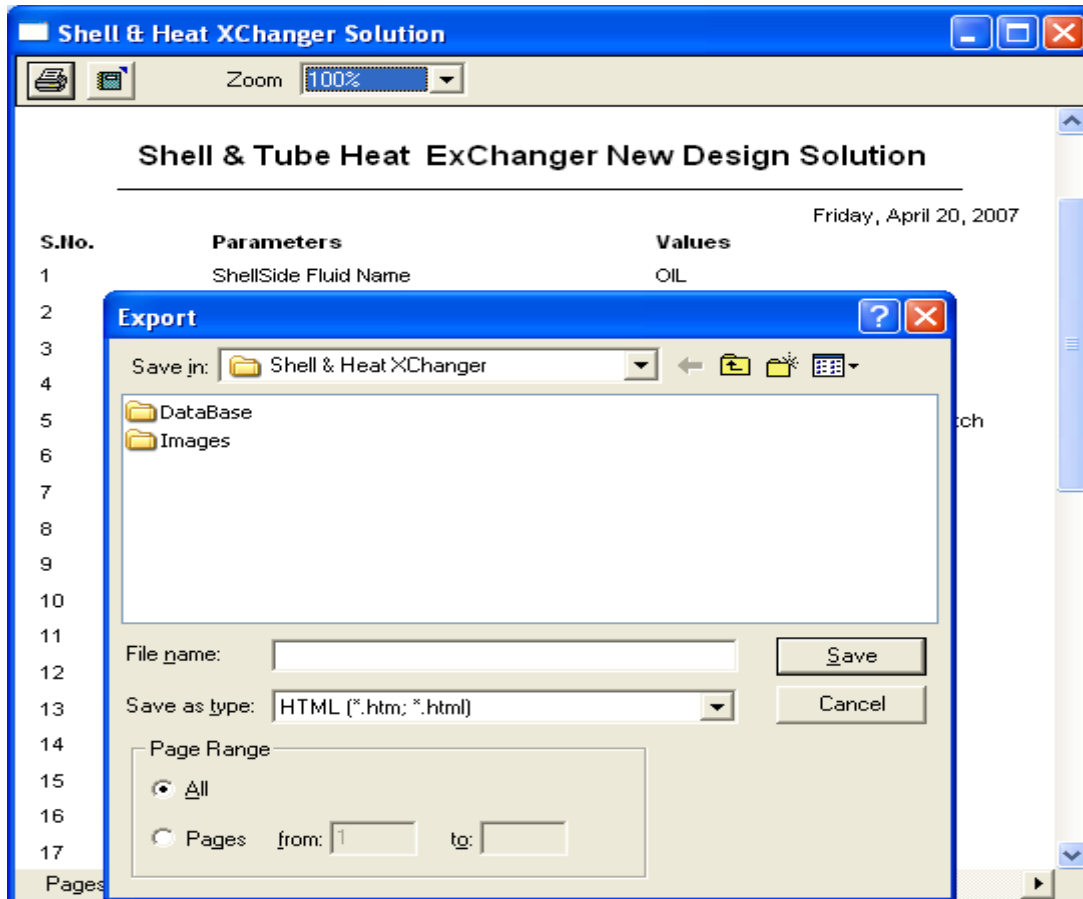theuser

Shell Side Properties

Fluid properties form

This form is used by user to enter the various fluid properties and their respective units. Units can be slected from combo box provided in front of text box . Three command buttons are provided 1. Help 2. Apply 3. Cancel. Help button unable

user to find conversion factor in the table while by clicking apply button user enter in third form . Cancel button cancel the operation. In shell side properties user select pitch type i.e. triangular or square , outer diameter of tube , pitch dimension , inner diameter of shell and

Solution Window

This window shows the new design solution for the various input by the user.

Report: This is a report window which can be saved or print by the user **Save & Print Window** The window show how to save a report at the destination

5.2 CONCLUSION :

This software enable the user to predict about the suitability of heat exchanger or service and it has been developed for shell and tube heat exchangers (Rating module)   based on the D. Q. Kern method D.Q. Kern Method of rating module of shell and heat exchanger. Even this method helps to correct some of the parameters of the heat exchanger. So that final design is suitable for service. TEMA tables and graphs has been incorporated. Its interactive graphics feature allows the selection of exchanger configurations and change of design conditions to be performed with ease. Students can use this software to learn the basics of shell and tube heat exchangers at their own pace. As with the case of all software, it is always in a constant state of development. The addition of a mechanical design, optimization and costing modules are some of the enhancements that will be undertaken in the not too distant future. It is hoped that the software will bridge the gap between the teaching of fundamentals and industry practice of shell and tube heat exchanger design

5.3   LIMITATIONS OF THE SOFTWARE

At present, the user enters thermo physical properties of fluids. It is a simple though tedious task of incorporating more fluid data into the software. This limitation does not hinder the use of the software and in fact allows the user the opportunity to search for thermo physical data of fluids encountered in engineering applications. Being a Windows-based software, it requires more random access memory (RAM) on the PC than most software written for the DOS environment. Presently user has to find the value from the graph software just show the graph.

5.4 FUTURE SCOPE

Presently rating module has been designed shell and tube heat exchanger design means thermal design and mechanical design. Mechanical design includes three modules viz. sizing, rating, and vibration. This paper covers the rating modules. These modules can be designed and linked with this module. Thermo physical properties of fluid can also be store in the database. So that once user enter the name of the fluid all the concerning properties get entered. Curve fitting algorithm can be implemented to read the values from the graph when user provide one parameter.

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