

EXPRESS™

Heat Exchanger Software for the Process Engineer



GET THE FULL PICTURE

... "first look" software for design and operation of shell-and-tube heat exchangers

Use **EXPRESS™**

- To properly set up your design
- To evaluate exchanger operability
- To avoid fouling in units processing crude oil

See ESDU 00016 for guidance on the use of EXPRESS™

Minimum System Requirements:

PC running Windows 95, 98, or NT 4.0 Service

Pack Three or higher.

486 or greater processor.

2MB hard disk space.

Minimum 16MB RAM, 32 MB recommended.

Minimum display requirements: Minimum

screen resolution 800 X 600, recommended

screen resolution is 1024 X 678, minimum color

depth 256 colors.

Available via CD-ROM or the Internet. For Web delivery, customers must download a zipped file and install the application locally

Don't Miss Design Opportunities

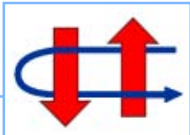
Appropriate Thermal Design of a Shell-and-Tube Heat Exchanger

Existing commercial computer programs are best suited to heat exchanger analysis rather than design. They can contain very poor design algorithms. As a consequence, most designers/engineers use these programs in an iterative manner—setting up a geometry; analyzing its performance; and, revising the geometry until an acceptable design is achieved. This is a time-consuming task that can miss the better designs. ESDU is applying a new design procedure. It can be used alongside existing, commercial software. By using ESDU's new software tools, the designer/engineer is quickly and systematically led to better geometry and a better design.

EXPRESS™ allows the process engineer a 'first-look' at rapidly sizing shell-and-tube heat exchangers and evaluating operability characteristics. The program uses 'short-cuts' to provide practical evaluation of possible designs. This program provides the engineer more design choices than are typically available to evaluate. With this program, an engineer can:

- Ensure exchanger pressure drop specification does not lead to unnecessary expense
- Make sure best baffle configuration is used
- Design out crude oil and other types of fouling
- Evaluate exchanger operability at initial design stage (before committing to full design)

A particularly interesting feature of the program is the incorporation of a range of fouling models including a crude oil fouling model which allows the prediction of fouling characteristics of exchangers that are to be used in crude oil pre-heat trains. An important point to make is that ESDU's userfriendly software tools can replace a lot of 'trial-and-error' and searching that does not always provide a solution. Keep in mind, saving the engineer time and resources is a fundamental principle of all ESDU products. The more choice you give an engineer in a shorter amount of time than what he or she could accomplish normally, the better the environment for optimising design. Given the nature of the work of an engineer, more information is always welcomed—not less.



Industry Situation



fouled heat exchanger

Fouling of the heat recovery pre-heat trains on refinery crude oil distillation units costs industry billions of dollars in extra energy use and adds millions of tons of greenhouse gases to the atmosphere each year. It is a serious problem, particularly in the economic and political climate following the Rio Earth Summit and recent changes in both oil prices and the structure of the industry. It is also unfortunately a complex problem with no simple cost-effective solution(s).

Fouling often occurs throughout the train and different 'mechanisms' can be responsible for fouling in different exchangers. However, some limited generalizations can be justified. At the 'cold' end of the train (i.e. before the desalter), deposition of fouling layers tends to be associated with the presence of salts, waxes and corrosion products. At the 'hot' end of the train, chemical reaction fouling tends to dominate and is often associated with the presence of asphaltenes. We can also make one further observation--reduction in the performance of the exchangers at the colder end of the train is partially compensated by increased heat recovery further along the train, as reduced crude temperature give rise to larger temperature driving forces. In terms of overall heat recovery, the exchangers at the hot end of the train are the more significant.

Product Driver

Given such observations, ESDU concludes that the development of a fouling mitigation strategy should start by concentrating on what can be done at the hot end of the train. Therefore, ESDU's initial work has focused on shell-and-tube heat exchanger units, the dominant type employed by the industry.

Product Description

Through extensive development and validation, ESDU has developed both unique and complementary computer programs that can be used in approximate shell-and-tube heat exchanger design. These programs cover vital design and performance issues including:

- Heat transfer enhancement
- Preliminary analysis of heat exchangers for sizing, costing, and operability
- Revamping of exchangers for header modification, heat transfer enhancement, and fouling mitigation

Assessment of exchanger operability is a vital element of good design. Units are subject to fouling. Operating conditions vary over the lifetime of the plant. The information used to obtain the design is subject to error. **EXPRESS™** generates a series of response curves that allow the engineer to evaluate the consequences of operational changes and performance uncertainties.