Key tools include novel graphically based software for:

- Rapid design, rating, revamping, performance prediction and analysis of operability of shell-and-tube heat exchangers (EXPRESS™, see below),
- Assessment of enhancement benefits in tubular heat exchangers (ENTRANS™),
- Process integration for new design and retrofit of heat transfer networks (INTEGRITY™),
- Analysis of minimum freshwater use in industrial plant (AQUAINT™).

Introducing EXPRESS™ for Shell-and-Tubes

ESDU’s powerful EXPRESS™ program was originally developed to support users of conventional design codes. Under the guidance of ESDU’s Oil Industry Fouling Working Party, it developed into a unique tool that is used not only by engineers looking to assess design and retrofit opportunities, often using new equipment options such as Helixchangers and tube inserts, but also by engineers seeking to design-out fouling (particularly in pre-heat crude oil exchangers).
Oil Industry Fouling Solutions:
Recent work includes the development of industry-standard ‘User Guides’ to crude oil, seawater and freshwater fouling, with supporting software. These guides were developed under the guidance of the Oil Industry Fouling Working Party, with expert members representing some 70% of the world’s refining capacity. Participating companies include:

- ABB Lummus Heat Transfer
- BP
- Brown Fintube
- Cal Gavin
- Chevron Texaco
- Conoco Phillips
- ExxonMobil
- Fluor
- Heatric
- Koch Industries
- Kvaerner
- Marathon Oil Company
- Mexel
- NaCo
- Shell GS
- StatOil
- Total
- Wellman Graham

EXPRESS™ v.4: E-Shell Rapid Design, Rating, Revamp, Fouling Analysis (Including Crude Oil Preheat Train Fouling), Performance Prediction, Budget Costing…

EXPRESS™ draws the Parameter Plot for your preliminary design and duty data to show the full thermal design picture - design options are then clear.

Some Key Features
Shellside geometries select and switch between segmental, helical and rod baffles.
Tubeside geometries plain tube, various inserts (twisted tapes, helical coil, wire matrix)
Units SI, US or British, dynamic updating at any time
Segmental shellside method - Switch between stream analysis and Bell methods - useful to assess uncertainties
Defaults or user-specified values for many parameters, including clearances, baffle, and end-plate thicknesses

EXPRESS™ uses minimum data input

Instantly update the Parameter Plot for:
- Altered baffle cut – optimum spacing calculated automatically
- New helical baffle angle – spacing updated automatically in line with design practice
- Switching baffle type – segmental, helical or rod
- Assessment of effect of tube insert
- Changed tube pass arrangement
- Switching fluids (shellside to tubeside)
- Exploring effect of specified fouling factors and allowable pressure drops on design
- Shells in series.

Design away from Crude Oil Fouling in Preheat Exchangers
- Determine crude fouling threshold conditions to develop no-fouling designs
- Where no-fouling design not possible, assess opportunities for helical baffles, inserts, etc
- Evaluate fouling response of unit to changes in inlet temperatures and throughput.

Cooling Water Fouling, Biofouling, Waxing…
Where in-tube fouling in dependent on flow velocity (eg, biofouling), tube wall temperature (eg, waxing or coking) use velocity or wall temperature fouling models in EXPRESS. All backed up by ESDU’s industry-standard User Guide collection to common fouling problems in heat exchangers.

EXPRESS™ plots the performance of your design over ranges of operating conditions
Exchangers rarely operate at the design point. EXPRESS™ generates a range of response plots to show how your exchanger will really operate.
For example, a crude oil preheat exchanger is designed in the no-fouling zone. However, EXPRESS™ shows how fouling can occur in downturn...

Example response plot (effect of tubeside flowrate)