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SPRINT

Overview **SPRINT** is the software package used for the design of the energy systems for individual processes on a site.

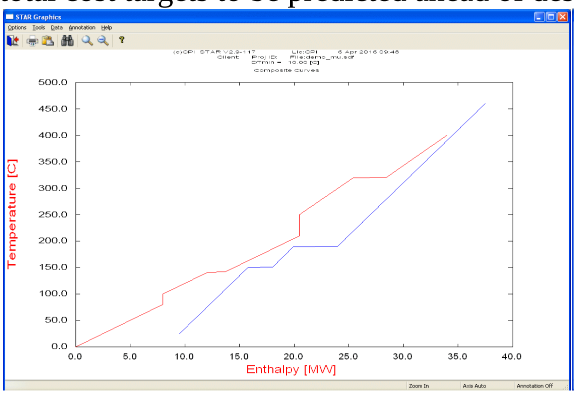
SPRINT not only provides energy targets and optimises the choice of utilities for an individual process, but also does heat exchanger network design automatically for the choice of utilities made. Both new design and retrofit are carried out automatically, but within a framework where the designer keeps full control over network complexity. In the context of retrofit, whilst retrofit modifications can be chosen automatically, these are presented to the designer one at a time such that the minimum number of modifications are made and the final decision is left to the designer. **SPRINT** carries out network optimisation. Because of the interactions between **SPRINT** and **STAR**, both programs are linked by common data structures such that each can use the same files and there is no manual data transfer between the packages.

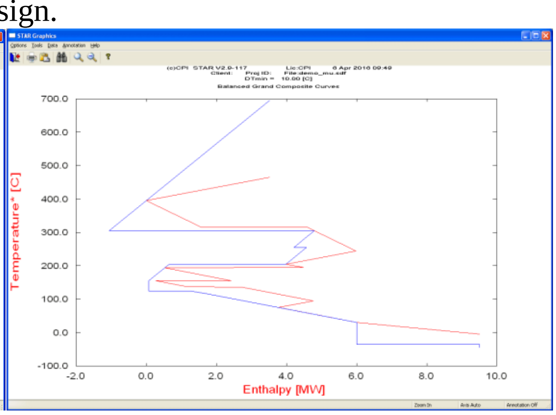
Issues addressed by **SPRINT** are:

- Optimisation of choice and load of utilities for individual processes • Automatic design of new heat exchanger networks
- Automatic retrofit design of heat exchanger networks with minimum number of modifications
- Automatic design for multiple utilities (new design and retrofit)
- Interactive network design
- Simulation of networks using simple models
- Targeting minimum energy consumption
- Optimisation of networks
- Network operability
-

Process Energy and Capital Cost Targets

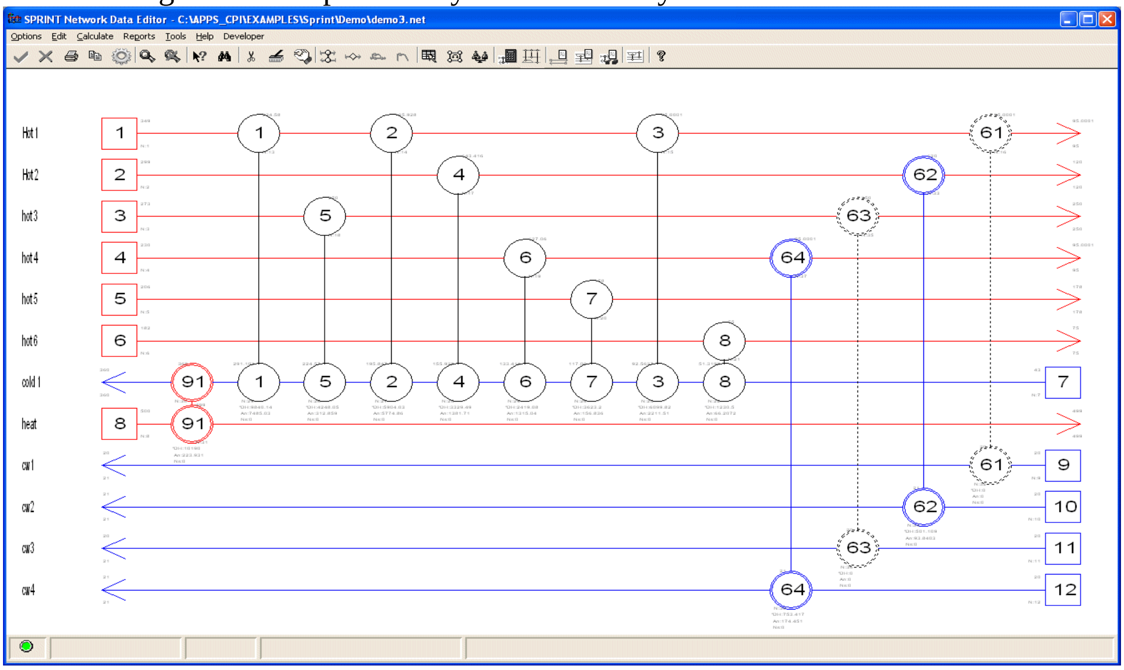
SPRINT sets energy targets and optimises the selection of utilities for individual processes. The tools include the composite curves, the grand composite curve, and the problem table. These tools allow the designer to predict hot and cold utility targets for individual processes. **SPRINT** automatically places the optimal mix of utilities against the grand composite curve. In addition to providing energy-based targets for the process, the program can also target for the surface area of the heat exchangers and the minimum number of heat exchanger units and shells. Combining these targets allows total cost targets to be predicted ahead of design.





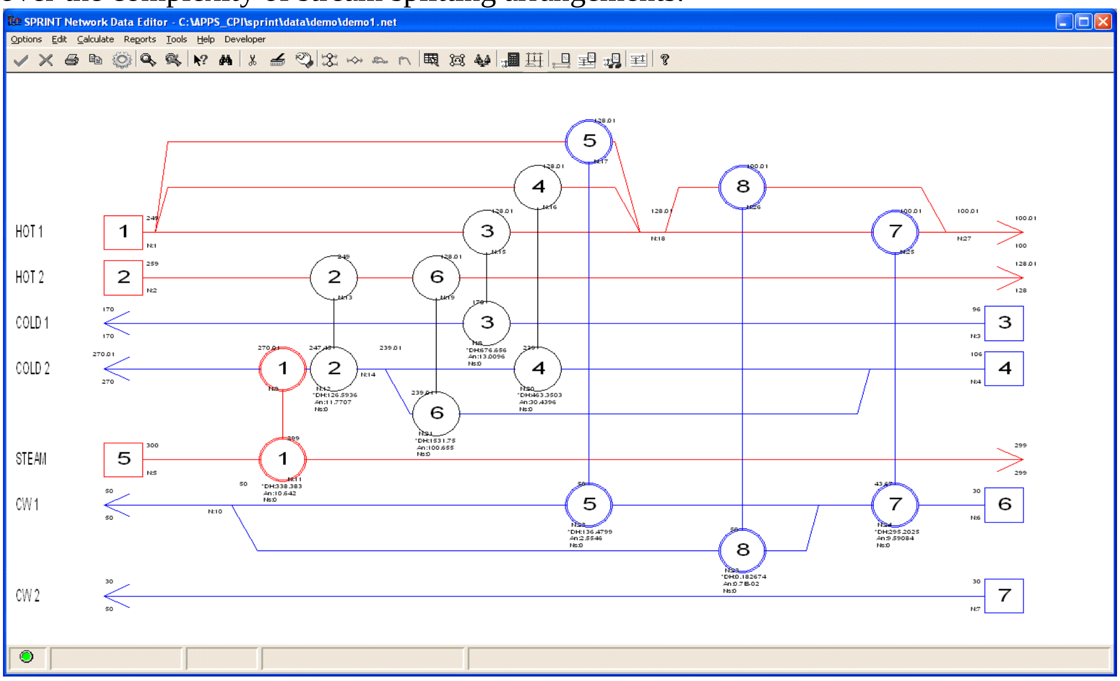
Graphical Network Interface

Interaction with the network structure is through an interactive graphical editor. This editor allows easy modification of the network by using a series of graphical tools. Simulation For the given network structure the program will calculate the intermediate network temperatures and heat exchanger performances. The program has various simulation modes which are dependent on the data specified and the options selected. Heat exchangers can be specified by either heat duty or heat transfer area.



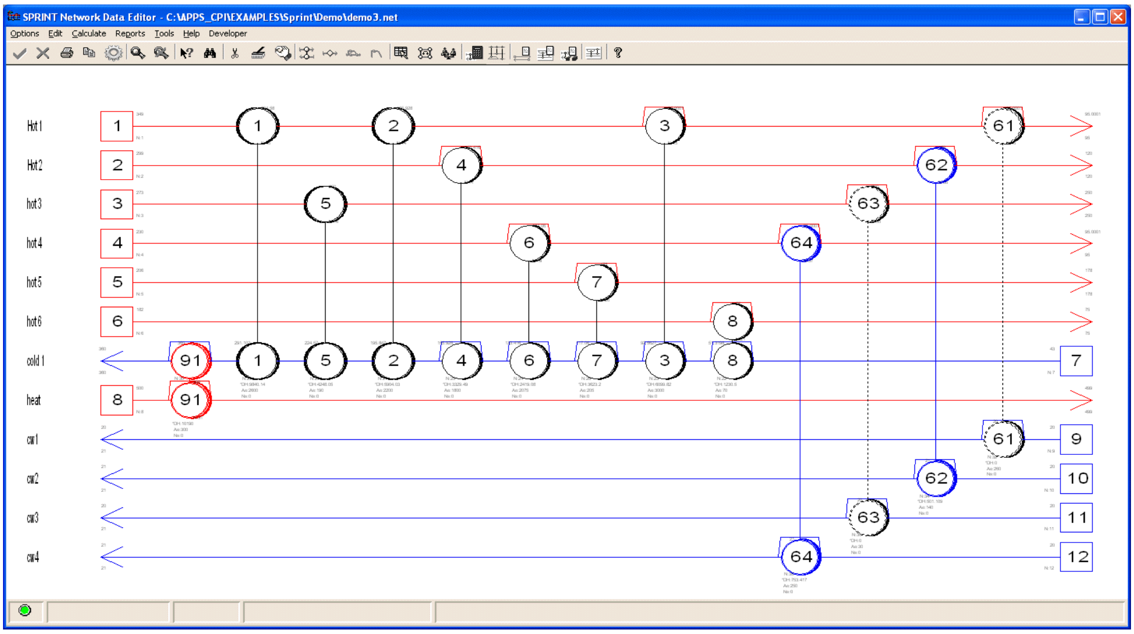
Automatic Design of New Heat Exchanger Networks

New design is carried out automatically, but within a framework where the designer keeps full control over network complexity. Automatic design can create structures, which involve impractical arrangements of stream splitting which the designer must then evolve to a practical design. **SPRINT** allows the designer to keep full control over the complexity of stream splitting arrangements.



Automatic Network Retrofit

The approach to heat exchanger network retrofit is based on the Network Pinch concept. This identifies bottlenecks in the network that limit energy recovery. Structural changes can then be made to overcome the bottlenecks. The structural changes made are resequencing (change of location of an existing exchanger on the same streams), repiping (change of location allowing the streams to change), adding a new exchanger or introducing a stream split. The user chooses one of these options and the program finds the best structural modifications. The structural modifications are taken one at a time, keeping the designer under full control and leading to retrofit with the minimum number of modifications.

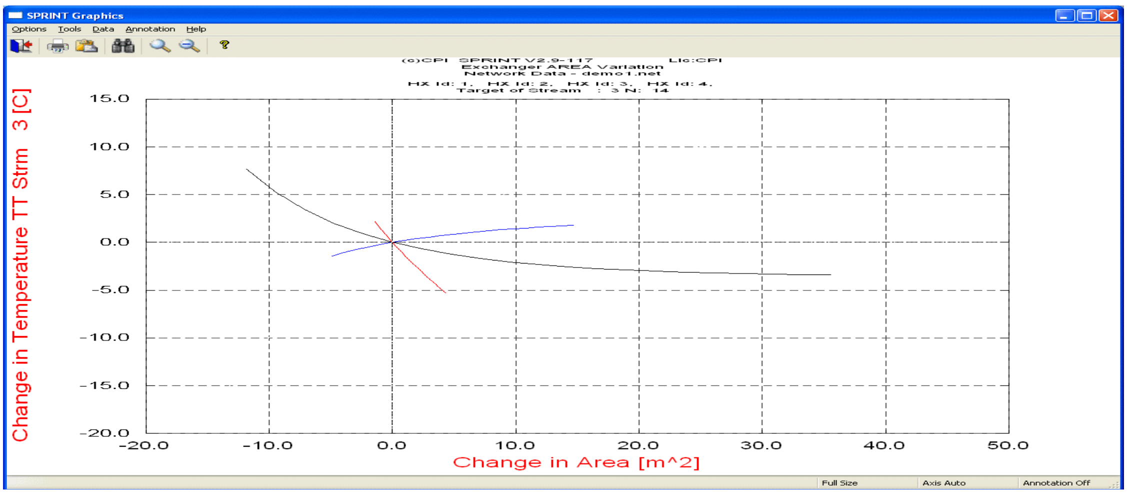


Optimisation

SPRINT can automatically adjust the degrees of freedom in the network to achieve minimum total annualised cost for both new design and retrofit. The optimisation process reduces the network cost by trading off the utility cost against capital cost.

Control and Operability

The program can also determine which are the best network modifications to deal with different operating cases.



Fouling

Fouling models can be associated with each exchanger and the behaviour of network can be examined over an operating time period. A cleaning schedule and other network operating changes can be specified to mitigate the network fouling to reduce the overall operating cost. The cleaning schedule can be optimised to minimise network operating cost.