MANCHESTER 1824
The University of Manchester

HYDRO Overview

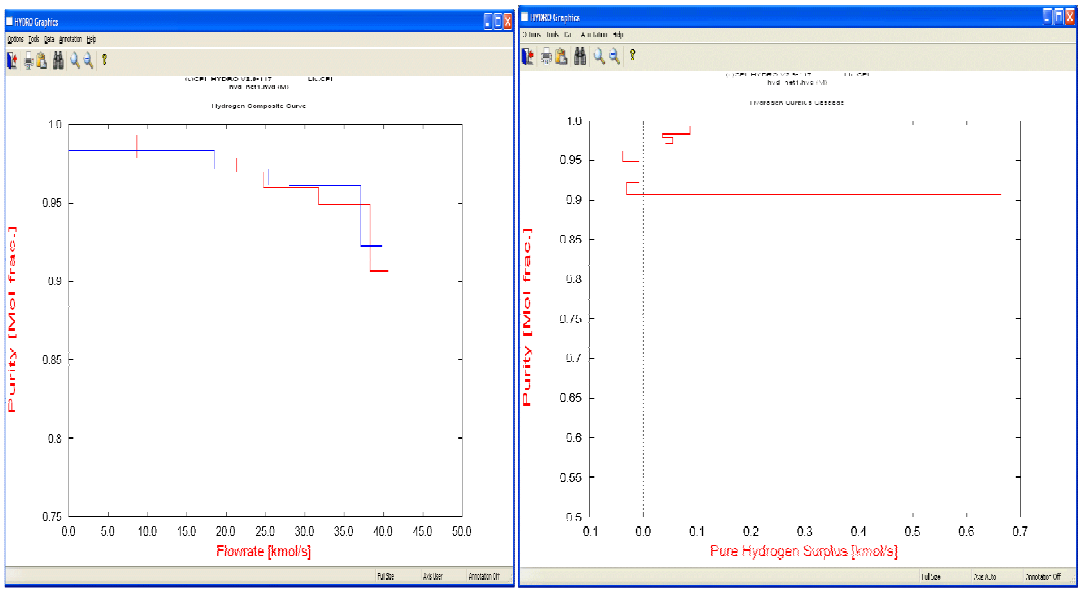
HYDRO is the software package used for the analysis and design of hydrogen distribution systems in refineries. **HYDRO** sets targets for the minimum overall hydrogen supply required by a refinery by maximising the recovery between the various consumers. Purification options can also be considered. The software also performs automated hydrogen network design, where the user has full control over network complexity and constraints.

Issues addressed by **HYDRO** include:

- Minimisation of hydrogen demand through maximum re-use
- Optimum selection between multiple sources of hydrogen
- Analysis of hydrogen purification options
- Automatic design of hydrogen distribution networks

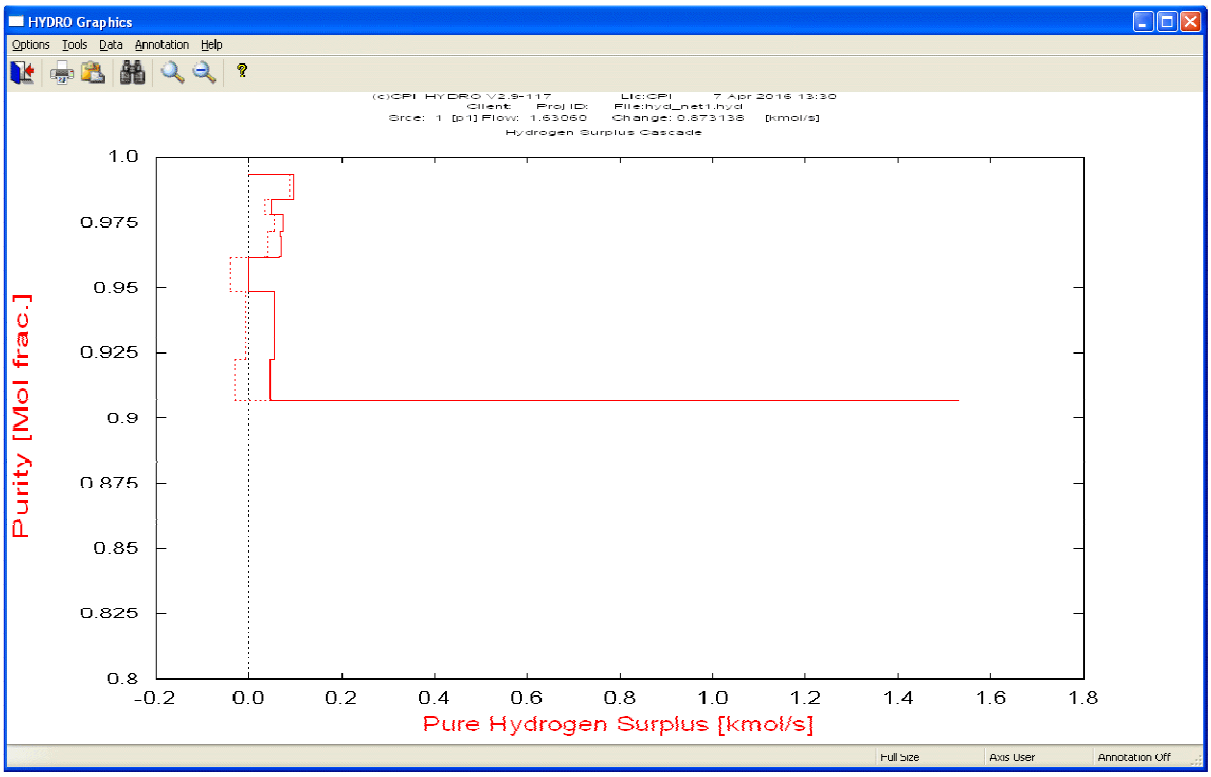
Hydrogen Reduction

Hydrogen consumers require a certain flowrate of hydrogen with a specified partial pressure at their inlets. In many cases, there are gases leaving the consumers that contain significant amounts of hydrogen. The **HYDRO** software systematically analyses the potential for re-using and/or recycling hydrogen across a refinery. This analysis gives a target for the minimum supply of hydrogen that will still enable all the consumer demands to be met. Maximising the recovery of hydrogen also means that the losses to the fuel or flare systems are minimised.



Multiple Sources of Hydrogen

Often, there are several possible sources of fresh hydrogen available, for example, a hydrogen plant, import from a pipeline, or "across-the-fence" purchase. Each source can have a different quality and cost. **HYDRO** is able to select the best mix of supplies in order to satisfy the problem with a minimum cost.



Analysis of Hydrogen Purification Options

The targets for hydrogen supply can be reduced further by introducing the appropriate purification technology (e.g., pressure-swing adsorption, membrane or cryogenic separation). From the product purities and recoveries of these units, the software allows the designer to determine the optimum type, size and placement of purifiers.

Automatic Design of Hydrogen Distribution Networks

Once targets have been determined for hydrogen supply and purification, **HYDRO** carries out automated design of the distribution system to meet the targets. The designer maintains control over the network complexity and can impose all forms of constraints, such as maximum and minimum flowrates, forbidden connections and compulsory connections. Distribution costs associated with pipework and compression are included in the design.

The design output comes in the form of a tabular report as well as an interactive graphical representation.