

## WATER Overview

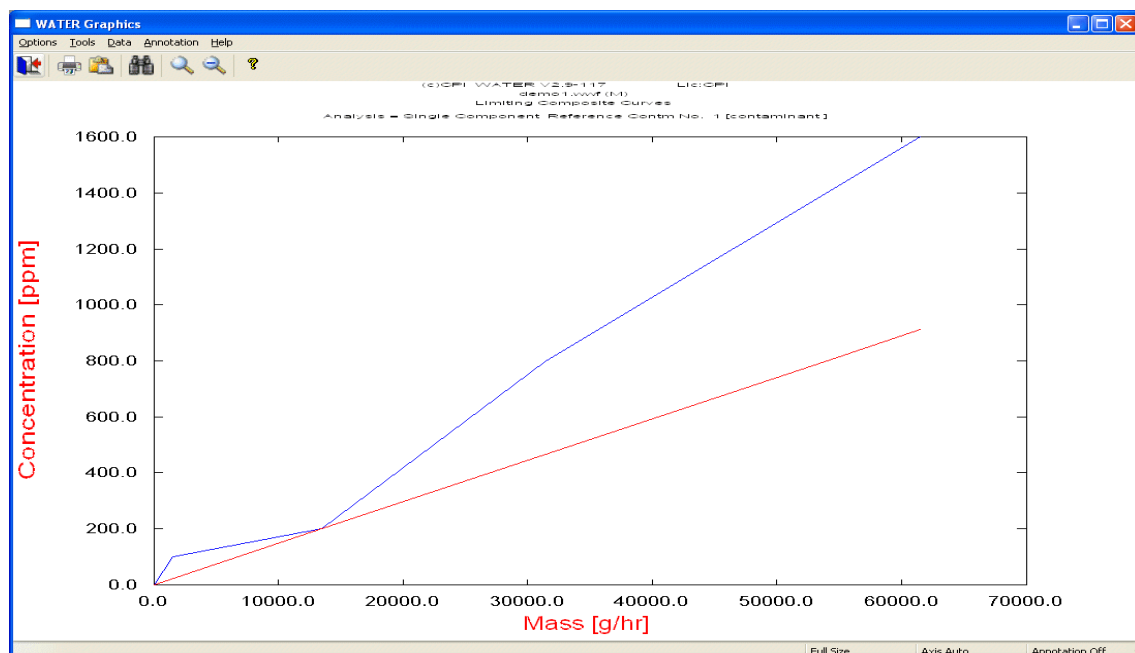
**WATER** is a software package for the design of water systems in the process industries. Water is used for a wide variety of operations in mass transfer and washing operations, steam systems, cooling systems, etc. Rising water costs, restrictions in water use and increased environmental awareness have driven designers towards more efficient water systems. **WATER** targets and designs for minimum water consumption through identification of re-use opportunities. Opportunities for regeneration of water for further re-use or recycling are also identified. Effluent treatment systems are designed for minimum cost through design methods that lead to distributed effluent treatment systems. Water-use, regeneration and effluent treatment networks are designed automatically, keeping the designer under full control of network complexity. Multiple contaminants are handled.

Issues addressed by **WATER** include:

- Minimisation of freshwater consumption through maximum re-use
- Minimisation of wastewater generation
- Optimisation of freshwater sources when multiple freshwater sources are available
- Automatic design of water re-use networks
- Identification of opportunities for regeneration of water
- Automatic design of effluent treatment networks
- Trade-off between freshwater, effluent treatment and pipe-work/sewer costs

## Water Minimisation

**WATER** allows fresh water to be minimised through the identification of re-use opportunities. Maximising re-use minimises consumption and minimises the volume of wastewater generated. The program works from a knowledge of the constraints on water quality required by each operation. Constraints can be specified for multiple contaminants. Also, maximum and minimum flowrate constraints, forbidden matches and water losses/gains in individual operations can be specified.

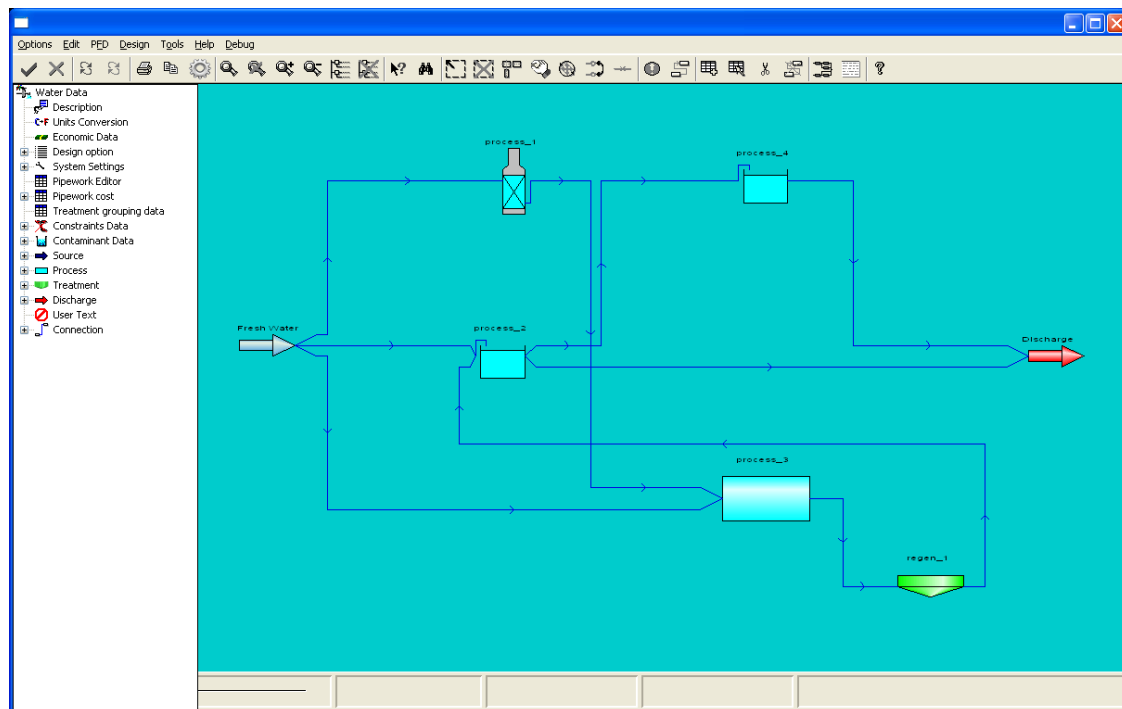


## Multiple Sources of Freshwater

It is often the case that there are a number of different sources of freshwater available with different qualities and different costs. **WATER** is able to optimise the use of different sources of fresh water.

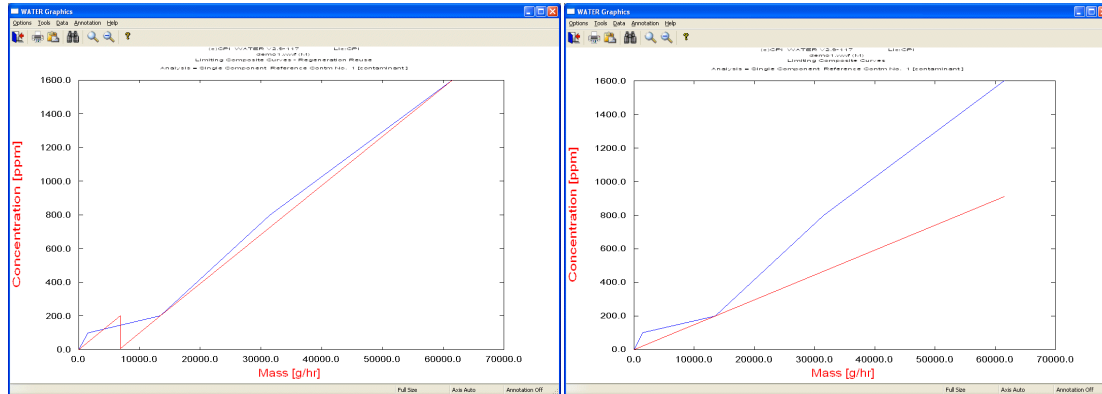
## Automatic Design of Water Re-Use Networks

**WATER** not only allows targets to be set for water re-use networks, but also designs the network automatically. All constraints relating to maximum and minimum flowrates, forbidden matches and water losses/gains in individual operations can be catered for. The designer also has control over the network complexity.



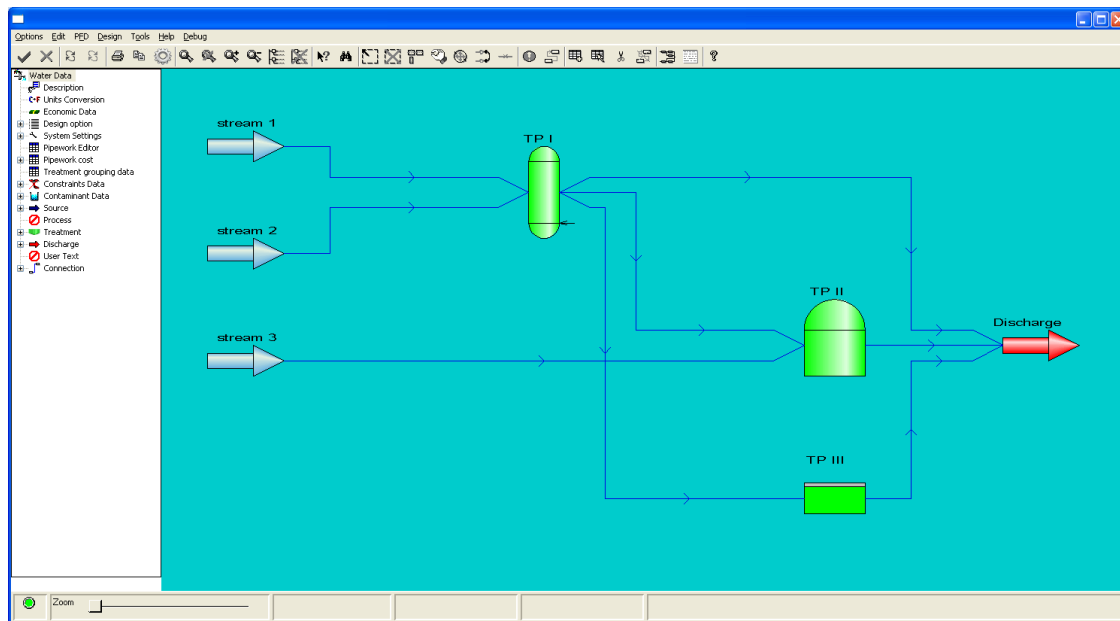
## Regeneration of Water

Once the re-use of water has been maximised, further reduction can only be brought about by the regeneration of wastewater. The regeneration can in principle be any reaction or separation process that removes the contamination, which would otherwise prevent its further use. Once regenerated, the water can either be re-used or recycled. In regeneration re-use any water used by an operation is not allowed to re-enter the same operation. In regeneration recycling, the water can enter the same operation many times. It is important to distinguish between these cases, as recycling can sometimes be undesirable. **WATER** allows the cases for regeneration reuse and regeneration recycling to be examined and compared.



## Automatic Design of Effluent Treatment Networks

Once water use has been minimised the resulting effluent must be disposed of at minimum cost, whilst meeting environmental discharge regulations. Effluents should be segregated for treatment where appropriate and only mixed where appropriate. If this policy is adopted, the design becomes distributed rather than centralised. **WATER** can design effluent treatment networks automatically for minimum cost. The designer maintains control over network complexity and constraints relating to maximum and minimum flowrates, forbidden matches and water losses/gains in treatment operations.



## Pipe-work and Sewer Costs in Network Design

Not only can **WATER** include capital costs associated with regeneration and treatment processes, but the cost of connecting operations associated with running new pipes and sewers can also be included. These costs are included with the freshwater costs and other capital costs in the overall trade-off. It is important to include pipe-work and sewer costs as these have a profound influence over the network structure and complexity.