DNV·GL

Screenshots

TARO

Plant wide reliability simulation with Taro software

1. Logic Network and Reliability Block Diagrams

The first and most important step in the modelling process is to generate a logic network of the system under investigation. A logic network can be considered as a Block Flow Diagram (BFD) which defines the connectivity of nodes and focuses on the production aspects of the system e.g. flow rates and product mass balances. Taro provides a user-friendly interface and many tools that make the process of building the BFDs very efficient and intuitive.
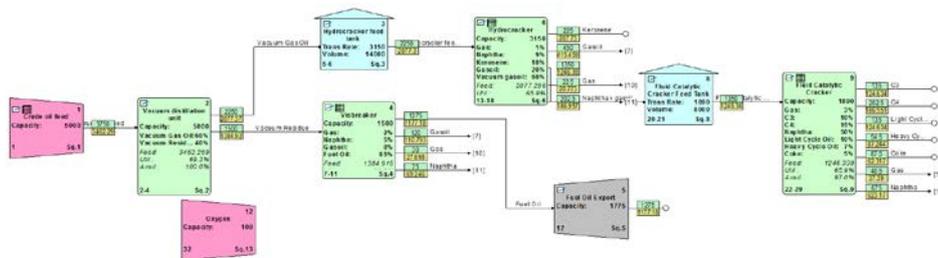
Figure 1: Block Flow Diagram (BFD)

Each node within the network will require its own RBD which identifies the system's components and their operating mode.
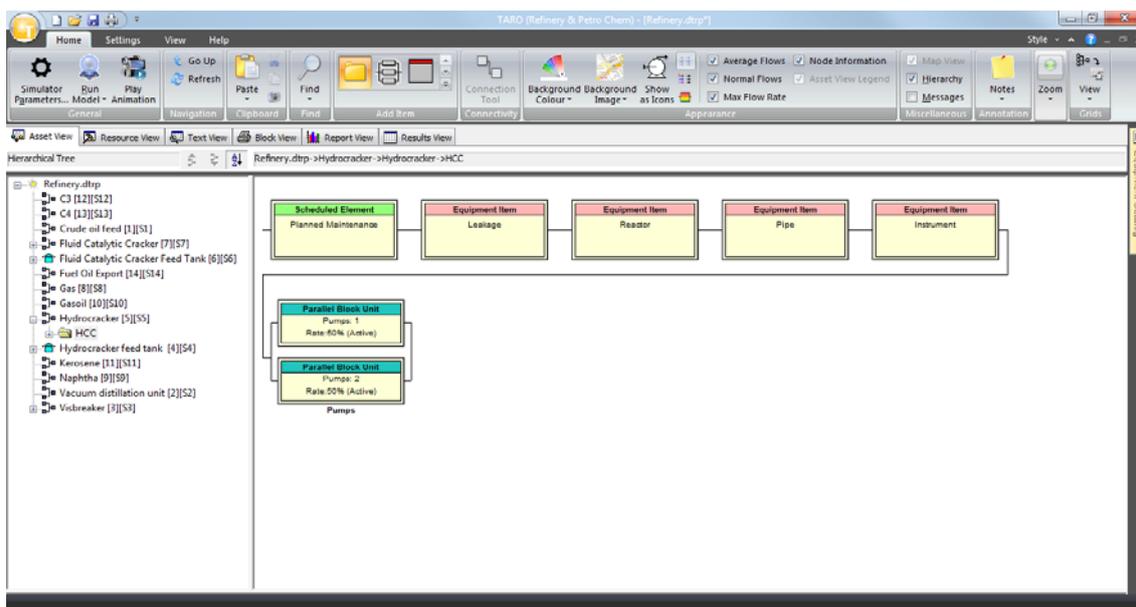
Figure 2: Reliability Block Diagram view of a model in Taro

The classical Reliability Block Diagram can be converted to an Equipment view at any point during the modelling.
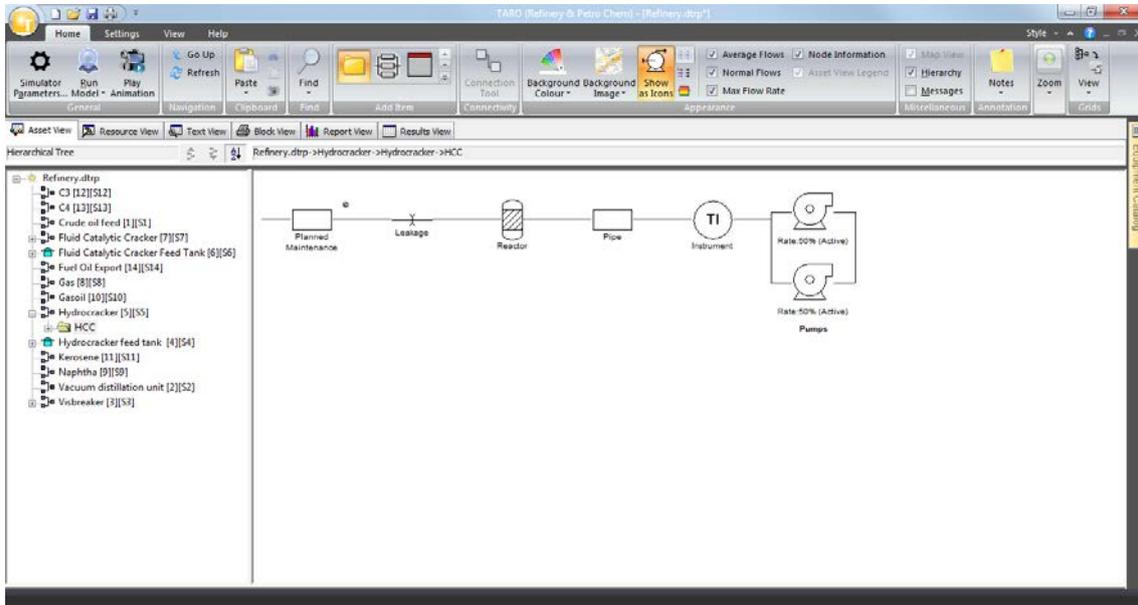
Figure 3: The classical Reliability Block Diagram can be viewed in its Equipment form at any point during the modelling

2. Equipment Catalogue

The Equipment Catalogue is a repository for items used during the construction of a model. In order to build a model, the user must simply drag the items to the working space. The Equipment catalogue contains a vast range of pre-defined equipment but the user can also add new equipment and create its own catalogue. This catalogue can also be used to create a database, which can be shared with other users, of the most widely manipulated equipment including reliability data (failure and repair modes).
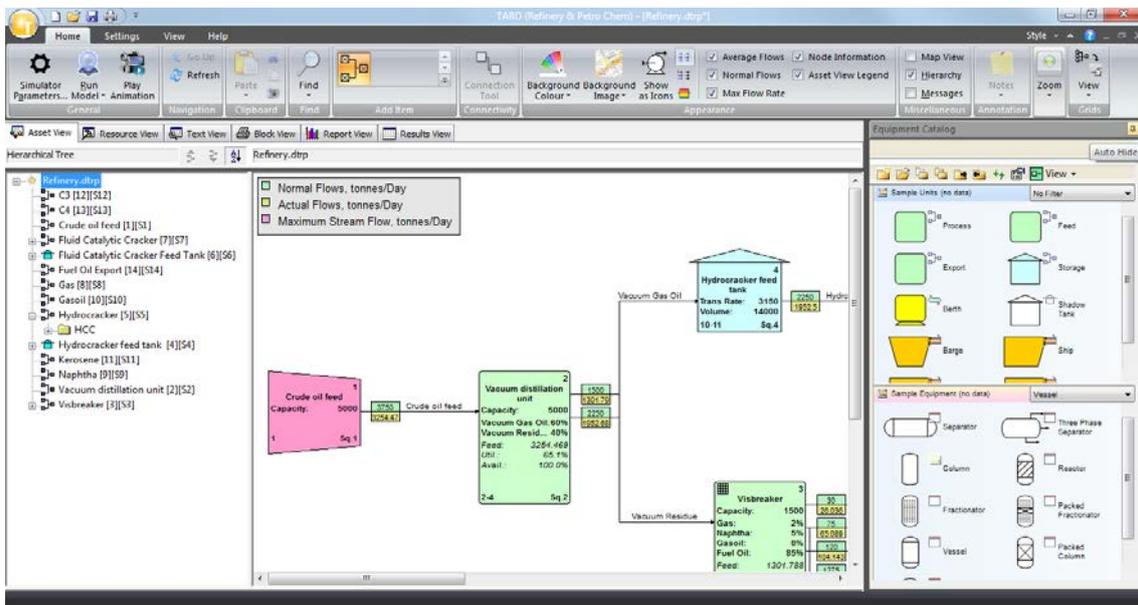
Figure 4: At the right side of the screen, it is possible to see the Equipment Catalogue

3. Data management and grids

The Equipment Catalogue is a repository for items used during the construction of a model. In order to build a model, the user must simply drag the items to the workspace. The Equipment Catalogue contains a vast range of pre-defined equipment but the user can also add new equipment and create their own catalogue. Catalogues of the most widely manipulated equipment including reliability data (failure and repairs modes) can be shares with other users.

Figure 5: Example of usability of Taro

Currently, there are seven table views available: Asset, Flow grid, Equipment grid, Scheduled Activities, Conditional grid, Parallel Blocks grid and Resource grid.

4. Powerful logistics and storage modelling

One of the many strengths of Taro is the ability to handle multiple feedstock and product streams along with complex buffer and operational strategies. The Bulk Transport Logistics feature covers all types of transport systems that involve movement of batches of products from suppliers to customers. Taro has been specifically developed for the modelling of refining and petrochemical plants in which the production efficiency is a complex interaction between reliability, maintainability, blending and yield rules, flow routing and intermediate storage options.

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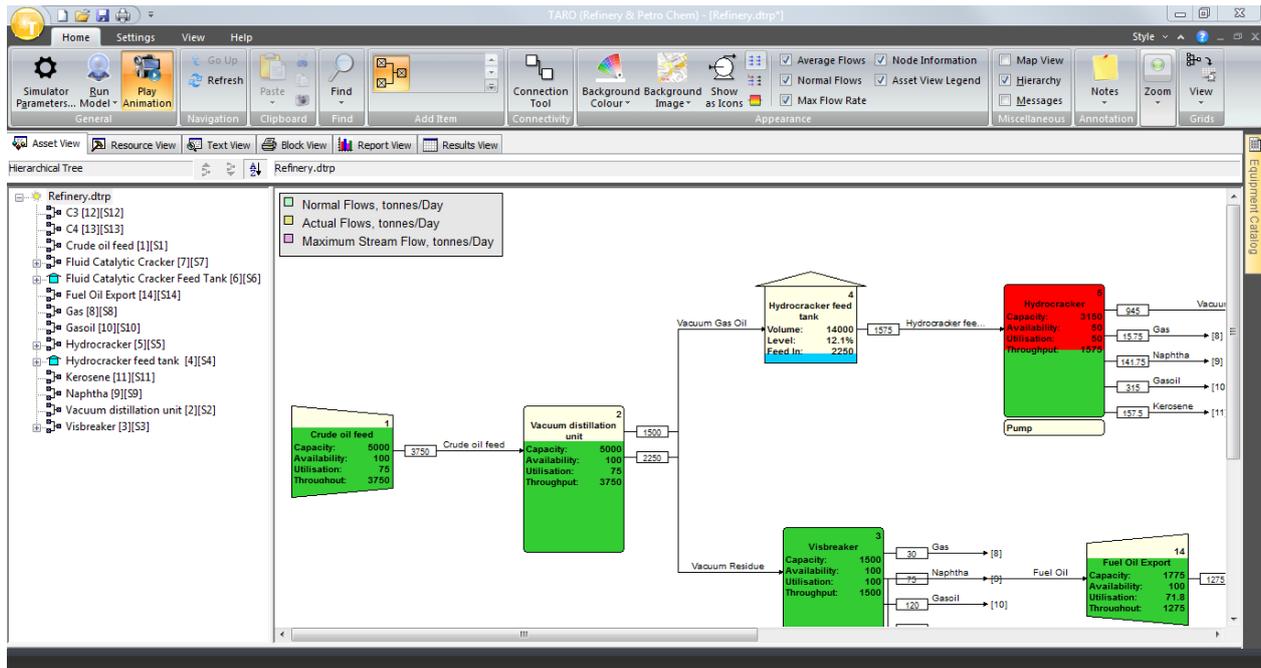
Figure 6: Example of the flow animation which visually describes how the production is affected by a certain failure (indicated by the red tank)

5. Failure Distribution and Repair Distribution

The software comprises the analysis-critical failure and repair distributions commonly used in RAM analysis.
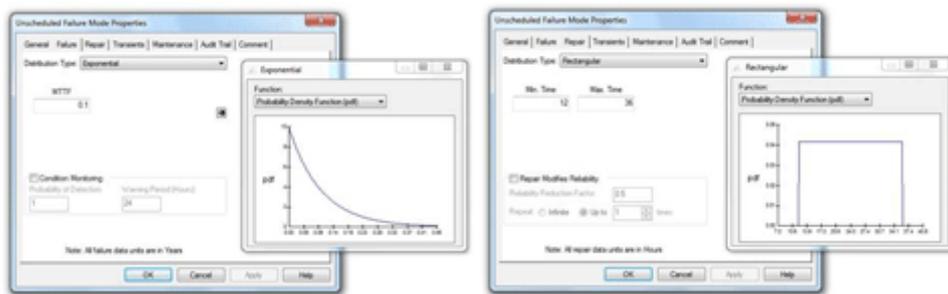
Figure - Examples of Exponential and Rectangular failure probability distribution profiles shown from the extensive library

6. Result Viewer

Taro offers a large range of summary results which can be drilled down into for more detailed analysis.
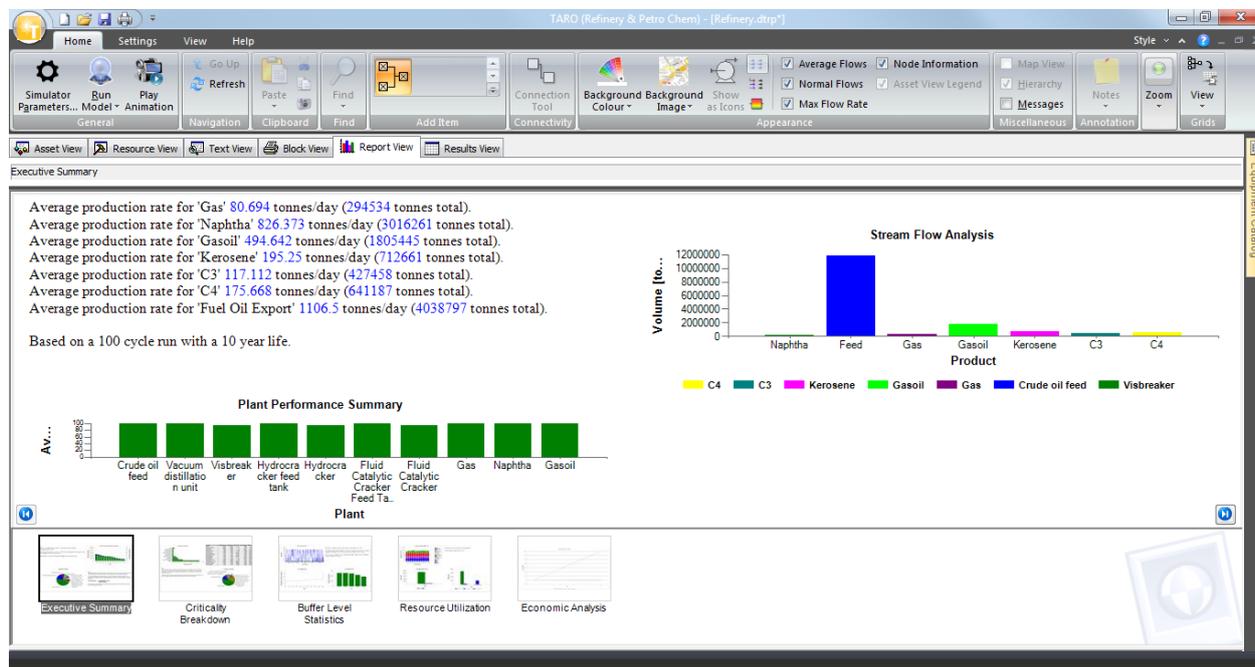
Figure 7: Results tab showing Buffer level statistics

The main focus of Taro is the quantification of units' availability and utilisation. Taro can also be used to generate detailed project operating expenditures based upon the expected behaviour of a system over its life, with accurate consideration given to proposed or existing maintenance strategies, future modifications/developments, third party involvement, etc.

7. Sensitivity Manager

Sensitivity Manager allows users to manage all the scenarios that need to investigate to ensure optimum performance. The application comes with a batch run functionality which empowers users to run multiple projects. Computers with multi-core processors will have the option to run multiple project files in parallel saving potentially a lot of time, depending on the number of processor cores available to be used and the number of projects to be simulated.

The base case can visualise using Maros and Taro Viewer – a read-only version of Maros and Taro. This ensures that the user has access to identify potential problems before changing any specific set of parameters.

Upon selection of the base case, a number of sensitivities can be defined. The sensitivities range from storage tank sizes to modification of reliability data.

Upon completion of the multi-core run, users have two options to visualise the results:

- The traditional Results Viewer in both Maros and Taro which compile all the key performance indicators of the base case

- A comparison view which compared the main KPIs of all the sensitivity models pre-defined by the user
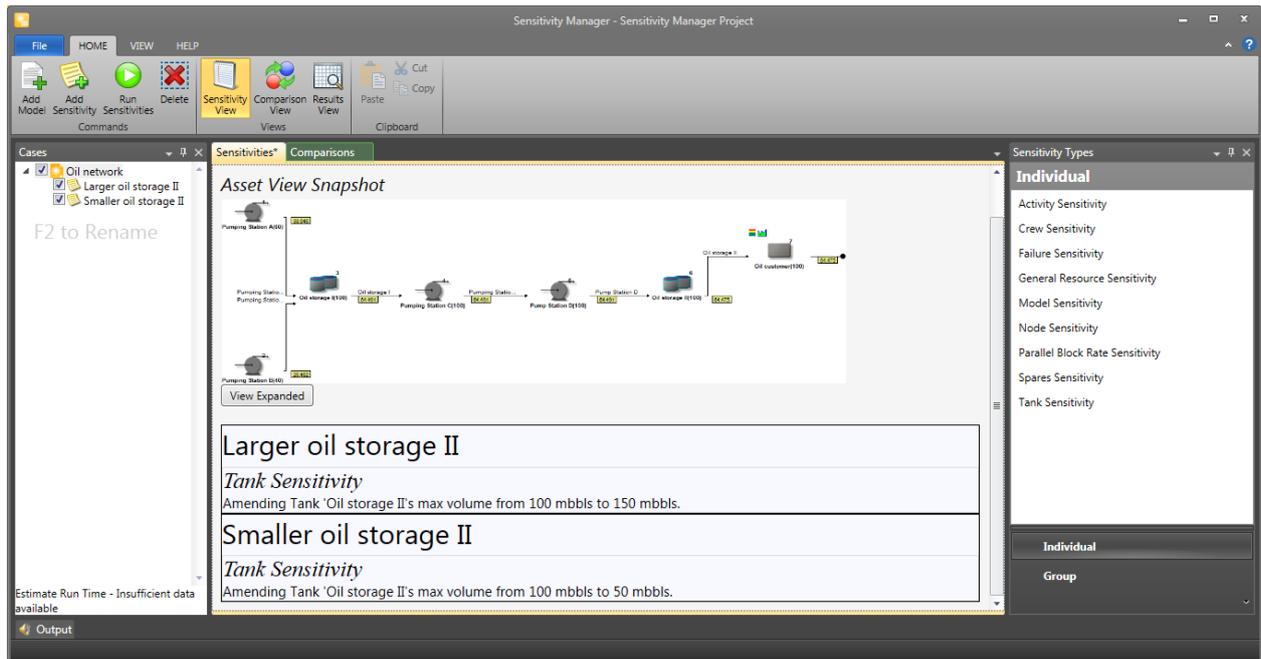
Figure 8: Sensitivity Manager