BatchMaster
A scheduling and mass balance program

ABB BatchMaster enables you to specify a process schedule and evaluate its production rate.

It has been developed, used and tested in a batch-manufacturing environment to enable engineers to evaluate new processes and investigate the effect of changes on existing ones.

One of the classic problems for a process engineer working in the batch process industries (typically Pharmaceuticals and Speciality Chemicals) is the conversion of a chemist’s recipe into a formal batch schedule that will enable manufacture of the chemical in a real process plant. The problem requires the engineer to allocate the steps to the particular equipment available and then work out just how long a single batch will take. The important parameter is the cycle time - the time between the start of successive batches. Halving the cycle time doubles production, doubling it, halves production.

This problem can be posed as a formal optimization problem, but as it involves integer / choice variables, formal techniques for solution are time-consuming and very sensitive to the size of the problem. The approach taken in Batchmaster is to provide extremely fast evaluation of a new schedule and powerful editing tools to enable the engineer to explore the possibilities. This has the advantage over automatic optimization that it gives the engineer a feel for the nature of the particular problem, which will lead to a better solution.

The product
ABB BatchMaster helps engineers in the batch process industries develop schedules to manufacture their products. Input to the program is the recipe for the process together with allocation of steps to process items, and output is a detailed schedule showing exactly when each step will be performed in order to minimize the cycle time between batches.

Features include:
- The ability to reallocate steps to different vessels
- Scale the process to fit in the equipment available
- Study complex recycle structures

After each change the user can see exactly what the new overall production rate will be, and can examine the detailed process statistics and the Gantt Chart showing the history of the batches (see diagram overleaf).

The program is small, easy to use, and fast to calculate, allowing the engineer to carry out rapid siting studies for new processes, and to study possible ways of expanding capacity of existing processes.
The main process schedule is input and edited using a spreadsheet like tool:

Where appropriate, cells contain drop-down lists to help selection of the correct option, and those containing numbers with dimensional units allow input in any consistent unit. For example, in the Mass column above typing 2.3 kg or 2.3 lb will be instantly converted to the current set used by the program.

The calculation immediately displays the resultant bar chart and cycle time, and reports can be displayed giving details of the mass balance:

Other reports available show the percent utilisation of the equipment items, which items are limiting, the raw materials usage, and production rate. To enable rapid evaluation of process modifications global changes can be made to:

- Reallocate a section of the process to a new vessel
- Scale a section of the process in order to fill a vessel to a particular level

These enable very rapid evaluation of possible changes, such as adding an extra vessel to debottleneck the schedule.