The gold standard for worldwide batch processing control, ISA-88, has had widespread impact in the process sectors which use batch operations. **Dave Emerson** explains the standard and the advantages it can hold for engineers and operators

Standardising batch control

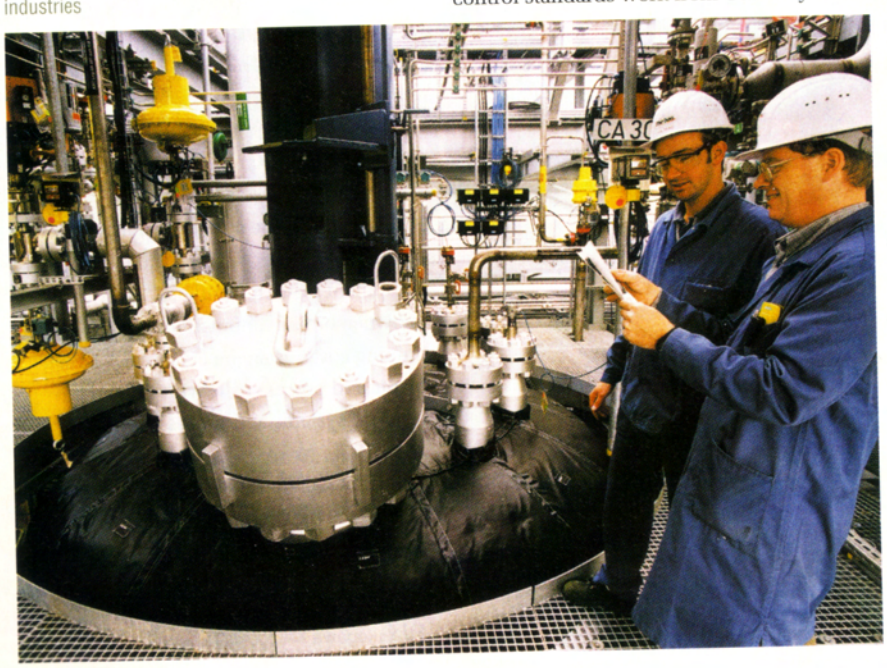
The ISA-88 batch control standard has had a profound and unifying impact on the batch processing industry. Its influence is steadily being felt beyond the classic domain of batch process control.

Even before the ISA-88 standard was formally released by The World Batch Forum (WBF) in January 1995, operating companies were using draft versions as the basis of specifications for batch control systems, and batch control system vendors were using it as the basis for new batch control system software. Once the standard was released, its use in industry increased. It is now the norm for batch control in Europe and the Americas and is steadily being adopted in Asia.

This widespread acceptance is due to the value it provides to operating companies, and the convergence of previous batch control standards work from Germany and the US. It represents guidelines produced through the several regional assemblies, to provide a truly global standard.

Following the release of ISA-88 Part 1, many of the members of the SP88 committee formed the non-profit World Batch Forum (WBF) in order to promote and educate the industry regarding ISA-88. The WBF, and especially its conferences, continues to be the premier organisation for promoting the ISA-88 standard worldwide.

ISA-88 is a multi-part standard. To date, three parts have been released. Part 1, which defines models and terminology for batch control, is the best known and most widely used. Of the models defined in this part of the standard, the control procedural, physical and activity models are part of virtually every batch control vendor's sales presentations and product documentation. Moreover, many operating companies have established internal standards based upon them and use them as part of their specifications and internal procedures.



Batch operations are used in many sectors of the process industries, but are mainly concentrated at the high-value end: active pharmaceutical ingredients, fine and speciality chemicals, and performance products. The ISA-88 standard is applicable across the whole range of products and industries

Basic concepts

The basic concepts of ISA-88 Part 1 have proven to be very powerful when applied to manufacturing, both batch and non-batch processes. For example, the concept of separation of product and process specifications refers to recipes. In batch processes, recipes are used to specify how a product is produced. If a recipe is kept separate from the process or equipment details, then the work required to implement the recipe and control the process can also be separated.

This approach allows equipment changes to be accomplished with minimal changes to the recipe. Similarly, product changes and

introductions can be accomplished without requiring costly and engineering-intensive effort to re-implement equipment logic in the recipe. Many operators have experienced savings in product introductions and changeover as a result of separating product and process specifications.

Modular approach

The separation of product and process specifications leads to the use of a modular technique for both recipe and equipment specifications. ISA-88 provides a means for creating modular recipes. It states that a recipe contains five categories of information: the header, containing information about the purpose, source and version of the recipe; the formula, giving the data values (process inputs, process parameters and process outputs) used during the production of a batch; the equipment requirements, detailing the specification used to constrain the choice of equipment to be used for a batch; the procedure, or strategy for carrying out a process; and a final category containing other batch processing support information which is not contained in the other components of the recipe.

Process engineers can benefit from these principles by using the equipment model as the centrepiece of designing a plant. The identification of the pieces of equipment, how they are connected, how material may flow and the capabilities required of each object are vital design criteria. When this modular approach is used the handover of designs from process engineers to automation engineers is also much easier.

ISA-88 Part 2 contains three main items: an overall data model for batch control; relational tables for batch information exchange; and procedure function chart (PFC) definition, which is a 'vendor-neutral' means to define recipe procedures.

The data model and relational tables provide a statement of the organisation and inter-relationships of the batch models and terminology defined in Part 1. This work has been used to create further standards and interfaces such as OPC for Batch, the Batch Markup Language (BatchML), ISA-88 Part 3 and the on-going Part 4 work.

Part 3 of the standard defines how recipes can be used to specify the capabilities, material movements and processing required to create a product before the recipe is associated with specific equipment. Multi-site companies can use site and general recipes to create generic product recipes that are then sent to each site's control systems.

Generic product recipes benefit companies by providing more consistent products produced at different sites. When product changes are made or new products are introduced this lowers costs and improves product roll-out.

The use of ISA-88 is evident whenever one visits a trade show or examines a batch control system supplier's offerings. In both cases ISA-88 will be mentioned prominently since virtually every system product is based upon the standard.

More important are the benefits that operating companies are now gaining from the standard. These can be demonstrated by examining the proceedings of the WBF conferences over the last few years. Many well-known operating companies in the chemicals and pharmaceuticals sectors, such as AstraZeneca, BASF, Du Pont, GlaxoSmithKline, Procter & Gamble and Unilever, have described how they use and have benefited from the ISA-88 standard.

Next steps

Through the 1990s, most batch control system vendors enhanced their batch system software products, or introduced new products, to more closely align them with the ISA-88 standard. Today we are seeing the next step in new and revised products, as companies start to introduce ISA-88 based batch historians and Plant Information Management Systems (PIMS). One example is the Exaquantum/Batch PIMS introduced by Yokogawa in 2003.

In addition to the actual standard and the numerous products based upon it, the ISA-88 standard has enabled new batch oriented interfaces to be developed. Two examples of these are the OPC Foundation's OPC Batch interface and the World Batch Forum's Batch Markup Language (BatchML) XML schema, which are now starting to be adopted.

The benefits of the ISA-88 standard are best represented by testimonials by operating companies. Some of the benefits they have attributed to the standard are: quicker time to market as a result of reduced effort required to build plants; the modular approach, which allows operators to create recipe and equipment logic in parallel; a lower total cost of ownership for automation; and reduced training costs, as engineers move between plants and process cells with different vendors' systems and processes. PE

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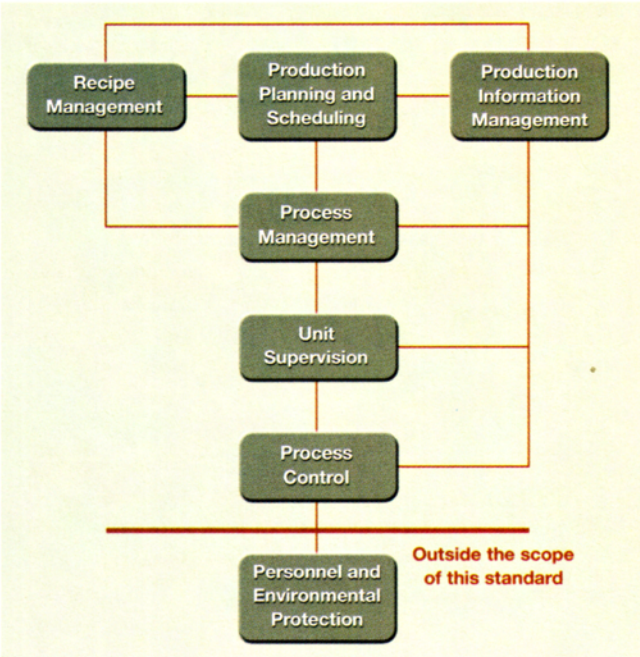

The ISA-88 standard covers most aspects of batch control, allowing operators to assemble modular recipes which can be moved from one set of equipment to another

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