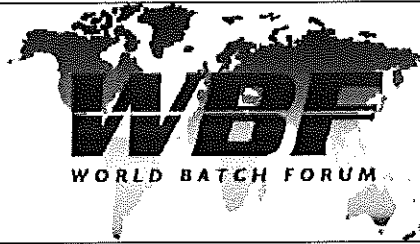


White Paper written for
World Batch Forum
October 2004



900 Fox Valley Drive, Suite 204
Longwood, FL 32779-2552, USA
Phone: +1 (407) 774-5764
Fax +1 (407) 774-6751
E-mail: info@wbf.org
www.wbf.org

White Paper ISA 95 for Beginners

Charlotta Johnsson
Dept. of Automatic Control
LTH, Lund University
Box 118, 22100 Lund
Sweden

Are you interested in or curious about Manufacturing Systems, MES, enterprise-control system integration, ISA 95, then this whitepaper is for you.

In the following three pages you will learn the basics about enterprise-control system integration and ISA 95 and you will understand how you can benefit from knowing them. For a deeper understanding I recommend you to read the other whitepapers in this series as well as reading the ISA 95 standard.

ISA 95 is a standard. But what is a standard?

A standard does not tell you what you have to do (regulations do), but rather what you should do in order to be successful. A standard has normally been developed with lots of thought and with input from many-many people with different knowledge and experience, i.e. a standard contains common and good knowledge.

ISA 95 is a standard for enterprise-control system integration. But what is enterprise-control system integration?

Very roughly, one classification that can be done for industrial systems is to classify them as enterprise systems or control systems. What differs an enterprise system from a control system is the functionalities and the timeframes they are working within.

In the beginning of the 21st century a standard - ISA 95 - was developed and published, focusing on Enterprise-Control System Integration and Manufacturing Operations. It defines terminology and concepts that make design and operation of manufacturing plants easier and facilitates enterprise-control systems integration.

ISA 95 is based upon the *The Purdue Enterprise Reference Architecture (PERA)*, the *ISA S88 standard* and the *MESA models*.

The ISA 95 standard currently consists of three parts:

- ANSI/ISA S95.00.01-2000 Enterprise-Control System Integration Part1: Models and Terminology
- ANSI/ISA S95.00.02-2001 Enterprise-Control System Integration Part2: Object Model Attributes.
- ANSI/ISA S95.00.03-(draft17) Enterprise-Control System Integration Part3: Activity Models of Manufacturing Operations Management.

Additional parts are under consideration.

In order to understand the set of standard, it is important to know the main concepts;

1. How to classify the systems you have within an Enterprise's (Functional Model)
2. How to model what you have within your Enterprise (Equipment Model)
3. What information needs to be exchanged between the Enterprise systems and the Control systems (Categories of Information and Resources)
4. What activities are needed within the Manufacturing Operations system (Activity Models)

Each part of the standard is about 150 pages long, it takes a while to read but it is worth the effort.

ISA S95 provides values for you

The standard is being used by the vendor community as well as of the end-user community, integrators and academia. Independently of which of these groups you belong to, you can benefit from knowing its content.

First, the standard does not target a specific industry nisch, it is broad enough to cover both batch processing, discrete manufacturing and continuous industries.

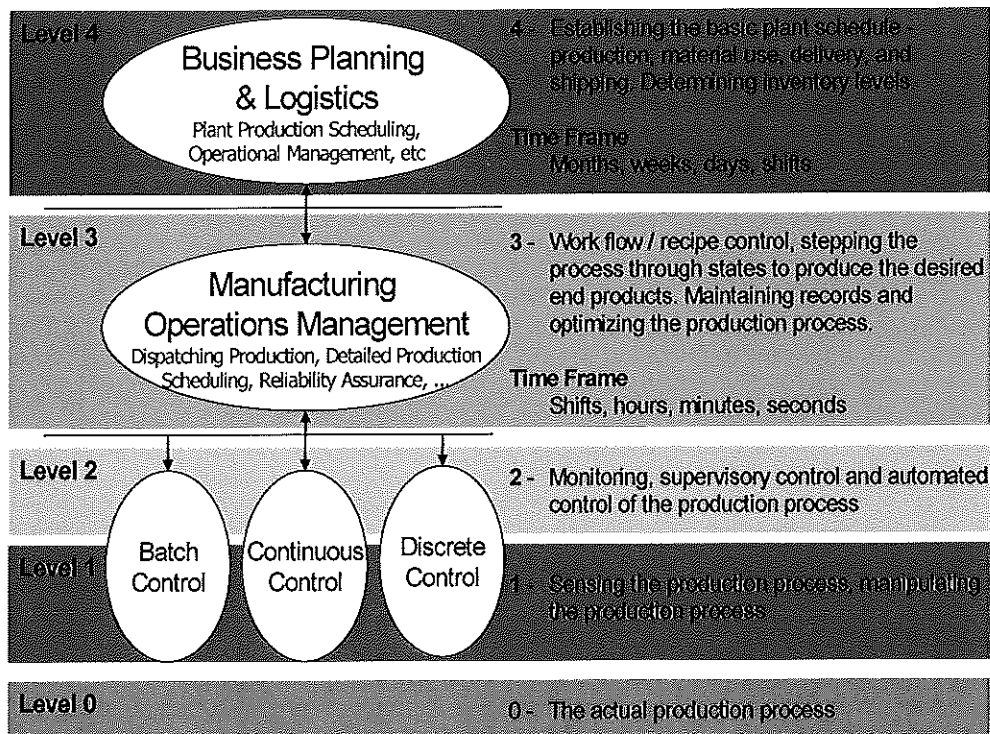
Secondly, ISA 95 offers standard terminology, with the objective of improving communication. In this way different people don't use different terms for the same thing, or the same term for different things. Difficulties in communication can cost time and money, or even worse, it can cause failures.

Third, the standard has been developed by a large group of people with different backgrounds, working with different aspects of the Enterprise-control system integration topic. The collective knowledge of this group is unbeatable and there is no need to "reinvent the wheel". What this group has agreed upon is probably the best solution concerning models and terminology to be successfully used.

ISA S95 basic concepts

So which are the basic concepts presented in ISA 95?

Industrial systems can generally be divided in different functional categories depending upon its focus, as presented by the **functional model**. This is a hierarchical model with 4 levels, see figure below (i.e., figure 3 in ISA S95 Part1).



The functional model represents the functional view of a company, i.e., which system is doing what task. Another view is the equipment view, representing a company according to its physical structure. The **physical model** provides you with terminology and a hierarchy than can be applied on the physical equipments within the company. In the physical model, the highest level is the Enterprise, An enterprise consists of one or several Sites, a site consists of one or several Areas. The terminology used for the lower levels varies depending upon the type of industry they apply to (batch, continuous, or discrete). Below the Area we have process cell (batch) production unit (continuous) and production line (discrete).

Between the Enterprise systems and the control systems, information has to be exchanged. To be more precise the information should be exchanged between the enterprise system (compare level 4 in figure 1) and the part of the Control system referred to as the Manufacturing Operations System (compare level 3 in figure 1). The information that should be exchanged can be divided into 4 **categories of information**; product definition, production capability, production schedule, production performance. Each one contains information about the **resources**, i.e., about personnel, material, equipment and process segments.

Part 1 and part 2 of the standard defines the information that should be exchanged, whereas part 3 of the standard focuses upon the activities needed within the Manufacturing Operations system (level 3 in figure 1). The manufacturing operations are divided into 4 groups, production operations, maintenance operations, quality operations and inventory operations. Each of the operation is presented with an **activity model**, detailing the set of activities that are required for manufacturing.

More info

The standard can be purchased from ISA (www.isa.org), the organization that manages the development of the standard. The international version of ISA S95 is called IEC 62264 and is available from the International Electrotechnical Commission (www.iec.ch). World Batch Forum provides valuable information and they organize conferences, web seminars, etc related to e.g., manufacturing operations. Their site, www.wbf.org, is recommended.

