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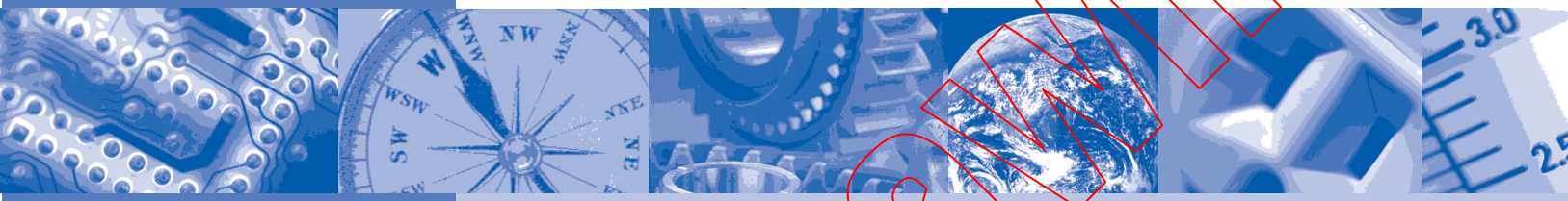

Batch Control Part 3: General and Site Recipe Models and Representation

Approved 14 March 2003

ISA–The Instrumentation, Systems, and Automation Society

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

BATCH CONTROL –

Part 3: General and site recipe models and representation

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This document has been structured to follow IEC (International Electrotechnical Commission) guidelines. Therefore,the first three clauses discuss the *Scope* of the standard, *Normative References*, and *Definitions*, in that order.

Clause 4, *Recipe Description*, is informative.

Clause 5 is normative. The intent of this clause is to describe the contents of general and site recipes.

Clause 6 is normative. The intent of the clause is to describe an object model of general and site recipes.

Clause 7 is normative. The intent of this clause is to describe a symbolic language for general and site recipe depiction.

Clause 8 is informative. The intent of this clause is to describe some aspects of general or site to master recipe transformation.

The annexes are informative.

This document is intended for those who are:

a) responsible for defining product processing requirements;

b) involved in designing and/or operating batch manufacturing processes;

c) responsible for specifying controls and the associated application programs for batch manufacturing plants;

d) involved in the design and marketing of products in the area of batch control; or

e) use product information for the purposes of manufacturing or managing the manufacture of product.

ISA Introduction

ANSI/ISA-88.01-1995, Batch Control Part 1: Models and Terminology (referred to as Part 1 throughout this document) provides models and terminology applicable to batch control. ANSI/ISA88.00.02-2001, Batch Control Part 2: Data Structures and Guidelines for Languages (referred to as Part 2 throughout this document) addresses data structures and guidelines for languages. This Part 3 defines additional information on general and site recipes. Clause 4 of this document contains definitions of general and site recipes in greater detail than in Part 1. Clause 5 defines detailed description of the contents of general and site recipes. Clause 6 defines a data model that identifies objects and relationships that were addressed in Clauses 4 and 5. Clause 7 defines a method for depiction of general and site recipes that can be used for both simple and complex processing requirements, using both a tabular and a graphical notation. Clause 8 describes some aspects of general or site to master recipe transformation. The annexes provide complementary information.

Although this document is intended primarily for batch processes, it may have considerable value for other types of processes as well.

BATCH CONTROL –

Part 3: General and site recipe models and representation

1 Scope

This PAS on Batch Control defines a model for general and site recipes; the activities that describe the use of general and site recipes within a company and across companies; a representation of general and site recipes; and a data model of general and site recipes.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ANSI/ISA-88.01-1995, *Batch Control Part 1: Models and Terminology* (referred to in this PAS as "Part 1").

ANSI/ISA-88.00.02-2001, *Batch Control Part 2: Data Structures and Guidelines for Languages* (referred to in this PAS as "Part 2").

IEC 61512-1:1997, *Batch Control — Part 1: Models and Terminology*.

IEC 61512-2: 2001, *Batch Control — Part 2: Data Structures and Guidelines for Languages*.

ANSI/ISA-95.00.01-2000, *Enterprise-Control System Integration Part 1: Models and Terminology.*

ANSI/ISA-95.00.02-2001, *Enterprise-Control System Integration Part 2: Object Model Attributes.*

IEC 60050-351:1998, *International Electrotechnical Vocabulary — Part 351: Automatic Control.*

ISO/IEC 19501:2004, *Information Technology — Open Distributed Processing — Unified Modeling Language (UML) Version 1.4.2*

3 Definitions

For the purposes of this PAS, the following definitions apply. Definitions and concepts expressed in the Part 1 and Part 2 standards (IEC 61512-1 and 61512-2 respectively) apply, except where differences are explicitly stated in this PAS. Definitions in IEC 60050-351:1998 were also used as a basis.

3.1 equipment-independent recipe:
a super class of a recipe type that is independent of equipment and follows the procedural model of general recipes.

3.2 master recipe transform component:
part of a master recipe that is used in the transformation of an equipment-independent recipe into a complete master recipe.

3.3 process procedure chart (PPC):
a method for the graphical representation of equipment-independent recipes.

3.4 product family:
a set of produced materials that are related by manufacturing business policy.

3.5 product grades:
a collection of similar materials with some variations in properties.

4 Recipe description

4.1 Recipe types

As defined in the recipe model of the Part 1 standard, a recipe is an entity that contains the minimum set of information that uniquely defines the manufacturing requirements for a specific product. Recipes provide a way to describe products and how those products are produced.

Four types of recipes are defined in Part 1: general recipe, site recipe, master recipe, and control recipe. There are substantial differences between general/site and master/control recipes. General/site recipes describe the equipment-independent processing requirements to make a specific product. Master/control recipes describe the specific actions required with specific equipment to make a batch of product.

Additional information on the four recipe types is defined the Part 1 standard.

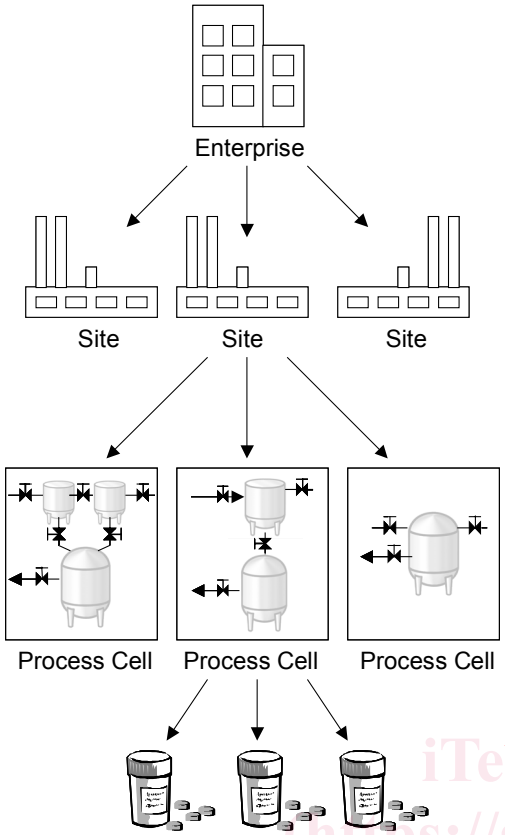
4.2 General and site recipe description

4.2.1 Manufacturing information

General and site recipes are sources of information for the development of process cell-specific master recipes. Their purpose is to describe manufacturing information without regard to specific manufacturing equipment. They describe, in manufacturing terms, the materials, equipment requirements, chemical transformations, and physical transformations required to manufacture a product.

4.2.2 Multiple site definitions

General and site recipes are intended to define processing requirements that can be carried out in differently constructed process cells and that can be valid in multiple areas and multiple sites, as shown in figure 1. In some circumstances, general recipes can even be used to convey product-manufacturing information across multiple enterprises.



One **General Recipe** per produced material, maintained at the enterprise level.
For example, 1000 company wide products

One **Site Recipe** per site and produced material, maintained at the site for local materials, language, or segment of production.
For example, 10,000 site recipes for 10 sites

One **Master Recipe** per Process Cell and produced material.
For example, 50,000 master recipes for 5 process cells per site.

One **Control Recipe** per batch.
For example, 1,000,000 batches per year.
Describes the custom options and formula values for one specific batch of product.

Figure 1 - Recipe hierarchy example

There are generally fewer general and site recipes in a manufacturing enterprise than master recipes. For example, a small specialty chemical company can have 1,000 general recipes, and 10,000 site recipes for 10 production sites. The company can have 50,000 master recipes, assuming an average of 5 process cells per site that can manufacture the products. Large companies can have thousands of products and millions of master recipes. A single change to a general recipe can result in changes to hundreds of master recipes.

4.2.3 Expansion and collapsing of the recipe type hierarchy

The general and site recipe hierarchy can be expanded or collapsed to meet an enterprise's needs. For example, a company might only have general recipes and not site recipes. Alternately, a company could include another level of equipment-independent recipes below the site recipe that is specific to an area within a site.

4.3 Equipment-independent recipes

4.3.1 Equipment-independent recipe subtypes

General and site recipes are subtypes of a general class of equipment-independent recipes. They have the same structure, information, and display, but they differ by their use within a company, based on company policies.

4.3.2 Activities of equipment-independent recipes

There are multiple possible implementations of equipment-independent recipes within a company. Two commonly used approaches are defined here, one in which equipment-independent recipes are used as input to trial or pilot plant production, another in which equipment-independent recipes are generated as a result of trial or pilot plant production. These approaches are defined for product manufacturing; they do not necessarily apply to other areas of the enterprise, such as research and development (R&D), but the concepts can be beneficial in other areas.

In the examples, the recipes are identified as General Recipes, but they can be any type of equipment-independent recipe.

Development of equipment-independent recipes is typically an iterative process so there will be feedback loops throughout both processes. For simplicity, the multiple feedback loops have not been shown in figure 2 and figure 3.

4.3.3 Input to trial or pilot production

Figure 2 illustrates the activities associated with the generation and use of equipment-independent recipes as an input to trial or pilot plant production.

In this usage scenario, a company generates equipment-independent recipes that are the definitions given to the trial or pilot plant operation. The equipment-independent recipes are converted to master recipes that match the pilot plant equipment layout and the process is scaled up and validated.