# INTEGRATION OF GENERAL MASTER RECIPE MODELING INTO PROCESS SYSTEM ONTOLOGY FOR IMPROVED AUTOMATION

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The globalization of trade has brought forth new opportunities to process industries since new markets are available, but also poses serious threats regarding the entrance of new competitors. Thus, increasingly stricter regulations and customer requirements motivate the adoption of advanced methods and tools to integrate and optimize decisions from different levels along the enterprise structure. In this sense, an ontological framework allows to establish a common modeling environment as well as to coordinate the information exchange among the different modeling paradigms/conventions currently used. This work focuses on the use of such framework at operational level.

An ontology based model consists of a semantic model which represents a given domain of knowledge. It contains classes (or sets), attributes (or properties) and relationships (or relations among class members). Thus, a high level of the domain knowledge and skill is required. As a result, the ontology provides with a rich framework for integrating features stemming from different parts of the domain. The enterprise structure has been traditionally split in different levels in order to tackle its complexity. However, decisions at one level may be highly related to information from other decision levels. Therefore, the use of an ontology allows to simplify those sharing tasks.

Concerning processing, as well-known, equipment actions must occur in a defined sequence. Precisely, the definition of a particular sequence of actions to be implemented is the primary function of a recipe. A recipe is defined as the necessary set of information that uniquely identifies the production requirements for a specific product (ANSI/ISA 88). In other words, a recipe describes how to combine ingredients (raw materials) using equipment (physical model) to make a product.

In this work a master recipe is targeted to a processing area and is derived from either a general or site recipe. Master recipes depend on equipment types or classes, such as a glass-lined reactor or mixing vessel. These recipes can contain product-specific information required for detailed scheduling, such as equipment requirements. A master recipe is the template for recipes used to create individual batches. Without this template, no specific batch recipes can be created, and therefore, no batches can be produced.

Regarding the above described, there is a high potential when an enough general model of a recipe is developed. This potential refers to the capacity of structured data that are contained at this level of the process, and the improved model capability to transform data into quality information by using a single framework that captures the features of several decision levels.