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Background information

Weihenstephan, June 2, 2016

500 years of the German Purity Law

Robofill 4.0 research project – robot-based filling concept for customized beverage supply

The growing expectation among consumers for ever more customized products is placing manufacturers under enormous cost pressure, as dwindling batch sizes are leading to an ever increasing amount of unproductive time spent resetting. The “RoboFill 4.0” concept offers a solution: This research project aims to provide a new kind of flexible automation concept for the economical filling of customized bottles and containers in batch sizes as small as one.

The digital revolution is not only changing consumer behavior but also the way producers operate. What this means for the beverage industry is that the market is demanding ever new types and sizes of bottle, different container grades and customized labeling. But the production technologies and marketing structures customary to date permit hardly any customization of small batch volumes and frequent changes of format. The same applies to existing automation concepts. While production facilities may be networked under the IT pyramid schemes introduced already decades ago, these operate in rigid succession and are tied to predefined structures. This also applies to the individual production units, which can neither operate independently nor be networked with cloud-based services without considerable investment of time and effort. Any low-cost method of creating greater flexibility in production can only succeed if the rigid linear mechanical and IT networking of machines used for beverage filling is made smarter and more modular in structure.

Research product for a highly flexible material flow

The “RoboFill 4.0” research project run by the Technical University of Munich, the Fraunhofer IWU Institute and various industrial partner companies seeks to address this issue by developing an adaptable, flexibly upgradable filling and material flow concept and a distributed control concept. This will take charge of coordinating the

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system's different modules, which have each been equipped with artificial intelligence. The concept envisages development of all the plant elements as cyber-physical system components which are capable of continuous communication both with each other and with higher-level systems using network and cloud technologies. This approach reflects the Industrie 4.0 paradigm which envisages the provision of a wide range of new services and offerings designed to allow machines and processes to plan and optimize themselves. Customer requirements and production orders are synchronized and the relevant production planning and control processes performed using a virtual twin of the production environment in the cloud. This entails the distributed, structured intelligence accessing the statuses of the individual system elements (for instance, the capacity utilization status of a filling module) and situatively including this data in the design of the process sequence. Smart objects network with IT standards and carry all the necessary characteristic, production and logistic information they require in their own memories. These are read by the machines which are then informed about where the object originates from, where it is going and how it is to be produced. This allows a product being manufactured to independently and intelligently control its own filling process. In contrast to the rigidly configured and controlled filling lines traditionally used in the beverage industry, this creates extremely flexible processing stations controlled by products equipped with their own intelligence.

The project partners

The current project consortium is made up of the Chair of Brewing and Beverage Technology (TUM), the Chair of Food Packaging Technology (TUM), the Fraunhofer IWU Institute Project Group RMV, Bavarian State Brewery Weihenstephan, infoteam Software AG, Krones AG, ProLeiT AG, Siemens AG, Till GmbH, Yaskawa Europe GmbH and Zimmer Group. Scientific and administrative coordination is performed in cooperation between the Chair of Brewing and Beverage Technology and the Chair of Food Packaging Technology, as well as the Fraunhofer IWU Institute, Project Group RMV. The research project entails the design and engineering of a demonstrator plant which encompasses all the necessary functionalities. The hardware and software components are developed in line with given technological and economic framework conditions and assessed in terms of their efficiency, sustainability and security. The project is intended to create a decisive competitive

benefit specifically for small and medium-sized enterprises vis-à-vis globally operating manufacturers.

This background information and further material are available at www.siemens.com/press/500-years-reinheitsgebot

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