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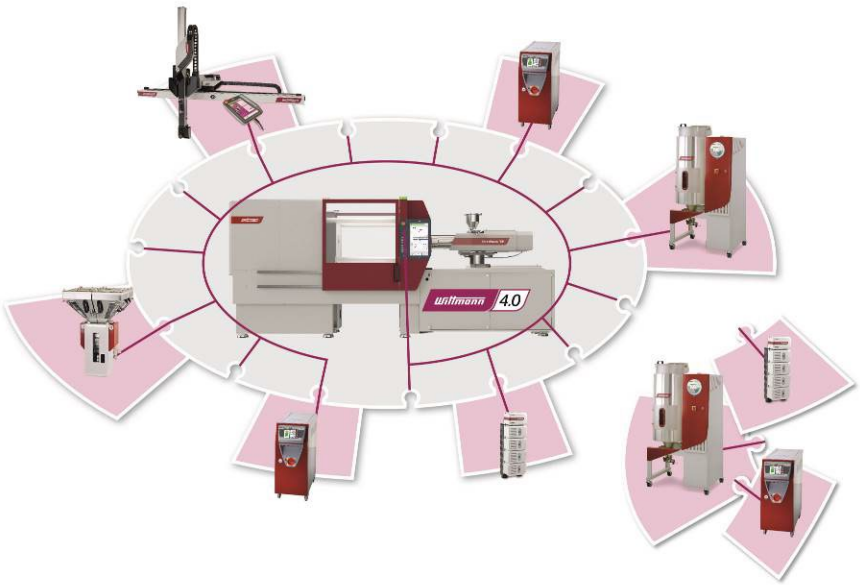
WITTMANN Competence Days 2024: increasing productivity with plug & produce – reaching next higher service level with novel AI-based solution

Digitalization is playing a more and more significant part in efficiency, quality standards and sustainability and has thus become an important competitive factor. But not just any digitalization. The potential can only be exploited in a profitable way if the digital solutions fit the company and the requirements and processes involved. WITTMANN has therefore given its digital product portfolio a modular structure and included counseling in the scope of delivery. At the WITTMANN Competence Days 2024 to be staged in Vienna in June, the company will present innovative solutions together with solutions already proven in practice and open up a new chapter by presenting its first KI-based application.



Within the Smart Work Cell network, all components of the production cell exchange information and coordinate their functions with the objective of reaching the maximum possible overall efficiency.

Digitalization is playing an increasingly significant part in all daily life, work and application areas. For instance, with their intelligent assistance systems, integrated service functions and infotainment options, our cars have long since become something like mobile computer centers. Working with machines and equipment in the plastics industry these days creates a very similar feeling. Yet the injection molding industry is facing some very industry-specific challenges when it comes to digitizing its operating and working processes.

In contrast to a modern automobile, however, an injection molding processing plant contains a random collection of different machines, appliances and software products acquired at various times and often coming from different suppliers. Accordingly, there are many different control system generations and operating logic variants as well as numerous different options to be handled.

So, the key to achieving maximum end-to-end digitalization and integration of all systems is designing digital solutions with a modular concept.

With Wittman 4.0, the WITTMANN Group has a modular library comprising numerous Industry 4.0 technologies to cover all four sectors of the Smart Factory – Smart Machine, Smart Work Cell, Smart Production and Smart Service.

Smart Machine – on course to the self-optimizing machine

Digitalization starts on the level of individual machines. Here, financial advantages can often be achieved with only minor investments. The objective is self-optimizing production. To this end, assistance systems are used, which continuously analyze quality-relevant process parameters, detect any deviations within fractions of a second and balance them out within the same cycle. In this way, a stable injection molding process with consistent high product quality is maintained despite fluctuations in environmental conditions, operating resources or raw materials.

In many cases, the assistance systems perform functions impossible to perform for humans. Previously, many irregularities in the production process could only be identified and remedied after scrap parts were detected. In contrast, the assistance systems intervene before even a single scrap part is produced. In this way, they contribute significantly to sustainability by reducing energy and raw material consumption.

The assistance systems also ensure transparency. They enable machine operators to view and analyze all measured values and use them for process optimization.

For injection molding machines, WITTMANN distinguishes between two groups of assistance systems. HiQ is the designation for systems active during plasticizing and injection. HiQ Flow, for example, detects viscosity fluctuations in the melt and automatically adjusts the changeover point and the holding pressure phase accordingly.

Assistance systems in action around the mold closing process and the mold bear the name Expert. One example is Expert StepForce for step-by-step clamping force build-up, to facilitate venting via the mold parting line and ensure homogeneous filling of the cavity.

Smart Work Cell – injection molding production speaks OPC UA

The Smart Work Cell goes beyond the scope of integration via the internal control system of the appliances. While the Industrial Internet of Things (IIoT) was limited to the level of machinery for a long time, standardized interfaces and communication protocols now make it possible to link up all components of a production cell with each other. In this way, injection molding machines, robots, auxiliaries and other systems and applications exchange information with each other to coordinate their operations. The result is higher overall efficiency and often a quality improvement as well. The integration system also simplifies perfect data storage and tracing, which can be a decisive criterion for awarding contracts, for example in the automotive and medical technology industries.

Just as IEEE-802 standards brought about the global breakthrough in the development of the Internet, the OPC UA communication protocol has now established itself as the global standard for the plastics industry. In Europe, the mechanical engineering umbrella organization EUROMAP is the strongest driver of this development.

WITTMANN used OPC-UA technology already at a very early stage and now offers a flexible platform for the installation of integrated injection molding cells by the name of Wittmann 4.0. In this context, flexible means that plastics processors can put together their work cells according to their own individual needs and still achieve a consistent data communication system.

A special feature of WITTMANN is that all system components required for injection molding processes are available from a single source, which enables particularly extensive exploitation of the efficiency potential – from granulate preparation and feeding, injection molding, mold tempering, automation, in-line recycling and integration of the production cell into higher-level IT systems.

An essential part of each Wittmann 4.0 cell is its separate work cell control system, the Wittmann 4.0 router, which performs various communication tasks and protective functions. The protective functions include the firewall, which shields the control systems of the machine and the appliances from the outside world. In an integrated WITTMANN cell, communication consists of more than just exchange of quality-relevant parameter settings and operating data. It also covers common user rights and language settings specified by the injection molding machine for all connected appliances. In this way, Wittmann 4.0 facilitates start-up and operation of the production cell and reduces the risk of errors, as manual entries are no longer required.

Thanks to complete integration, a plug & produce system is no longer a dream, but reality. The basis here is the digital mold data sheet. Already during the second setup, the injection molding machine recognizes the mold and automatically sets the optimal process parameters recorded in the mold data sheet –not only on the injection molding machine itself, but also on the robot and all auxiliary appliances connected to it. This drastically reduces setup times and thus extends the work cell's productive time.

Inside an integrated cell, the Wittmann 4.0 also has some further tasks. To enable flexible connection and disconnection, it allocates individual IP addresses to all system components and at all times keeps available a list of all systems currently present inside the work cell. The injection molding machine is able to request this list from the router and thus automatically provide access to individual components of the work cell. A temperature controller, for example, will recognize following log-on to a new router that it has been moved to a different work cell. After automatic addition to the list of participants and allocation to the correct slot inside the machine, the temperature controller is available for production.

Smart Production – seamless integration of the entire machinery

With its own MES, specially developed for the injection molding industry, the WITTMANN Group even goes a step further when it comes to integration. Temi+ paves the way to extremely easy intuitive integration across the entire fleet of machinery, plus integration into adjacent departments such as logistics or procurement. The data collected can be directly synchronized with the ERP system, for real-time monitoring of the production processes, efficient planning of capacities and resources and meaningful analyses of production data. In this way, the MES ensures transparency and delivers KPI figures relevant for business management.

Smart Service – AI becomes a gamechanger –AIM4Help is the first application

The advantages of digital service products became particularly apparent during the Corona pandemic. Tools for remote servicing and online support experienced a veritable boom. Via its web service, the WITTMANN Group offers access to pooled expert knowledge independent of location and time. About 70 per cent of all technical assignments concerning injection molding machines can be accomplished via remote access. This not only reduces service costs, but simultaneously increases the availability of production systems.

At the WITTMANN Competence Days 2024 being held in Vienna in mid-June, Smart Service will be lifted to its next higher level. With AIM4Help, artificial intelligence (AI) will be used in a first application as a knowledge-based expert system for technical inquiries and troubleshooting. AIM4Help is being made available as a first-level support system via a web portal, and it offers multiple possibilities of support, for example with mold settings or sequence programming for robots. The AI system is being trained by all documentations, descriptions, technical documents, charts and error analyses that WITTMANN has created throughout its entire corporate history. The WITTMANN software developers have optimized the training data to achieve high efficiency in answering inquiries and a high hit rate. Visitors to the Competence Days will be able to try out AIM4Help live.

An extensive database also provides support in the area of maintenance and servicing in an effort to increase efficiency. Thanks to status-based preventive maintenance, downtimes are reduced to a minimum. An example for condition monitoring is the “health factor” developed by WITTMANN, which provides information about the “state of health” of the servo-hydraulic axes, from which, in turn, the condition of the pump can be derived. The axis-related key figures calculated from the health factor take into account a large number of real-time process parameters for each drive shaft, as well as trend values. If the key figure for a particular axis shows anomalies, this is an indicator of wear on this axis. If the key figures of all axes are changing, the cause may be a pump defect.
The calculation of actual condition data makes it possible to plan servicing and repairs ahead of time. The required spare parts can be ordered in time, and the ensuing machine standstill can be scheduled exactly and kept short.

WITTMANN continues to invest regularly in the further development of digital products and solutions, and to promote jointly with partner companies the standardization of interfaces and communication protocols. Artificial intelligence, in particular, still offers enormous unexploited potential.

The WITTMANN Group

The WITTMANN Group is a globally leading manufacturer of injection molding machines, robots and auxiliary equipment for processing a great variety of plasticizable materials – both plastic and non-plastic. The group of companies has its headquarters in Vienna, Austria and consists of two main divisions: WITTMANN BATTENFELD and WITTMANN. Following the principles of environmental protection, conservation of resources and circular economy, the WITTMANN Group engages in state-of-the-art process technology for maximum energy efficiency in injection molding, and in processing standard materials and materials with a high content of recyclates and renewable raw materials. The products of the WITTMANN Group are designed for horizontal and vertical integration into a Smart Factory and can be interlinked to form an intelligent production cell.

The companies of the group jointly operate ten production plants in six countries, and the additional sales companies at their 36 different locations are present in all major industrial markets around the world.

WITTMANN BATTENFELD pursues the continued strengthening of its market position as a manufacturer of injection molding machines and supplier of comprehensive modern machine technology in modular design. The product range of WITTMANN includes robots and automation systems, material handling systems, dryers, gravimetric and volumetric blenders, granulators, temperature controllers and chillers. The combination of the individual areas under the umbrella of the WITTMANN Group enables perfect integration – to the advantage of injection molding processors with an increasing demand for seamless interlocking of processing machines, automation and auxiliaries.

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