Industrie 4.0

Initial situation
The demand for individualised plastic products is increasing. The production of small batches without impairing economic efficiency or availability is a genuine challenge. Combining injection moulding, additive manufacturing and Industrie 4.0 technologies should make it economically viable to individualise large-volume products in single-unit batches in a flexible, automated, cyberphysical production system.

Solution
A fully networked and automated production cell will be used to demonstrate the manufacture of individualised office scissors in series, for example. An ALLROUNDER injection moulding machine and a freeformer for additive manufacturing are linked by means of a seven-axis robot. When entering their orders, users will create their own individual lettering on a tablet PC and choose from one of four types of scissors. The data will be registered in digital form and high-volume production will start automatically. A data matrix (DM) code turns every product into an information carrier. In the next step, the freeformer will apply the 3D plastic lettering in an additive process. The ARBURG host computer system, ALS, plays a central role in registering the parameters and passing them on to a web server. The product, process and quality data can be retrieved from the product-specific website in the cloud by means of the code using mobile devices.

Benefits at a glance
- Increased added value, production efficiency and process reliability
- A more flexible and efficient high-volume process for individual parts or multi-variant small-volume batches
- Online data archiving, documentation of quality assurance and traceability of parts

Individualised high-volume plastic products
Initial situation
Successful machine manufacturers set trends and are developing dynamically. They specify the applied technology exactly according to the needs of the respective machine. In mobile hydraulics, annual purchase quantities of a few thousand pieces for highly integrated hydraulic, filtration and tank solutions are the rule.

Solution
ARGO-HYTOS has recognized this trend and has followed the concept of “ZERO SET-UP TIME” for several years. Through the use of networked components, “production facilities 4.0” are developed in our own plant engineering. Such as the “Laser Cube 4.0” which has been put into operation at the factory in Kraichtal, Germany, in December 2015.

The “Laser Cube 4.0” has been optimized for flexibility and cost reduction in the manufacture of highly integrated plastic system and plastic tank solutions. The flexible configuration of the system consists of interconnected core components which communicate with each other partly directly and partly via a machine controller. The on a moderate industrial robot mounted laser head can freely move in space and thereby weld even complex geometries in different welding levels. The sophisticated laser optics allows both the laser transmitted light welding as well as the quasi-simultaneous welding of plastic parts, sequentially in one welding operation. An in the plant control system integrated online monitoring and control of temperature in the melt ensures optimum welding results at maximum welding speed.

Benefits at a glance
- Possibility to economically realize even small quantities of customized highly integrated plastic system and plastic tank solutions
- A maximum in flexibility and independence of component geometries
- Targeted tuning of the system functions
Initial situation
Consistent virtual engineering is a precondition for Industrie 4.0. This is a principle followed by “Smart Engineering and Production 4.0” – the technology network from Eplan, Phoenix Contact and Rittal. “Thermal Design Integration” informs control cabinet designers about the functionality, performance limitations and integration options in climate control systems. Efficient solutions can then be developed in an intuitive and simple way while avoiding “hot spots”.

Solution
Using “Thermal Design Integration”, components in Eplan Pro Panel are coloured differently according to their heat-load capacities. Designers receive information on how heat-load densities are distributed throughout the cabinet. All the required information is made available as device data through the “EPLAN Data Portal” – both for active components and connectors. Phoenix Contact is the first manufacturer to provide device data – such as maximum heat loss, minimum spacing and flow directions – entirely within the portal as part of “Smart Engineering and Production 4.0”.

Benefits at a glance
• Visualisation of functionality, performance limitations and integration options of different climate control systems
• Information on the air inlet/outlet for climate control components and the resulting air flows
• Quick identification of parts that require extra cooling to enable optimal positioning of climate control components
• Visualisation of the main device parameters to identify airflow-specific reserved areas.

More information available under: www.SEAP40.com
**“Consistent R&D” – Creating new processes in product development**

**Initial situation**
Many companies have optimized their production process by making continual improvements. But there is still a lot of untapped potential in product development. This applies both to the design of a systematic process as well as the quality of content when developing new products.

**Solution**
Techniciency has developed a holistic approach that differs strongly from “Lean Development”. It enables companies to benefit in the future from “Industrie 4.0”. This process, which is called “Consistent R&D”, has the following features:

- All business units play an active role in development.
- Product development requirements and production requirements are weighted equally by corporate management.
- Development and production merge – the company becomes a “development factory”.
- Competence and authority are concentrated in small, freely operating teams.

Product development cycle times can be reduced drastically through the highly developed integration of information. Results can be incorporated directly. Greater amounts of information can be integrated into newly formed parts, for example.

**Benefits at a glance**
- Shortens the development process by up to 25 %.
- Takes into account the additional revenue potential in holistic indicators (e.g. “Total Value Matrix”). Sustainability aspects are already incorporated during product development.
- Greatly increases flexibility, as the close integration of development and production promotes a new way of working.
- Supports corporate management to be product oriented, viewing the value added holistically.