

Industrie_Integrator: Integrated Sensor Effects/bypassing in Smart Manufacturing Processes

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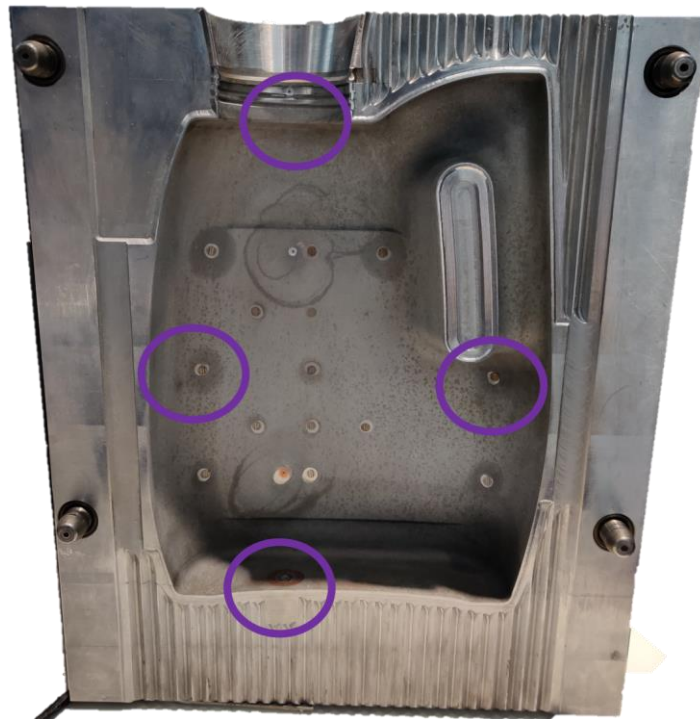
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Graphical Abstract

Through a tool-integrated array of nontactile sensors unique insights into the inner cavity while ongoing blow-moulding processes are possible.



Abstract

Blow moulding hollow plastic parts, is a specific manufacturing process, used all over the world. Despite decades of development, certain aspects of the process are still inefficient and therefore main cause of unnecessary efforts. Especially the amount of time needed to cool down earlier heated plastics, in order to realize stable products, implies a huge amount of inefficiency. Regarding the market change towards short production cycles and therewith required high frequency of heating and cooling operations, the need for additional value-added solutions is higher than ever.

Therefore, the reduction of required cycle time of each production process is an effective lever for decreasing downtime and raise productivity. The Key to solve the outlined situation is the **approach of a sensor- and logic-integrated tool for direct process control** in blow mould cavities themselves. Thereby top of the line blow mould equipment is fitted with specialized measuring and control devices to substitute the manual and potentially flawed setup processes.

The special application of this technology is essential through the extremely limited space between the level of the machine, the extrusion line and the tool itself. So, a non-machine-invasive smart tool was designed and equipped with almost imperceptible arrays of miniaturized sensors (temperature, pressure, conductivity, ...). This was combined with a novel logic board-concept to manipulate sensor data streams near to real-time as random-access memory function.

The already obtained results indicate a major probability that prototypical successful trials can be scaled to industrial level and therefore be used as a smart retrofit solution in industry 4.0 orientated SME. The main benefit addressed by the approach is the elimination of manual handling flaws and unproductive downtime by retrofit a microcontroller-based sensor/actuator bond fully integrated in the blow moulding tool itself as smart tool.

Keywords: IoT, smart tool, blow moulding, self-calibration.

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Biography of Presenting Author



As CEO of the INNOVATOR_INSTITUT GmbH [IN²] **Dr.-Ing. Dennis Bakir** leads and represents the independent, commercial research company “Institute for applied SME-Innovation” since 2015. After his studies of *Sales Engineering and Product Management*, he earned his doctoral degree in mechanical engineering while leading the research project: “Resource-efficient interlinked Production-Systems in Breweries”. Next to gaining essential insights through his consultancy career he established the INNOVATOR_INSTITUT.

Main area of actions is best described as inventors and implementers of modern solutions, finally used by willing-to-change SME’s. Instead of mere

consultancy the INNOVATOR_INSTITUT is known for the deliverance of practicable and highly efficient solutions in terms of smart solutions, combined with Industry 4.0 approaches.

The staff of colleagues is dominated by engineers, technicians as well as business economist, to ensure multi-faceted and market-fit developments. For Dr. Bakir academia and research activities are shining and valuable source of knowledge but not only xxx. [IN²] itself acts as a development-promoting partner of mid-tier businesses. Among others, the Institute is directly authorized and promoted by the German Federal Ministry for Economic Affairs and Energy to support SME.

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