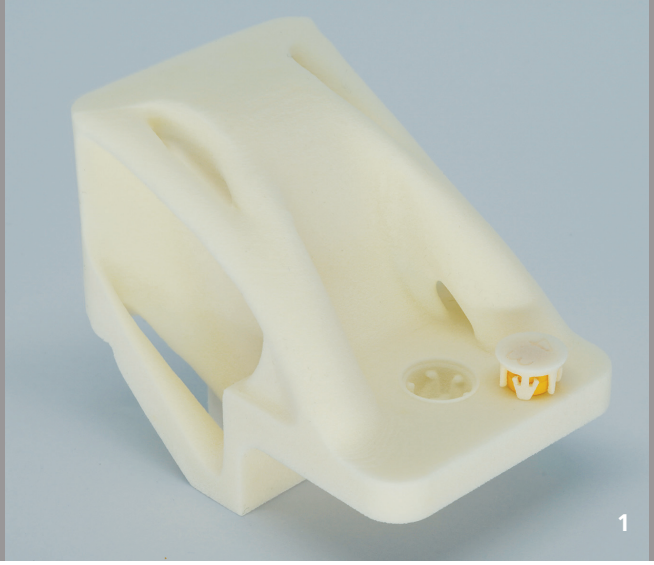

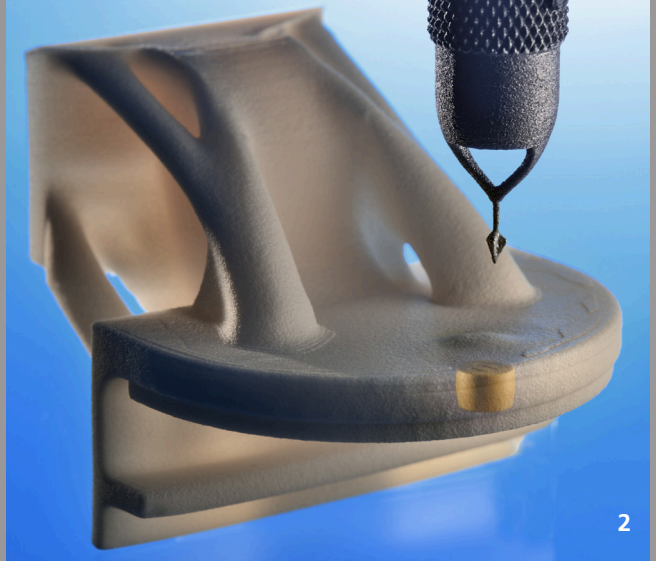

Subject to alterations in specifications and other technical information. 06/2022.

IN-SITU INTEGRATION OF SENSORS WITH AM TO IDENTIFY COMPONENTS

Task

RFID chips are an effective means of protecting components against counterfeiting and make it easy to digitally track aircraft components and assign them to the correct step in the production process. By using additive manufacturing processes, the industry can reduce work steps, but also irreversibly integrate an RFID chip into the component. In order to make in-situ integration possible, however, the laser sintering process must be modified.

Method

Research needs to develop design guidelines on the chips' readout probability and investigate how this process will influence the mechanical properties of the components. This way, the RFID chips can be integrated in additively manufactured aircraft components in a space-saving, robust and secure manner. For process development, Fraunhofer ILT has determined the geometric constraints such as maximum wall thickness and size of the required cavity. In addition to sensor integration by means of geometric solutions, it has worked out how feasible in-situ integration in plastic components is and what effect the required process interruption has on the component.

Results

RFID chips can be integrated into PA 12 components both by a geometric solution after the build process and in situ. For the geometric solution, barbs are used to integrate the shuttle-receiver approach, which is flush and irreversible. The in-situ integration requires a process interruption during which the powder is extracted from a cavity inserted into the part, and the RFID chip is inserted into the cavity. The build process is then continued. The required cavity size is the chip size +1 mm. A process interruption of less than 5 min does not impair the mechanical component properties. The maximum wall thickness for reliable reading of the RFID chip for components made of PA 12 is 10 mm.

Applications

The integration of RFID chips and other sensors in additively manufactured components enables digital component tracking, which simplifies logistics and makes piracy more difficult. In addition, integrated sensors can be used to measure environmental parameters such as temperature or pressure, e.g. in medical technology and the automotive industry.

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1 Shuttle-receiver approach as a geometric integration solution.
2 Component after in-situ chip integration with AM-manufactured suction tip.