

Apium M220

Cost- and time-efficient manufacture of implants

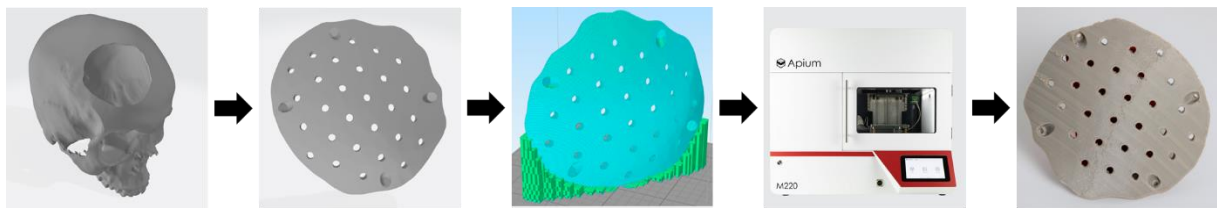
Case study



Apium
Additive Technologies GmbH

Additive manufacturing is a cost- and time-saving process for single parts and small series production. Within the additive manufacturing industry, there is one particular technology which has become highly advantageous for the medical sector: the material extrusion process. Through this technology it is now possible to manufacture implants and prosthetics with the Apium M220 3D printing machine. The thermoplastic PEEK (polyether-ether-ketone) has established its position as a suitable material for long-term implants and prosthetics. This material is ideal for the material extrusion process in order to manufacture mechanically resilient parts.

Process integration



The technology can be easily integrated into existing processes. Data used to reconstruct defects are converted into a machine code that results in component generation in the M220. In addition to manufacturing the implant, the printer also logs temperature curves, batch number of the material and orientation of the part in the printer. The closed-loop machine control provides high component quality and the integrated camera detects problems that could occur during the printing process. This data is used for quality control. The patented temperature management, the integrated air filter system and the selection of high-quality materials in the build volume are specially designed for the production of medical components.

Manufacturing advantages with material extrusion

Using the example of a patient-specific skull implant, the time and cost savings compared to a conventionally manufactured implant are demonstrated.

In a static test, the skull implant could be loaded with 2.99 kN on a small area before the component cracked. A human skull withstands a force of 2.88 kN in a comparable test [1].

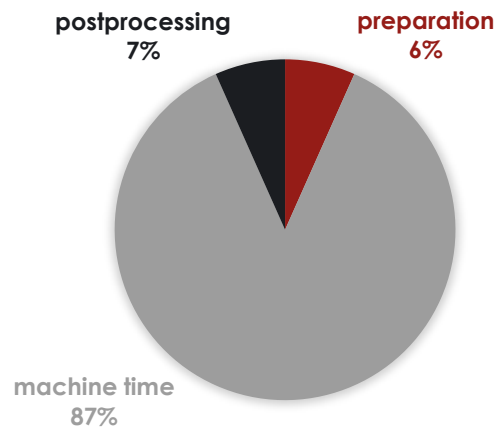


	MILLING	3D PRINTED
MATERIAL USAGE	831,60€ / 475g	352,75€ / 49g
MANUFACTURING	464€ / 0:25 hrs	20,96€ / 6:30 hrs
PREPARATION	210€ / 6:00 hrs	17,50€ / 0:30 hrs
POSTPROCESSING	-	17,50€ / 0:30 hrs
TOTAL TIME	6:25 hrs	7:30 hrs
TOTAL COSTS	1505,60€ (100%) offer from SRM AG	408,71€ (~27%)

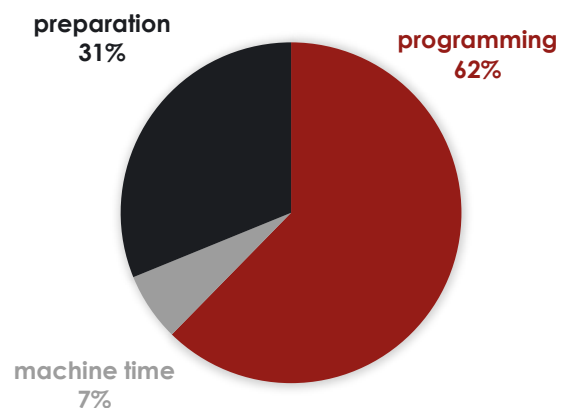
Conclusion

- **83% working time reduction**
- **73% cost reduction**
- ISO 13485 includable
- Medical devices grade III producible
- Detailed print protocols for quality control

TIME DISTRIBUTION 3D-PRINTING



TIME DISTRIBUTION MILLING



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References

[1] C. Van Lierde, B. Depreitere, J. Vander Sloten, R. Van Audekercke, G. Van Der Perre und J. Goffin, „Skull biomechanics: The energy absorbability of the human skull frontal bone during fracture under quasi-static loading,“ Journal of Applied Biomaterials & Biomechanics, 2003.