Watertight Innovation

POLYJET TECHNOLOGY PROPELS HIGH-REQUIREMENT PROTOTYPING

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– Avi Zelig, Arad Group

CASE STUDY

3D printed injection molds created in Digital ABS material.

A leader in the field of water-measurement solutions, the Arad Group (Arad) designs, manufactures and sells cutting-edge water meters to residential, bulk, irrigation and water-management companies around the world. The company manufactures more than 500,000 units a year, and operates an in-house manufacturing plant using a sophisticated testing and quality-control method.

To increase its competitive edge, Arad looked to PolyJet™ 3D Printing to help develop smart water meters. Bringing the technology in-house means quickly 3D printing prototypes. More interestingly, it also enables Arad to 3D print injection molds for low-volume runs, which means functional testing can take place with the intended production material and process.

3D Printed Injection Molds

Demanding requirements govern the design, testing and production of the watertight components that protect electronics. The ultrasonic welding required to seal the parts together can only be tested on real components in the final material, typically produced using an aluminum test mold or even the final steel mold. These metal molds cost $5,000-$20,000 and take four weeks to three months to produce. If the welding trial reveals needed design improvements, the mold-making process starts again and the cost multiplies.

Instead, Arad now creates injection molds using its PolyJet 3D Printer. The design includes a step joint for the welding process, which provides high strength and good aesthetics since the welding melt partially encapsulates the joint. The molds are 3D printed using Digital ABS™ material in four parts: the core, cavity and two inserts to create the negative draft. The total printing time is just 10 hours.

Ready for Welding

After the injection molds are printed, the male and female parts are mounted on an injection molding machine and injected using two different materials for testing: Grilamid TR90 (amorphous nylon) and ABS 757. Once the parts are injected, they are welded together for a watertight fit with the electronic components inside.

“3D printing injection molds enabled us to quickly produce functional prototypes that we could test in the field, dramatically reducing our time to market, which is absolutely vital in this competitive industry,” Avi Zelig, Arad Group mechanical engineer, said.

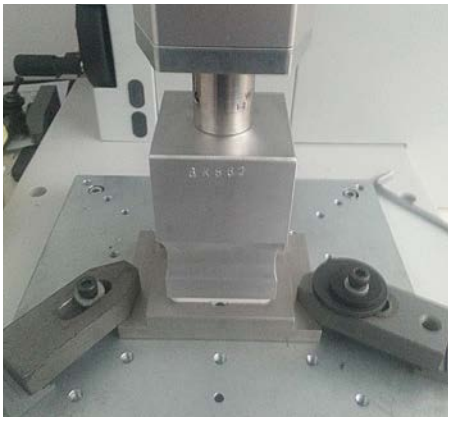
By using 3D printed injection molds to produce functional prototypes, Arad has reduced its time to market by five weeks, and its prototype production costs by 80 percent.

METHOD	COST	TIME
3D Printed Mold	$2,000	10 hours
Metal Mold for Prototype Testing	$5,000	4 weeks
Metal Mold for Final Production	$20,000	2 months

INJECTION MOLDING PARAMETERS		
Material	Grilamid TR90 (amorphous nylon)	ABS 757
Temp Profile	250-255-260-265-260	190-220-220-230-240
Injection Pressure	880 bar	640 bar
Shot Size	38 cm^3	38 cm^3
Switchover Point	8.5 cm^3	6.5 cm^3
Packing Pressure	200 bar	200 bar
Cooling Time	140 seconds	60 seconds

Injected parts from 3D printed molds.

Injection molded part being ejected from 3D printed mold.



Welding process for injected parts

Microscopic image of the welding area

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