Shown mounted on a vibrating tray is an ARBOmeter, designed and manufactured by Anubis Manufacturing Consulting Corporation, for measuring particulate flow (Source: Anubis).

Additive Manufacturing Helps Anubis Go with the Flow (Meter)
EOS technology and materials provide low costs, high quality, and quick turnaround times for flow meter parts

If you’re rolling out an industrial product and you want to manufacture it in the most efficient, cost-effective way possible, you may want to touch base with someone who has done exactly that time and again – Anubis Manufacturing Consultants Corporation (Mississauga, Ontario, Canada). Recently, Anubis developed, patented, and commercialized a mass flow meter for particulates. Called the ARBOmeter, the device can operate either as a strictly volumetric device or, with the addition of a hopper and tray, a meter that can measure variable bulk density of materials. The ARBOmeter is easy and inexpensive to install on existing product lines, where it can be mounted without touching the product. The device is primarily used in the mining, plastics, recycling and food processing industries, and it can measure flow of everything from pellets to powder to potato chips.

Challenge
Inside the meter’s stainless steel enclosure are a number of delicate electronic components, several of which require a framework that reduces vibration and keeps it in place. The individual frames need to hold each part firmly and accurately at a fixed angle. They also need to allow for easy, tool-free installation and removal.

Components to be supported include two cameras and an LED light that have different shapes and require unique frames. “Given the challenges involved in making the frames, using Additive Manufacturing to make them seemed like a good idea,” says Tharwat Fouad, owner of Anubis.

Because of prior experience with EOS technology and materials, Anubis selected laser sintering as the process to make seven of the frameworks, including those for the cameras and LED light. There were several reasons for the choice: frame complexity (incorporating such features as built-in hinges and quick-release snap fits), small production runs and – most important – continuing evolution of the frame designs.

Short profile
Anubis Corporation specializes in providing professional engineering services to companies with industrial manufacturing operations. Strategically placed, with offices in Canada and Egypt they offer services throughout North America, Europe, the Middle East and Africa so that they may meet their global customer’s needs.

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In the Anubis ARBOmeter, white nylon frameworks are custom designed for individual components and manufactured in a FORMIGA P 100 plastic laser sintering system from EOS (Source: Anubis).
The ARBOmeter employs an internal CPU that gives off heat. To protect electronic components, the temperature inside the stainless steel enclosure should not exceed 42 °C/108 °F. “We needed to explore a cooling system of some kind,” explains Fouad. That presented a challenge. Standard practice might be to cut a hole in the enclosure and mount a fan. But in this instance, the device is IP 65 rated, so neither dust nor water can enter the enclosure – and that means no holes at all. Any cooling system would need to be internal. “We searched extensively and consulted electrical manufacturers,” Fouad explains, “but we didn’t find an inexpensive way to cool an enclosure and keep the IP rating we wanted.” Laser sintering’s potential for innovation and design freedom should also keep a solution for this challenge ready.

Solution

“Several of the plastic parts went through extensive redesign and we chose to revise the flow meter at least 15 times,” notes Fouad. With so many changes, traditional plastics processes such as molding would be far too costly and would slow down product development. By contrast, using laser sintered nylon (PA 2200, a Nylon 12 material), it was possible to manufacture the frames inexpensively and produce new versions overnight. The ability to make multiple revisions within tight turnaround times allowed Anubis to create optimal frames for each component.

A further benefit: A plastic laser sintering system can create nearly any shape. It could incorporate channels inside the nylon frames so that air could flow through to cool the electrical parts. A thin layer of nylon isolating the components from the channels would ensure that the meter could still earn its IP rating. Engineers calculated the volume of air flow needed to remove the heat as well as size and design of the channels. Adding an impeller fins and baffles maximized the heat transfer. Although time constraints prevented Anubis from finalizing the cooling channel design on the ARBOmeter they are currently considering such a feature for several other applications.

Results

Meanwhile, the ARBOmeter has gone into full production. The meter’s laser sintered frames are built in batches of four nested sets, seven to a set, over about 20 hrs. As a basis 3D data of the part is used and before the production starts it gets “sliced” into layers. The laser sintering system, which contains a bed of plastic powder, generates the desired geometry layer by layer. A focussed laser beam then fuses the powder material on the basis of the digital data provided. Once one layer has been completed, the powder bed is lowered by a few micrometers and the process begins again. “The quality, repeatability, and durability of the parts are very satisfactory,” Fouad enthuses. “The EOS technology is uniquely suited to our needs on this project.” Anubis has minimized the frames to optimize set sizes and plans to run five sets at once in the FORMIGA P 100. The company expects to make between 100 and 200 ARBOmeters in 2013.

Anubis’ experience with plastic laser sintering and other Additive Manufacturing (AM) processes has given them a broader understanding of the future role of the technology. “I believe that AM will close the competitive gap between larger corporations and small businesses, or even individual inventors, for bringing new products to market,” Fouad says. “It will have a major impact on speed to market and will provide more manufacturing choices to end users. I don’t think it will eliminate traditional manufacturing – at least in the foreseeable future. But for low-volume applications, it is filling a valuable niche in which it is more cost-effective, and offers greater design freedom, than traditional processes.”