

SLM Manufacturer Measures Up the Benefits of SmartScope ZIP Lite

MTT Technologies Group (www.mtt-group.com), a UK-based designer and manufacturer of SLM (Selective Laser Melting) machines for additive manufacturing applications, has purchased and installed a SmartScope[®] ZIP Lite 300 dimensional measurement system from OGP[®] (www.ogpnet.com). In addition to enhancing the accuracy of its class-leading SLM-series rapid manufacturing machines, the SmartScope ZIP Lite has allowed MTT to eliminate the costly and protracted subcontracting of measurement/calibration tasks.

With sales of approximately €15-20M (~\$20-26M) generated by 80 employees worldwide, MTT is a major player in SLM technology. However, until recently MTT used manual methods or subcontracted the task of calibrating the range of SLM machines built at its Stone, Staffordshire, UK headquarters.

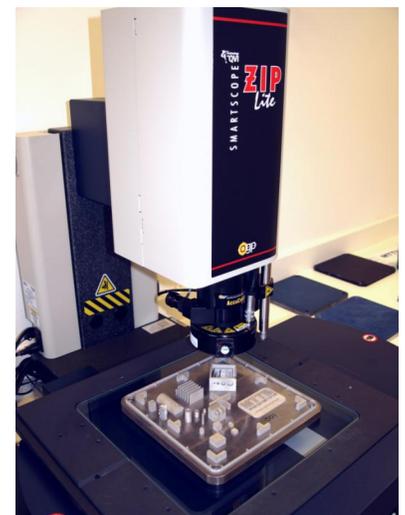
“We realized some of our competitors had better ways of ensuring machine accuracy,” says MTT Group Marketing Manager, Robin Weston. “In our search for a suitable metrology solution we assessed a number of leading players, but several factors set OGP apart from the rest. For instance, OGP personnel here in the UK were very patient and understanding, and listened carefully to our requirements, advising impartially on optimum solutions. They also provided an impressive product demonstration and performed measurement trials. Furthermore, because we have SLM machines installed at customers all around the world, OGP’s international presence was very appealing should a field accuracy problem ever occur.”

Advantages Add Up

SLM is a pioneering additive manufacturing process capable of producing fully dense metal parts directly from 3D CAD models using a high power fiber laser. Parts are built from a range of fine metal powders (including cobalt chrome, stainless steel, tool steel, titanium, Inconel, and aluminum) that are fully melted in a controlled atmosphere, in layers as thin as 0.002 mm.

The laser is at the center of the SLM machine’s operation. From its source, it is directed through a series of optical components before entering the X-Y scanning head, which is used to direct the laser. The X-Y head features two highly responsive scanning mirrors capable of translation speeds of 7000 mm/sec — so even the smallest of errors can have a negative effect.

The laser has a focal distance of approximately 400 mm, but with machine tolerances of approximately ± 1 mm, a reliable method of compensation is required to guarantee accuracy for SLM machine users.

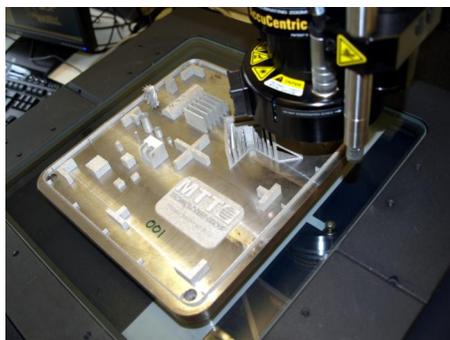


“An important function of our ZIP Lite 300 is to scan a standard grid produced by the SLM and to measure various points to check for variations in X-Y locations,” explains Mr. Weston. “From the results we can see precisely how much compensation we need to apply to each individual machine. This is a process we can iterate many times if required, ultimately achieving accuracy down to 0.03 mm and beyond. Put very simply, without the ZIP Lite, we couldn’t make machines this accurate.”

Fair and Square

The MTT-installed SmartScope ZIP Lite also allows the company to ensure its laser is square and centered perfectly on the build plate. A 250 x 250 mm build plate is used on MTT’s standard SLM250 model, and each newly-constructed MTT machine is required to create a square at the extremes of the build area. The ZIP Lite measures the difference at each outside edge and the straightness of each axis, allowing MTT to introduce compensation that guarantees a centrally located build at the correct size. That compensation is then written to a system calibration file.

90% of MTT’s SLM machines are destined for export markets such as Germany, France, Italy, and the United States, and the company confirms that the last few months have seen a marked rise in demand as the worldwide economy strengthens. Sectors like dental, medical/orthopedic and aerospace are exploiting the benefits afforded by SLM, such as the creation of complex geometries that would be nearly impossible using conventional subtractive machining techniques. With SLM scanning speeds up to 2000 mm/sec and build rates up to 20 cm³/hour, parts can be produced in as little as a few hours. And multiple parts can be constructed simultaneously on the same build plate.



A Matter of Fact

MTT also uses the SmartScope ZIP Lite to produce artifacts. While the SLM process is perfect for complex, lightweight parts, the inherent nature of SLM means parts with substantial cross-sections can sometimes exhibit minor distortion or shrinkage. In these cases, MTT uses its ZIP Lite to measure a first-off part to identify problem areas, then inputs this information back to the CAD model and subsequently produces a perfected artifact.

The impressive magnification of ZIP Lite’s zoom lens is also used to examine the surface roughness of SLM-produced components, and to determine their material density.

“The magnification is terrific and we can easily identify any inclusions or flaws,” adds Mr. Weston. “It helps analyze the process and see how the weld pool is behaving. We’ve also started to use the machine for a limited amount of critical incoming inspection.”

For All Applications

SmartScope ZIP Lite metrology systems are fully automatic and incorporate a color camera, AccuCentric[®] zoom optics (a patented technology that calibrates each magnification during operation), and programmable lighting including OGP's patented SmartRing[™] white-LED illuminator. These features guarantee optimum performance and the delivery of accurate, fast and consistent measurement results in all environments. Because multisensor technology is at the heart of all ZIP models, users can add a touch probe, laser, low force Feather Probe[™], or the nanometer white-light-scanning Rainbow Probe[™] — for maximum versatility on a single machine. ZIP Lite capabilities can be further enhanced with single or multiple rotary indexers, providing up to five axes of movement.

Four MTT employees were trained by OGP UK to use the ZIP Lite, with two days of training provided on site at MTT's 22,500 ft² Stone facility. Each employee uses the metrology system for a different function. OGP MeasureMind[®] 3D MultiSensor metrology software, which is extremely powerful yet easy to use, controls the ZIP Lite systems. With MeasureMind 3D, fully automatic measurement routines are programmed in minutes, while data outputs can be customized to personal reporting formats or used by analysis packages to compute 3D surface profiles, part-to-CAD comparisons, SPC, or for reverse engineering.

“The training provided was very comprehensive, which in combination with excellent technical output on the OGP website has provided the foundation for a successful and rewarding experience,” says Mr. Weston. “Ultimately the machine has given us a sense of awareness, that if we are going to improve, we have to measure what we've done. It's proven to be a very objective way of boosting business performance.”

Rapid Payback

MTT views its investment in the ZIP Lite as money well spent, and declares that justifying the capital expense was straightforward.

According to Mr. Weston, “If we bid for a tender and have to make a very accurate part, without the ZIP Lite our success is almost entirely down to luck. From the outset we knew we would only need one sale for the OGP system to pay for itself several times over.”

With accuracy firmly under control, sales of MTT machines show improving strength. The company adds that anyone with a requirement for complex components should investigate SLM. With SLM, almost anything is possible.

