APPOLO SUCCES STORY

LARGE AREA LASER MATERIAL PROCESSING

THE COMPANY NEXT SCAN TECHNOLOGY

In 2009, it became clear that economically viable ultra-short-pulsed laser micro-machining would require high average power lasers and very high speed scanning systems. The management of the Dutch/Belgian start up NEXT SCAN TECHNOLOGY (NST) realized that well-established technology in demanding industries as high-performance laser printers could be adapted to the needs of this new laser material processing market.

At Laser World of Photonics 2011 in Munich, NST was the first to introduce a polygon based scanner system compatible with high power ultra-short-pulsed lasers. From 2013 to 2015, all business activity was transferred to and extended at the new facility in Evergem, Belgium. Since end of 2015 NST is associated to SCANLAB GmbH. With over 20,000 systems produced annually, SCANLAB GmbH is the world-leading and independent OEM manufacturer of scan solutions for deflecting and positioning laser beams in three dimensions.

THE CHALLENGE

To achieve industrial-scale productivity, USP lasers are best combined with ultra-fast scanners – e.g. a polygon scanner. Polygon scanners are particularly advantageous for line oriented full-surface processing of workpieces – at fine resolutions and with freely definable patterns and structures. Thanks to the high speed, these systems can considerably slash material processing times . USP laser processing applications range from structuring touchscreen surfaces or solar cells, to micro-drilling and processing of electronic components, glass and plastics, as well as sensor manufacturing.

Ultra-precise micromachining requires small focused spot sizes and full telecentricity. This means a constant round spot size over the complete scan area. To focus a small spot f-theta optics are required. However, traditional optics using lenses are limited in size due to its progressive cost increase when the laser area becomes larger. This means cost efficient laser scan heads have a limited scan field. To process an area larger than the f-theta optics is by step & repeat approach which introduces potential stitching issues (overlap of different scan jobs). This issue introduces the need for accurate feedback of positioning errors and controls for active correction. Such technology requires a higher level of investments and challenges production yields if not working accurate enough.

THE SOLUTION

The core technology of NST is a polygon scanner system with a patented and integrated f-theta mirror optics.

I4MS enabled the possibility to increase its full telecentric scan field from 170 mm to 300 mm. Compared to traditional f-theta lens optics, this increase in scan field is a multiply factor 4 to 5. In addition, NST was able to develop the 170 mm mirror optics with a higher Numerical Aperture version, enabling even smaller spot sizes.

THE BENEFITS

The increase in scan field unlocks the opportunity to process larger areas with a higher accuracy and throughput than traditional galvo scan head solutions are offering. Industries which are processing larger areas and require smaller features due to miniaturization are the semiconductor (300 mm wafers) and flat panel display industry (UHD resolution). In addition, the advent of USP lasers in performance offer a competitive edge to chemical etching processing. Chemical etching is a common used process for patterning enabling e.g. touch functionality on consumer electronics.

Next to the possibility to apply more accurate features by laser technology, the overall environment benefits from green manufacturing when chemical processes can be converted into laser based processing. And last but very important, our customers benefit from more cost-efficient manufacturing. Transferring manufacturing technology in advanced and high tech industries such as semiconductor and flat panel display require substantial investments in capex equipment. Lower manufacturing cost without compromising quality is a key decision making maker in justifying investments.

THE APPOLO PROJECT

APPOLO has been built to establish and coordinate connections between:

- The end-users, which have demand on laser technologies for (micro)fabrication;
- Knowledge accumulated in the application laboratories of research institutes and universities;
- The laser equipment manufacturers for integration, lasers, beam deflection systems and software.

The APPOLO consortium, formed by 21 partners from 8 different countries, is assembled from:

- Research institutions with active and experienced staff across Europe;
- SMEs companies producing equipment and components for laser material processing;
- System integrator with global scope;
- End-users.

The research institutes are connected to the Hub of Application Laboratories. The HUB of the Application Laboratories is a common entry point to the assessment service provider net. Core of the HUB are the laser application laboratories, centers or departments at **FTMC**, **IOM**, **UPM**, **LUT** and **BUAS**.

The HUB's allow for faster validation of the process feasibility adaptation or customization of the technology & equipment for manufacturing conditions, including:

- reliability of the components;
- their interaction;
- assessment of the dedicated production processes;
- process speed, quality and repeatability;
- socio-economic issues