

Tiny Tech

A recap of some of the applied microsystem technology innovations presented at the Hannover Messe trade fair. By Alan Richter, Editor

MicroTechnology, a leading trade fair for applied microsystems technology and nanotechnology, was one of the 10 international trade fairs that comprised this year's Hannover Messe trade show. The event took place April 21 to 25 in Hanover, Germany. Highlighted here are a sample of the micro-technologies exhibited.

Micro Production System

The TUT Microfactory from **Tampere (Finland) University of Technology**, Department of Production Engineering, is a compact production system for manufacturing and assembly of small parts and products, such as biodegradable medical implants or electronic devices. The reconfigurable microfactory concept consists of independent modules for various manufacturing tasks such as assembly, laser processing and quality inspection. All production equipment is integrated in the 300mm×200mm×220mm base module, which has a 180mm×180mm×180mm inside workspace and a clean room environment. The airflow in the workspace is from top to bottom. Air inlets are located on the module's top edges, and air outlet hoses are spread throughout the floor. Two options are available for material logistics: a pallet conveyor or manipulators that can reach to the workspaces of neighboring cells. A pallet conveyor is typically used for assembly-type processes where several components are transferred from one cell to another and higher production capacity is essential.

Micro Assembly System

Amadyne GmbH's fab¹ automatic micro assembly system is suitable for pick and place, sorting, inspection and test functions. The system has a

500mm×430mm area for the X-axis and Y-axis and has Linux-based open software architecture with SQL storage. According to the company, the fab¹ system permits fabrication of standard and advanced packaging technologies, such as chip on board, chip on chip, flip chip, multichip modules and eutectic soldering processes. An integrated flow box has a separation efficiency of 99.995 percent, according to the company. Some of the options are an eject system, stamping unit, camera and tape feeder.

Photo Electro Forming

According to **Tecan Ltd.**, microstructure specialists at the company's micro-manufacturing facility have developed photo electro forming (PEF) processes that deliver cost-effective micro metal parts and larger parts with ultrafine features. The parts can be formed from a variety of metals, including nickel, copper and gold. In addition, epoxy can be used as a structural material, which is particularly suited to biomedical applications where the use of nickel is sometimes inappropriate. Compared to micromilling or micro laser machining, PEF—a molecule-by-molecule growing process—creates accurate microparts free from stresses and burrs without time-consuming secondary operations or having to slow the machining process. Once a PEF product design is cleared for production, Tecan says cost-effective mass production can be achieved. For example, millions of identical parts or a mixture of different parts can be produced simultaneously on a single mandrel in a single production process,

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according to the company.

Microwelding of Polymers

TWIST (Transmission Welding by an Incremental Scanning Technique) is a method for microwelding polymers from **Fraunhofer Institut Lasertechnik**. TWIST combines the characteristics of laser contour welding and quasi-simultaneous welding. Along the welding contour, the laser beam moves with a high dynamic circular motion, which allows the laser beam to pass over each contour increment several times. Using this laser beam movement and high feed rates, shops can weld polymeric components with welding geometries down to less than 100 microns despite the use of high-focused laser beams and therefore high laser intensity. The laser beam's high dynamic movement leads to a homogeneous energy deposition across the weld seam and significantly reduces the depth of the heat-affected zone compared to conventional welding with diode lasers, according to the company.

Benchtop Machine

Brunel University West London's UltraMill is a 5-axis benchtop micro



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assemble, store or protect machined materials and instruments. A segmented curtain consisting of stripes of different synthetic, rubber or similar materials encloses the work area of the Clean-Room-Cell without restricting access. By combining several modules, the effective clean room surface can vary from 2.16 to 180 sq. ft. The system can also be integrated into a production or assembly line.

Dust Extractors

Small dust extractors from **Chiko Airtec Co. Ltd.** optimize production and preserve machinery and manufacturing processes while providing a clean work environment. The Model CBA-080/1200-HC-CE is a high-pressure dust extractor for micro-welding, micromachining and micro-engraving applications. It measures 287mm×317mm×275mm and offers a maximum filtration rate of 99.97 percent for particulates equal to or greater than 3µm, according to Chiko. CTE

milling, drilling and grinding machine for ferrous and nonferrous metals, plastics and crystals. The machine features an aerostatic spindle capable of reaching spindle speeds up to 200,000 rpm. Aerostatic bearings incorporate squeeze-film dampers and direct-drive motors on all linear axes and one rotational axis to provide smooth motion. The UltraMill has a natural granite base for enhanced thermal stability and damping capacity. The linear axes' feed rates are from 0 to 3,000 mm/min., and the X-axis has a 230mm stroke, the Y-axis a 225mm stroke and the Z-axis a 160mm stroke. A reconfigurable handling system for automated inspection and handling of workpieces and cutting tools is optional.

Clean Room

Spetec GmbH said its Clean-Room-Cell is a flexible clean room system that provides an economical alternative to a full-size clean room. One or more laminar flow modules can be placed on a base frame. The modules function as clean air showers above the enclosed clean room workbench used to

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