

PRESS RELEASE

2012 Machine Tool Biennial

IK4: Avant-garde technology for machine tools of the future

- *This year IK4-TEKNIKER and IK4-IDEKO will be showing their technological developments on a joint stand that will be displaying the innovation of the IK4 Alliance at the service of the machine-tool sector*
- *The R+D centres will be showing advanced developments like laser equipment, systems for robotising artisanal processes or systems for reducing vibrations*

(Bilbao. xx May 2012).- Ultraprecise laser equipment, advanced inspection and measuring technologies for the railway industry or advanced robotics for the automating of artisanal processes are just some of the developments that the **IK4 Research Alliance** will be presenting at the forthcoming **Machine Tool Biennial**, to take place at the Bilbao Exhibition Center (BEC) from 28 May to 2 June.

IK4 will have the support of two of its partners: the R+D centres **IK4-TEKNIKER** and **IK4-IDEKO**, benchmarks in the machine-tool sector, and which in recent decades have achieved a high degree of specialization; this allows them to put their advanced technological developments at the service of a whole range of applications.

Visitors heading for the stand located between aisles C08 and D09 of pavilion no. 1 in the Bilbao Exhibition Centre will be able to see first-hand a whole range of advanced technologies designed by IK4 at the service of machine tools. The functioning of these innovations of **IK4-TEKNIKER** will be all the more visible though a spectacular visual presentation based on 3D mapping ([sample video of this technology](#)). **IK4-IDEKO** will be

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showing two micromachining prototypes arranged in the form of cell that will produce intraocular lenses *in situ*.

Both IK4-TEKNIKER and IK4-IDEKO are active members of **CIC marGUNE**, the Cooperative Research Centre involved in High Performance Manufacturing. So they work together on important high technology research projects like Hiperión, which is aiming to position the Basque machine tool sector as the first purchase option worldwide in precision machines for large-sized parts.

The sum of the capabilities of the two centres constitutes the broadest and most powerful offer of manufacturing technologies in Spain, which puts them on the level of benchmark countries in this sector. IK4-TEKNIKER and IK4-IDEKO are collaborating closely within the IK4 Alliance by working together, optimising research costs with public funding, and customising technology transfer in an individual way and tailored to the client.

The pieces of equipment that the two R+D centres will be exhibiting in their joint pavilion at the Bienial are prototypes destined for machine tools and which reflect the potential of IK4-TEKNIKER and IK4-IDEKO as technological benchmarks for this sector; they are as follows:

Advanced developments in laser equipment

IK4-TEKNIKER and IK4-IDEKO will each be presenting at the BEC developments of laser equipment with applications for sectors that require the utmost precision, like the medical sector, aeronautics or the automotive sector.

IK4-TEKNIKER will be showing a laser prototype designed to carry out welding; the centre has developed the mechatronic part and the high-powered diode laser with 100% in-house technology. The welding of plastic components by means of fibre-optic guided laser is a technique that has been recently introduced into industry and which offers advantages over other conventional methods: it does away with chemical adhesives, minimizes thermal distortions in the welding section, and offers greater efficiency and greater flexibility.

IK4-IDEKO will be presenting a three-axis laser ablation machine that can work with three pulsed laser wavelengths at intervals of picoseconds. These ultrashort picosecond pulses make possible high quality operations with applications that focus, above all, on the medical sector as well as on the automotive sector, the aeronautical sector or renewable energies.

Technology applied to the railway industry

At the Biennial IK4-IDEKO will be presenting an innovative solution for inspecting and measuring train wheel profiles. Current technologies require that the railway track be

modified, so installing them requires undertaking civil engineering works to build specific tracks with limited features.

The R+D centre has developed a new measuring system based on 3D multi-camera technology for the integral measuring of the geometry of the wheel; this does away with modifications to the track and is capable of carrying out simultaneous measurements preliminary to a complete profile. What is more, the measuring system, thanks to an innovative 3D reconstruction model, allows the wheel profile and diameter to be measured precisely without the wheel needing to turn with a predetermined, controlled alignment. This innovative system for the railway industry is in the patent application process.

Robotics for complex processes

The automation of production systems enables production to be controlled automatically either totally or partly by means of robots. The result is greater productivity and an improvement in the working conditions of people. IK4-TEKNIKER is working on the evolution of traditional manufacturing systems by means of robotics by developing improvements in the production mechanism, optimising its processes and developing sustainable systems to achieve faster, more efficient production.

IK4-TEKNIKER is presenting at the Machine Tool Biennial the "Robofoot" project that is a robotised cell prototype in which a robot manufactures and inspects footwear. The R+D centre has decided to show this development to convey the idea that even the most labour-intensive processes lend themselves to being "robotised" to improve the quality of the final product, staff working conditions, and to maximise the efficiency of plants by means of 2D vision technology in the inspection module, and technologies for the dynamic generation of trajectories (Visual Servoing) to locate the footwear.

Solving machine vibrations

Vibrations constitute one of the most common and serious problems not only for the quality of the final product in the machining processes, but also for the integrity of the machine itself. That is why IK4-IDEKO is presenting at the Biennial an inertial electromagnetic shock absorber and a signal acquisition and processing platform for machine tools entirely developed by the R+D centre.

The active shock absorber is an electromagnetic device specially designed to be coupled to the machine's mechanical structure and insert a controlled force into it. This force is regulated by means of advanced control techniques to increase the shock-absorbing capacity of the structure, whereby the vibrations are drastically cut. This device has managed to eliminate chatter in milling, turning and grinding.

As regards the acquisition and processing platform, this equipment allows ICP piezoelectric accelerometer signals or selectable voltage signals to be captured by

means of acquisition software, so that the evolution in time of the signal acquired can subsequently be displayed and a spectral analysis conducted.

Advanced manufacturing technologies

Developments in advanced manufacturing technologies which the two members of the IK4 Alliance will be presenting at the Biennial will confirm the credentials of these two R+D centres in this field.

IK4-TEKNIKER is proposing an ultrasound machining and manufacturing system that allows a whole range of applications for sectors like the automotive sector, aeronautics or medicine in which work is done on materials that are difficult to process by means of other techniques. IK4-TEKNIKER will have a demonstrator of an ultrasound rotary machining process; it is based on the removal of material through the combination of turning and vibration in an axial direction using a super-abrasive tool.

This process offers significant advantages over other types of processes as it reduces cutting effort, the thermal load on the part, and as a result, the wear and tear sustained by the tool. Likewise, removal rates are increased (up to 5 times higher than through grinding), a good surface finish is obtained, and the process produces a surface layer of residual compression stresses, thus increasing fatigue life.

For its part, IK4-IDEKO will be showing an ultraprecision lathe with an aerostatic head for turning. The ultraprecision lathe has three axes for machining optical quality parts and is mounted on a granite structure to increase its stability in the event of temperature changes.

The aerostatic Fast Tool Servo (FTS) head allows rapid action of the tool for turning with a diamond point; this facilitates the generation of free geometric shapes with applications like the generation of spherical surfaces to improve the finish of optical lenses. This device will be on show at the Biennial as an accessory for the laser equipment displayed by IK4-IDEKO on the same stand. Both pieces of equipment will make up a complete production line for intraocular lenses.

The R+D centre will also showing a parallel kinematic table designed for the rapid and accurate positioning of photovoltaic wafers. This device has been designed to correct positioning errors in photovoltaic wafers during manufacturing; it makes use of a vision measuring system compensated by the movement of the table, a technique that makes a high productivity, low-cost solution possible.

Sustainability in manufacturing and industrial production technologies

IK4-IDEKO will be presenting at the Biennial optimum cooling ECO-JET nozzles for grinding processes. This is a large range of nozzles with an adaptable design, guaranteeing a reduction of between 25% and 50% in the loss of the system's load.

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Their use enables productivity to be increased in the processes and a corresponding cost reduction per part through various means: increase in the useful life of the grinding wheel, reduction in the diamond dressings, increase in the time between the diamond dressings, the possibility of using greater removals through the reducing of friction and heat in the machining area, etc. Furthermore, this system brings improvements in the stability and precision of the processes and cuts the costs associated with the sizing and performance of the cooling equipment.

IK4-IDEKO belongs to the European **Blue Competence** initiative of the machinery sector which is geared towards sustainability. The commitment as a result of this initiative reflects the R+D centre's commitment to the design of machines that are energy-efficient in the use phase, in their orientation towards the consumption of environmentally-friendly raw materials, the optimized use of cutting and cooling fluids, as well as a commitment to sustainable manufacturing processes.

3D Technology put to use for gaining precision in the large machine tool

IK4-TEKNIKER will also be showing a new system for the volumetric verification of the positioning of large-sized machine tools in order to meet the growing demand of companies for systems with full geometrical verification systems.

The system uses 3D technology to measure positioning accurately, and makes use of the most innovative measuring equipment in the field (the Leica AT901-MR laser tracker and the Wyler BlueLEVEL levels), supported by a robust, multilateration-based framework.

The result is an advanced service that can be rapidly executed, and which allows the positioning error in the complete volume of the machine to be characterised, by providing a measurement uncertainty that suits the needs of the application.

The reduction in the time needed to carry out the verification of the machine's positioning means greater stability in the results, and cost savings. A set of geometric parameters (straightness, rectangularity and linear positioning) are obtained from the results of the measurements. These allow one to get a better understanding of the machine and even to feed a compensation system.