A real networking

The 2009 Precision Fair (Precisiebeurs) was the ninth in a series of successful yearly happenings. On one hand, it has become an excellent place to experience the power of Dutch precision industry, on the other hand it offers more and more the opportunity for "good old precision boys" to meet. Indeed, the 2009 theme "International market opportunities" involved a lot of networking, which this fair made amply possible. So, Dutch precision specialists could see and hear the novelties that English, German and other foreign companies showed in their booths. And booth holders could take take the opportunity to discover what their competitors/colleagues showed in their stands.

• *Frans Zuurveen* •

Of course, writing an evaluation of the event, see Figure 1, with its elaborate exhibition and accompanying lecture programme, is impossible within the limited scope of one article. And impossible within the context of a reviewer with a limited brain absorption power. So this again is not more and not less than an impression coloured by personal preferences that originate from education and experience.

Figure 1. Impressions of the 2009 Precision Fair. (Photos: Mikrocentrum)

Moving

Mechatronics can be found everywhere on the fair, held on 2 and 3 December 2009 in Veldhoven, the Netherlands, for reason that controlling precision movements is impossible without thorough experience in that discipline. VarioDrive from Oud-Beijerland proves that statement by showing many of the components that they deliver for precision movements, together with their ability to calculate mathematical models of drive chains. An amusing set-up for positioning marbles demonstrates VarioDrive's capabilities; see Figure 2.

Figure 2. VarioDrive shows how marbles can be positioned.

Another interesting driving component in their stand is a very powerful actuator, the Narr Serac LH 100. It has the appearance of a hydraulic or pneumatic cylinder but functions completely mechanically. In principle it is no more than an ordinary screw-nut combination, but without the disadvantage of a bad efficiency. An extreme high power yield of 13,000 N within limited space has been attained by coupling screw and nut through grooved rollers. This reduces internal friction considerably; see Figure 3.

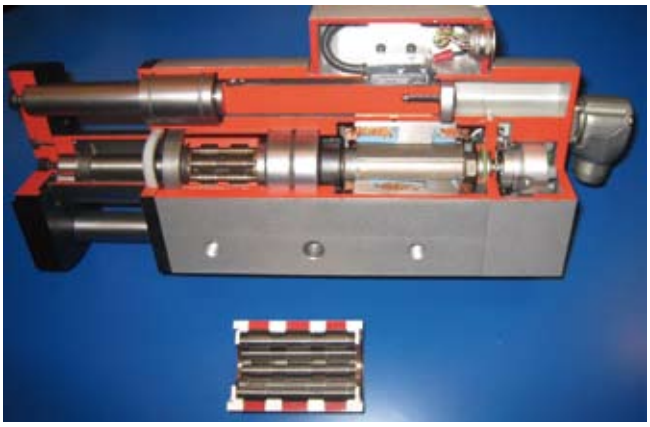


Figure 3. The Narr Serac LH 100 is a mechanical drive that might replace a hydraulic cylinder.

Modelling

Modelling of drive trains and other mechatronic assemblies asks for clever mathematical solutions. Cleverness is one's first impression when hearing Paul Lambrechts explain how international company The MathWorks can help to facilitate mathematical modelling. He shows a simple experimental set-up of a motor drive with flexible shaft. The shoot-over in extreme angle positions can be reduced by introducing a software-integrated back-coupled control loop; see Figure 4.

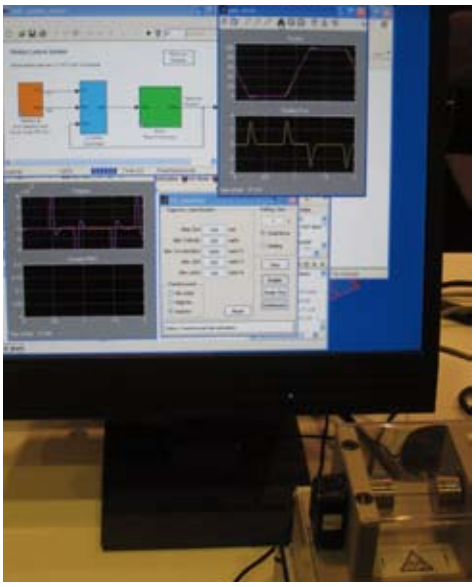


Figure 4. The MathWorks's results for calculating shoot-over caused by positioning with a motor with flexible shaft.

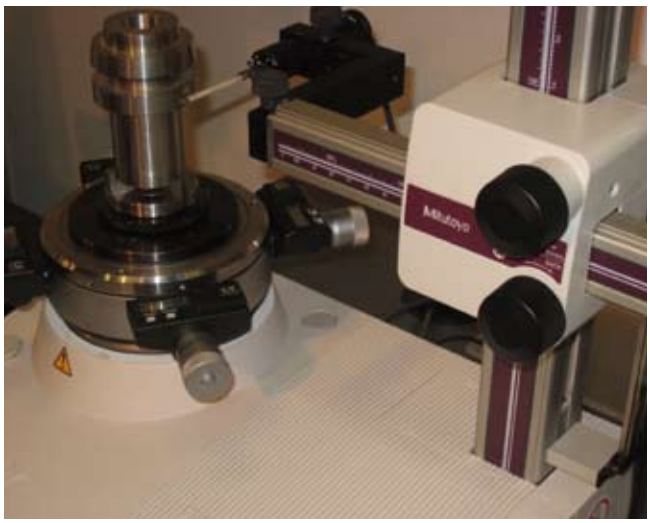


Figure 5. A Mitutoyo manual roundness tester.

The MathWorks's Simulink is a valuable tool for calculating non-linear dynamic systems. Their AutoSar program package helps to standardize integration into one central car-server of up to 70 microprocessors for controlling automotive functions.

Measuring

No exact positioning without measuring. Again, Heidenhain and Renishaw show their linear scales for determining positions of slides with sub-micrometer accuracy. And as usual, stands with stand-alone measuring machines, often highly automated, are amply present.

So, Bronno Schut of Schut Geometrische Meettechniek from Groningen demonstrates one of their DeMeet measuring machines. The largest in the series is the DeMeet 705 with a measuring range of 700 x 500 x 400 mm^3. The best accuracy achieved is 1.9 + L/400 µm, with L in mm. The machines are deliverable in two versions, with multisensory probe or with video observance of the object. It is interesting to hear that the granite base plates, columns and other parts are being manufactured in China, not as rough parts but finished in high dimensional accuracies.

Of course, Mitutoyo has an extensive booth to show examples from their wide range of measurement equipment. Product manager Ron Meijer explains that Mitutoyo not only manufactures its own measuring optics, but also delivers objectives to other companies, including competition. This way of keeping production in own hands originates from the philosophy of Yehan Numata, who founded Mitutoyo in 1934. A "poor man's" manual roundness tester, already deliverable for € 17,000, is provided with air bearings with a rotational accuracy of 0.04 µm; see Figure 5. However, this roundness tester is also available, of course against higher price, in a completely automated version, comparable to the universal measuring machine Quick Vision Apex, which fully automatically measures workpieces against CAD-files.

Figure 6. A ring rotating in air bearings made from New Way's porous carbon.

More measuring

Eindhoven-based IBS Precision Engineering shows its new Isara 400 CMM with a measuring range of 400 x 400 x 100 mm^3. It is said to be the most accurate measuring machine in the world, with a resolution of 1 nm and a one-dimensional measuring uncertainty of 45 nm, three-dimensional 100 nm. Its measuring principle complies with the Abbe criterion, which states that measuring trajectory and measuring scale are in line. This avoids first-order errors due to angular guiding deviations. BoTech in Helmond manufactures all granite parts.
IBS supplies porous-carbon air bearing material from New Way and therefore shows a ring that accurately rotates in air bearings; see Figure 6. Such bearings are easily made to measure from New Way's porous carbon. Really interesting are the inductive measuring probes with a resolution of 10 nm from Lion Precision, also represented by IBS. They can be integrated into precision manufacturing processes by coupling them to CompactRIO electronic modules in a handy and handsomely small rack system.

Figure 7. A model 1 : 10 of the Hembrug Nano-Focus 425 milling machine.

Machining

Hembrug, from Haarlem, does not show their precision hydraulic lathes and milling machines on full scale because of their dimensions, which obviously do not fit into one small booth. But their rather new, fully hydrostatic Nano-Focus 425 milling machine with five axes is prominently featured on scale 1 : 10, see Figure 7. The work piece accuracy amounts to 5 µm, whereas the positional accuracy of the hydrostatic guides is better than 1 µm. Comparable with the already well-known hard turning on Hembrug lathes, this machine is capable of hard milling, that is machining hardened material. This not only saves time and costs by avoiding finish grinding but also improves accuracy by eliminating work piece reclamping.
Also new is the relatively cheap hydrostatic lathe Mikroturn 300 Base Line, which becomes available at a base price of € 175,000. At the other end of the price range are Hembrug's Mikroturn vertical lathes (carrousel lathes) for finish hard turning. The largest machines accommodate workpieces up to a maximum of 1,400 mm diameter.
It is impressive to see a flat surface with a 2 µm deep recess machined by a miniature finger mill in hardened steel. The recess is clearly visible thanks to the stability of the time-consuming machining process taking more than one day. Needless to say that all hard machining tools are provided with PCBN chip plates (Polycrystalline Cubic Boron Nitride).

Figure 8. Ilse Buter demonstrates IMS's ProMicro assembly machine with manual feeding.

Mounting

IMS from Almelo is a member of the WWINN Group (World-Wide INNovations). IMS provides solutions for mounting problems. One of these solutions is ProFast, a high-speed flexible assembly platform. ProBot is another versatile assembly platform, for small to medium-sized series. Common feature of those platforms is a modular set-up, making them suitable for the fast realization of production mechanization.
Ilse Buter of IMS demonstrates a ProMicro machine, a semi-automatic assembly system with manual feeding of components; see Figure 8. In this demonstration the machine mounts loudspeakers for hearing aids and thus serves as a tool preliminary to the final mechanization. Another example shown is a ProFast machine for assembling mobile telephone loudspeakers out of seven different parts supplied by small vibratory hoppers. The machines not only bring parts with micrometer accuracy to their final place, but also accomplish processes like laser welding and gluing with UV hardening of two composites.

Manufacturing

As usual, many precision-engineering companies show their skills with lots of examples of narrow-toleranced products. One of these firms is Nijdra from Midden-Beemster; see Figure 9. Their slogan "precision is our profession" becomes reality in three production facilities with a conditioned measuring room each.

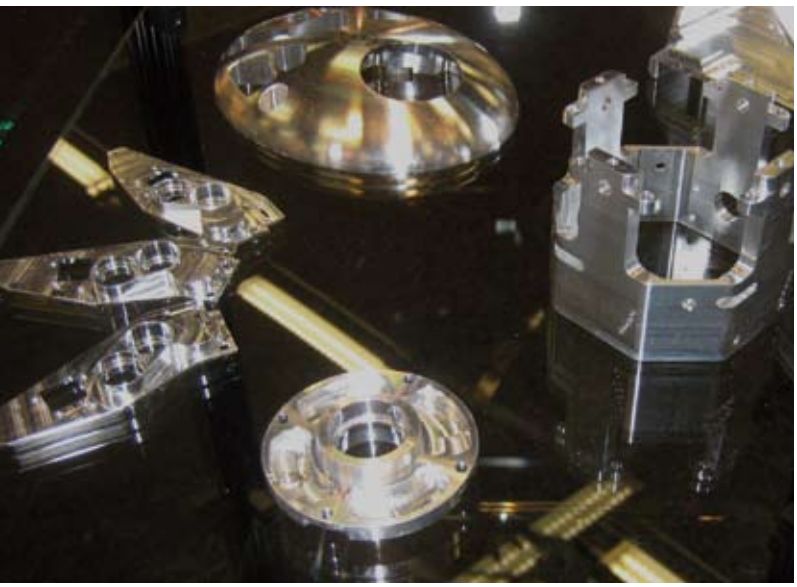


Figure 9. Aluminium precision parts manufactured by Nijdra.

Quite different precision products are the optical components manufactured by Anteryon in Eindhoven; see Figure 10. Their machining abilities include sand blasting, grinding, lapping, etching and coating. For instance, Anteryon delivers two million miniature lenses a month for mobile telephones.

Figure 10. Optical components manufactured by Anteryon.

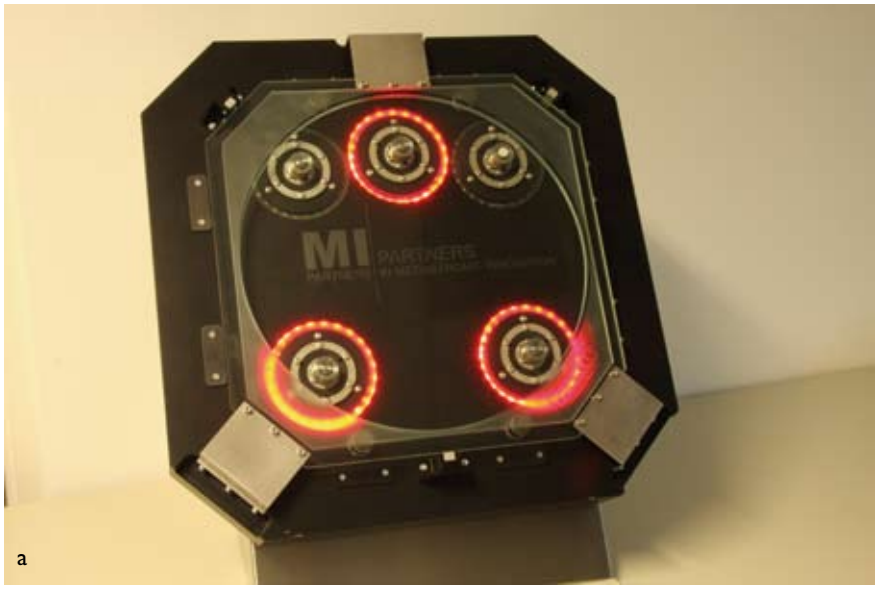
As last but not the least, manufacturing firm D&M Vacuum Systems from Budel is to be mentioned. D&M fabricates complete vacuum systems, including stainless steel recipients, pumps, valves and control units; see Figure 11.

Figure 11. A welded stainless steel recipient, fabricated by D&M.

Magnetics

Above the stand of Magnetic Innovations towers a donQi Urban Windmill that got an improved generator designed by Magnetic Innovations; see Figure 12. Johan Dams tells that his firm, based in Veldhoven, offers electromagnetic

Figure 12. Impression of a donQi Urban Windmill; this type of windmill was fitted with an improved generator designed by Magnetic Innovations. (Photo: donQi)



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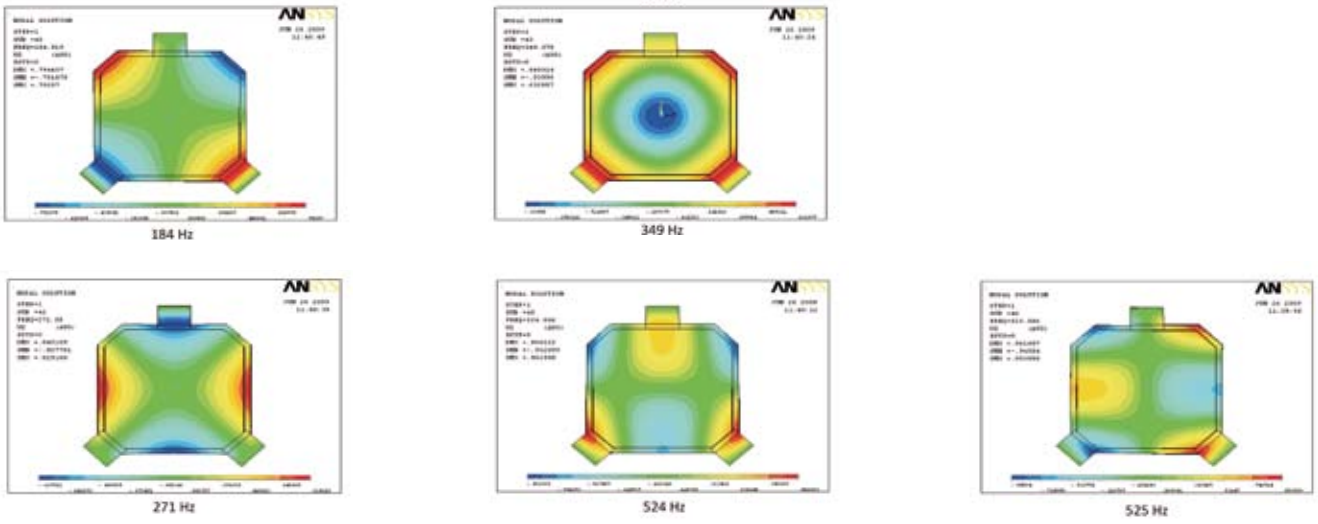

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Figure 13. MI-Partners developed a magnified model of a silicon wafer for solving vibration problems.
(a) The physical model: a large glass plate represents the wafer and three actuators excitate vibration modes.
(b) Five different vibration modes of the wafer model.

knowledge for customer-oriented projects, such as this windmill project and hub motors for electrical bicycles. Permanent and coil-excited magnets for actuators and sensors are the application area for his knowledge-driven firm. Dams explains that an improvement of generator efficiency from 80% to 90% does not look very impressive, but that this means a reduction of losses with a factor of two. And in most cases this is quite a challenge.

Miscellaneous

Another interesting stand is that of MI-Partners, Partners in Mechatronic Innovation. This small Eindhoven-based firm comprises a team of engineers specialized in problem solving and prototype building. They show a magnified model to solve a vibration problem of silicon wafers. A large glass plate represents the wafer and three actuators excitate five different vibration modes; see Figure 13. MI-Partners proves that a fourth actuator can be used to compensate the unwanted vibrations by introducing counter-phase oscillations in the nodes.

Stefan Kuypers from JEOL Benelux shows the NeoScope, see Figure 14, a very small scanning electron microscope that can be acquired for no more than € 16,000, which is a relatively small sum for an electron microscope. The resolution amounts to about 25 nm, which yields much higher magnifications than light-optical microscopes can provide, of course. But the NeoScope has a lowest magnification of 10x, which is a remarkable low value for a SEM.
Laser2000 shows several optical components that can be used to build one's own laser set-up; see Figure 15. Also pulsed lasers with fibre optics are shown. They easily integrate into laser units for machining on submicron scale.

More visitors than ever before

With some 3,000 visitors, the 2009 Precision Fair confirmed the fair's status as the largest precision engineering event in the Benelux (Belgium, the Netherlands and Luxembourg). The fair was organized by Mikrocentrum, the Eindhoven-based, independent competence centre serving the high-tech industry, supported by DSPE and the IOP (Innovation-driven Research Programme) Precision Engineering.
Key figures:

- 218 exhibitors (companies and knowledge organizations);
- 3,000 visitors (5% more than in 2008): 89% from the Netherlands, 9% from Belgium, 1% from Germany, 1% from other countries;
- 40 lectures (6 plenary and 34 parallel) with in total 1,100 attendants;
- 80 appointments during the international matchmaking/ brokerage event.

The next edition of the Precision Fair will be held on 1 and 2 December 2010, once again in the NH Conference Centre Koningshof in Veldhoven, near Eindhoven, the Netherlands.

www.precisiebeurs.nl

The opening lecture was given by Rob van Gijzel, Mayor of Eindhoven and President of the Brainport Foundation. He stressed the importance and the strength of the high-tech industry in the Netherlands and in the Eindhoven region (Brainport) in particular. (Photos: Mikrocentrum)