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Press Release

Developed for MRI (Magnetic Resonance Imaging)

No Metal: Amazing air motors made from ceramic

Generating growth and expanding market leadership with brand new concepts. It is a company's manpower which makes it more successful than its competitors, the decisive ambitious factor which results in constant development and realization of new and innovative ideas. Highly motivated employees who provide a combination of creativity and knowledge make all the difference. Growth and expansion of a market position begins with a key person driving the ideas factory within the company.

Germany's machine industry is extremely competitive. It is a race to bag the contract as companies compete to provide the most suitable solution, quickly and flexibly, designed to fit the customer's application and all at a great value price. Medium sized companies such as DEPRAG SCHULZ GMBH & CO. rely on the inventiveness and expertise of its engineers.

The internationally renowned specialists for air motors have a uniquely diversified standard program. Product Manager Dagmar Hierl emphasizes: "85 % of all our projects are special solutions. We individually adapt the air motors from our catalogue to fit our clients' specific requests. We are able to develop special motors at low-cost prices because of our modular system. The spectrum ranges from single air motors to fully automatic production systems. Creativity and customer focus are therefore very important to us."

One particular challenge set to DEPRAG's Development Department was a request from a research center to investigate the possibility of a completely non-metal air vane motor. Gerd Zinn, the Head of Serial Machine Development remembers: "This motor was needed for diagnostics in an MRI system where the use of metal would cause interference with the operating system and was therefore not a suitable material for the application".

The team set to work, drawing on their knowledge from decades of developmental projects involving air motors. What was created sounds amazing: an air motor made from ceramic and synthetic materials which does not contain a single piece of metal. The prototype of the ceramic motor has a diameter of 40 mm and is only 78 mm in length. When pneumatically operated the motor achieves 150 W at a speed of 14,000 rpm.

This motor is suitable for applications where the use of metal is out of the question. Magnetic resonance imaging (MRI) a modern, particularly gentle process of medical diagnostics is an example of this kind of application. An MRI machine is in principle a large circular magnet which contains a specially shielded area within it. The patient is driven horizontally into the "tunnel". The MRI generates layer images, 3D data and films by creating a magnetic field which covers the body and transmits intangible radio waves through the body.

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The field of Radiology is now unimaginable without the MRI scan (also known as nuclear magnetic resonance), which provides excellent images of all areas of the body. It offers unparalleled soft tissue contrast which allows detailed analysis of all organs and regions of the body. All tissue with high water or fat content can be portrayed in detail by the MRI without use of intravenous contrast agents. Diagnostically valuable information can also be gathered about bones despite their comparatively low water content.
The image contrast is based on the concentration of protons (hydrogen ions) in the tissue, the magnetism of particles from outside through the magnetic field and the de-magnetism (relaxation) after the stimulus through the radio frequency impulses. Low energy radio waves comparable with those transmitting radio programs are used. In contrast to X-rays which could theoretically have an effect on the body. Magnetic fields and - radio waves are not harmful. This enables safe and unlimited repeat examinations to be carried out for clinical follow-up and therapy monitoring.

The use of an MRI machine in the operating theatre itself would be ideal for clinical monitoring of minimal invasive procedures (keyhole surgery), during tumor operations on the brain or liver, and also procedures in the vascular system (heart). However metal causes interference fields in the operating theatre. The patient therefore has to be moved to an adjacent room accompanied by an anesthetist in the middle of an operation to be examined using operative magnetic resonance imaging. Such brain tumor examination procedures have been successfully carried out at the Neurosurgical University Clinic in Heidelberg for 13 years.

Ambitious research projects which aim to provide an accompanying MRI exam inside operating theatres are concerned with improving this situation. Instead of the MRI tunnel system there are now open MRI exam systems available which enable doctors to access the required part of the patient during image scanning. The development of innovative ferrite-free drive systems is another decisive step. Product Manager Dagmar Hierl: "Our ferrite-free air motors were especially designed and developed for such an application. These DEPRAG air motors can play an important role in the development of medical equipment".

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