

# Two for six

## Engine builder invests in double spindle grinding machine

Nikolaus Otto, Carl Benz, Gottlieb Daimler, Wilhelm Maybach, Ettore Bugatti – names recognized by even those who see vehicles merely as a means of mobility and transportation. Names closely linked with Deutz AG today, still building engines that satisfy the most stringent of criteria. And this calls for high quality machines in the production process.

Do you remember the huge Airbus A 380 making its maiden flight? No? That's no surprise. Only a few dozen people and scarcely a camera were present to witness just a couple of hundred horse power, or rather KW, bracing against a few hundred tonnes. Just a few hundred hp/KW? Yes – and they were generated by an airfield machine (the well known "aircraft towers") and a Deutz engine built in Ulm, Germany.

Which brings us to another name: Magirus. Back in the 1930's, this Ulm-based commercial vehicle manufacturer was bought out by Humboldt-Deutz Motoren AG, which a little later changed its name to Klöckner-Humboldt-Deutz AG (KHD). Then, in the mid-eighties, the Motoren-Werke Mannheim originally founded by Carl Benz also became part of the organisation. Since 1997, Klöckner-Humboldt-Deutz has been known simply as Deutz AG.

### The world's longest-established engine builders

The only legacy left by Magirus was Ulm Münster, designed in the shape of an 'M' and not to be confused with Cologne Cathedral. Famous for its two front and one back tower (which is why we accept that churches typically have a main portal at the front and the altar room at the back, although we walk "up" to the altar), Ulm Münster has two towers at the rear and one at the front, and, at 161 metres high this makes it the highest in the world. When the famous Ulm sparrow comes to rest here, its size in relation to the tower is in the order of a micron to a millimetre.

Justifiably, Deutz AG can be regarded as the oldest builder of combustion engines in the world. It was originally founded, you see, in 1864 by Nikolaus August

Otto whose "atmospheric gas engines", presented in 1876, later assumed the name of its creator - the "Otto engine".

Shortly after the company went public, Gottlieb Daimler became its Technical Director and Wilhelm Maybach Head of Design. Ettore Bugatti, who, instead of diesel engines, commercial and rail vehicles, was in favour of building more expensive cars with powerful engines and weak brakes, gave just one short guest appearance at the beginning of the 20th Century.

Enough of the history – Deutz AG is well capable of proving itself today, no matter whether the engines are powered by diesel oil or methane mixtures.

Ulm, in southern Germany, is where customized six, eight, ten and twelve-cylinder diesel as well as gas engines delivering up to 500 KW are built for mobile and stationary applications. The famous German sail training ship "Gorch Fock" also has Deutz inboard engines.

These days, diesel engines are high-tech, especially when it comes to optimizing the use of fuel. Every gram per kilowatt hour comes under bargaining, and often under very special operating conditions. A stationary

gas engine, to which a generator is attached, has to exactly maintain a certain speed. Deutz engines are virtually unique. Based on clearly defined model series, some 5,000 "Ulm" engines are brought into the world every year.

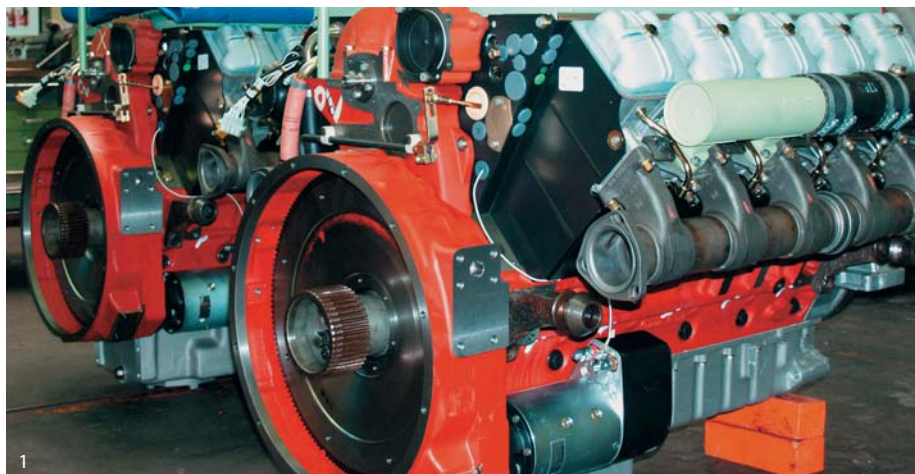
Today, competitive, legally-compliant engines must be made with the utmost precision. A requirement which, accordingly, calls for high-precision yet productive machines – for grinding crankshafts for instance. A roundness from about 1 µm every 10 degrees, or a 5 µm overall roundness, 1 to 2 µm on 10 mm of linearity and 0.05 mm stroke height accuracy are today the benchmarks for crankshaft bearing seats.

Bearing and sealing seats used to be processed on six rough and finish grinding machines from modified C-38 steel. In the opinion of Bernhard Wamsler, Head of Production Planning at Deutz in Ulm, this was four too many. That's why five of these old machines have just been replaced by one high-speed grinder, the JUCRANK 6000 from JUNKER in Nordrach, Germany. This machine grinds the pin bearings, or alternatively the main and pin bearings, with rough and finish grinding process in one clamping.

### Extensive experience with CBN grinding technology

A JUMAT 6000 has been used to grind main bearings for around eighteen months. Crankshaft grinding is therefore now firmly in the hands of this German Black Forest-based company – and justifiably so, because this area, where landscape and buildings look as idyllic as a model railway, is home to the finest high-technology.

But other mothers have beautiful





The JUCRANK 6000 enables savings everywhere: Primary and secondary processing times, monitoring, tools, auxiliary substances, maintenance, disposal, space. First and foremost improving quality and process

**THE JUNKER GROUP**

Just under 1,000 employees are involved in corporate development, sales and production at 11 sites worldwide. More than 80 patents highlight the company's technological leadership. The best testimonies are Quickpoint technology and high-speed grinding with CBN and diamond grinding wheels. In the Automotive, Tooltec and Metalworking divisions, Junker offers bespoke solutions for practically every precision grinding application, ranging from stand-alone machines to turn-key systems.

1 Ulm is where customized diesel and gas engines up to 500 KW are built.

2 (From left) Martin Blankenhorn (Project Manager) and Bernhard Wamsler (Head of Production Planning) from Deutz, Monika Hipp (Marketing Manager) and Michael Uhl (Regional Sales Manager) from JUNKER in front of the JUMAT 6000.



daughters too – in the end, there were four manufacturers in the competition – what made Junker machines the ultimate choice. Bernhard Wamsler: “First of all, we were looking for precision and productivity. What tipped the scales though, were the references demonstrating Junker’s extensive experience in the field of crankshaft grinding with CBN grinding technology. This was a key criteria for acquiring the first Junker system. We were able to see the machine in action at Audi in Ingolstadt and twelve of them are already in use in our Group companies in Cologne.” Experience from experience.

The JUCRANK, a double spindle grinding machine, grinds pin bearings. This machine combines the rough grinding of the main bearing, which compensates for the expansion after hardening, with the finish grinding of the pin bearings. The main bearings are ground on the JUMAT.

Achieving much higher precision than their predecessors, JUMAT machines are also able to offer more process reliability. This in turn significantly reduces the complexity of testing, as a 100% test is no longer required. Random samp- ☒

ling proves more than adequate.

Because they are located on the second floor and forklift trucks etc. cause vibrations, the two grinding centres must be installed in a vibration-free environment so that they can achieve the required quality.

At Deutz in Ulm, the two grinding machines are not installed on a foundation. Instead, a special construction developed by Bilz Schwingungstechnik, a vibration technology company in Leonberg, Germany, separates them from the inter-

units per year depending on the variant. Cycle times on the new machines are five to six times higher than the conventional grinding wheels previously used were able to achieve. The parts are fed and removed by a portal loader. The parts can be measured during the process. Usually, even the first part in a batch is a good part.

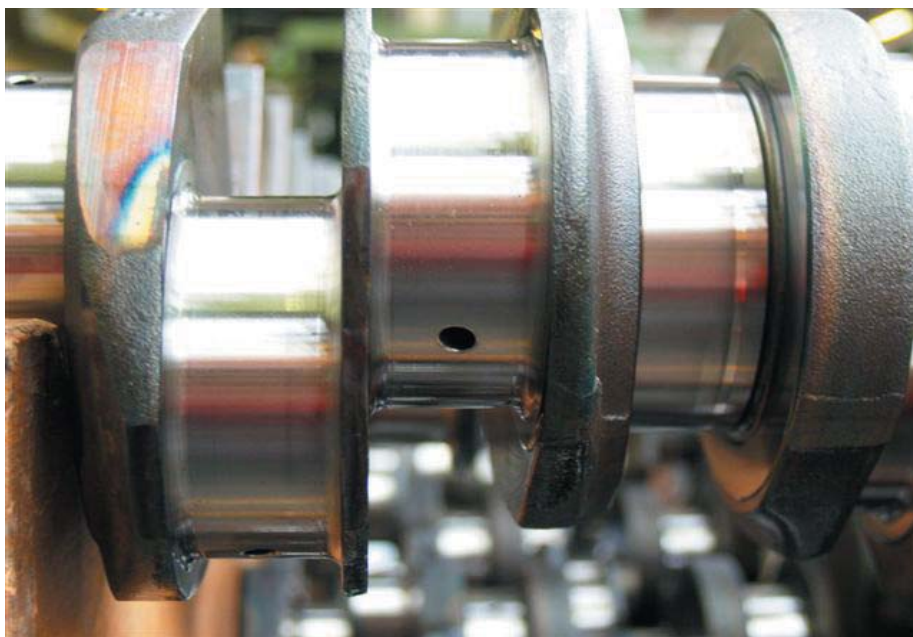
Martin Blankenhorn, who, in the Production Planning Department, headed the entire feasibility study on new process flows, machine integration as well as

overall project implementation, is full of praise for a completely different aspect: the control via the "Erwin Junker EJ-OP operator panel": "A new job can be called off in no time, programming is very simple. Generally, the machine is very user-friendly and easy to service. If need be, one of Junker's skilled engineers can be on hand to solve any problem, swiftly and reliably. Junker people respond immediately, there are no lengthy discussions. We deal with the more minor problems ourselves – where necessary with support from Junker's Teleservice."

### Time, space and money saved, quality and reliability improved

For cooling lubricant, Deutz uses an oil that has been filtered, without additives, in a plant from Knoll in Saulgau, Germany. "This is a vacuum filter with a synthetic, endless filter strip and an integrated slurry drying facility. We get completely dry chips that we can send for recycling", explains Martin Blankenhorn. This also helps to minimize costs.

Savings are achieved everywhere: Primary and secondary processing times, monitoring, tools, auxiliary substances, maintenance, disposal, space. First and foremost improving quality and process reliability.



mediate ceiling, which is not intrinsically stable and therefore transfers the vibrations generated by production.

The construction, developed jointly by Deutz and Bilz, consists essentially of a ribbed, grey cast iron plate mounted on air-sprung elements. It can be adjusted to suit the conditions it is in. What's more, a subsequent change of location would be much more cost effective.

Integration into production was also a smooth process. Space was created next to the old machines. As Bernhard Wamsler proudly remembers; "We were therefore able to integrate the new machines without either expensive pre-production runs or production interruptions".

It must be possible to quickly convert the process to a new work piece. It takes just 90 minutes to retool a Junker machine from one engine family to another, and within the same family, this impressive time is reduced even further. Eleven crankshaft variants from four families are processed on one line, from 300 to 12,000

Efficiency and environmental protection call for optimum precision in crankshaft production.

## DEUTZ AG

The question as to what's behind the Deutz brand can be answered by people all over the world. If the engine is a Deutz, customers can be sure of one thing - it will be reliable. Never mind how high the requirements. Never mind what scope. In a world of machine manufacturers and operators, the Deutz brand is a known quantity - and has been for over 140 years. This independent manufacturer of diesel and gas engines offers an ongoing engine range, some bespoke, for numerous applications, from 4 to 4,000 kW air, oil or water-cooled.

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