

PECM Technology

The New Cutting Edge

Pulsed Electrochemical Machining for Series Production

Don't deburr it - PECM it!

The PECM Story

The electrochemical machining technology developed by a team of Leistritz engineers in Nuremberg, Germany, began its game-changing, trailblazing development in 2018. The revolutionary pulsed electrochemical machining made it possible to manufacture flow contours on engine blades in a non-stop pulsating ECM process.

Aero-Engine Quality Standards

The standards and specifications for this technology are rooted in the exceptional demands on quality and safety in the aero-industry. These are, in a nutshell, absolute precision in series, no compromise quality, micro-accurate surface smoothness and documented reproducibility.

Expertise Available. Technology in Place

Harald Brand, Head of Operations at Leistritz Turbine Technology in Nuremberg confirms: „This technical concept in operation. It has proved its stability and reliability in an industry known for the most stringent quality standards in the world.“

“Now we are in an equally unique position to share our expertise and in-depth know how with production specialists who are keen to employ this technology in new applications and industries.”

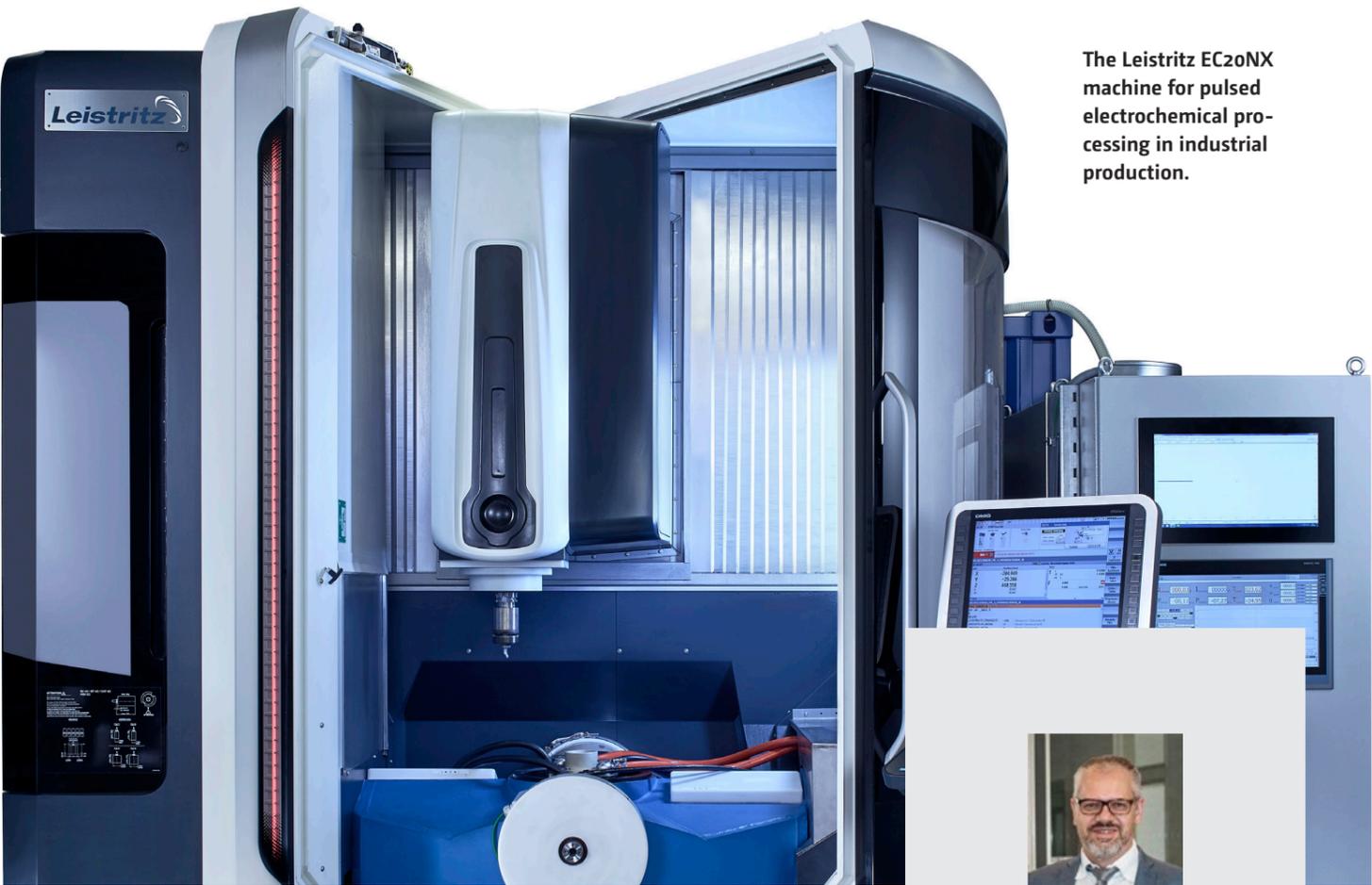
Georg Schmidt, Head of Process Planning, elaborates: “The EC20NX machine is based on a conventional design, but was adjusted, combining mechanical engineering skills and our long experience in ECM technology.”

The Nuts and Bolts of it all

High pressure compressors and complex 3D geometries with leading and trailing edge shapes and close tolerances demanded a reduction in the gap between the workpiece (the anode) and the tool (the cathode) during ECM. This would increase the accuracy of reproduction and reduce the set-up time. On the other hand, a reduced gap between the tool and the workpiece makes it more difficult to remove waste products.

Klaus Theusner, Managing Director of Leistritz Production Technology (second from right) with the Team (from left to right): Johannes Meyer, Cindy Liebl, Georg Schmidt and Helmut Reinfelder





The Leistriz EC20NX machine for pulsed electrochemical processing in industrial production.



To alleviate this, the current is switched off with a specific frequency (normally 10 Hz) and the cathodes moved away from the workpiece. This allows the gap to be flushed to remove waste.

In addition, four-sided machining was introduced, reducing the 'countersink flash' of the original process to a minimum and making manual processing redundant.

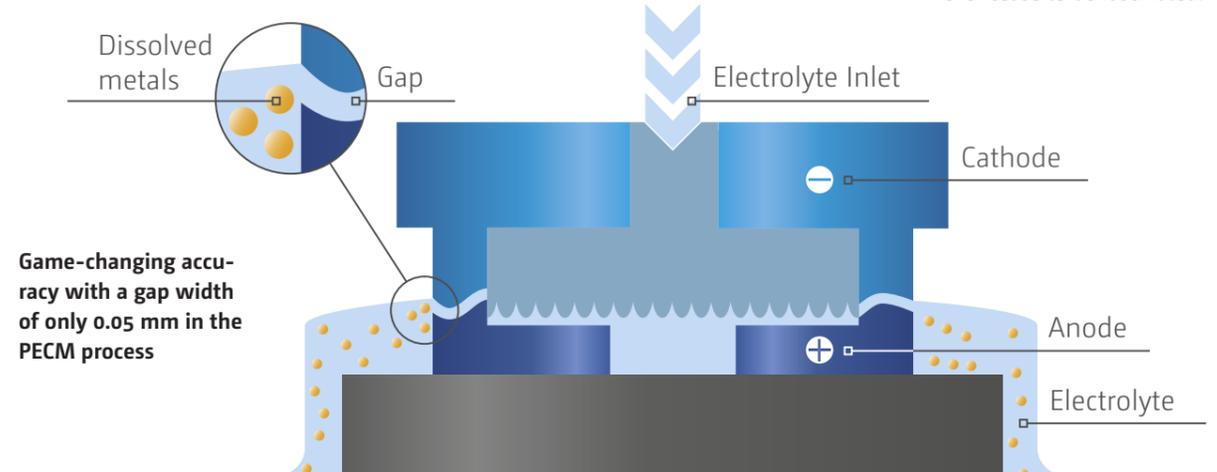
Compared with generator countersinking with its constant gap and constant electrical supply, these interruptions bring an increase of machining time. „It was thus necessary to build a machine of our own design which combines both processes and eliminates the respective drawbacks,“ explains Georg Schmidt. „The redesign enabled us to implement what we called the 'pulsed process' This is in place and working 100%“.

A further important point is that the machine is equipped with an independent electrolyte supply and can be operated directly in existing production lines. Thanks to intelligent automation, the machine works unattended throughout a shift.

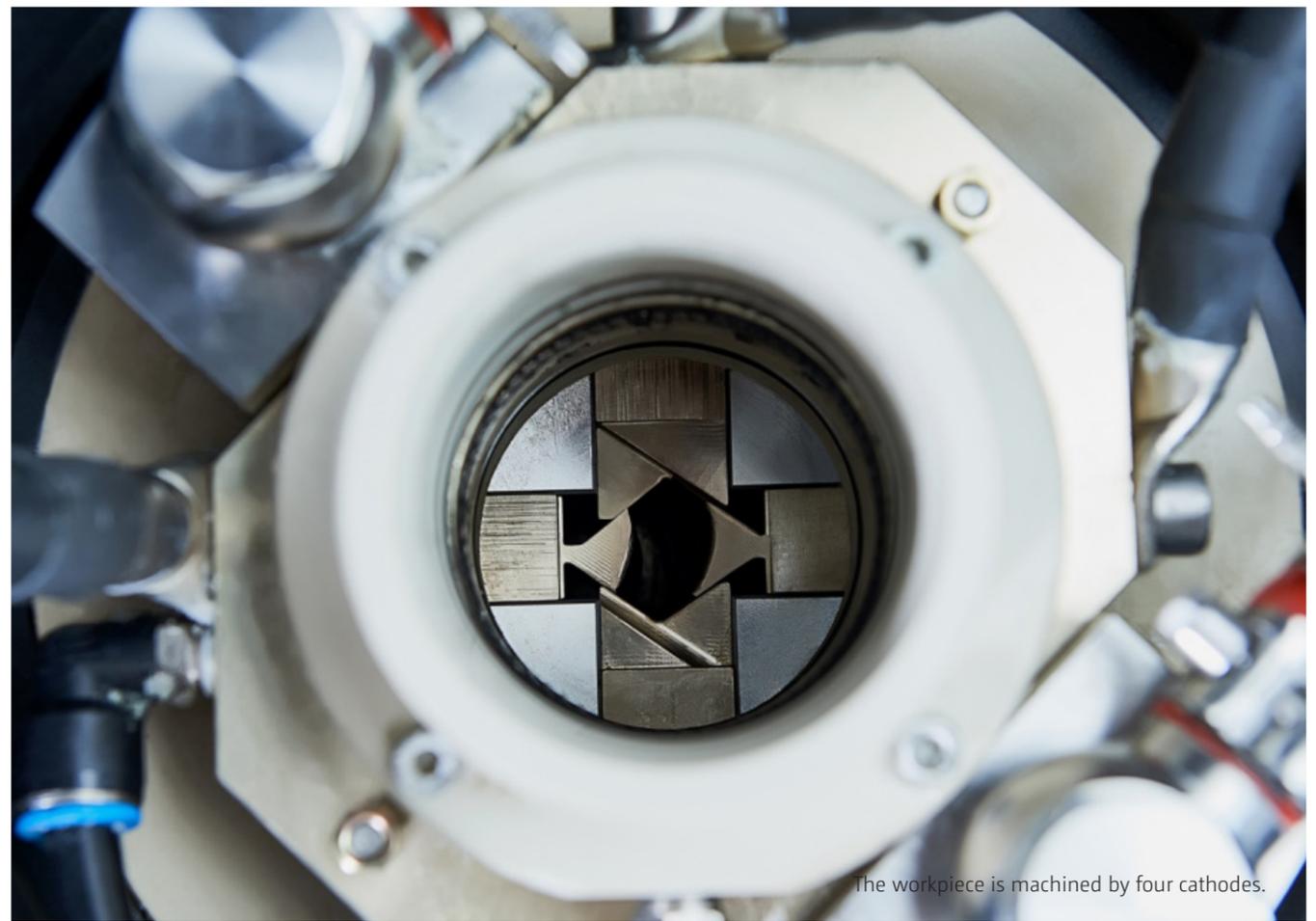
A World of Opportunities
The technology opens up new perspectives in terms of precision, accuracy, microsizing, reproducibility and cost-effectiveness.

“Take metal powder injection moulding or 3D printing that require surface finishing,“ forecasts Harald Brand. “As a result of the decentralized supply we are also able to bring mechanical machining centers and ECM machining together in the production line and automate them.”

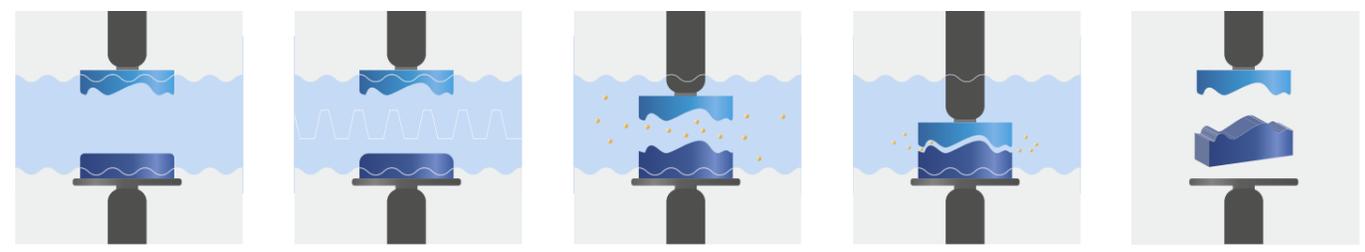
Georg Schmidt concludes: “PECM opens up so many technical options you would normally consider impossible. The precision in microdimensions, the microscopic smoothness of surfaces achieved are astonishing. I never cease to be fascinated.”



Game-changing accuracy with a gap width of only 0.05 mm in the PECM process



The workpiece is machined by four cathodes.



Step 1
Electrolyte inlet cathode and anode are set up. Electrolyte is pumped between the two parts.

Step 2
As the two pieces move together, a pulsed DC current is applied to the anode and cathode.

Step 3
The flowing electrolyte removes heat and waste products from the gap.

Step 4
The workpiece is machined into the complimentary shape of the cathode tool.

Step 5
The part is completed without any need for subsequent work, burr removal or polishing.

- ALLOYS for PECM**
- Martensitic stainless steel**
Greek Ascology AMS 5616
17-4-PH AMS 5643
 - Austenitic stainless steel**
ST 17/13 W 1,4962
 - Nickel based alloys**
Nimonic 90
Nimonic 115
Inco 718
Gathorized Waspaloy

Pulsed electrochemical machining (PECM) is a non-contact machining process based on the principles of electrolysis. The machining operation involves a tool (the cathode) in the inverse shape of the desired workpiece (the anode).

As the tool moves towards the workpiece surface, it machines the workpiece into the complementary shape of the tool. This occurs as a pulsed DC current is applied, allowing for high precision and superior surface quality.

At the same time, an electrolyte is pumped between the cathode and anode at high speed, removing dissolved metal and heat.

The result is an operation capable of producing a burr-free 3D shape with no tool wear in alloys that are difficult or impossible to machine through traditional methods.



PECM Technology Your Opportunity

Pulsed Electrochemical Machining for Series Production

8 Benefits at a Glance

Pulsed Electro-Mechanical Maching: Empowering your Production Future

Electrochemical machining technology is a touchless procedure that is employed to manufacture large volumes of precision parts quickly and cost-effectively. This allows you to position yourself as a premium supply-chain partner with confidence and exceptional quality claims. The chances for innovative, quality-focused production operations are huge: cut costs while exponentially improving precision in series, supplying your customer with a proven supply-chain solution - both at first tier and component supplier level.

- 1 **No recast layer**
- 2 **No heat-affected areas**
- 3 **No burrs**
- 4 **No tool wear**
- 5 **Capable of machining thin walls and microstructures**
- 6 **Capable of machining 3D shapes in a single production step**
- 7 **Exceptional surface precision and quality**
- 8 **Cost-effective series production**



Your Partner for Equipment and Expertise

Klaus Theusner heads Leistritz Production Technology in Pleystein, Germany. "Our pledge is to provide first class consultation, engineering excellence and real industry-focused solutions to your machining needs. In additions, pristine machines are available to discerning investors and to dedicated quality improvers."

Consult our website to obtain the latest technical data.

This technology is ideal for clients all over the world, who need much better quality than possible with existing equipment.

"You are also welcome to consult us on your specific specifications or demands. Our production engineers will support you in designing the best solution for your specific production line."