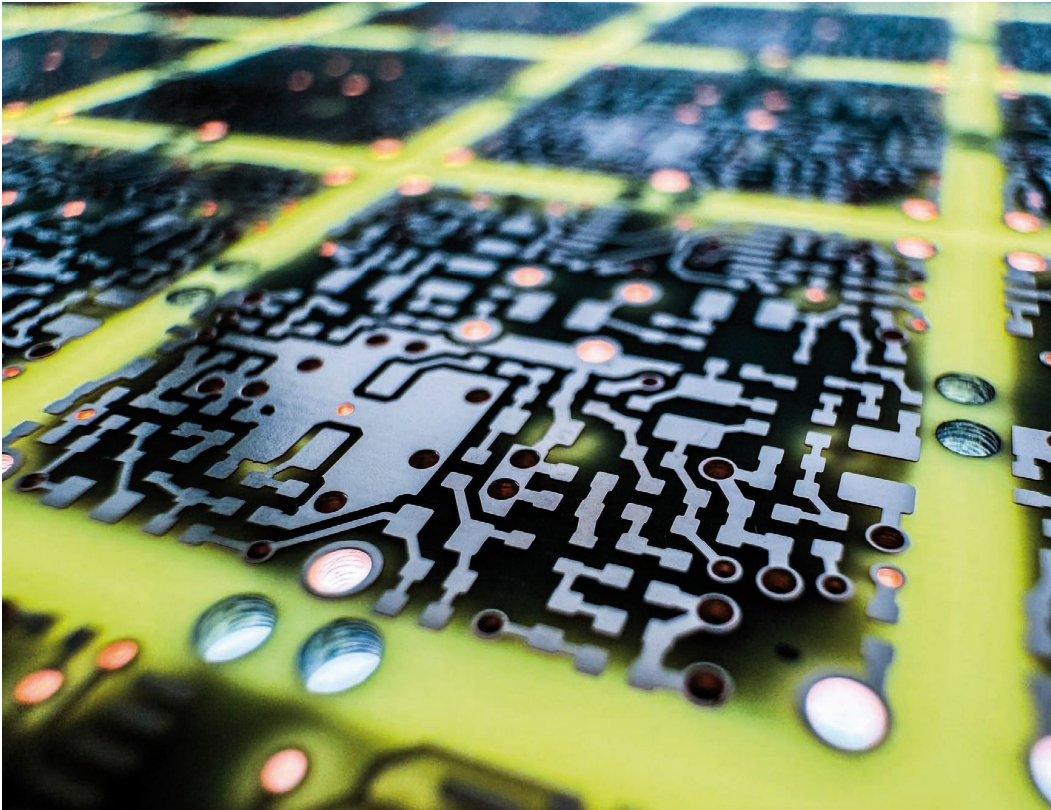


PCB etching at the highest level

Becker&Müller invests in innovative process optimisation.



Etched conductive pattern

The new SES line at PCB manufacturer Becker&Müller

Etching is one of the most important process steps in the production of printed circuit boards - and at the same time one of the most demanding. By investing in a new etching system, Becker&Müller is setting the course for even more precise and efficient PCB production. The new PCB processing line was developed in close cooperation with the chemical industry and a specialised machine manufacturer and combines higher process reliability with greater user-friendliness and sustainability.

Becker & Müller
Schaltungsdruck GmbH
becker-mueller.de

translated reprint from the German PCB magazine „electronic fab“, issue 01/2024

"The new etching line is a big step into the future of our production," explains Managing Director Janik Becker. "Our focus as a manufacturer of sophisticated PCBs in respect of samples and prototypes requires us to always be at the forefront in terms of quality and precision - even with very small batch sizes, different layer thicknesses, and layouts. The new PCB processing line is a decisive factor here."

The so-called SES system (Strip-Etch-Strip) consists of three main modules. The process steps of photoresist stripping, etching of the copper cladding and tin stripping are carried out over a length of 15 m - all under multiple automated monitoring and cleaning. With numerous technological innovations and improvements, the etching line now offers several advantages in PCB production.

The new etching line - advantages on many levels

"First of all, the new system has been extended by a whole chamber length," explains Janik Becker. "This alone ensures increased volume and process reliability." This extension in combination with an increase in the throughput speed, enables the capacity of the system to be increased to up to 36 m² per hour. For the prototype manufacturer, there is therefore still sufficient scope to further increase its own productivity in the future. Another plus for use in PCB prototyping is the sophisticated transport system, which enables the processing of panel thicknesses between 50 and 6000 µm.

A new filter system was used for the photoresist: With a cyclone filter instead of the old belt filter system, it is possible not only to extend the

service life of the chemicals, it also means that fewer chemicals are used overall, which also benefits the environment. The automation in the Sn-Strip module also takes this factor into account: Continuous monitoring and precise dosing keeps the level of chemicals used at the required concentration at all times, so that you never use too many chemicals. Contaminated water from the downstream chamber is also fed in as a water component, so there is no need to use fresh water - here too, sustainability becomes an active component of the process.

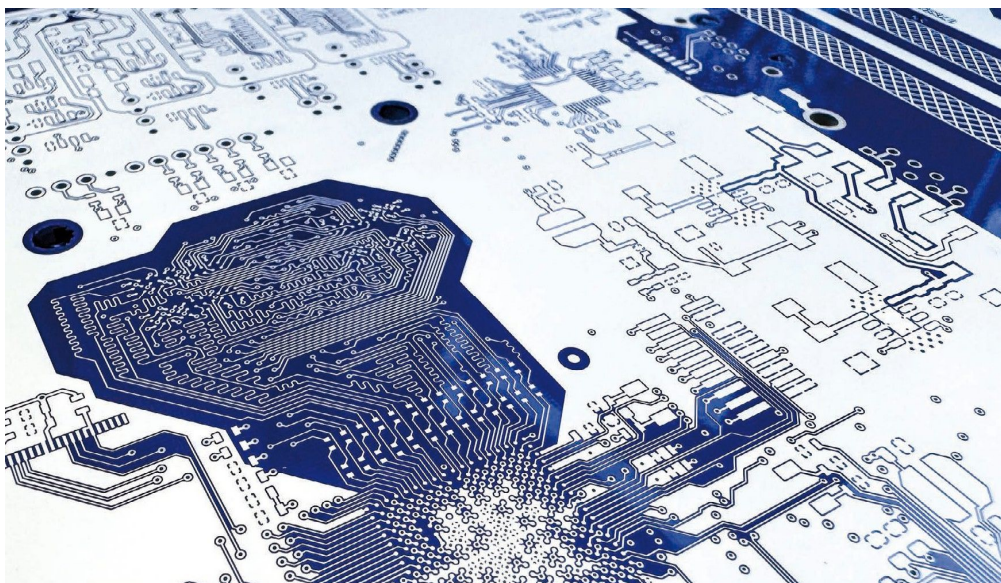
A special nozzle arrangement was selected in the post-stripping module that allows significantly higher pressures of up to 6 bar: "We can achieve a significant improvement in precision, quality and cleanliness, especially with very complex PCBs," says the Managing Director of Becker&Müller.

Maximum cleanliness and therefore product quality is also achieved in all three areas of the plant thanks to a newly optimised rinsing system. Becker&Müller goes beyond the legally prescribed threefold use of water, as the Managing Director of the PCB specialist explains: "The system flushes in four cascades, one more than prescribed. This allows us to reduce the amount of rinsing water by up to 50%, whereby we also use rainwater in some cases."

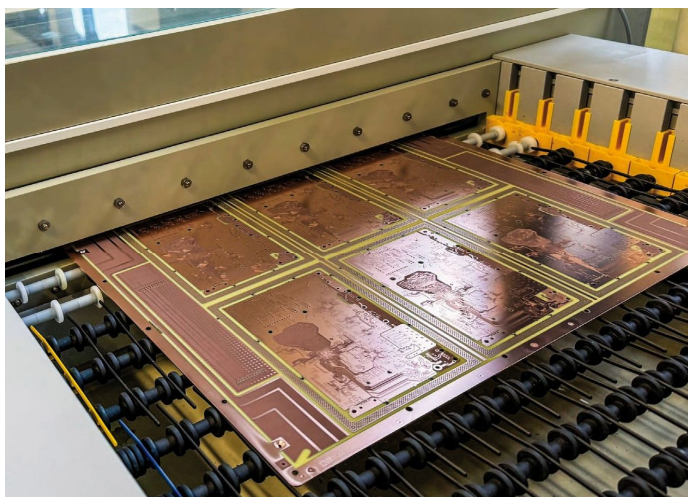
High degree of automation

The actual etching module offers a significantly higher degree of automation and efficiency compared to the old system. Copper thicknesses from 9 to 200 µm can be etched in a single run. This is made possible above all by the consistent monitoring of the density and pH value of the media used: 16 pipes, each with its own flow meter and nozzle check. There is also a new patented vacuum etching system that minimises the previous

differences in etching results between the top and bottom sides of the processed circuit boards: "Since the etching is done horizontally in the line, the etching medium would accumulate on the top side and the spray jet would no longer hit the surface at full power. On the bottom side, the medium drains immediately due to gravity; an identical result could not be achieved conventionally. This is remedied by a vacuum, which is generated via a Venturi principle and aspirates the medium from the top of the PCB. Thus, as with the bottom side, this ensures



PCB panel prior to etching with photo (blue) and Sn resist (silver)



PCB panel after etching process

that the spray jet hits the PCB surface directly. Overall, the automation and technological innovations in this demanding area provide a significant boost in terms of quality and process reliability, as well as convenience for employees," explains Janik Becker enthusiastically

The new PCB etching plant: A joint process

The new system for etching printed circuit boards is the result of lengthy deliberations by those responsible at Becker&Müller, including their R&D department, as Janik Becker points out: "The old system was no longer entirely suitable, not only from a techno-

logical point of view, but also in terms of sheer size." In close cooperation with the chemical industry and the specialised machine manufacturer for the wet-chemical process chain of PCB production, a new etching line has been developed, which sets standards throughout Europe in the production of PCB prototypes, samples, and other specific PCBs.

The design of the etching system for Becker&Müller was also challenging and exciting for the machine manufacturer Pill GmbH, based in Auenwald in southern Germany.

The company has been specialising in the development of production systems for printed circuit boards for a long time, but much of this project, particularly in terms of automated monitoring and the safe and efficient management of sensitive media, was uncharted territory. It was therefore even more important to incorporate empirical values and feedback from practical examples into the development in a closely coordinated process. Becker&Müller was the ideal partner for this.

Quality, process reliability, convenience and sustainability

In addition to numerous technological optimisations, the new processing line is not only more user-friendly for employees, but also pays special attention to environmental protection. "As a family business with deep regional ties, such positive aspects of sustainability are of the utmost importance to us," says Becker. The new system has been in operation since mid-2023 and completely fulfils the desired function: "Set-up and installation was challenging, but it was worth it: We can now offer our customers even better quality and process reliability, further underpinning Becker&Müller's reputation as a reliable and high-performance manufacturer of sophisticated printed circuit boards." ◀



Managing Director Janik Becker