

## Cost-Efficient Laser Depaneling

### Why depaneling with a laser is the most efficient solution

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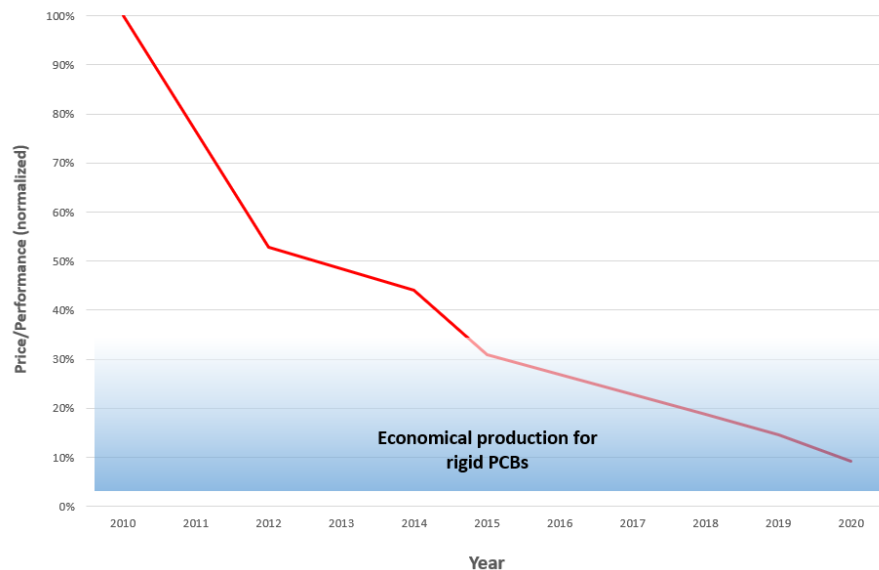
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For years now, there have been rumors going around in the electronics industry that laser depaneling is very costly. This may have been true for investments in laser machines ten or more years ago – but when considering the operating expenses, especially with newer systems, the situation looks quite different today. In the end, depaneling with laser systems has become by far the most efficient method for a wide range of applications and the cutting results are excellent, which means that the highest quality standards are also met.

The trend in the price-to-performance ratio for current laser systems, especially with respect to production of rigid PCBs, is quite obvious: The cost of depaneling based on the effective cutting speed has fallen to approximately one tenth of what it was a decade ago.



**Fig. 1:** Changes in price-to-performance ratio for laser depaneling systems over the period 2010–2020

There are two main drivers for this phenomenon: on one hand material costs are much lower today than they were a few years ago, and on the other hand, the performance of laser systems has improved dramatically due to integration of more powerful lasers and the more advanced process know-how developed by leading laser machine manufacturers such as LPKF.

### **Material Savings and Fewer Upstream Processes**

With the use of modern laser systems such as LPKF's CuttingMaster 3000, savings in terms of PCB material of more than 30% on average can be achieved. This is made possible by utilizing a full-perimeter cut through the panels with the laser, rather than cutting tabs of pre-routed boards. With a full-perimeter cut, PCBs can be spaced very closely together for minimal material loss; taking full advantage of the narrow kerf width of a laser tool which is typically around 0.15 mm vs. a 1-2 mm router bit. This eliminated the space that is otherwise occupied by pre-routing lanes around each PCB on the panel. Another advantage is the variable and exact laser guidance and the narrowest possible cut to accommodate even the most intricate geometries, ensuring optimum material utilization. Through these factors, laser systems can realize even greater savings potential, especially for smaller-sized PCBs.

In addition, the costs of upstream process steps are reduced, and users also profit from indirect savings because of the higher number of PCBs per panel: The handling time for the individual PCB is reduced and human errors caused by manual handling are minimized.

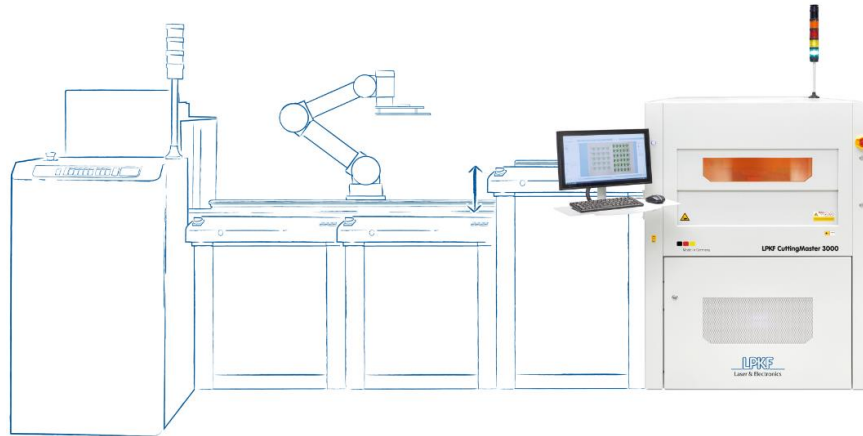
### **Low Operating Expenses, Minimal Downtime**

In addition, unlike with milling machines, there are no significant operating expenses. Background: The laser as a tool has no mechanical wear and the quality of the laser is constant. There is no need for regular replacement of saw blades or router bits also eliminating the unproductive downtime and cost to replace such tools.

Preventive maintenance work can be done at longer and planned intervals because the replacement of machine wear parts is done during regular preventive maintenance deployments. Through this, the downtime can be reduced to a minimum.

### **Error Minimization and Quality Improvement**

For high volumes, laser machines integrated into production lines are often advantageous. Extensive automation often reduces manual errors.



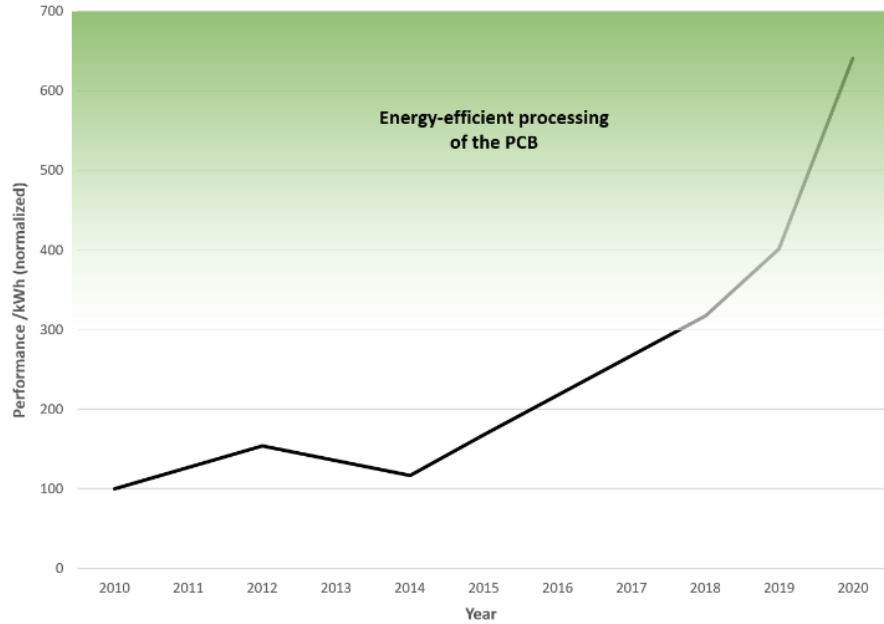
**Fig. 2:** LPKF CuttingMaster 3000 Ci: laser depaneling system for lines

By using a laser for PCB depaneling operations, both dust and stress to the PCB are eliminated, drastically improving production yield. Unlike traditional mechanical depaneling methods, laser depaneling machines, do not generate milling dust which can become airborne and cause quality issues anywhere in the plant, as well as cause health problems for employees exposed to these airborne particulates. Lasers also don't create the mechanical stresses that are imparted when using a dicing saw or router, which could jeopardize the functionality of sensitive components on the circuit board or even compromise the integrity of the board itself. PCB manufacturers achieve a higher quality and a better yield if laser depaneling system are being used. These two factors together provide a significant advantage, which traditional depaneling technologies cannot equally provide.

### **Energy Efficiency**

Even if it seems at first that the energy use for depaneling was negligible for many production facilities, this factor is nowadays often considered more carefully. Over the years, the performance of the laser has risen considerably while their overall power consumption in relation has dropped significantly. This translates into a sixfold

increase in overall energy efficiency – a remarkable factor that can currently only be achieved by laser technology.



**Fig. 3:** Changes in energy efficiency over the period 2010–2020

### Conclusion

When considering the above-mentioned aspects in terms of the cost-effectiveness of laser systems for depaneling of rigid and flexible PCBs, modern laser machines are the tools of choice, especially for high throughput applications. These systems save on material costs, handling efforts, and improved production quality which equates to higher yield. The return on this investment is easy math.

### About LPKF

LPKF Laser & Electronics AG is a leading provider of laser-based solutions for the technology industry. Laser systems from LPKF are key elements in the manufacturing of printed circuit boards, microchips, automotive parts, solar modules, and many other components. Founded in 1976, the company is headquartered in Garbsen, near Hannover, Germany, and has subsidiaries and representative offices

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