

## Milling Process of Rigid Flex Printed Circuit Board to Which Polyimide Covers the Whole Surface

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**Abstract :** Kostal Macedonia has the challenge to mill a rigid-flex printed circuit board (PCB). The PCB elaborated in this paper is made of FR4 material covered with polyimide through the whole surface on the one side, including the tabs where PCBs need to be separated. After milling only 1.44 meters, the updraft routing tool isn't effective and causes polyimide debris on all PCB cuts if it continues to mill with the same tool. Updraft routing tool is used for all another product in Kostal Macedonia, and it is changing after milling 60 meters. Changing the tool adds 80 seconds to the cycle time. One solution is using a laser-cut machine. Buying a laser-cut machine for cutting only one product doesn't make financial sense. The focus is given to find an internal solution among the options under review to solve the issue with polyimide debris. In the paper, the design of the rigid-flex panel is described deeply. It is evaluated downdraft routing tool as a possible solution which could be used for the flex rigid panel as a specific product. It is done a comparison between updraft and down draft routing tools from a technical and financial aspect of view, taking into consideration the customer requirements for the rigid-flex PCB. The results show that using the downdraft routing tool is the best solution in this case. This tool is more expensive for 0.62 euros per piece than updraft. The downdraft routing tool needs to be changed after milling 43.44 meters in comparison with the updraft tool, which needs to be changed after milling only 1.44 meters. It is done analysis which actions should be taken in order further improvements and the possibility of maximum serving of downdraft routing tool.

**Keywords :** Kostal Macedonia, rigid flex PCB, polyimide, debris, milling process, up/down draft routing tool

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