



Miraco, Inc. Case Study

1. Project:

Increase Flex Cycle Life of Flexible Printed Circuit (FPC) Assembly

2. Contact Details:

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3. The Customer:

As an industry leader, the customer is constantly pushing the limits of technology to provide healthcare professionals with the latest products that achieve superior performance.

4. Industry Category:

A non-invasive medical accessory to assist surgeons, dentists, and hygienists with meeting the needs of patients and improving surgical safety.

5. Executive Summary:

Miraco's customer was experiencing a higher than desired field return rate of their product due to unknown failures. Miraco was tasked with evaluating these returns to determine the root cause and to develop a solution to reduce product failure.

Miraco prides itself on offering state of the art evaluation, analysis, brainstorming, and cutting-edge solutions to real world problems. All of this is balanced with the need for reducing costs and lead-times while delivering a high-quality, reliable product. Miraco enthusiastically accepted the challenge of solving this customer's product life issue and integrating it into current production without causing a stockout condition to the market.

6. Purpose of Project / Technical Challenge:

Miraco's customer, a leader in the medical industry, developed a product which was a step above in terms of style and technology compared to its competitors' products while maintaining a competitive market price. Unfortunately, the product was not meeting reliability expectations and needed to outperform competitive offerings which were available to medical professionals.

The customer tasked Miraco with reviewing the current design and performing failure analysis on returned customer product. The goal was to significantly improve the life of the product with minimal or no impact to the overall assembly cost, product class, and tooling. In addition, the customer's intent was to introduce the revised product to the market in less than six months.



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7. Solution:

Miraco developed test methods which were designed to push the product to the point of failure while simulating normal working conditions in order to determine root cause(s). To accomplish this, Miraco designed and built a custom flex cycle life testing machine which accurately simulated the worst case flexing conditions for every day human use. The machine was used to exercise the prototypes while monitoring the electrical resistance and number of cycles to failure.

The testing and analysis demonstrated that the failures were isolated to a specific portion of the FPC where it passed through a hinge joint which was subjected to flexural fatigue. It was determined that the current FPC was not designed to handle the worst case bending conditions that the product could experience during day to day use resulting in lower than desired flex cycle life.

Utilizing state of the art software, Miraco designed several prototype options which would help reduce stress introduced to the thin copper layers of the FPC. The thought process included focusing on strain relief, bend isolation, stress reduction, copper grain direction, and proper material stack-up which would maximize flex cycle life. The prototypes were then tested to verify improvements to the flex cycle life.

Miraco engineering demonstrated that by revising the routing of the FPC through the hinge and modifying the circuit layout to reduce stress, that **flex cycle life increased by nearly 10 times** therefore providing a much higher quality product to the customer. This was all accomplished without affecting the selling price or having to modify any tooling related to the product housing.

8. Benefits / Business Case:

Customer Benefit: Miraco's customer now offers the market a product which outperforms and outlasts its previous product. Product appearance and pricing has not changed, while the reliability has improved, and the customer's name brand reputation been maintained.

Miraco Benefit: Miraco has gained the customer's confidence on this product and has been offered the opportunity to not only become the primary / sole source of the FPC, but also is in discussions of completing the box-build of the completed product.