

Featured Company: Mooney Industries Precision Machining, Inc.

An Aerospace Job Shop Turned to the 'DarkSide' to Beat Parts Distortion

In a case where "warp speed" slowed production, a small, high-tech, boutique machine shop, Mooney Industries Precision Machining, Inc., Canoga Park, CA., found a wizardly way to cut reworking time and improve production.

For 34 years, Mooney Industries has manufactured small production, high-quality parts for the space shuttle, the space station, and the Department of Defense.

But, when work came in from the defense department that required working with 7075 aluminum and copper, warpage became a problem. After witnessing Black Magic® high frequency vibratory stress relief from Bonal Technologies Inc., Royal Oak, MI, at a trade show, Mooney Industries President Brian Mooney decided to try the system for stabilization of the problem material.

Quality, Time, or Money – Pick Two

Mooney Industries was using temperature-type stress relief from an outside source to reduce part distortion. This traditional approach – because of small lot sizes – added a significant number of dollars and time to processing. The company also encountered considerable warpage necessitating parts reworking.

The Black Magic system the company adopted induces sub-harmonic vibration energy into single parts or batches on its platform. The amount of induced energy is based on the weight load of the components being treated. The result is less distortion in subsequent processing.

When distortion is anticipated in a machining process, Bonal recommends sound-induced stress relief before each step. Manufacturing steps may include machining,



Relieving stress in parts before machining results in less distortion. By mounting pieces on the Black Magic stage and subjecting them to sub-harmonic vibration, Mooney Industries reduced parts warpage and reworking.

grinding, EDM, hardening, welding, heat-treating, and sawing. The stress-relief process lets companies to use less machining and manufacturing time, thus improving productivity and profitability.

Mooney tested Black Magic on two products. The first test was on 7075 aluminum concentric rings. **After treatment and one rough and one finish machining, workers saw the rings were flat to an accuracy of 0.0003". In former operations it took as much as three hours of additional machining to reach the same flatness.**

The second test used 14 copper injector plates, with 14" diameters and a 1/2" flange on top. Distortion was usually 0.005" after processing. After treatment, the parts could be machined to within a flatness of 0.001". The Black Magic treatment reduced distortion by 80 percent.

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A California high-tech machine shop saves time and money by using "Black Magic"

"After using Black Magic on the first parts, we found the process to be a better way to control the material," Mooney said. "With the system's size and convenience, we could bring it in house. I can use it on in-process parts while other parts are being manufactured."

We have also found Black Magic less likely to reduce or change the temper of the part."

After the test results, the mandate went out to treat all such rings with the Black Magic system before machining.



Prior to using the stress-relief system, copper injector plates, with 14" diameters and a 1/2" flange on top, were out of flatness by 0.005". After use of the Black Magic system, distortion after machining was reduced by 80 percent.

Practicing Black Magic?

The Black Magic system consists of a control console that has a vibration platform as its top. It comes in three sizes: 12"×18" with a 50-lb capacity, 15"×30" with 150-lb capacity and 18"×36" with 300-lb capacity. Other options include: power: 110 V or 220 V; SAE or metric mounting holes; and styles.

18 Month Payback

In use only four hours per week, the Black Magic system has paid for itself in 18 months with reduced reworking of warped pieces.

Mooney cites the savings from bringing stress-relief in-house.

"If we outsource heat treatment, we may have to wait anywhere from two days to three weeks, plus it costs an average of more than \$80 per part," he said. "If I can run this process in-house, then it's a negligible expense and the parts will be done within one hour.

Also, by having my own equipment I might use Black Magic to treat something that I wouldn't have heat treated."

When possible, Mooney Industries uses Black Magic on other projects and plans to use it earlier and more often.

"We have the advantage of making a higher quality part without having to spend a lot of money. The system lets us eliminate some of the finish cuts and polishing at the end of our machining operations," Mooney said. "In the past, we may have needed to do two to three hours of reworking per part."

The stress-relief system has interested Mooney Industries customers.

"We're seeing new business with Black Magic. Bonal has been very good at keeping in touch and giving us leads," said Mooney. "Some companies would like to buy a unit, but want to try it on the product first. This process has opened a new market and new place for us to look for business."

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Bonal Technologies, Inc. - 1300 North Campbell Road - Royal Oak, MI 48067
P: 248-582-0900 or 800.638-2529 F: 248-582-0901 - info@bonal.com - www.bonal.com

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