

# Shot Peening Solutions Save Prop Maker Money

by Herb Tobben

## The Customer's Problem

A manufacturer of aircraft propellers was shot peening the shank, the portion of a propeller blade that mounts to the hub. The hub is the center section of the propeller, which carries the blades and is attached to the engine shaft. They shot peen the shank to maximize its fatigue life. It goes without saying that the propellers perform a function critical to the operation of the aircraft. Therefore, shot peening specifications must be followed precisely.

The company's production included three different sizes of propeller blade sets ranging in size from three feet to four feet in length. The aircraft manufacturer's specification called for shot peening to a specified intensity on the Almen-A strip. The propeller maker shot peened one size propeller at a time.

They were using an old cabinet, which had one oscillator and two blast guns, and their procedure called for a unique set-up for each size. That meant they needed to readjust the blast guns each time they changed from one propeller set to another. Setting the guns for each propeller set was critical as the customer had to be especially concerned about maintaining peening intensity. The old cabinet had no media flow control, necessitating painstaking attention to detail and testing for each set up. A shank that fails has catastrophic consequences.

The customer reported an estimated 400 hours per year on indirect labor changing from one set up to another.

## The ZERO Solution

The ZERO automated solution was a special four feet by four feet by eight feet tall cabinet fabricated of 3/8-inch plate steel and rubber lined to withstand the barrage of steel shot. The cabinet has double opening doors in front for easy access to the cabinet interior for placing the parts on and removing them from the fixture.

The ZERO cabinet, sized to suit the range of parts, and painted a customer-specified color, incorporates special time-saving features. What differentiate this machine from its predecessor are its six guns, and simple but sophisticated controls. The cabinet has two oscillators and a total of six guns. Only two guns operate at a time; each set of two is appropriately positioned for a particular propeller set. So, simply by turning on each set of two guns and turning off the others, the set up is complete. Making this possible is at the heart of the new system, its PLC controls. They control the air to the guns, the media on-off from the shot gates that open and close to feed media to the guns, the oscillator speed, as well as the recovery equipment. And because the manufacturer's specification called for the steel shot to be gravity fed to the blast guns, the ZERO cabinet incorporates this out-of-the-ordinary feature. Since the PLC controls the set up for each of the three propeller sets, the changeover requires no other adjustment.

This cabinet not only saves the company 400 labor hours per year, but also eliminates the need for them to process larger-than-needed batches of product to reduce the labor cost associated with the changeover.

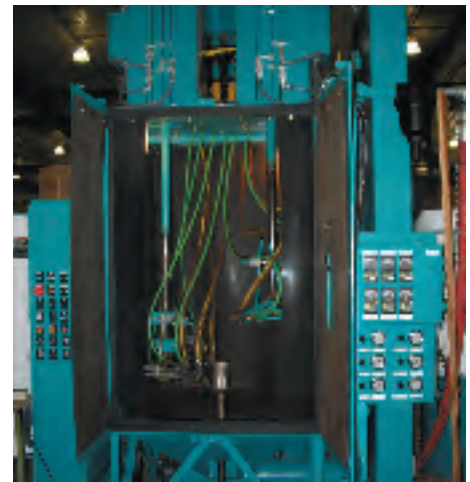
Operation of the ZERO cabinet is simple. For each propeller size, the appropriate fixture is put in place and the PLC is set to turn on and off the guns for the appropriate blast cycle for the particular size propeller blade. Controls also include a limit switch that controls the length of the oscillator stroke. The oscillator movement slows for the shot peening and has a rapid-traverse mechanism to return to the home position to minimize processing times. The cabinet also includes MagnaValve shot flow controllers, a vibratory classifier, and a level sensor with indicators for low-media and full conditions. These indicators prevent the system from running out of media and from overfilling the hopper.

Media recovery is handled with a screw conveyor and a bucket elevator to carry the shot to the top of the vibratory separator. From there the shot cascades through a two-screen vibratory classifier. And from there another bucket elevator refills the hopper, mounted above the cabinet for gravity feeding of the guns.

The vibratory classifier is especially critical to maintaining the proper operating mix to keeping the peening intensity within spec. The customer supplied their own dust collector. This new cabinet system significantly reduces indirect labor costs for the company and is easier to operate. Testing is minimized; now at prescribed intervals, the operator sends an Almen block through the cabinet and logs the results. With the cabinet's sophisticated controls, peening intensities are easier to maintain resulting in a more efficient and productive operation. ●



The customer processes various sizes of parts with unique fixtures and masking for each set up.



A flexible cabinet system—a PLC controls many functions, including the on-off cycle of the gravity-feed guns, the oscillator speed, and the media recovery.



Got a question about shot peening, abrasive blasting, or sample processing? Clemco can help. Call **Herb Tobben** at 1-636-239-8172 or submit your request at online at [www.clemcoindustries.com](http://www.clemcoindustries.com) in the Contact Us section. Herb Tobben is Sample Processing Manager for the ZERO Automation product line at Clemco Industries Corp. He is a regular speaker at the Electronics Inc Shot Peening Workshop.