Sample Processing Update: Fitting a Round Part into a Square Blast Pattern

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Question:
An aerospace company asked for ZERO’s help in creating a relief pattern on the surface of a ceramic plate. The pattern of evenly spaced bumps resembles an inverted golf ball skin. Most manufacturers would turn to machining to produce this type of pattern, but the high-tech ceramic plates proved too brittle for conventional CNC machining processes.

The company already had created its own templates and tried to manually blast the plates to remove a precise amount of material while leaving the raised bumps, but even the most experienced blast operators produced inconsistent results.

The customer needed to process fewer than 100 parts per year — one of the lowest automation production requirements we’ve ever seen. Each plate was valued at several thousand dollars, so the customer wanted to limit rejects to as few parts as possible.

One blast equipment manufacturer submitted a proposal that included an indexing turntable and sophisticated computer controls to vary the speed of the blast gun as it traversed the part. To get a consistent depth of “machining” with this process, the nozzle must dwell longer at the outer edge of the spinning ceramic plate, then progressively increase speed (to decrease the dwell) as it nears the center.

The customer had a few concerns about this proposal. The system was expensive, and with so few parts per year to process, this purpose-built machine would sit idle most of the time. But more importantly, the customer feared the sophisticated, variable-speed nozzle oscillator would not create perfect parts.

Solution:
When is a circle not a circle?
This customer needed to uniformly blast the flat surface of a disc — not the edge. ZERO treated the disc as if it were a square, which changes the very nature of the problem.

So, how do you deliver consistent blast coverage to a flat surface?

With the system ZERO proposed, a motorized work car moves slowly through the cabinet, while two automatic guns, mounted on an oscillating arm, thoroughly and consistently blast a square area slightly larger than the actual part. The overspray falls harmlessly through the perforated surface of the work car.

Instead of an indexing turntable with sophisticated computer controllers, ZERO used a fixed-speed work car and a simple oscillating arm — components readily available from our “Options-Plus” program. (The Options Plus program allows ZERO to adapt custom-engineered components from one system and apply them to another, similar application. By not starting with a blank CAD screen each time, ZERO’s engineers can save money, reduce delivery time, and still produce a proven system.)

Sample processing quickly demonstrated that the selected components would work.

To make matters even better, ZERO mounted everything in a standard BNP 220 suction blast cabinet — with gloves, a manual blast gun, and view window. When not needed to process the ceramic plates, the cabinet can be used to manually blast a variety of parts, just like the customer’s other ZERO cabinets.

This creative use of existing technologies saved the customer a bundle of money and delivered a versatile cabinet with automated and manual options.

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