Article reprinted from the May 1993 issue of ***Modern Applications News***

Abrasive Blasting Deburrs at Exceptional Speeds

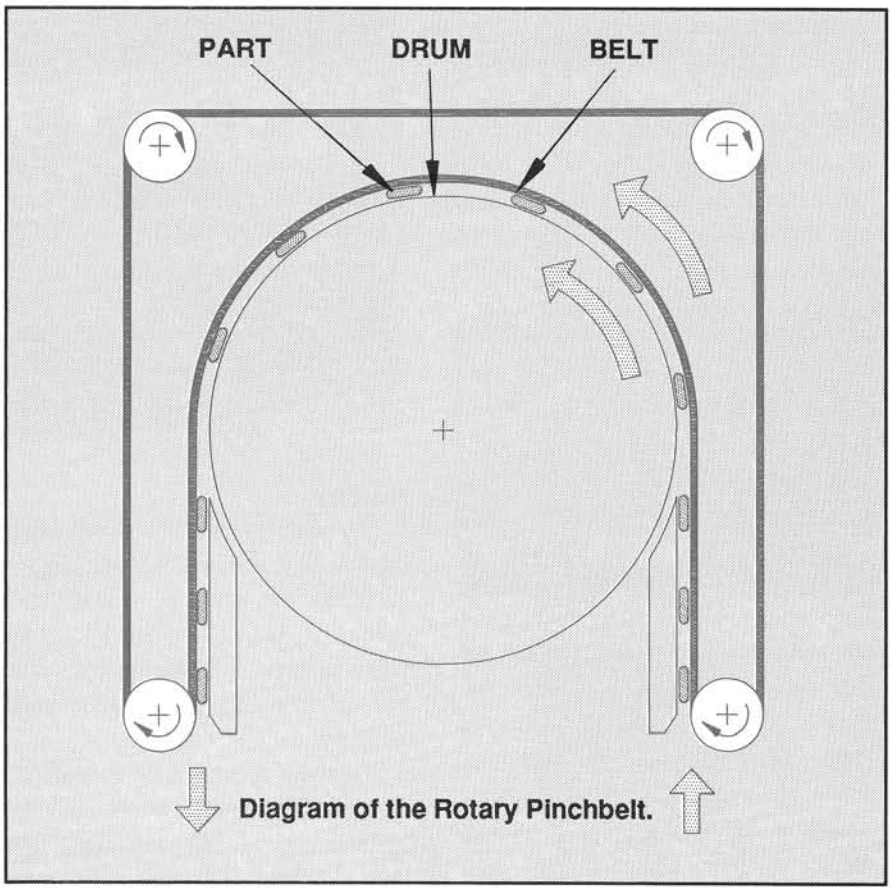


Diagram of the Rotary Pinchbelt.

Manufacturing hypodermic needles is a little less painful for two New England companies, thanks to a new concept in removing grinding burrs.

A critical step in producing the cannula, the needle's surgical stainless steel delivery tube, is precisely grinding the point. It must be extremely sharp, even when examined under high power magnification, so that it penetrates the skin cleanly. Sharp needles deliver a less painful injection.

Grinding a point with a 20° tip angle leaves a 70° obtuse angle at the base of the grind. It is in this "heel" area that problems arise. The grinding wheel pushes as well as cuts the ductile stainless steel. The moved metal is pushed part way over the center hole of the tube to form a burr.

Burr Problems

The burr may cause pain and present other problems if it comes loose in the skin. Therefore, all burrs must be completely removed regardless of size, and without dulling the nearby edges or point on the cannula.

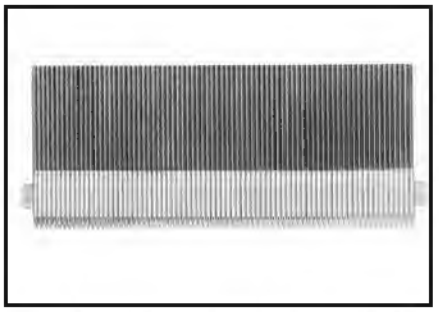
The traditional method for cannula burr removal is micro-abrasive blasting (otherwise known as abrasive-jet machining). Micro-abrasive blasting delivers extremely fine abrasives in a very high pressure compressed air stream through nozzles a few thousandths of an inch in diameter. The abrasive particles knock off hard burrs and wear down softer flash. Micro-blasting is performed in a separate automatic machine, or it can be done on the grinding station itself.

All needle manufacturers have complaints about light duty micro-blast equipment. It can't meet production demands and creates a process bottleneck, necessitating overtime. It often requires twelve passes of the tiny nozzle to remove all of the burr. Poor, imprecise fixturing results in loss of control and incompletely removed burrs or rounded edges. A special 150 psi air compressor requires excessive maintenance. In micro-blasting on the grinder, abrasive particles land everywhere, creating a mess and working their way into the grinder's precise way beds.

The Solution

Empire Abrasive Equipment Company was selected by one of the needle manufacturers to devise a solution. "One of the things we noted at the start of the project was the clamping method used throughout their manufacturing process," explains Ansell MacMillan, Empire's Manager of Applications Engineering. "A gang of needles are placed side-by-side into 5" long strips, then taped together. Batch grinding and deburring in this configuration would lead to simplified (and safer) material handling and high production rates. It would naturally fit into the customer's methods."

Empire's solution was a single deburring machine that would exceed foreseeable production rates for all of the company's grinding stations. It would be located just before



an ultrasonic cleaning operation, which is the last step before packaging, providing a logical production flow. The machine uses a turntable concept, with part entry and exit on the same side, so that only one operator is needed.

Abrasive blasting is still used to eliminate burrs, but larger 0.062" blast nozzles were selected to prevent clogging of ultra-fine glass bead blasting media. Initial tests indicated that burrs could be effectively removed with a pressure-blast system at pressures as low as 35 psi. An aerating media regulator was added to assure smooth, dependable media flow.

"We needed to be able to position the strip of cannulas precisely to hit the tiny burrs at the heel while avoiding the finely ground point and edges," says MacMillan. "We did this by locating the two blast nozzles with a micromanipulator. This device positions the nozzles in all three planes to within 0.001", and provides nozzle angle adjustment to 0.01°. Masking is not required when you can hit the parts with pinpoint accuracy."

How It Works

Parts are manually loaded into a guide, point side down, and automatically fed into the machine on a miniature urethane conveyor belt. Once inside the blast chamber, parts are automatically transferred to a serpentine pinch belt/rotary drum

mechanism, which firmly suspends the strip of cannulas, exposing the downward facing cannula points. The workpieces pass over two upward facing blast nozzles which remove the burrs inside the heel of the ground cannula. Just one pass removes all burrs.

The parts are then transferred to a second miniature conveyor belt, and just before exiting, pass through a blow-off chamber to assure they are free of glass bead particles and dust.

The blast machine handles a wide variety of cannulas, ranging from 12-gauge to 27-gauge. Lengths vary from 1" to 11". The machine is capable of automatically deburring every shape cannula, from ordinary straight ones to curved and specialty shapes.

Results

The new system now produces an astonishing amount of parts–up to 162,000 per shift of smaller size cannulas. In fact, the deburring machine now sits idle for several hours because the other machines cannot keep pace.

The equipment is easy to maintain and reliable. The first machine was installed over 2 1/2 years ago. Other than scheduled maintenance, it has not had any downtime.

The manufacturer has realized an extremely fast pay-back. By removing the deburring bottleneck, the needlemaker has been able to expand production while cutting overtime.