thefabricator.com
A publication of the Fabricators & Manufacturers Association, Intl.®

Brushing up sheet metal assembly

By Tim
Heston

Table brushes support cosmetically critical parts without a scratch

THE FABRICATOR® FEBRUARY 2016

February 1, 2016

Scratching a cosmetically critical part during assembly can be costly. This is where choosing the right material for the assembly table surface can be critical. It's here that the table brush may be able to help.

Figure 1
At Metcam, a custom fabricator in Alpharetta, Ga., assemblers slide parts across a series of table brushes for

scratch-free production.

A job goes through punching, forming, hardware insertion, inspection, and now it's at the assembly station, after which an employee notices something. The cosmetically critical parts aren't acceptable. They're scratched.

What happened? A kaizen event commences, people start asking questions, and they find that the parts were scratched in the assembly stations. It really was no one's fault. Parts move across carpeted tables, and those tables sometimes have tiny metal parts or debris stuck on them. So how do they avoid this?

Diligently cleaning the carpeted tables is one solution, but it's still easy to miss a spot. Is there a way to "engineer out" the problem? The *kaizen* team then turns to another machine in which parts slide across the surface: the punch press. To protect parts against scratches or other cosmetic defects, these punch presses have brush tables. They even have bristles high enough, and arranged in such a fashion, to account for forms like downward protruding louvers and flanges fabricated with form tools. The flange bends downward in between groupings of bristles so that the part remains stable; yet the bristles aren't packed so tightly that the part becomes stuck before being sent down the chute.

Seeing this, the team asks the obvious question: Why wouldn't similar brushes work in assembly, where workers handle cosmetically critical parts all day?

Richard Uber, quality manager at Metcam, told this story during a tour the Alpharetta, Ga.-based fabricator gave for Manufacturing Day 2015. To prevent part scratches, the shop installed table brushes—rectangular sections that have a PVC base, or block, with stapled brush bristles—at certain assembly areas (see **Figure 1**).

Because Metcam has some unique applications, including intricate parts, managers decided not to buy table brushes off-the-shelf but instead go with a custom system. Assembly is late in the process chain, after a lot of value has already been added to the part. The later the error occurs, the more expensive rework and scrap can become.

First Questions

Uber worked with Rickey Bates, lead technician at Brush Design & Manufacturing, a small custom brush shop in Fayetteville, Ga., south of Atlanta. As Bates explained, numerous variables go into a table brush design.

The first question to ask is, What bristle material do I need? "If a brush is going to be touching any food, then you'll need to stay with nylons that are antibacterial," Bates said, adding that nylon brushes may be needed in high-heat applications too.

Regardless, for the vast majority of metal fabrication applications, Bates said that less expensive polypropylene bristles should suffice. (Metcam went with polypropylene material.)

The next question: How heavy will the workpieces be? The answer will determine how stiff the brushes need to be. "This ensures that when you're sliding a product across [a table brush], the brush is robust enough to support the product without the fibers bending over." Bending or wobbling brush fibers opens the door for potential scratching, and it makes it difficult for parts to slide across without getting caught on the bristles.

Figure 2
Metcam chose a straight bristle pattern, which allows pieces that may have short protrusions sticking out underneath to slide easily from one station to the next.

Stiffness Variables

Determining how stiff a table brush will be involves several factors, the first being the diameter of the individual bristle fibers. “We can work with bristles from 0.012 in. all the way up to 0.120 in. diameter,” Bates said.

Other factors that influence stiffness are the brush pattern, density, and length. The more bristle fibers you pack into each staple hole (that is, the hole in the PVC base the bristles are stapled into), the stiffer the brush will be.

Bristle length has the most obvious effect. The longer the bristle is, the more give it has and the less stiff it becomes. Bates said that the bristle length in industrial brushes varies widely, from 0.375 in. up to about 12 in. A 12-in. brush will have significant give, even with thick bristle diameters, while 0.375 in. will be extremely stiff, even with very thin bristles.

Many table brushes don’t have more than 1 to 2 in. of bristle length, if that, though Bates added that it does depend on the application. If you have a brush with short bristles packed tightly, even the thinnest fibers can hold up a heavy part.

“Many assume that if they have heavy pieces, they really need a heavy fiber to hold them up,” Bates said. “But if you take a piece of 0.120-in.-diameter fiber and cut it to 1⁄2 in. long, it’s almost like a piece of steel. It’s very rigid. It’s

rough on the hands, too, and it's difficult for us to trim and repunch it. Although it's really stiff, it won't scratch your parts, but it may be overkill."

This is why many choose a brush that is only as stiff as it needs to be for the operation, but no stiffer, especially in a manual operation where workers handle parts directly.

Pattern Considerations

Workers may need to slide parts that have small protruding forms. Or they may need to reach into the bristles to grab small parts. Or they may want to avoid losing small parts among the bristles.

The right brush pattern and bristle density can address these concerns. Bristles can be so tightly packed that the brush looks and feels like a doormat, or they can be spaced out and staggered, similar to how they appear on many modern punch presses. If assemblers work with small parts that can get caught, a tight brush pattern might not be ideal. In a tight, doormat-like brush, a small part can be difficult to remove. Bristles that are too far apart can open the door again for scratching and make it difficult to slide the part.

Some applications call for a straight-grid table brush, Bates said, often because of the part geometry. An assembly worker may need to slide a part with a shallow flange along the table, and the straight pattern of bristles allows space for the part to slide easily from one station to the next (see **Figure 2**).

There's a trade-off, though. A straight grid pattern requires more bristles to cover a specific area to maintain adequate bristle stiffness. As Bates explained, this is why some choose a staggered brush pattern (see **Figure 3**). "A staggered pattern will allow you to fill more space without using so much material," Bates said.

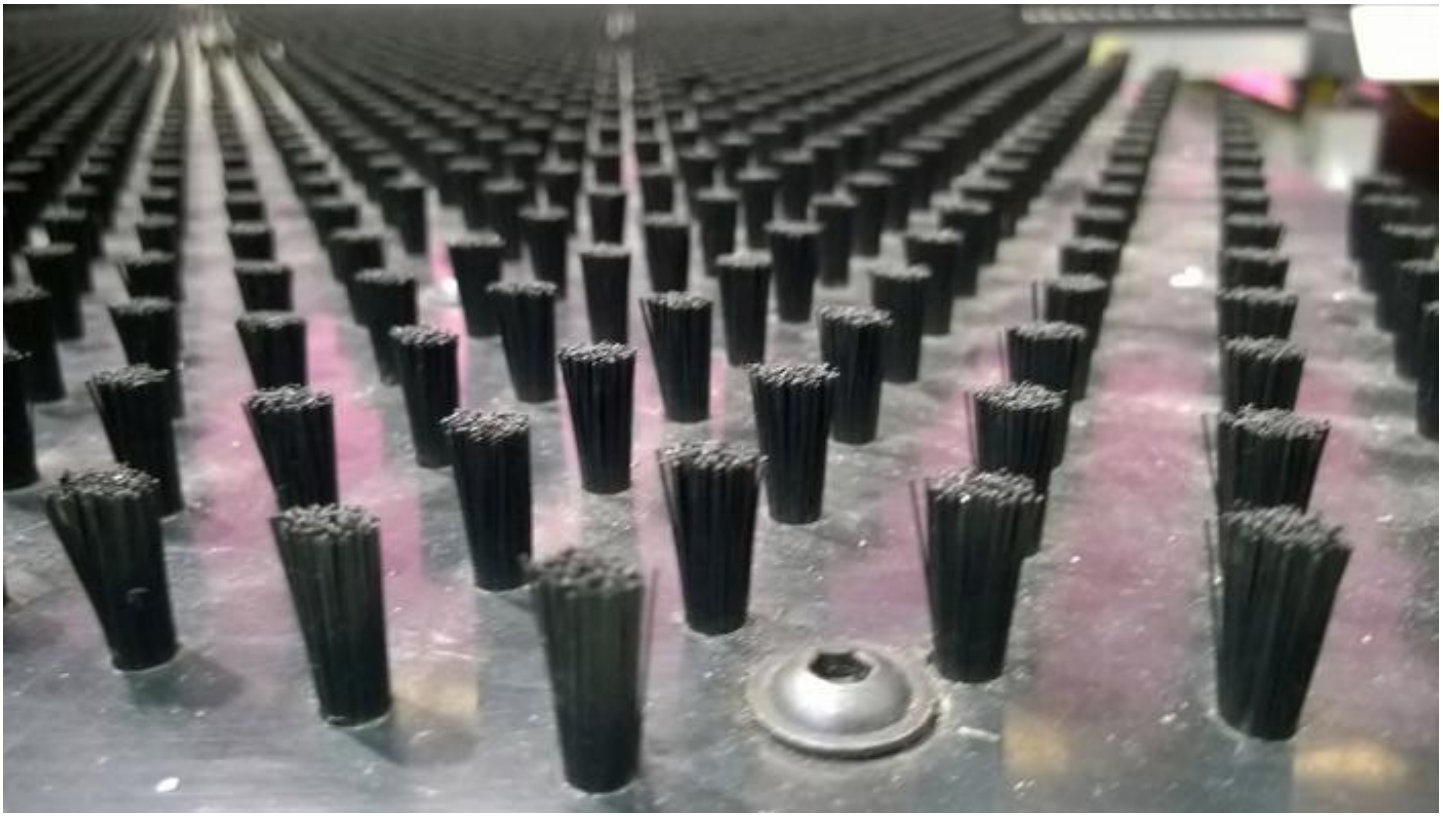


Figure 3
Staggered brush bristle patterns like this are found on some modern punch presses.

The ideal table brush pattern should prevent parts from scratching and be gentle enough for assemblers (or anyone one else) to work with without scratching or pinching themselves. At the same time, table brushes should be robust

enough so the bristles don't wobble and bend. With all the variables tuned correctly, a good table brush can last for months of rigorous use.

Restapling the Brush

But they don't last forever. Still, when the brush bristles wear or flatten, they needn't be thrown away. They instead can be restapled (see **Figure 4**). Aside from certain brushes, in which every strand is individually glued, Bates said that most industrial polypropylene brushes use what's known as a "multistrand staple set." A brush-making machine pulls a fiber through a die, and a staple is inserted into a hole drilled in the PVC base.

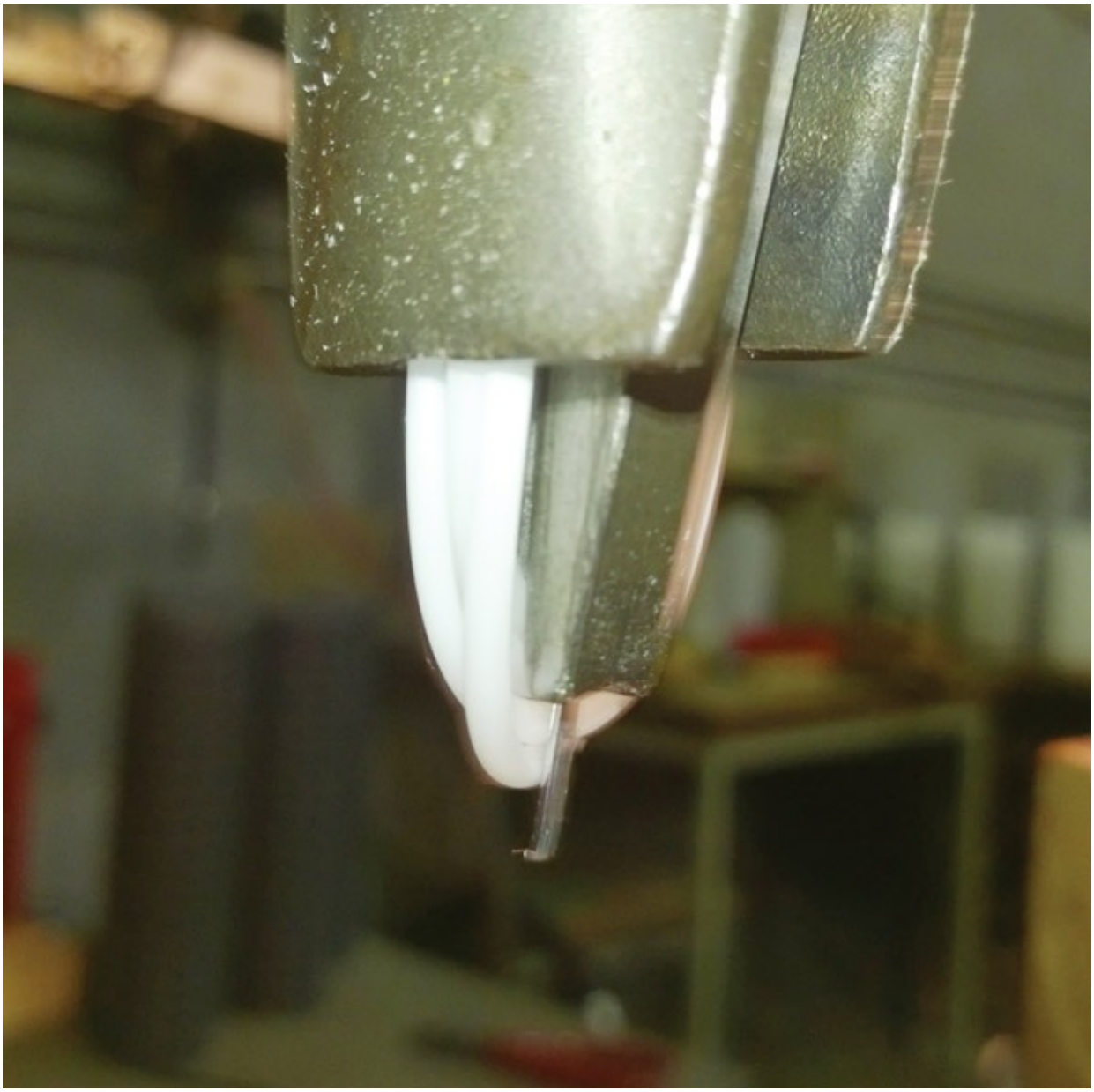
When brushes wear, fibers can be pulled out and new fibers can be stapled in their place. In Metcam's case, the company sends certain table brushes to Brush Design & Manufacturing for restapling every six to eight months. And the fabricator has a few extra table brushes on hand, so that assembly isn't interrupted while the brushes are out for restapling. This, Bates said, can be much more cost-effective than having to order a custom table brush every time an old brush wears out.

The longer the brush lasts between restapling, the better. This brings up yet another variable: the thickness of the table brush's PVC base, or block (see **Figure 5**).

"As long as the core of the block isn't mangled or otherwise damaged, you can repunch and rebristle a brush," Bates said. "Eventually, though, you do get to the point where the staple will not hold, especially if you have a thinner table brush [with a thin PVC base]. If you have a thicker table, you'll get more repunches out of it."

The humble table brush on the assembly table exemplifies how the little things really do make a difference in the fab shop. Scrapping a part is never a good thing, but repeatedly scrapping cosmetically critical parts in assembly, so late in the production process, can add up to serious costs.

Brush Design & Manufacturing Inc., 135 Bethea Road, Ste. 506, Fayetteville, GA 30214, 770-461-3137, www.brushdesignmfg.com



Slide Show | 5 Images

Published In...

The Fabricator®

The FABRICATOR® is North America's leading magazine for the metal forming and fabricating industry. The magazine delivers the news, technical articles, and case histories that enable fabricators to do their jobs more efficiently. The FABRICATOR has served the industry since 1971. Print subscriptions are free to qualified persons in North America involved in metal forming and fabricating.

Preview the Digital Edition

Subscribe to The Fabricator®

Read more from this issue