

NAF Brushes

IN AUTOMATED GEAR DEBURRING

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Ever since gears were fabricated by the early watchmakers, nearly all gear producers have battled with a common enemy—burrs. The problem is simple. Burrs interfere with proper tooth engagement. The tighter the tolerances, the bigger the problem becomes. Additionally, burrs break off and can damage expensive power transmission components.

While the 18th century Swiss watchmaker would undoubtedly be dumbfounded by today's CNC gear cutting equipment, he could probably write the deburring procedures and inspection criteria for the deburring operations in some facilities. In many cases, advances in gear deburring have not kept pace with gear generation. However, in recent years, new technologies and practices have been spreading into factories around the country.

One of the cornerstones of the new approaches is nylon abrasive filament (NAF) brushes. NAF brushes can be used in a variety of automated gear deburring operations and offer several benefits. First, they thoroughly remove moderately sized burrs from the edges of gear teeth. Second, they leave a smooth, defect-free radius on the edge. An edge with a burr can act as a nucleation site for fatigue cracks. Third, they do not change part tolerances.

As new abrasive filaments have been developed, the range of gears which NAF brushes can deburr has broadened considerably. The first NAF brushes were only suitable for non-ferrous gears and those steel gears with very light burrs. However, advances in filament technology have led to the develop-

ment of brushes capable of removing well-attached burrs from steel gears. Large burrs on steel parts are still the domain of wire brushes, abrasive wheels, and carbide tools, but these products often leave secondary burrs and result in rougher surface finishes than NAF brushes.

Aside from part quality considerations, another major advantage of NAF brushes is their low consumable cost per part. As long as burr size is controlled and an appropriate wear compensation system is used, NAF brushes can often produce a consumable cost per part of less than \$0.01.

However, the caveat that burr size must be controlled cannot be overstated. Delaying cutter changes may help reduce tooling cost per part, but it can be a death knell for a deburring process. Best case, brushing parameters must be increased for enlarged burrs, creating a geometric escalation in consumable cost per part. Worst case, the deburring process will fail to completely remove the burr, generating a customer complaint or expensive rework.

Dedicated machinery designed to handle a family of related parts is used for most NAF brush deburring processes. When part geometries vary considerably and a high level of system flexibility is required, robotics may be used. However, the cost of robotic systems and the fact that they generally have longer cycle times has resulted in much greater use of dedicated equipment.

NAF brushes may not be the right solution for all gear deburring applications, especially when very large burrs are



involved. However, well designed and implemented systems reliably produce high quality gears with minimal consumable cost per part. Most brush producers operate laboratories where manufacturers can send parts for evaluation and process development. The old Swiss watchmaker would be impressed. ■

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