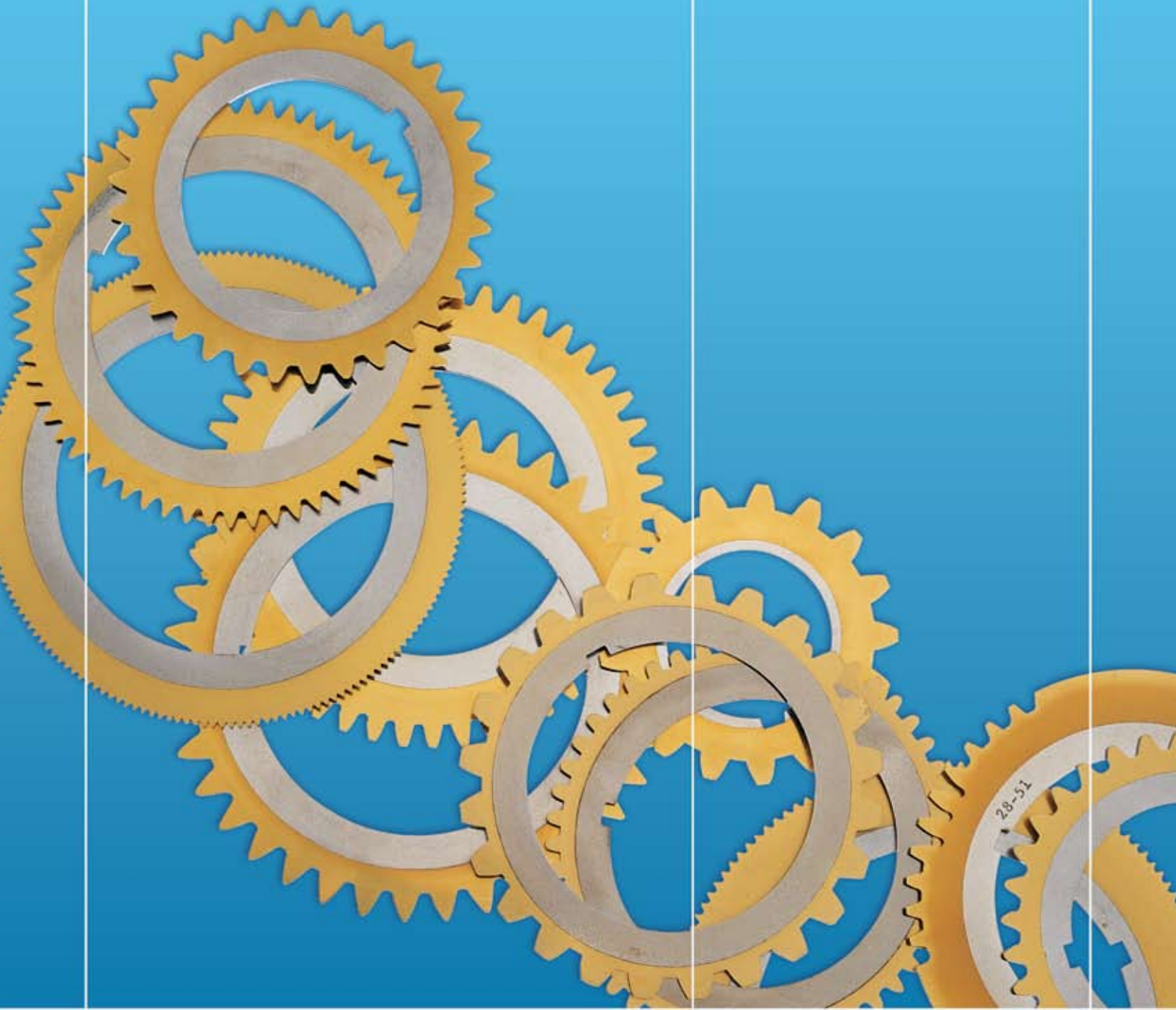


**Gleason**



**White Paper**

**The Wafer<sup>®</sup>  
Concept**

*KEEPING THE WORLD IN MOTION™*

**Gleason Cutting Tools' Wafer®**

shaper cutter design was a revolutionary concept when first introduced a number of years ago. Today, the concept of a disposable, non-resharpenable shaper cutter makes more sense than ever for many applications. After all, consider the cost of resharpening and re-coating conventional re-sharpenable tools, which can often be triple the initial cost of the tool over its useful life. In addition, re-sharpenable tools have always been designed for compromise: doing the best job within the limitations required to allow for resharpening. That's why Gleason's complete line of Wafer® and Wafer® II shaper cutters are more popular than ever – they optimize tool performance and tool life through highly efficient tool geometry, and eliminate costs that far exceed those of the disposable tool itself.

**Wafer® Shaper Cutters: the design**

The Wafer® Shaper Cutter concept employs a thin wafer which is held in place with a backup ring and a clamp. The whole assembly is held in place with setscrews, and a key is used to keep alignment of the wafer as shown in Figure 1.

The assembly is reusable and is adaptable to any existing shaper machine. The wafer blade is made from premium high speed steel, hardened and ground and then coated with the best PVD coating for the application. Because the wafer is disposable, its cutting face of a new blade always has the fully coated surfaces for optimal tool life. The Wafer® Shaper Cutter is used the same way as a conventional shaper cutter except when a cutter completes its effective life, it is simply removed and a new wafer blade is inserted.

**The Advantages**

Below are several advantages to using Gleason's Wafer® Shaper Cutter for your shaping application:

- Part quality is more consistent.
- Overall tool life is increased.
- Cutting edges and faces are always coated.
- Elimination of the cost of cutter resharpening.
- Elimination of part error caused by inaccurate cutter resharpening.
- Elimination of shaping machine adjustments for stroke length or center distance are needed with wafers, as they are when conventional cutters are being changed.
- Elimination of scrap due to "trial-and-error" machine adjustments.
- Reduced shaper cutter tool inventories.
- Increased machine up time due to fewer tool changes.
- Cutting clearance angles and tooth geometries can be optimized for only one design plane of the cutter.

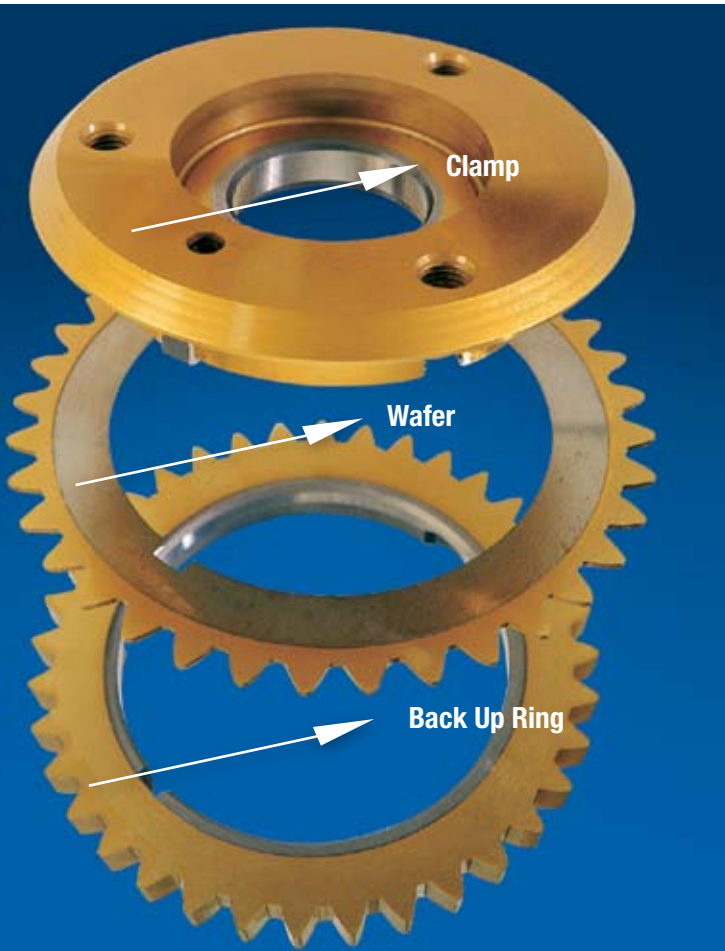


Figure 1  
(Exploded View)



Figure 1 (Assembled View)

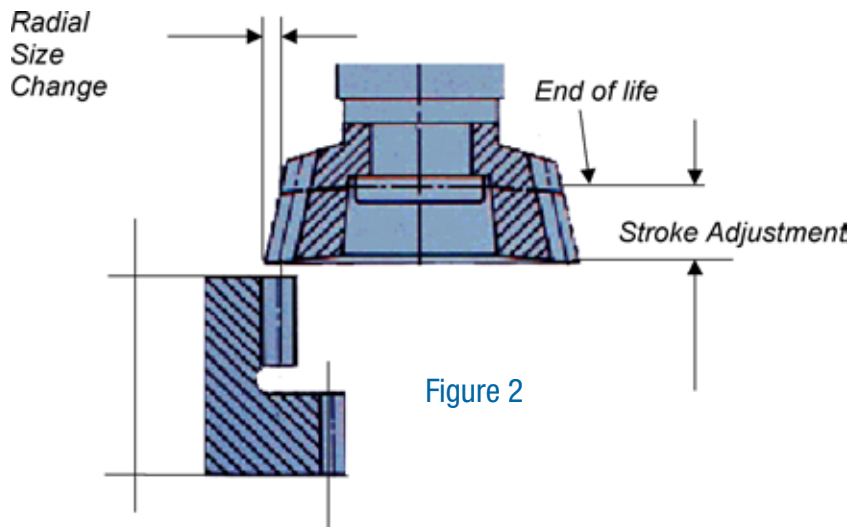


Figure 2

Perhaps the greatest advantage of the wafer cutter is that its diameter is exact. Every part is cut to the same dimensions from one wafer to the next. The need for this consistent precision from one wafer to another demands strict controls of the manufacturing process. Our years of experience enable us to heat treat these very thin wafer blades with a minimum of distortion. Form grinding ensures consistent part dimensions. The application of Gleason's PVD coatings to the wafer requires special processing and fixturing to assure uniform coverage without distortion or buildup. While this extra care adds cost to manufacturing, it also ensures that each wafer will be of the highest quality and consistency. Of course, there is more to making precision parts than the accuracy of the cutting tool. The gear manufacturing process itself is vulnerable. Errors often appear when conventional shaper cutters are resharpened. Worn grinding wheels, loose machines and improper setups are all common sharpening problems, which introduce errors to the cutter. These sharpening problems are all eliminated with the wafer.

Another way the Gleason Wafer® Shaper Cutter adds consistency to your manufacturing process is through the elimination of machine adjustments. When a conventional shaper cutter is sharpened, its diameter and length are both reduced. This requires adjustment of the stroke length and the center distance as shown in Figure 2. Since each wafer is manufactured to the same diameter and length, the need for stroke and center distance adjustments are eliminated. Scrap and rework costs associated with these adjustments also are eliminated.

The Wafer® cutter offers design flexibility, which enables optimization of the tooth form for superior tool performance. Since the wafer is not a sharpenable tool, only the tooth geometry in one axial plane has to be considered. Cutting clearance angles can be chosen for optimum performance and tool life.

Unlike conventional cutters which require compromises in tooth geometry in order to offer a reasonable sharpenable tooth length, wafers allow the designer to choose the best operating pressure angle. This pressure angle allows for a generous full top radius, which helps distribute wear and increase cutter life.

Figure 3 shows tooth wear of an unfavorable tooth design after cutting only 65 parts. In contrast, Figure 4 shows tooth wear of a favorable tooth design after cutting 400 parts.

Another factor which increases cutter life is the use of a tool with PVD coating on all cutting surfaces. Since these tools are never sharpened, coating is always on all surfaces presented to the work, yielding more parts per use than a resharpened conventional cutter with an uncoated front face.

Figure 4

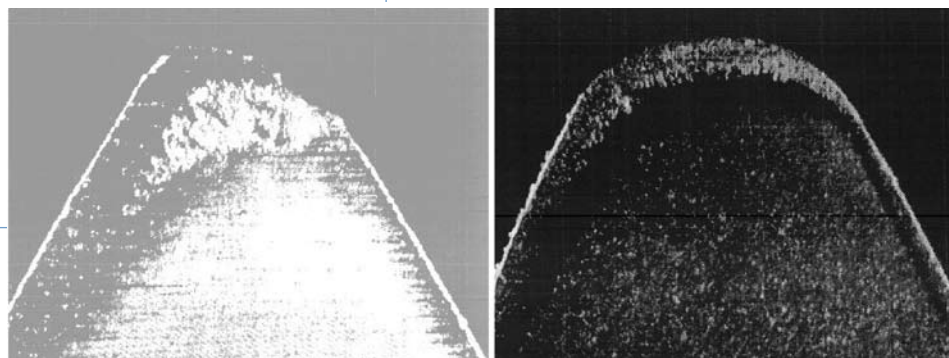


Figure 3

**Wafer II Shaper Cutter:**

**A low-cost alternative**

An all-purpose disposable Cutter – The Wafer® II inherits the benefits of the Wafer® cutter without the up-front costs of a special cutter body. No assembly is required. This concept was initially used for small diameter helical cutters, but the use has expanded to larger diameter spur and helical applications.

Available for all spur and helical applications regardless of helix angle, the Wafer® II brings the advantages of the Wafer® cutter to your lower volume applications and to those where the size of the standard Wafer® assembly is not acceptable. Examples include: small internal gears, shoulder gears and tandem cutters setup on one spindle adaptor.



Figure 5

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