



## **Cutting Edge Designs for Horizontal Flow Wrapper Knives**

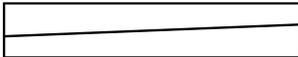
This paper covers the variety of knife cutting edge styles available for horizontal form/fill/seal flow wrapping machinery (SIG, Dobby, Delta, Cavanna, Tevopharm, Fuji, Autowrapper, etc.). The differences between the styles are discussed relative to both set up and function in the machine as well as the implications of the resulting cut on the package.

### **Straight Knife**



In the days of cellophane this was a common knife and was all that was required to cut the packaging material. In addition, because cellophane is easy to tear, a straight cut on the end seal did not make it difficult for consumers to open the packages. Today, this type of knife is rarely seen.

### **Diagonal Knife**

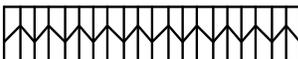


From an operational standpoint this is an improvement of the straight cut because the diagonal orientation of the cutting edge provides for easier cutting. This biased cutting action requires less pressure to make a cut, which, when compared to a straight edge, makes it easier to set up and results in longer part life.

The diagonal orientation of the cut on the package is difficult to detect and is not an issue with consumers. Again, as with the straight knife, cellophane packages would be easy to open. This is not the case, however, with OPP (oriented polypropylene) films, which are the standard today and are quite difficult to tear.\* If a diagonal knife is used for packages made with OPP film the consumer is usually forced to either peel the seal apart or use some device (teeth?) to gain access to the product.

\* The problem is propagating, or starting, a tear in OPP film. Once the tear is started, however, there is very little remaining resistance. This can sometimes be a liability, as the tear can continue much further into the package than intended.

### **Zig Zag Knife**



The zig zag knife played a leading role in the acceptance of OPP films as they were being introduced in the late 1960's and early 1970's. The serrated cut made by this knife makes it easy to tear the film and allows consumers to easily get to the product. Package cosmetics may be a concern with a serrated rather than a straight cut, but it's simply a matter of function over form.

On the operational side, there are a couple of potential drawbacks. Because of the increased width and surface area of the cutting edge, the zig zag knife requires more pressure to cut than does the diagonal knife. This can make set-up more difficult and can cause the knife to become dull more quickly.

At one time this was by far the most popular knife style for flow wrappers, at least in North America. The next knife in our discussion, however, offers advantages that have allowed it to reach the number one position.

### Diagonal Zig Zag Knife



The diagonal zig zag knife combines the superior functional characteristics of the diagonal knife with the easy open feature of the zig zag cut. Like the standard diagonal knife, it requires less pressure to cut than its straight counterpart, aiding in both set-up and longevity. Because of these advantages this style knife has been the most popular over the last 10 years, but recent improvements in manufacturing techniques have engendered a variation that offers even greater benefits.

### Micro-Edge Diagonal Zig Zag Knife



This is the current "state-of-the-art" cutting edge design for horizontal flow wrapper knives. It improves on the functional benefits of the standard diagonal zig zag by reducing the width of the cutting edge (measured point to point on the teeth) to approximately .010" (.25mm). This further decrease the amount of pressure required to make a cut and approaches the regular diagonal knife in ease of set-up.

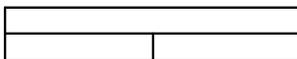
The package cosmetics are improved with this knife, as the serrated cut is difficult to detect and looks much more like a straight edge. This is accomplished without sacrificing any of the easy open characteristics inherent with the zig zag. In fact, it increase the number of possible tear initiation points by 400%.

### Extreme Angle Zig Zag Knife



This knife is designed for use with films that have unusual resistance to tear propagation. The sharper angle of the teeth makes it easier for the consumer to start a tear. It is available in both straight and diagonal configurations, and it's operational characteristics are similar to the standard zig zags.

### Slit Notch Knife



This is the first of the specialty cutting edges designed for situations where it is desirable to have the consumer begin to tear open the package at a specific location on the end seal. This particular style allows tearing only at the specific spot where the notch makes a slit cut in the film. This can be done on one end or both ends of the package.

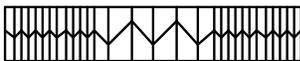
Although the knife works for its intended purpose, there are several operational drawbacks. It often requires extra pressure in order to cut effectively, making it more difficult to set up and having a negative impact on longevity. In addition, this style knife can be quite expensive.

### **V-Notch Knife**



The v-notch knife also directs the consumer to open the package at a specific location. Instead of a slit there will be a single V-notch or multiple notches at each end of the package. The functional characteristics of this knife are somewhat better than the slit notch, but the cost of the parts is still high.

### **Variable Pitch Zig Zag Knife**



This is an effective, lower cost alternative to both the slit notch and v-notch knives. The consumer is directed by the larger notches to open the package at a specific location, but is still able to tear the film if an attempt is made at the wrong spot.

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