TT-Cut for Sheeter

The retrofit or automation of a sheeter always brings with it the question of whether the cutting quality can be improved beyond the automation or the lifetime of the blades can be extended. Also, the dust is a recurring issue.

Important for the quality of a shear cut are various factors, including:

- side pressure
- cutting angle
- stiffness of the knife holder
- over speed of the anvil knife to the web
- overlap depth
- material (volume und grammage)
- cutting point (tangential or wrap)
- knife geometry / material of the knife

Some of these points will be considered in more detail below.

For shear cutting applications there is always the discussion about a good and a bad cutting edge, with "good" and "bad" is certainly in the eye of the beholder. In fact, the classic shear cut creates two different cutting edges, as shown schematically in Fig. 1. Both cutting edges have their own characteristics and must be taken into account when selecting the appropriate cutting process. The smooth side apparently gives the better cut. This is desired in applications such as photo paper. The deformed cutting edge, on the other hand, has advantages with voluminous materials.

Figure 1

By taking a closer look at both edges they're showing a different behaviour. A smooth cut edge will negatively impact dust-prone materials that include short fibre or fillers. The dust not only contaminates the machine, in the worst case the dust can also be found on the final product. A deformed edge on the other hand prevents an extrusion of these fillers. However, this does not mean that the deformation at the cutting edge may be arbitrarily large. The degree of deformation should be kept as low as possible.

How can the deformation be influenced? The bulkier the paper or carton becomes, the greater the deformation. This effect can also be seen with multi-layer papers. A simple example with stacked sponges illustrates the deformation caused by the penetration of a knife (see Fig. 2).

Figure 2

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The deformation can be controlled via the overlap depth of the upper knife or an optimized knife geometry. However, experience shows that this influence is not sufficient to bring about a significant improvement.

If you take a closer look at the cutting edge, you can place the cut in different levels: An upper cut, a lower cut, a smooth cut and a crack surface. An increasing bulky of the paper or carton means a larger crack surface.

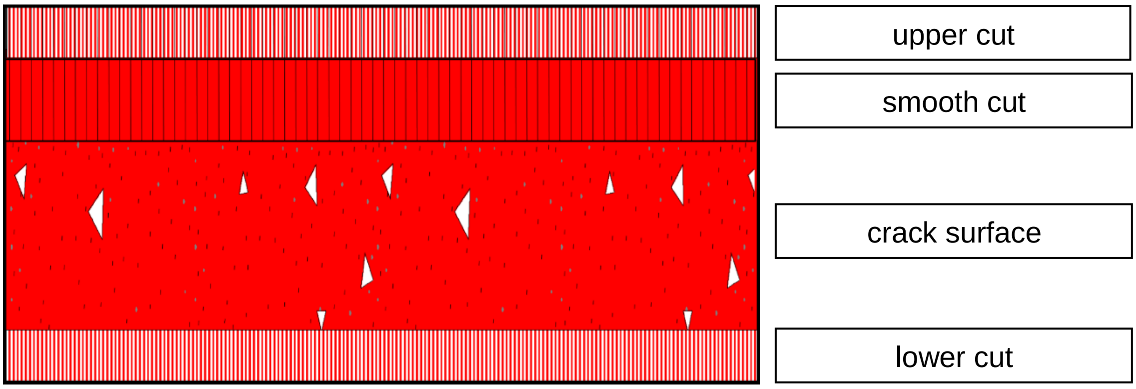


Figure 3

When you exchange the anvil knife with a knife similar to the upper knife geometry, the material is separated on both sides by two specially shaped knives (Tip-Tip or TT-Cut). After this change, both sides of the material show a deformation, but this is divided on both sides (Fig. 4) and the crack surface is reduced (approx.) about the half (Fig. 5). How can the result be determined qualitatively? The service life of the knives is a very good parameter to make an appropriate statement. When the cut is rated to be bad or the dust content increases significantly, the knives are usually changed. Experience have shown that the service lifetime of knives with modernized cross-cutter applications has multiplied by up to a factor of five.

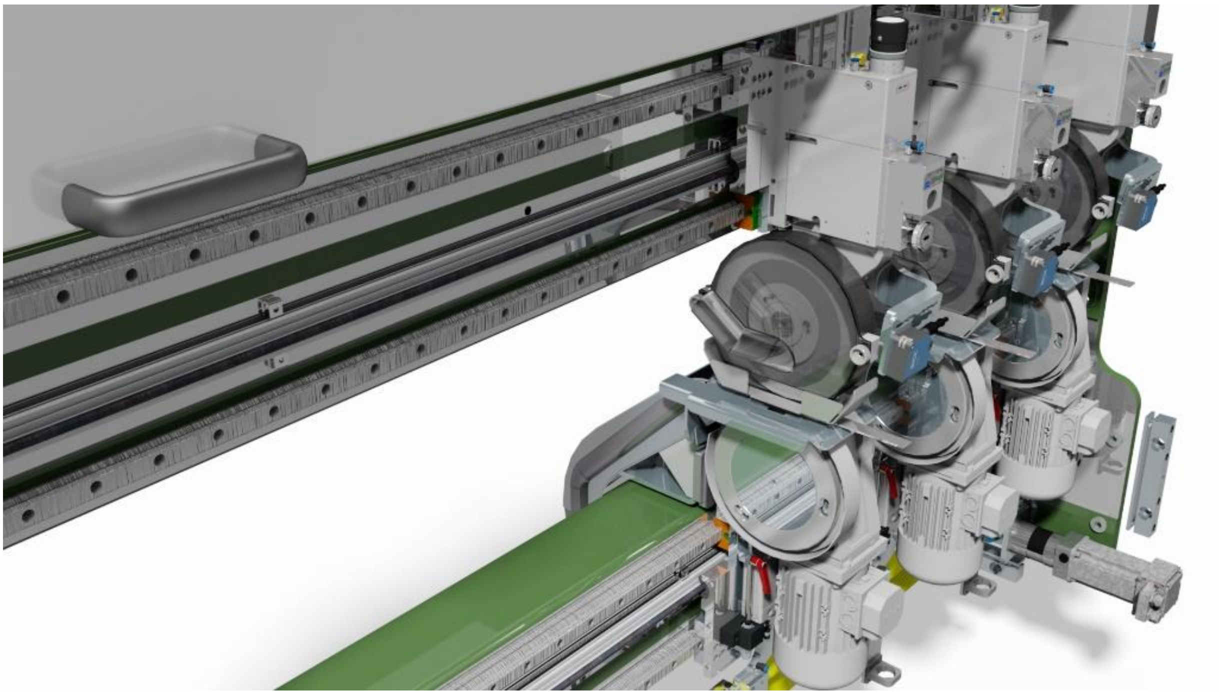

Figure 4


Figure 5

Another important point in terms of cutting quality is the so-called overspeed. The circumferential speed of the anvil knife runs faster than the web. The over speed is chosen depending on the application, but is usually 2-7%. The upper knife is taken along by the lateral force (side pressure) of the upper knife holder and the driven lower knife. Here, for example, a side impact (run-out) of the blade or an incorrect side pressure can lead to a difference.

However, due to the material displacement while cutting and its resulting force on the knife, the force increases with a higher material grammage. The increasing force presses the upper blade at the anvil knife. This minimizes the risk of losing side contact which means a differential speed.

If the upper knife is driven, the upper and lower blades can be synchronized to approximately 100%, so there is no difference between the upper and lower blade speeds. The disadvantages are certainly the additional costs and the worse handling of a driven upper knife.
But where is this extra effort necessary? For materials where even minimal differences in speed can lead to a web break. This would be the case for very thin foils or papers with minimum grammages. However, for materials with a high grammage, this deviation can be completely neglected.



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