



## **Excessive top knife overlap – “THE” major shear slitting villain**

Dave Rumson - Slitting Educator/Consultant

The single worst and most common shear knife set-up error made when slitting flexible webs is excessive Overlap of the top (male) knife to the bottom (female) knife.

There are six significant ways that excessive Overlap creates slitting defects and poor finished roll quality;

- Increased Web Travel Chord
- Cut Point Location Change
- Wider Knife to Web Contact
- Increased Knife Side Load Contact Friction
- Longer Slit Edge Knife Face Rubbing
- Slowing of Top Knife Rotation

This first article of these six will detail the affects of Excessive Top Knife Overlap.

Before we begin ... take note that this article may lead you to lessen top knife Overlap settings on your slitter. But, before you do that ... make sure you know ... exactly ... the amount of bottom knife radial run-out you have.

Do measure all bottom knives and record this data for future comparison to measurements taken after you re-sharpen and/or replace knives.

Also ... measure your shaft run-out ... especially with older, long time running machines. Can you say ... "Hey ... let's start a data history Slitting Log Book"?

### **INCREASED WEB TRAVEL CHORD**

The Cut Point is the location where the web meets the top and bottom knives in contact with each other. To create the Cut Point, the top knife bottom must be lower than the bottom knife top. To do this the knife holder Overlap Stroke is set to the side of the bottom knife before the 90° knife travel Engagement Stroke is activated.

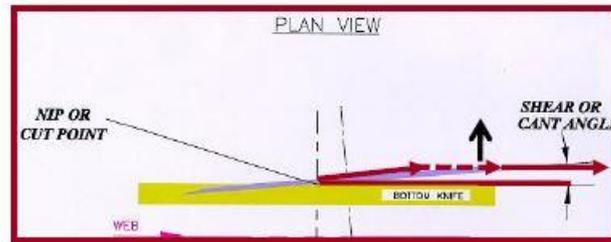
With a tangential web path a slitting system designer has the top knife contacting the bottom knife very close to the bottom knife apex. It is extremely important that the web be supported by the bottom knife at the Cut Point location. For this reason the bottom knife should intrude the web to push it slightly above the tangential web path line. An area of web support must be established.

From a "Bird's Eye" or plan view ... to ensure making "top knife sharp-edge to bottom knife sharp-edge contact" the top knife is usually set on an angle ... intentionally misaligned to the web path direction ... known as the Shear Angle, or Cant Angle, or Toe In, or other names.

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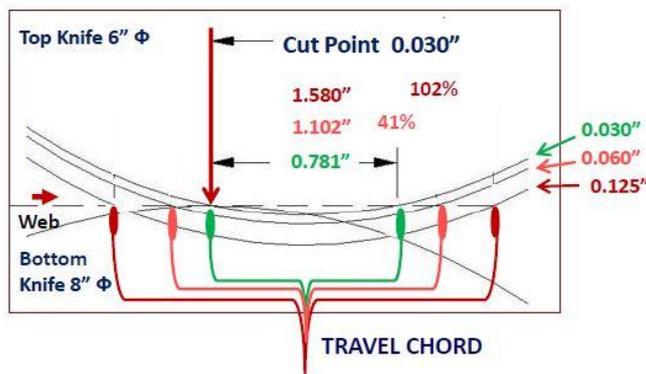
The required amount of knife angle misalignment varies with the material being slit, but usually falls between  $\frac{1}{4}^\circ$  and  $1^\circ$ , with  $\frac{1}{2}^\circ$  being most common.



When shear knives fracture the web, one side of the fracture follows the web path ... traveling over the bottom knife O.D. straight through towards the winder. The other side of the fracture is directed away from the web path by the amount of top knife Shear Angle. The Travel Chord (T.C.) is the length the web is in contact with the top knife face, which usually has a beveled shape, until released back to the winder web path. Do keep in mind that during the web-to-beveled-face-contact, the web is rubbing under winder, or pull roll, draw force tension ... whatever that amount might be for the material being slit.

Increasing Overlap adds to the T.C. distance. The length of the T.C. depends on top knife diameter and the amount of set Overlap. A 0.76mm to 1.01mm (0.030" to 0.040") Overlap is a common recommendation but as always ... material dependent.

It's important to understand that ... as the Overlap is set deeper the Travel Chord length increases. A 152mm (6") top knife and 203mm (8") diameter bottom knife with a 0.76mm (0.030") Overlap will create a T.C. of 19.8mm (0.78"). An Overlap increase to 1.52mm (0.060") from 0.076mm to (0.030"), changes the T.C. by 41% to 27.9mm (1.10"). At a 3.17mm (0.125") Overlap the T.C. will be 102% wider at 40.1mm (1.580").



Obviously different knife diameters will create different web-to-knife contact lengths.

Factors that affect finished roll quality are:

1. "Material Dependent". Two very often heard words from my 2 Day Web Slitting Technology Course ... meaning; how fragile, tough, stretchy, etc it is. Does it fray easily? Is it brittle? Does it splinter? How thick is it? Are adhesives involved?
2. Obviously the length of web rubbing contact
- 2: The top knife bevel shape and width at the Cut Point
- 3: The top knife bevel surface finish
4. The speed the web is moving through the knives
5. The amount of winder pull tension

Needless to say ... there's much, much more information to talk about relating to Excessive Top Knife Overlap ... stay tuned.



**Who is Dave Runsom?**

Dave Rumson has 29 years of domestic and international sales/marketing management experience with slitting, unwind/rewind and roll/shaft-handling equipment and more than 26 years of experience developing and conducting technical presentations for CEMA, AIMCAL, TAPPI and employer sponsored seminars.

Since 2009, he has been an independent slitting consultant, providing in-plant analysis/Slitting Educational Programs and lab slitting trials. Additionally Dave conducts “Web Slitting Technology”, an AIMCAL 2-Day Converting School Seminar. Dave also writes the “Cut Points” Q&A technical column for AIMCAL’s Converting Quarterly magazine and manages the 1,400 plus member Slitting Community Group on LinkedIn. He holds a B.S.B.A. degree from Westbrook College (Portland, ME).  
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