# Web Fracturing - Slitting Basics

## Dave Rumson - Slitting Educator/Consultant

The more common flexible web genres include, but are not limited to, paper, nonwovens, extruded thermoplastic film and sheet, metal foils and the mats (carbon fiber, rubber, fiberglass). Webs made from these materials can have a wide range of thicknesses. For instance ... 84 familiar paper products range from 0.076mm (0.003") to 2.43mm (0.096"). Then there's many coating, laminating and adhesive processes applied to the webs.

Don't forget the varying web density/toughness levels, elongation and deformation potential, stiffness and compressibility ... on, and on it goes. Now let's look at about how we convert these many webs into a multitude of consumer products.

To meet finished roll specifications we need machinery to properly control the web. And most often these webs need to be fractured, or slit, from a full web into narrow widths and wound under proper tension onto cores. Operators and process engineers must deal with the web material slitting /winding challenges and production throughput demand.

Given so many different web products, no one slitting method is satisfactory for all. The three most common slitting methods used by the paper and converting industries are razor, crush and shear slitting ... and these slitting methods separate web materials differently.

Having once sold winding and slitting machinery I had very little knowledge of the slitting process. And because I did not design slitter rewind machinery I didn't fully appreciate the engineering considerations needed to manufacture a machine capable of slitting a specific web material to demanding specifications. It wasn't until I went to work for a major slitting company that I came to realize just how complex the slitting process was.
So ... with limited space, and many more thousands of words needed to help better understand slitting, I'll briefly touch upon the three more common web fracturing methods. Saving much more detail for future articles.

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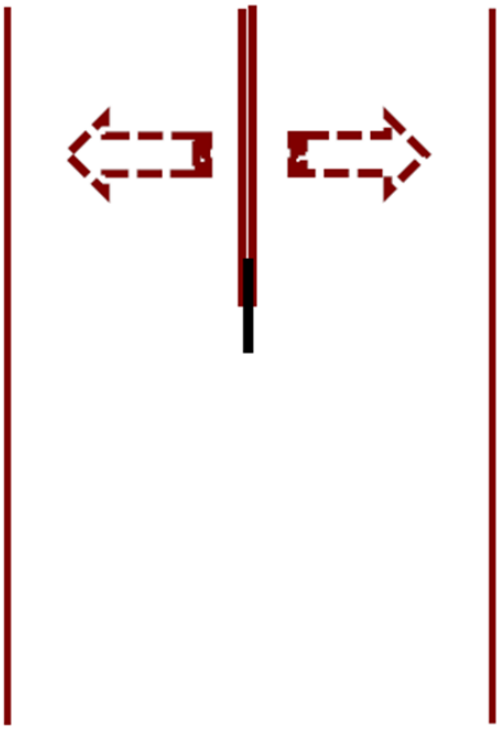
## *Razor Slitting*

Tensile Stress Fracture

***The process of placing a stationary and very sharp bevelled edge into a moving web to sever the material as it is pulled past it.***

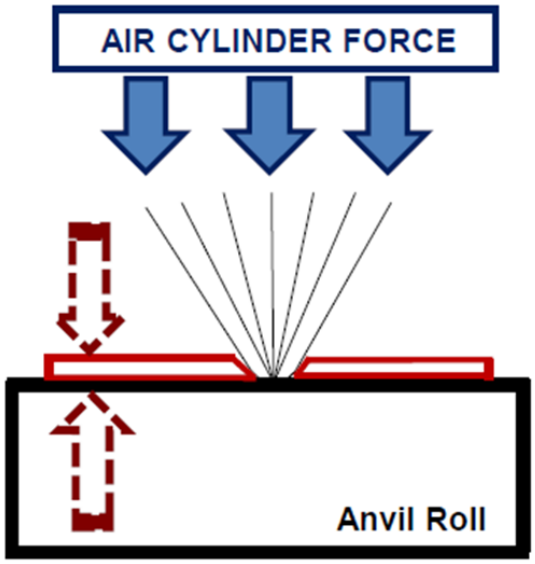


**Razor Slitting** creates a "tensile stress web fracture" process (see image 1). Razor blades are set directly in the web path. The oncoming web collides with the razor edge, fractures and splits away from the razor as it is pulled by the winder. Separation forces are relatively low but, as always, web material dependent. The thin, very sharp blade develops a clean edge cut. However, constant web-to-blade friction, web toughness and desired operating speed makes blade material selection very important to ensure a reasonable production life.

## *Crush Cutting*

### *Compressive Stress Fracture*

***The process of pulverizing a moving web with heavy force between a rotating angled knife and a hardened anvil roll.***




**Crush Cutting** is the process of forcing a small radius knife tip through a web until it contacts a hardened anvil roll that supports the web. The web is compressed and divided. This is a "compressive web stress fracture". Web cut edges are much more damaged than with razor and shear slitting methods (see image 2). Knife to anvil roll contact force is always severe with serious knife and anvil roll damage potential. But crush cutting maintains a strong presence in the slitting arena.

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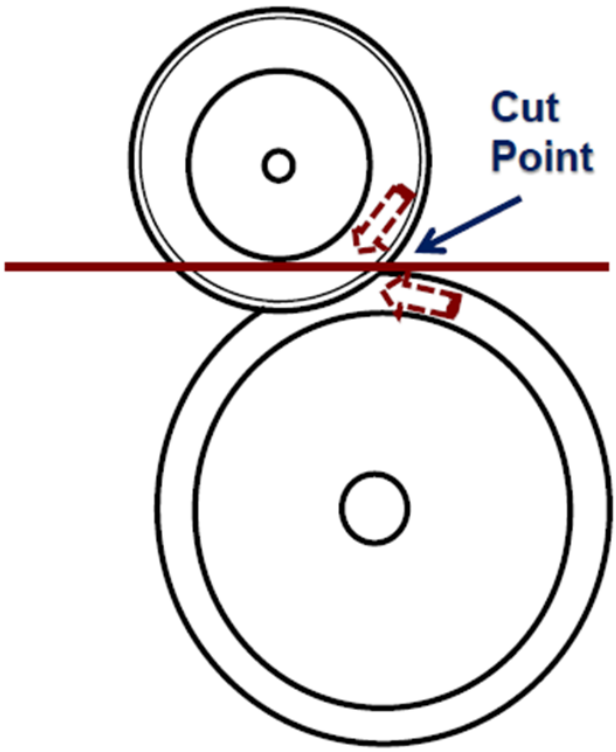
# *Shear Slitting*

## *Shear Stress Fracture*

***The process of using two sharp rotating knives to slice both sides of a moving web at the exact point where the two sharp knives are in contact.***




**Shear Slitting** uses two sharp-edged rotating knives to slice a web at the exact point where the knife edges are in angled, side-to-side contact. The web is pinched (nipped) between the knife edges. Top and bottom knives slice the web face they are in contact with. Web separation is due to "shear stress web fracturing" ... occurring in the direction of web travel.

The bottom (female) knife is more often mounted on a motor driven shaft or ton its own individual motor. The Top knife is freewheeling and rotation is provided by friction between the two knives. Knife-to-knife and web-to-knife friction are the main factors in knife wear and clean edge cut life.

Shear slitting can provide clean cut edges on a wide variety of web materials but is by far the more complex process. Eighteen geometric, dynamic and equipment factors impact slit edge quality.

Some of these include knife shear angle, knife shape, cut point location, knife contact force, kinetic friction, knife overlap depth, mounting methods and knife materials.

A web material's reaction to "stress fracture" is the key to selecting the slitting process that best suits your operation. The potential benefit of fully understanding the slitting process cannot be over emphasized.

**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).