

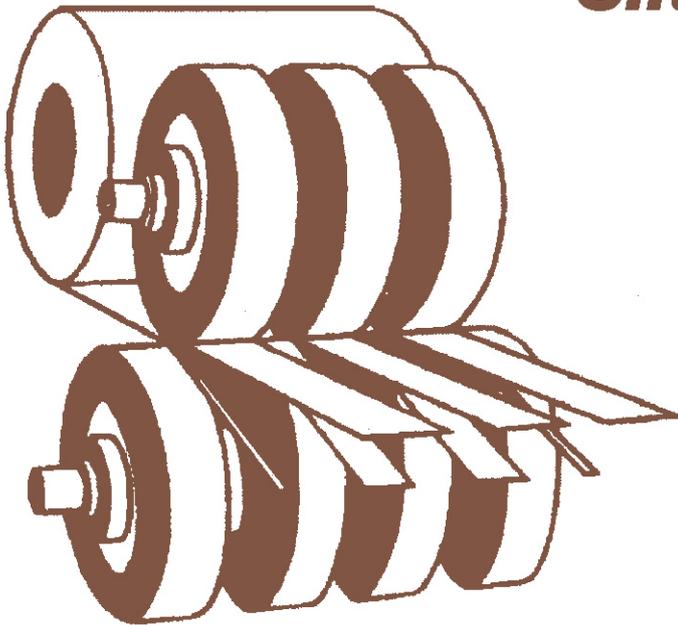


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VIEWS

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Determination to Establish Excellence  
Through Efficiency and Expertise

## **Hints and tips on the application of Slitter Tooling**



Slitting line is a large capital investment item. For precise slitting, you need a good slitting line, Slitter tooling quality is as important. Without good quality tooling you can't get good results even if slitting line is very precise. In slitting line, slitting arbor should have run out within 10 microns and outness of shoulder w.r.t. diameter should be within 5 micron.



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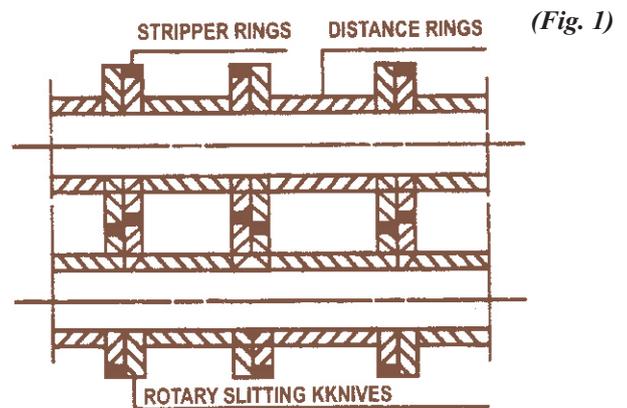
**DeeTee stands for total quality movement**

## 1. SLITTING LINE TOOLING CONSISTS OF :

- 1.1 Slitting Knives
- 1.2 Distance Rings/Spacers
- 1.3 Shims
- 1.4 Stripper Rings
- 1.5 Rubberised Spacers
- 1.6 Over-Arm Separator Discs
- 1.7 Distance Rings for Over-Arm Separator

### FUNCTIONS :

- 1.1 The rotary slitting knife is the most important part of the set as it performs the actual slitting task. It is a circular knife with parallel faces. This produces two cutting edges per knife which can be used simultaneously or one at a time, depending on the mode of application.
- 1.2 Distance rings are provided in order to maintain an accurately defined distance between two rotary slitting knives. As a rule distance rings have same accuracy as the knives, although they are smaller in diameter to permit regrinding of knife. Accuracy of distance rings will decide the performance of slitting operation.
- 1.3 The shims are a special kind of distance rings. Generally they are lesser than 0.5 mm in thickness and are made of plastic or brass. Shims are utilized to get exact slit width.
  - 1.3.1 In case of shimless tooling, shims are not used. Spacers' thickness is made in such a manner that desired spacing between knife is obtained.
- 1.4 The fourth functional part of the tool set is rubber ring made of wear resistant rubber. It sits on spacer. This ring pushes the cut strips out from between the rotary slitting knives as the strip has a tendency to get stuck with knife faces.
- 1.5 Rubberised spacers are a combination of spacers and rubber rings.
- 1.6 Separating discs, running on separating shaft, separate the cut strips, so that they can be fed to individual winding coils. Because separating discs are subjected to heavy frictional wear, they are usually made from hardened tool steel and have a cross section which is tapered towards the outside diameter.
- 1.7 Spacers for over-arm separator are arranged between the separating discs so as to maintain a distance between the discs that is slightly larger than the width of the strip.



## 2. KNIFE MATERIAL :

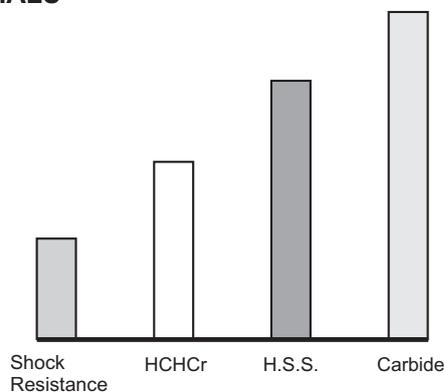
- 2.1 Selection of the knife material with regard to steel composition is governed primarily by the material to be cut. Because steel is to be cut by steel, the cutting quality is always the prime criteria for selection.

This means that the knife material must be harder than the material to be cut. The second most important criteria for the material selection must be the capability of holding its cutting edges, that is to say, the cutting quality under load must be impaired in anyway. Thus the material suitable for knives is the kind of alloy steel that can be hardened in principle, can be hardened in depth and is resistant to plastic deformation under pressure.
- 2.2 When selecting the material, it is essential to decide which of these three main characteristics, namely hardness, tenacity and resistance to wear, should be given preference or which optimum combination of all three characteristics is desirable and possible.
- 2.3 The loads to which knives are subjected on a slitting line, vary considerably, as the thickness of the material to be cut can vary from 0.05 mm to 20 mm. Besides thickness, the composition and tensile strength of the material to be cut also governs the loading on the slitting line. A general rule : the thinner the material to be cut, the higher should be the hardness of the knife.
- 2.4 There are four basic grades of steels used for slitting knives :
  - (a) Shock Resistance Steel/Hot Die Steel
  - (b) High Carbon High Chrome Steel
  - (c) High Speed Steel
  - (d) Carbide

- (a) Shock Resistance Steels / Hot Die Steels are generally used to resist shock. Cutters made out of these steels are used on the lines, slitting material more than 6 mm thickness in-mild steel. As indicated in figure 2, this type of material has got the least wear resistance properties as compared to other knife materials.

### COMPARATIVE WEAR RESISTANCE OF KNIFE MATERIALS

(Fig. 2)



- (b) High Carbon High Chrome Steel is probably the most widely used alloy steel in slitting application. In manufacturing process it machines well, heat treats uniformly with the hardness penetrating the entire section of the knife and can be ground accurately. It is preferred at the user's end, because of its retaining properties, and resistance to rust or corrosion while being stored.
- (c) High Speed Steels are basically used on light gauge slitting jobs, generally 1.5 mm or less in mild steels, or its equivalent in tensile strength. There are many variations of high speed steels, some of the high speed steels being used today can be hardened upto 69-70 Rockwell C. These knives cost approximately triple the cost of High Carbon High Chrome knives.
- (d) Carbide Steel Knives are scarcely used because of initial high cost, which may be approximately 10-12 times of High Carbon High Chrome Steel knife cost. The application of Carbide Steel knives demands a high accuracy of the slitting line, uniform thickness of the material to be slit, and skilled operators. These knives are used where slitting is required for long runs with same setting.

### 4. MANUFACTURING TOLERANCES :

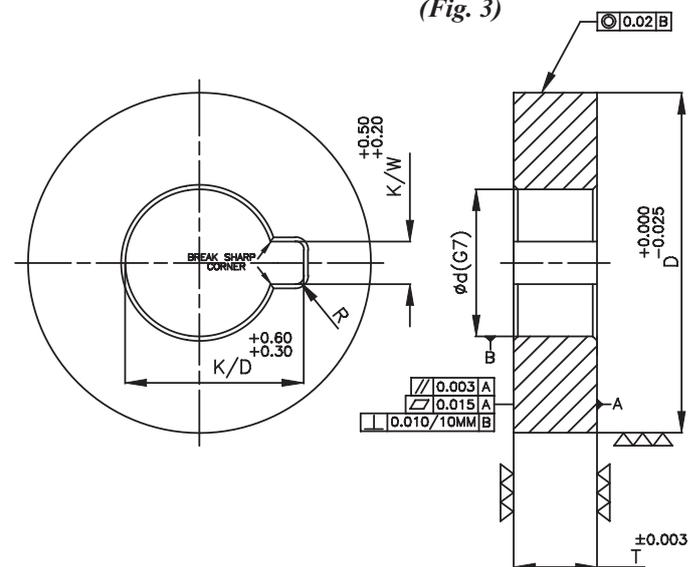
Dee Tee adheres to extremely tight tolerances in the manufacture of slitting tooling. Dee Tee generally adheres to the tolerances as indicated in figure 3.

Manufacturing tolerances to which rotary slitting knives and distance rings have to be produced, depend on the material to be cut. For thin strips, closer tolerances are required.

Precision Grade Tolerances (Ref. News Views No. 1) serve the purpose for slitting strip upto 3 mm thickness. Closer tolerances can be achieved. However, there is extra charge for extra precision grade of tolerances. Lapped knives and distance rings are required for soft material and/or thinner material and accurate width of strip.

Sometimes, individuals confuse between parallelism and flatness. A knife can be parallel and still not flat. Flatness is measured from a near perfect flat surface such as a granite surface plate to the surface of a knife. A knife which is parallel may be twisted to become out of flatness. Knives upto 5 mm thickness which are out of flatness by 0.025 mm may run true when tightened on the arbor. Parallelity is more important.

(Fig. 3)

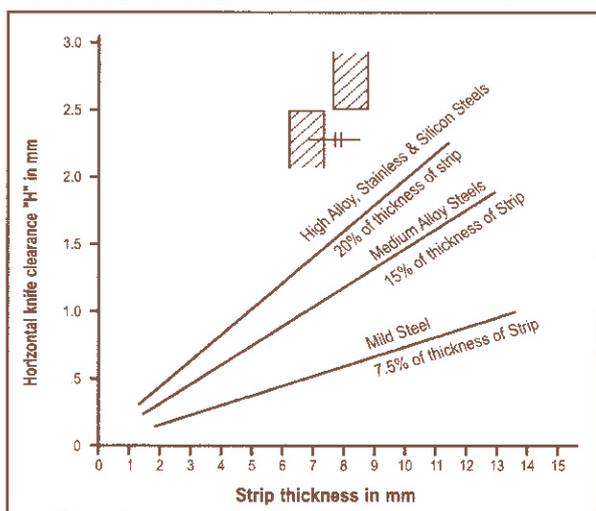


K/W = width	+0.2/+0.5	depth	+0.3/+0.6 mm
OUTSIDE DIA.	D	=	within 0.025 mm
INSIDE DIA.	d	=	G7
THICKNESS	t	=	± 0.003 mm
PARALLELITY	P	=	Half of thickness tolerance
FLATNESS	F	=	within 0.015 mm
CONCENTRICITY		=	within 0.02 mm

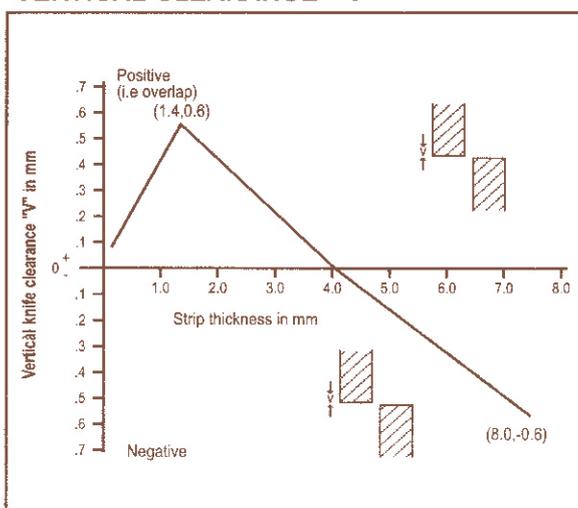
## 5. SETTING UP OF KNIVES :

Maintaining correct clearances at all times is decisive for the outcome of the sitting operation. It will effect not only the quality of the strip edge, but also the life of the knife. While setting the knives, maintaining the horizontal and vertical clearance is very important. The following chart and diagrams suggest the clearances for various thickness of the strip. Please note that improper clearances can cause premature wearing, making edges dul and possible chipping of the knives. As a thumb rule, the horizontal clearance is approximately 10% of the thickness of the material to be slitted. Much depends upon the operator and condition of slitting line.

### TYPICAL HORIZONTAL CLEARANCE - H (Fig. 4)



### VERTICAL CLEARANCE - V



## 6. STORAGE AND MAINTENANCE OF SLITTER TOOLING :

A sizable investment is made on these tooling. They have been manufactured to precision tolerances and should be handled accordingly. It is most important that the operator and set-up man realize how much money they are handling, when they pick up a knife or distance ring.

The following points should be taken care of for getting the best out of the slitter tooling :

- While setting the knives & distance rings, ensure that all the components are cleaned properly. Arbors should be cleaned & oiled.
- When mounting, removing and storing knives, cutting edges and surface must be treated with extreme care.
- Knives must be reground regularly. Please do not use blunt knives for the slitting operation - this will cause excessive load on the knife edge and there are possibilities of their chipping off.
- All the knives should be ground in a set and variation in O.D. should be within 0.02 mm.
- Since the material of the knives is hard, a suitable grinding wheel should be used for the grinding of knives. We suggest (AA60K5V18N).
- While regrounding the knives, use enough coolant.
- While slitting the material, ensure that the check nuts of the arbors are tight.

**Tools WHICH LAST LONGER - Slitting Line Tooling, Tube/Section Mill Rolls, Tube Cut Off Knives, Cold Rolling Mill Rolls, Leveller Rolls, 20 Hi Mill Rolls, Bar Mill Tooling, Fins, Steel Centers, Friction Saws, Shear Blades & C.T. Saw Bodies.**