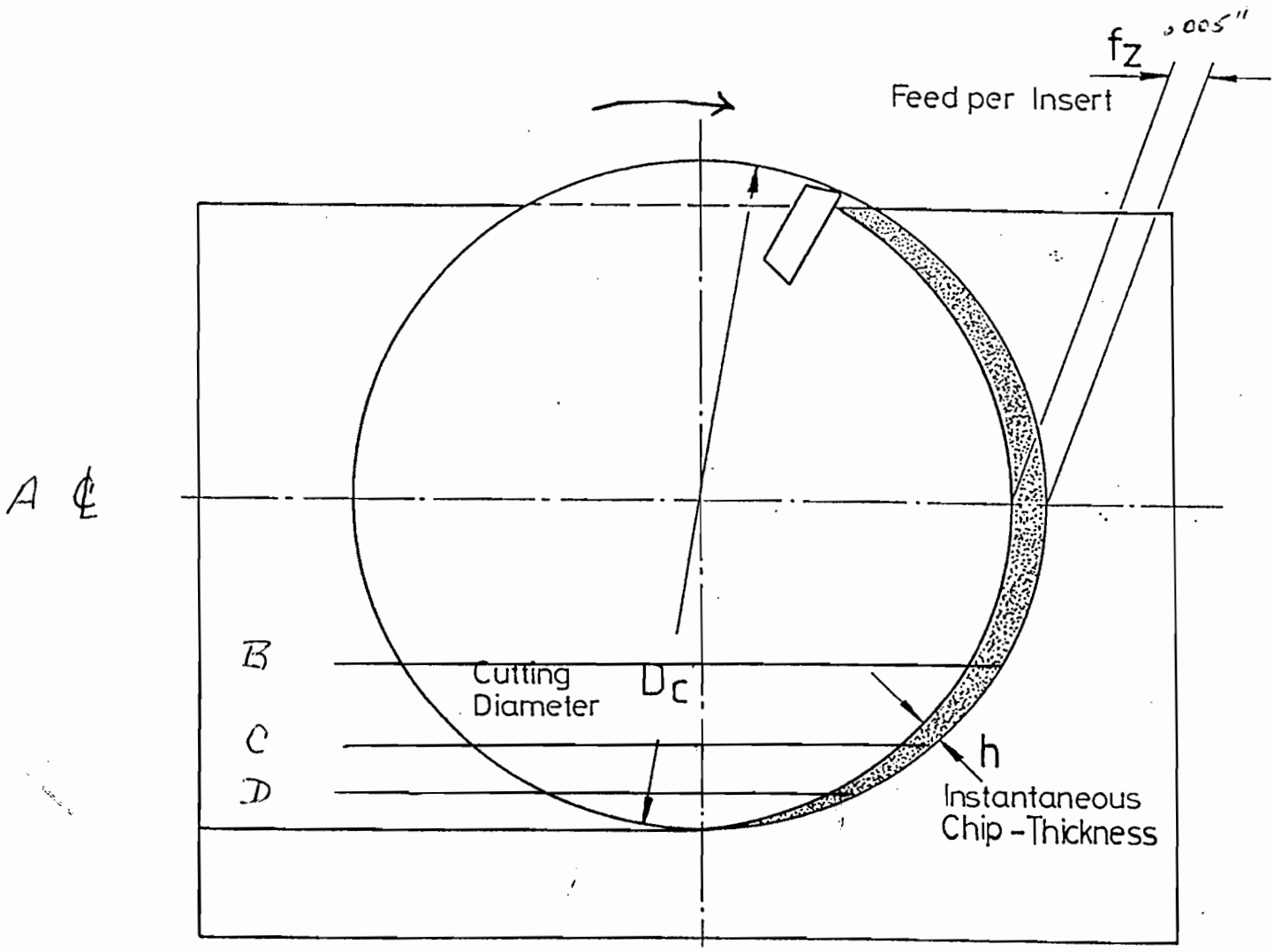
Average Chip Thickness

The sketch below shows a milling cutter advancing at a rate of .005"/tooth per revolution.

"A" - Shows the chip created at the Centerline of the Milling Cutter
"B" - Shows the chip created with 25% of the Cutter engaged
"C" – Shows the chip created with 1/8th of the cutter engaged
"D" – Shows the chip created with a "skin" cut.

The Milling Cutter program works off the centerline of the milling cutter. It determines what feed per tooth is created at that centerline. But not all milling is done with the cutter engaged by 50% or more. At the same feed rate the chip thickness changes dependant on the radial engagement of the part.

When engaging 25% (or less) of the cutter body it is good to increase your actual feed per tooth to bring the actual chip thickness back to what it would be if you were cutting at the centerline. In addition to reducing your cycle time this process also reduces insert wear because the insert is recognizing less material and doing more true cutting and less rubbing.



Each Milling Cutter, Milling Insert and Grade combination has a speed and feed range that it is designed to work best at. Once you know what feed is recommended for a particular cutter in the material you are cutting you can use this formula to maximize the performance of your tools and reduce your cycle time.

Although it is always best to use the recommendations of the Manufacturer of your cutter the chart below makes some general recommendations of feed rate (per tooth) based on the thickness of your insert and the material you are cutting.

The formula shown at the bottom of the page can be used to calculate what feed per tooth has to be programmed in to bring your actual chip thickness back to what is normal. This is the formula for "Average Chip Thickness".

	WORK PIECE MATERIAL		
Thickness of Insert	Steel h_m [inch]	Cast iron h_m [inch]	Aluminum h_m [inch]
.125	.0025 to .0040	.0035 to .0055	.0016 .0040
.1874	.0040 to .0060	.0055 to .0085	.0016 .0040
>.1874	.0055 to .0065	.0080 to .0090	.0016 .0040

Remember ?

$$\text{Feed per Tooth} = \text{Average Chip Thickness} \times \sqrt{\frac{\text{Cutting Diam.}}{\text{Width of Cut}}}$$

$$f_z = h_m \times \sqrt{\frac{D_c}{a_e}}$$

! *Valid only if diam.(D_c) over width (a_e) ratio is 3.5 or larger*