



## Undercutting Guide

Undercutting end mills, often referred to as lollipop cutters, are extremely versatile tools. Harvey tool offers a variety of reach and wrap angles to provide an answer for even the most difficult of applications. Due to the varying neck lengths and the applications, specific machining parameters must be calculated to avoid breakage.

### Speeds & Feeds calculations:

1. Determine the correct SFM and Base Chip Load (IPT) for the cutter, material and application (see application descriptions Figure 1.)
2. Adjust Chip Load to account for neck length to cutter diameter ratio. (see Table 1)
3. Calculate the Speed (RPM) and Linear Feed (IPM)
4. Determine correct number of passes

Example: Tool #966593 to machine for a Deburring application in 4140 steel at 32 Rc.

1. Using Figure 1 (upper right), determine the type of application you will be performing.  
From Speeds & Feeds chart (next page), SFM is 200 and Base Chip Load (IPT) for Deburring is .0003.
2. Calculate the neck length to neck diameter ratio for the tool. Calculate adjusted chipload based on values in Table 1.

$$\begin{aligned} \text{Neck Length Ratio} &= (\text{Neck Length} / \text{Neck Diameter}) \\ &= (.375 / .054) \\ &= 6.9 \end{aligned}$$

$$\begin{aligned} \text{Adjusted Chip Load} &= \text{Adjustment Factor} \times \text{Base Chip Load} \\ &= .8 \times .0003 \\ &= .00024 \end{aligned}$$

3. Calculate Speed (RPM) and Linear Feed (IPM)

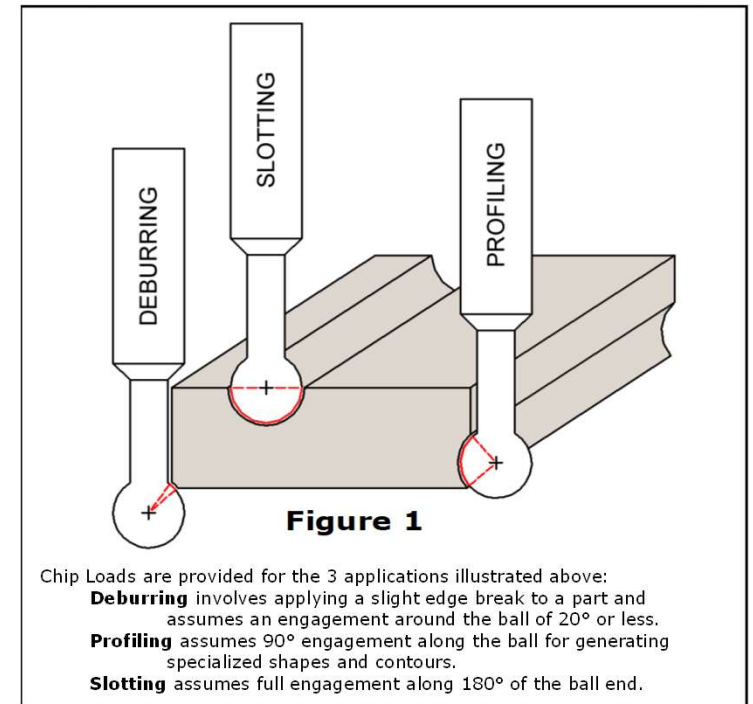
$$\begin{aligned} \text{RPM} &= (\text{SFM} \times 3.82) / \text{Cutter Diameter} \\ &= (200 \times 3.82) / .093 \\ &= 8215 \end{aligned}$$

$$\begin{aligned} \text{Linear Feed (IPM)} &= \text{RPM} \times \text{IPT} \times \text{Number of Flutes} \\ &= 8215 \times .00024 \times 2 \\ &= 3.94 \end{aligned}$$

4. From Speeds & Feeds chart (next page), the number of passes for a deburring operation in 4140 steel is 1 pass.

5. Conclusion

In this example, the tool would run at 8215 RPM, 3.9 IPM and make 1 pass.



Neck Length Multiple	Chip Load
3x	120%
5x	100%
8x	80%
12x	65%
15x	55%



Speeds & Feeds

Product Table: Undercutting End Mills - 270° High Helix
Characteristics: 45° Helix, 2 Flutes
Series: 7223xx, 7737xx, 7744xx, 8373xx, 9511xx, 9665xx, 9704xx

Table with columns: MATERIAL, SFM, Hardness: ≤ 28 Rc (≤ 271 HBn), Chip Load (IPT) By Cutter Diameter (0.015 to 0.500), and Depth of Cut Passes (1, 2, 3). Rows include ALUMINUM ALLOYS, MAGNESIUM ALLOYS, ZINC ALLOYS, and COPPER ALLOYS.

Product notes:

Posted values are Base Chip Loads and do not account for varying neck lengths. Use Table 1 (previous page) to determine the correct adjustment multiplier and calculate final adjusted chip loads.

General notes:

All posted speed and feed parameters are suggested starting values that may be increased given optimal setup conditions. Chip loads reflect uncoated cutters and may be increased 10%-20% if coated. For ferrous materials with hardness ≤ 28 Rc, chip loads can be increased 10%-20%.

If you require additional information, Harvey Tool has a team of technical experts available to assist you through even the most challenging applications. Please contact us at 800-645-5609 or harveytech@harveyperformance.com.

WARNING: Cutting tools may shatter under improper use. Government regulations require use of safety glasses and other

Table with columns: MATERIAL, SFM, Hardness: 29-37 Rc (279-344 HBn), Chip Load (IPT) By Cutter Diameter (0.015 to 0.500), and Depth of Cut Passes (1, 3, 4). Rows include CARBON STEELS, STAINLESS STEELS, TOOL STEELS, and TITANIUM ALLOYS.

Table with columns: MATERIAL, SFM, Hardness: 38-45 Rc (353-421 HBn), Chip Load (IPT) By Cutter Diameter (0.015 to 0.500), and Depth of Cut Passes (1, 4, 5). Rows include CARBON STEELS, STAINLESS STEELS, TOOL STEELS, and TITANIUM ALLOYS.