



## 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 #831593-C6 to machine for a **Deburring** application in **hardened steel at 50 Rc**.

1. Using Figure 1 (upper right), determine the type of application you will be performing.  
From Speeds & Feeds chart (next page), SFM is **60** and Base Chip Load (IPT) for **Deburring** is **.00014**.

2. Calculate the neck length to neck diameter ratio for the tool. Calculate adjusted chipload based on values in Table 1.

$$\begin{aligned} \text{Neck Length Ratio} &= (\text{Neck Length} / \text{Neck Diameter}) \\ &= (.062 / .054) \\ &= 1.1 \end{aligned}$$

$$\begin{aligned} \text{Adjusted Chip Load} &= \text{Adjustment Factor} \times \text{Base Chip Load} \\ &= 1.2 \times .00014 \\ &= .00016 \end{aligned}$$

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

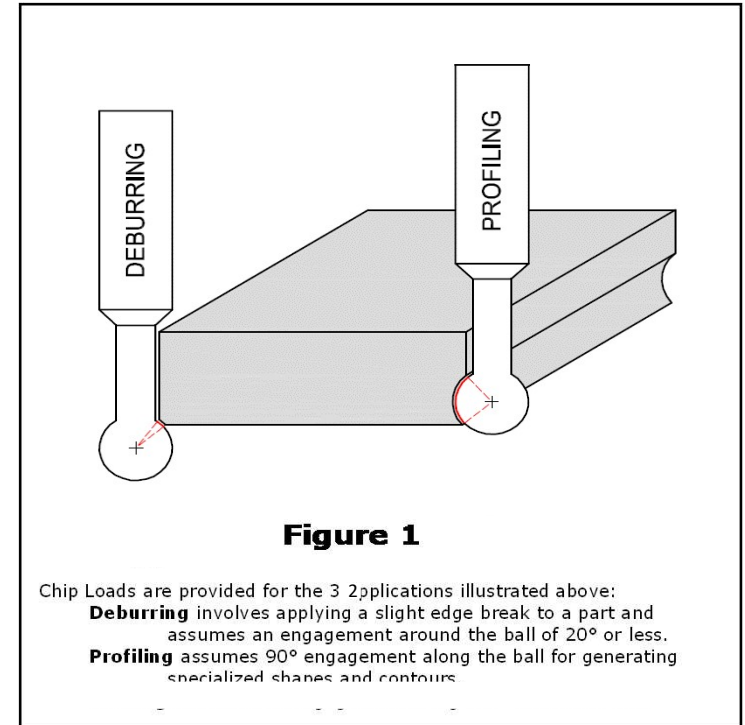
$$\begin{aligned} \text{RPM} &= (\text{SFM} \times 3.82) / \text{Cutter Diameter} \\ &= (60 \times 3.82) / .093 \\ &= 2464 \end{aligned}$$

$$\begin{aligned} \text{Linear Feed (IPM)} &= \text{RPM} \times \text{IPT} \times \text{Number of Flutes} \\ &= 2464 \times .00016 \times 4 \\ &= 1.57 \end{aligned}$$

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

5. Conclusion

In this example, the tool would run at **2464 RPM, 1.57 IPM and make 1 pass**.



**Figure 1**

Chip Loads are provided for the 3 applications illustrated above:

**Deburring** involves applying a slight edge break to a part and assumes an engagement around the ball of 20° or less.  
**Profiling** assumes 90° engagement along the ball for generating specialized shapes and contours.

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



## Speeds & Feeds

**Product Table:** Undercutting End Mills - 270° for Hardened Steels

**Characteristics:** 4 Flutes

**Series:** 8198xx-C6, 8232xx-C6, 8315xx-C6

Material	Hardness	SFM	Chip Load (IPT) By Cutter Diameter											Depth of Cut Passes		
			.015	.031	.047	.062	.078	.093	.125	.187	.250	.312	.375		.500	
Hardened Steels	45 - 55 Rc	60	Deburring	.00002	.00005	.00007	.00009	.00012	.00014	.00019	.00028	.00038	.00047	.00056	.00075	1
			Profiling	.00002	.00004	.00006	.00008	.00010	.00012	.00016	.00024	.00033	.00041	.00049	.00065	4
Titanium Alloys	56 - 68 Rc	50	Deburring	.00002	.00004	.00006	.00007	.00009	.00011	.00015	.00023	.00030	.00038	.00045	.00060	1
Nickel Alloys			Profiling	.00002	.00003	.00005	.00006	.00008	.00010	.00013	.00020	.00026	.00033	.00039	.00052	5

**Please note:**

All posted speed and feed parameters are suggested starting values that may be increased given optimal setup conditions. If less than minimum Axial or Radial DOC values are used, increased feed rates are possible. If greater than maximum Axial or Radial DOC values are used, decreased feed rates may be needed.

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 **tech@harveytool.com**.

WARNING: Cutting tools may shatter under improper use. Government regulations require use of safety glasses and other appropriate safety equipment in the vicinity of use.