

Chapter 3

OBJECTIVE

Identify and describe the differences between the two spindle speeds that can be programmed on the Okuma OSP 5000 series control.

FIXED RPM

Fixed RPM (or rotations per minute) is one of two methods used to define spindle speed during the cutting operation. This mode will be defined in the program with a **G97**. The S (or spindle speed) word, when used with a G97, identifies the specific RPM desired during the entire cutting operation.

If your tooling is rated in Constant Surface Feet use the following formula (in inches) to translate to Fixed RPM:

$$(\text{Surface Feet} \times 3.82) / \text{diameter to be cut} = \text{RPM}$$

CONSTANT CUTTING SPEED

Constant Cutting Speed is the second method that can be used to define spindle speed during the cutting operation. This mode will be defined in the program with a **G96**. The S (or spindle speed) word, when used with a G96, identifies the **surface feet passing the tool per minute**.

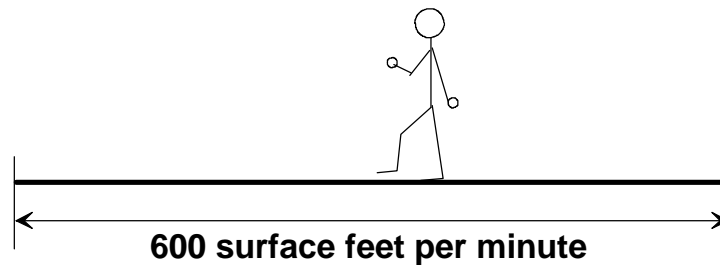
If your tooling is rated in Fixed RPM use the following formula (in inches and using 3.14 to represent pi) to translate to Constant Surface Feet:

$$((\text{RPM} \times 3.14) \times \text{diameter to be cut}) / 12 = \text{Surface Feet}$$

What is Constant Surface Speed

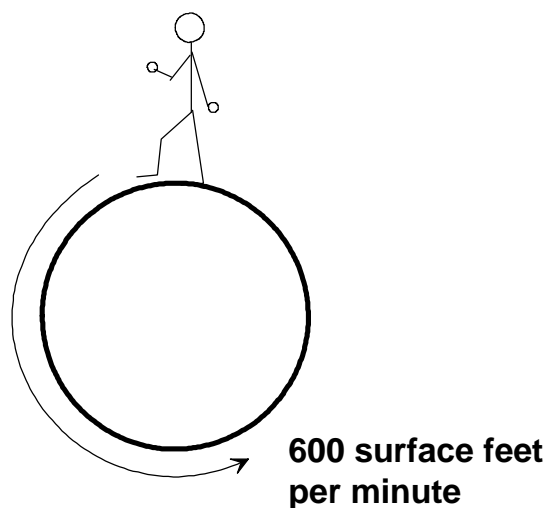
If you were to walk 600 feet in one minute we could say that you covered 600 surface feet per minute as shown in Figure 3-1.

Figure 3-1



You would still travel the same distance if this straight line were a circumference as shown in Figure 3-2.

Figure 3-2



If it were possible to have a part 600 feet in circumference on a lathe we could replace ourselves with a fixed tool and rotate the part as shown in Figure 3-3. Still the distance traveled is equal to 600 surface feet per minute.

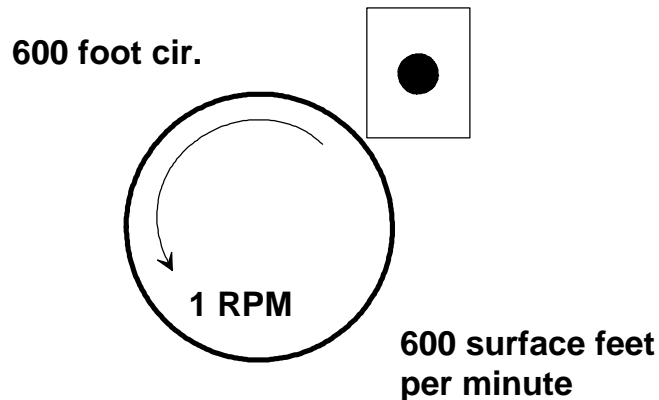


Figure 3-3

Because it is unlikely you will ever find a lathe that can hold a part that is 600 feet in circumference, let's say that our part has a 1 foot (or 12 inch) circumference. In order for us to maintain the same surface speed we would need to rotate the part 600 times every minute as shown in Figure 3-4.

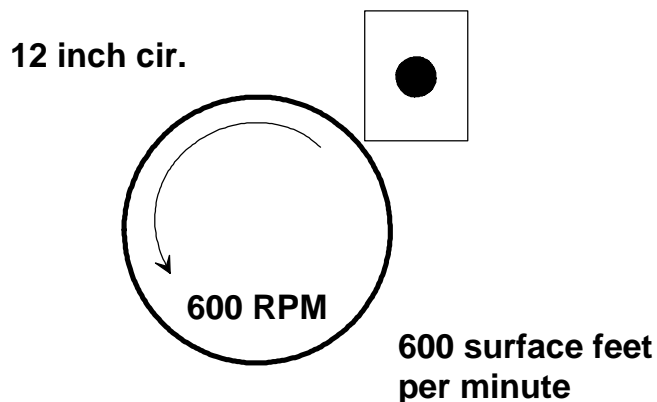


Figure 3-4

With a circumference of 12 inches the part rotates at 600 RPM to give 600 surface feet per minute.

The purpose of surface speed cutting is to ensure that the same amount of material passes the tool in the same given time no matter what the diameter. This is necessary because so much of the new tooling is *designed* to give best results under these conditions.

As the tool moves closer to the center of the part the RPM will *automatically* increase to maintain the same surface feet per minute. Figure 3-5 shows the same 12 inch circumference part. However, now we have cut toward center until the circumference has become 6 inches.

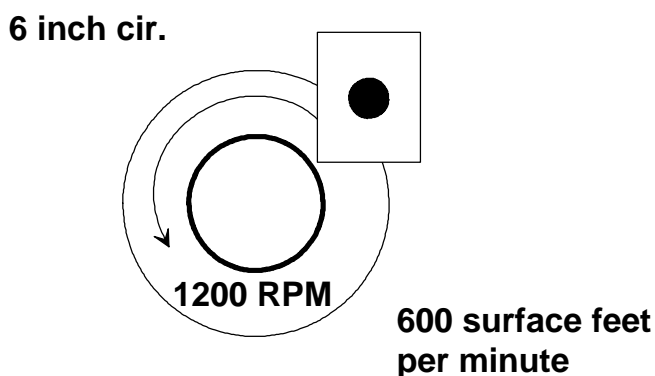


Figure 3-5

Once you reach a circumference of 3 inches the spindle would need to rotate 4800 RPM in order to maintain the 600 surface feet setting. Because the LB15 can only operate at 4200 RPM, you will reach the maximum allowed RPM of 4200 and then the RPM will "level off" at this highest available speed.

G50 Command

You can see the importance of the G50 command (see page 1-11). It is this command that determines what the maximum RPM of your machine will be. This is a modal command and becomes the maximum RPM ***even when you are in manual or MDI!***