# Rim Speed

1. We are using a 6” grooving cutter on the shaper. The rpm can be changed by adjusting pulley ratios. The speeds available are 3,000; 4,500; 6,000; 7,000; and 10,000 rpm.

The cutter has a maximum rated rim speed of 15,000 lfm. At what rpm would you operate this cutter to achieve the optimum rim speed of 14,000 lfm without exceeding the manufacturers maximum rim speed?

1. Determine **A:** the most appropriate machine and **B:** its proper rpm to produce raised panel doors given the following information:

* Optimum rim speed 14,000 lfm
* Manufacturers maximum rim speed: 16,000 lfm

## Machine A specs:

Type: Shaper

Cutter Dia. 7-1/4”

Rpm’s available: 3000, 4500, 6000, 7000, and 10000

## Machine B specs:

Type: CNC Router

Cutter Dia. 3-3/4”

Rpm’s available: 6000, 9000, 12000, and 18000

1. What is the rim speed of a 1”dia. router bit at a speed of 25,000 rpm?
2. What is the rim speed of a shaper knife going at a speed 7,200 rpm with a 5-1/2” dia. Knife?
3. A router with a speed of 20,000 rpm, what are the rim speeds of the following bits:
   1. ¼” dia. Router bit?
   2. 1-1/4” dia. Router bit?

# Pulley ratios

1. What pulley sizes should be on the motor and arbor to obtain a rim speed of 14,000 lfm with a 14” saw blade and a motor speed of 3,600 rpm?
2. With a ratio of 3 to 1, what size of saw blade should be used when motor speed is 1750 rpm to obtain a rim speed of 14,000?
3. A saw blade of 10” with a motor speed of 3600 rpm. What sizes of pulleys should be used to obtain a rim speed of 14,000 lfm?
4. What is the rim speed of a 10” dia., 2,500 rmp motor with a 4” dia. Pulley driving a 1-1/2” pulley?

# Blade/ belt lengths

1. What length of bandsaw blade is needed for a 2 wheel bandsaw with 20” dia. Wheels and a center-to-center distance of 75”?
2. What length of bandsaw blade is needed for a 2 wheel bandsaw with 26” dia. Wheels and a center-to-center distance of 64”?
3. What belt size is needed for an edge sander with a 10” dia. Drive wheel and a 4” idle wheel, the center-to-center measurement is 60”?

# Rim Speed - Answers

1. Rim speed = x rpm

14000 = x rpm

14000 = 1.57 x rpm

= rpm

8,917 = rpm

**Therefore, run this cutter at 7000 rpm.**

1. Machine A:

Rim speed = x rpm

14000 = x rpm

14000 = 1.898 x rpm

= rpm

7,376 = rpm

Therefore use the 7000 rpm setting.

Machane B

Rim speed = x rpm

14000 = x rpm

14000 = 0.98 x rpm

= rpm

14,285 = rpm

Therefore use the 12,000 rpm setting.

**Machine A is most appropriate, larger dia cutter and the rpms are closer to what is needed**

# Rim Speed answers cont.

1. 1” Ø at 25000 rpm

Rim speed = x rpm

Rim Speed = x 25000

Rim Speed = 0.26 x 25000

**Rim Speed = 6,500 lfm**

1. 5-1/2” Ø at 7200 rpm

Rim speed = x rpm

Rim Speed = x 7200

Rim Speed = 1.44 x 7200

**Rim Speed = 10,368 lfm**

1. Router bit “A”

1/4” Ø at 20,000 rpm

Rim speed = x rpm

Rim Speed = x 20000

Rim Speed = 0.065 x 20000

**Router bit “A” Rim Speed = 1,300 lfm**

Router bit “B”

1-1/4” Ø at 20,000 rpm

Rim speed = x rpm

Rim Speed = x 20000

Rim Speed = 0.327 x 20000

**Router bit “B” Rim Speed = 6,540 lfm**

# Pulley ratios - Answers.

1. Find the arbor rpm first

Rim speed = x rpm

14000 = x rpm

14000 = 3.665 x rpm

= rpm

3,819.9 = rpm

Find the pulley ratio between the desired arbor speed and the motor speed

Pulley ratio = Drive (motor speed)/ Driven (Arbor speed)

3600/3819.9 = 0.942433048

**The arbor pulley should be 0.94 times the size of the motor pulley. Therefore a 4-1/4” pulley on the motor and a 4” pulley on the arbor (4.25 x 0.942433048 = 4.005340454”).**

1. Ratio (Drive/ Driven) 3:1 – Drive is 3 times larger than the driven pulley.

Rpm x ratio = new rpm for driven

1750 x 3 = **5250 rpm (Driven)**

Now use the Rim Speed formula to find the diameter

Rim speed = x rpm

14000 = x 5250

12 x 14000 = 3.14159 x 5250 x d

168000 = 16493.36143 x d

= d

***D = 10.1859***

**Therefore we should use a 10”Ø saw blade.**

# Pulley ratios – Answers cont.

1. 10” blade, motor speed of 3600 rpm, what size of pulleys to use to obtain a rim speed of 14,000 lfm.

First find the arbor speed.

Rim speed = x rpm

14000 = x rpm

14000 = 2.618 x rpm

= rpm

**5,347.593583 = rpm (at the arbor)**

Now find the pulley ratio between the motor and arbor

Motor speed = 3600 rpm

Arbor speed = 5347.593583 rpm

5347.593583 / 3600 = 1.485442662

**Pulley ratio rounded 1.5 to 1** (Assume the faster rpm in the ratio = 1)

**Therefore, we could use a 3” pulley on the motor and a 2” pulley on the arbor (3/2=1.5).**

# Pulley ratios – Answers cont.

1. Motor speed 2500 rpm, Drive pulley 4”, driven pulley 1-1/2”, 10” blade.

***First, find the pulley ratio***

Pulley ratio = Drive pulley/ driven pulley

Pulley ratio = 4 / 1.5

**Pulley ratio = 2.66666666667**

***Now find the new arbor speed***

New arbor speed = pulley ratio x motor speed

New arbor speed = 2.66666667 x 2500

**New arbor speed = 6,666.666667**

***Now use the Rim Speed formula***

10” Ø at 6,666.666667 rpm

Rim speed = x rpm

Rim Speed = x 6666.666667

Rim Speed = 2.617993837 x 6666.666667

**Rim Speed = 17,453.29252 lfm**

# Blade / Belt lengths– Answers.

1. 20”Ø wheels, C to C = 75”

Blade length = ( x D) + (2 x center to center)

Blade length = ( x 20) + (2 x 75)

Blade length = 62.83185307 + 150

**Blade length = 212.8318531”**

# Blade / Belt lengths– Answers cont.

1. 26”Ø wheels, C to C = 64”

Blade length = ( x D) + (2 x center to center)

Blade length = ( x 26) + (2 x 64)

Blade length = 81.68140899 + 128

**Blade length = 209.681409”**

1. 10”Ø drive wheel, 4”Ø idle wheel, C to C = 60”

Belt length = ( ) + ( ) + (2 x center to center)

Belt length = ( ) + ( ) + (2 x 60)

Belt length = 15.70796327 + 6.283185307 + 120

**Belt length = 141.9911486”**

**Therefore, we would use a 142” belt on this sander.**