BEVEL AND MITER GEARS

5

COMMON APPLICATIONS: Bevel and miter gears are commonly used in dairy equipment, ag. equipment and food processing machinery

CATALOG CHECK: **The Boston Gear Advantage:** While there are many types of bevel and miter gears to choose from, most manufacturers supply them by special order only. Not Boston Gear! Boston Gear customers get to select from a stock line of 382 catalog numbers. This makes it easier – and less costly – for designers because they are able to standardize the specifications of their applications. Furthermore, Boston's stock line of bevel and miter gears is readily available through local distributors, thus minimizing discontinuance and replacement problems.

When an application calls for the transmission of motion and/or power between shafts that intersect at right angles (90-degrees), bevel gears and miter gears are often the "way to go". Let's learn more about them.

A **bevel gear** is shaped like a section of a cone. Its teeth may be straight or spiral. (If they are spiral, the pinion and gear must be of opposite hand to run together.) Because bevel gears are used to reduce speed, the pinion always has fewer teeth (see discussion of ratios below). *(See Figure 5.1)*

Miter gears differ from bevel gears in one very significant way: they are *not* used to change speed. In a miter gear set, therefore, both gears always have the same number of teeth and a ratio of 1:1. *(See Figure 5.1A)*

THE BOSTON GEAR LINE

Boston Gear manufactures a complete line of standard stock bevel and miter gears for the transmission of motion and/or power between intersecting shafts at right angles (90 degrees). As noted above, miter gears are always configured in a 1:1 ratio between the gear and pinion; stock bevel gears are available in ratios ranging from 1-1/2:1 to 6:1.

Boston miter and bevel gears are available with straight and spiral teeth. Straight tooth miter and bevel gears are suitable for many applications, though they are not usually recommended when high speeds are required. In high speed applications, spiral tooth miter and bevel gears are recommended because they run more smoothly and usually will transmit more horsepower than their straight tooth counterparts.

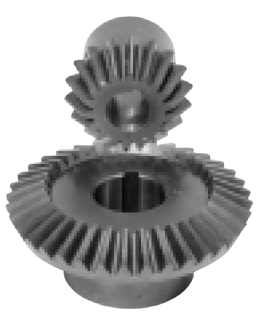


Figure 5.1, Straight Bevel-iron and steel

Figure 5.1A, Straight Miter-cast iron and steel

Important: Because *spiral* miter and bevel gears of the same hand will not operate together, a set of spiral bevel or miter gears consists of one left-hand gear and one right-hand gear.

BEVEL AND MITER GEARS—THE SIZE SYSTEM

Boston miter and bevel gears are listed in your catalog according to their *diametral pitch*, a term you should be familiar with by now. As you will recall, the diametral pitch (also referred to as *pitch*) indicates the size of a gear tooth. On miter and bevel gears, that tooth size is measured on the large end of the tooth. *(See Figure 5.2)*

Important: Both gears in a miter or bevel gear set must be of the same pitch.

The following formula is used to determine diametral pitch.

Pitch (D.P.) = Number of Teeth ÷ Pitch Diameter
This concept is reviewed below. *(See Figure 5.2A)*

CIRCULAR PITCH

In our lessons on spur, helical and worm gears, we learned how to calculate circular pitch. Now let's see how the circular pitch of bevel and miter gears are calculated.

Circular pitch (p) is the distance – along the pitch line or circle – from any point on a gear tooth to the corresponding point on the next tooth. It is also equal to the circumference of the pitch circle divided by the number of teeth.
(See Figure 5.2B)

The formula for determining circular pitch (p) follows:

- $p = \pi d$ (where d (or D) = the pitch diameter) ÷ n (where n (or N) = the number of teeth)

Example: To determine the circular pitch (p) of a 48-tooth gear (n) with an 8-inch pitch diameter (d):

p = 3.1416 x 8 ÷ 48 = 25.1328 ÷ 48 = .5236 inches

Note: Gears of larger circular pitch have larger teeth than gears of smaller circular pitch.

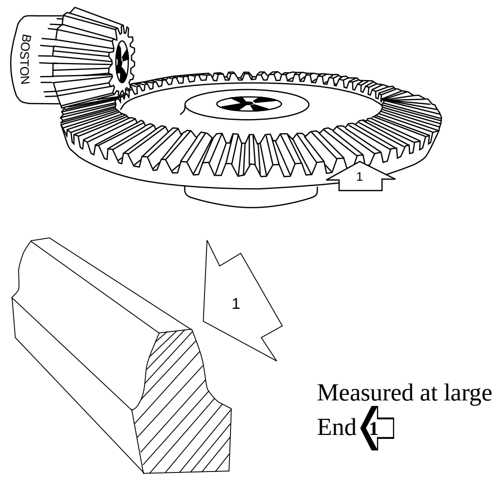


Figure 5.2

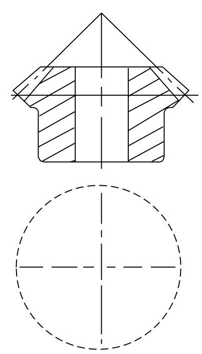


Figure 5.2A, A gear with a 1" P.D. and 24 teeth is 24 Pitch (Tooth Size).

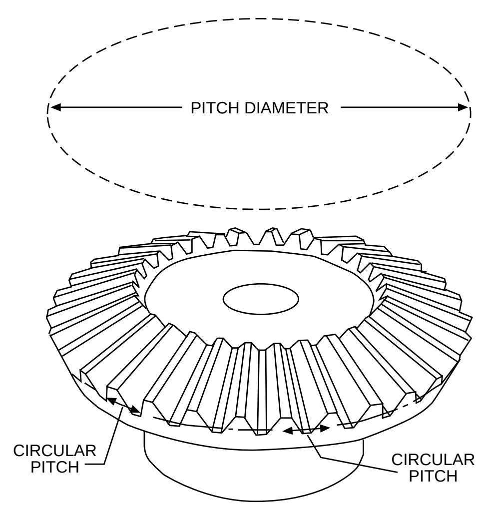


Figure 5.2B

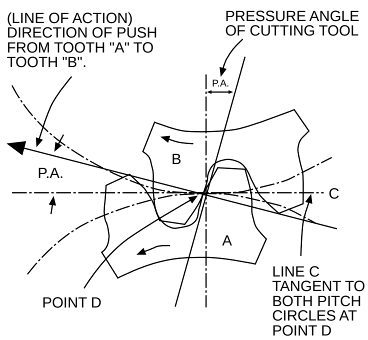


Figure 5.3

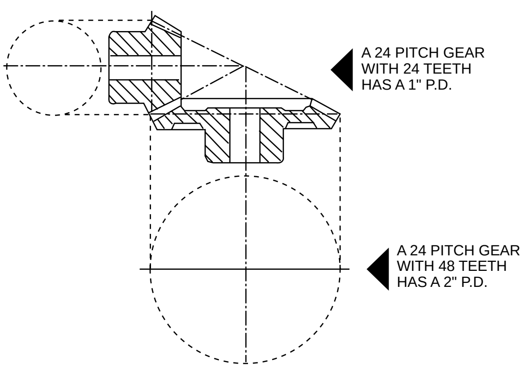


Figure 5.4

PRESSURE ANGLE

The pressure angle of a gear is the angle between the line of action (the direction of push from tooth A to tooth B) and the line tangent to the pitch circles of mating gears. A gear's pressure angle also corresponds to the pressure angle of the cutting tool used to create the teeth. *(See Figure 5.3)*

Important: In a gear set, both gears must have the same pressure angle.

PITCH DIAMETER

The pitch diameter is the diameter of the pitch circle. On both miter and bevel gears, the pitch diameter is measured on the pitch circle – at the large end of the teeth. The formula for determining the pitch diameter follows:

- Pitch Diameter (P.D) = Number of Teeth ÷ Pitch (D.P) *(See Figure 5.4)*

TOOTH PARTS

Tooth parts and dimensions are important because they provide valuable information when quoting customer gearing. Let's review the parts of a miter or bevel gear's tooth by learning their definitions and referring to Figure below. *(See Figure 5.5 on Page 5-5)*

- Addendum – the distance the tooth projects above, or outside of, the pitch line or circle
- Dedendum – the depth of a tooth space below, or inside of, the pitch line or circle. (Note: In order to provide clearance, the dedendum is usually greater than the addendum of the mating gear tooth.)
- Clearance – the amount of space by which the dedendum of a gear tooth exceeds the addendum of a mating gear tooth.
- Whole Depth – the total height of a tooth, including the total depth of the tooth space.
- Working Depth – the depth of the teeth of two mating gears at the point at which the teeth mesh. Working depth is also equal to the sum of the teeth's addenda.

- Tooth Thickness – the distance (along the pitch line or circle) from one side of the gear tooth to the other. It is nominally equal to one-half the circular pitch. (Note: The difference between circular pitch and tooth thickness is the width of the space between the teeth that is necessary to accommodate a tooth of the mating gear.
- Face – the length of the tooth.

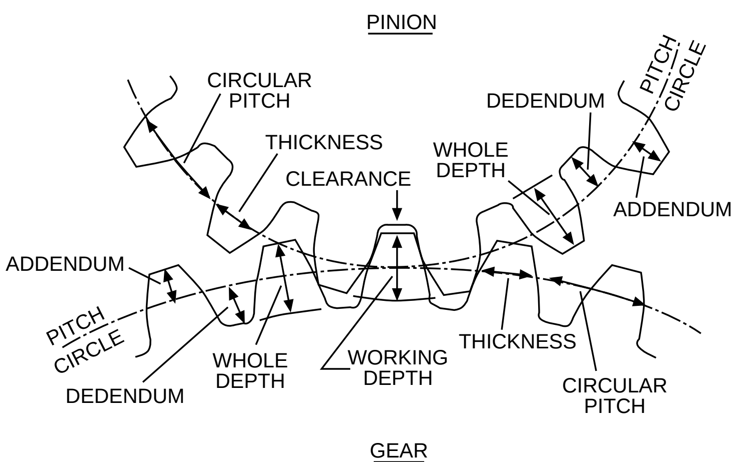


Figure 5.5

BEVEL AND MITER GEARS – CONIFLEX TOOTH FORM

Straight tooth bevel and miter gears cut with a generated tooth form having a localized lengthwise tooth bearing are referred to as having a *Coniflex*™ tooth form. Bevel gears with a Coniflex™ tooth form provide greater control of tooth contact than straight bevels cut with full-length tooth bearings. The "localization" of contact permits the minor adjustment of the gears in assembly and allows for some displacement due to deflection under operating loads – without concentration of the load on the end of the tooth. The result: increased life and quieter operation, *(See Figure 5.6)* The long and short addendum system for gears and pinions is used to reduce the undercut of the pinion and to more nearly equalize the strength and durability of gear and pinion.

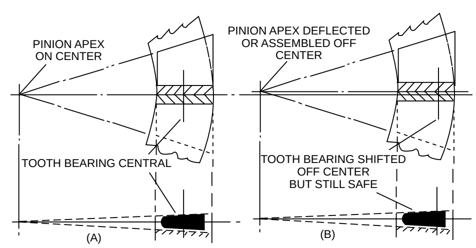


Figure 5.6

FORMULAS FOR DETERMINING GEAR DIMENSIONS

The following formulas on Chart 1 will help you find the dimensions of various parts of bevel and miter gears.

STRAIGHT BEVEL & MITER GEAR DIMENSIONS - 90° SHAFT ANGLE				
			RULE	
	TO FIND	HAVING	PINION	GEAR
1	Ratio	No. of teeth in Pinion and Gear	Divide the Number of Teeth in the Gear by the Number of Teeth in the Pinion	
2	Diametral Pitch (D.P.)	Circular Pitch	Divide 3.1416 by the Circular Pitch	
3	Pitch Diameter	Numbers of Teeth & Diametral Pitch	Divide Number of Teeth in the Pinion by the D.P.	Divide Number of Teeth in the Gear by the D.P.
4	Whole Depth	Diametral Pitch	Divide 2.188 by the Diametral Pitch and add .002	
5	Addendum*	Diametral Pitch	Divide 1 by the Diametral Pitch	Divide 1 by the Diametral Pitch
6	Dedendum †	Diametral Pitch and Addendum	Divide 2.188 by the D.P. and subtract the Addendum	Divide 2.188 by the D.P. and subtract the Addendum
7	Clearance	Diametral Pitch	Divide .188 by the Diametral Pitch and add .002	
8	Circular †† Thickness	Diametral Pitch	Divide 1.5708 by the Diametral Pitch	Divide 1.5708 by the Diametral Pitch
9	Pitch Angle	No. of Teeth in Pinion and Gear	Divide No. of Teeth in Pinion by No. of Teeth in Gear. Quotient is the tangent of the Pitch Angle	Subtract the Pitch Angle of Pinion from 90°
10	Cone Distance	P.D. and Pitch Angle of Gear	Divide one half the P.D. of the Gear by the sine of the Pitch Angle of the Gear	
11	Dedendum Angle	Dedendum of Pinion and Gear and Cone Distance	Divide the Dedendum of Pinion by Cone Distance. Quotient is the Tangent of the Dedendum Angle	Divide the Dedendum of Gear by Cone Distance. Quotient is the tangent of the Dedendum Angle
12	Root Angle	Pitch Angle and Dedendum Angle of Pinion and Gear	Subtract the Dedendum Angle of pinion from Pitch Angle of the Pinion	Subtract the Dedendum Angle of the Gear from Pitch Angle of the Gear
13	Face Angle	Pitch Angle & Dedendum Angle of Pinion & Gear	Add the Dedendum Angle of the Gear to the Pitch Angle of the Pinion	Add the Dedendum Angle of the *Pinion* to the Pitch Angle of the Gear
14	Outside Diameter	P.D., Addendum & Pitch Angles of Pinion & Gear	Add twice the Pinion Addendum time cosine of Pinion Pitch Angle to the Pinion P.D.	Add twice the Gear Addendum times cosine of Gear Pitch Angle to the Gear P.D.
15	Pitch Apex to Crown	Pitch Diameter Addendum and Pitch Angles of Pinion and Gear	Subtract the Pinion Addendum, times the sine of Pinion Pitch Angle from half the *Gear* P.D.	Subtract the Gear Addendum times the sine of the Gear Pitch Angle from half the *Pinion* P.D.

The face width should not exceed one-third of the cone distance, or 10 inches divided by the Diametral Pitch, whichever is smaller.

†These Dedendum values are used in other calculations. The actual Dedendum of Pinion and Gear will be .002 greater.

*Addendum and †† Circular Thickness obtained from these rules will be for *equal* Addendum Pinions and Gears. The values of these dimensions for 20° P.A. *long* Addendum Pinions and *short* Addendum Gears may be obtained by dividing the values in Table (P), corresponding to the Ratio, by the Diametral Pitch.

Chart 1

PHYSICAL DIMENSIONS

Using Chart 2, determine the physical dimensions of a Boston Straight Miter Gear No. HLK105Y.

STRAIGHT MITER GEARS

Pitch Dia.	Teeth	Face	Hole	D	MD +	Hub Dia.	Hub Proj	Steel-Hardened with Keyway & Setscrew Cat. No.	Steel-Hardened with Keyway & Setscrew Item No.	Steel-Unhardened without Keyway & Setscrew Cat. No.	Steel-Unhardened without Keyway & Setscrew Item N
12 PITCH											
			3/8"					—	—	L125Y	12204
1-1/4"	15	.27"	7/16	55/64"	1.250"	1"	1/2"	—	—	L126Y	12206
			1/2					HLK101Y	12328	L101Y	12154
1-1/2	18	.32	1/2	1-1/64	1.500	1-1/4	5/8	—	—	L127Y	12208
			5/8					HLK102Y	12330	L102Y	12158
			1/2					—	—	L119Y*	12190
1-3/4	21	.39	9/16	1-3/16	1.750	1-3/8	11/16	—	—	L120Y	12192
			5/8					HLK121Y	12334	L121Y	12194
			3/4					—	—	L133Y	12218
2	24	.43	1/2	1-7/32	1.875	1-5/16	11/16	—	—	L113Y	12178
2-1/2	30	.54	5/8	1-31/64	2.312	1-5/8	27/32	HLK114Y	12332	L114Y	12180
8 PITCH											
3	24	.64	3/4	1-37/64	2.562	1-3/4	13/16	HLK115Y	12366	L115Y	12182
3	24	.64	1	1-49/64	2.750	2-1/2	1-1/6*	HLK105Y-A	12362	L105Y-A	12164
3-1/2	28	.75	7/8	1-23/32	2.875	2	7/8	—	—	OA828Y-1‡	12418
			1					HLK117Y	12370	L117Y	12186
3-1/2	28	.75	1-3/16	2-3/32	3.250	2-1/2	1-1/4	HLK132Y	12374	L132Y	12196
			1-1/4					HLK106Y	12364	L106Y	12166
4	32	.84	7/8	2-3/32	3.438	2-1/4	1-1/8	—	—	OA832Y-1‡	12420
4	32	.84	1	2-9/32	3.875	3	1-1/8	HLK123Y	12372	L123Y	12000

Chart 2

You should have come up with the following dimensions:

- Face = .64"
- Hole Diameter = 1"
- "D" dimension = 1 49/64" (Hole Length)
- MD dimension = 2 3/4" (Mounting Distance)
- Hub Diameter = 2 1/2"
- Hub Projection = 1 1/16"

SELECTION GUIDE

Here is another guide to help you determine the various specifications of a gear. *(See Chart 3)*

	TO FIND	RULE	SOLUTION
1	Ratio	Divide the Number of Teeth in the Gear by the Number of Teeth in the Pinion	Teeth in Gear 48 Teeth in Pinion 24 48 ÷ 24 = ratio 2:1 Ratio = 2:1
2	Diametral Pitch (DP)	Divide 3.1416 by the Circular Pitch	Circular Pitch .2618" 3.1416÷.2618 = 12 Diametral Pitch (DP) 12
3	Pitch Diameter of *Pinion*	Divide Number of Teeth in the Pinion by the D.P.	Number of Teeth in Pinion 24 D.P. (Diametral Pitch) 12 24÷ 12 = 2" Pitch Diameter
	Pitch Diameter of *Gear*	Divide Number of Teeth in the Gear by the D.P.	Number of Teeth in Gear 48 Diametral Pitch 12 48÷12 = 4" Pitch Diameter
4	Whole Depth (of Tooth)	Divide 2.188 by the Diametral Pitch and add .002	Diametral Pitch (DP) = 12 $\frac{2.188}{12}$ + .002 = .1843" Whole depth of Tooth = .1843"
5	Addendum for *Pinion*	Having Ratio Use Table "P" and Divide by Pitch	Ratio = 2 to 1 From Chart "P" *Pinion* addendum for 1 Diametral Pitch = 1.350" 1.350÷ 12 = .1125 *Pinion* Addendum = .1125"
	Addendum for *Gear*	Having Ratio Use Table "P" and Divide by Pitch	Ratio = 2 to 1 From Chart "P" *Gear* Addendum for 1 Diametral Pitch = .650" .650÷12 = .0541" *Gear* Addendum = .0541"
6	Dedendum of *Pinion*	Divide 2.188 by the DP and Subtract the Addendum	DP = 12 Addendum of *Pinion* = .1125" $\frac{2.188}{12}$ - .1125 = .0698" Pinion Dedendum = .0698"
	Dedendum of *Gear*	Divide 2.188 by the DP and Subtract the Addendum	DP = 12 Addendum of Gear = .0541" $\frac{2.188}{12}$ - .0541 = .1282" Gear Dedendum = .1282"

Chart 3

THRUST

In previous chapters, we discussed how thrust (the driving force or pressure) affects the operation of various types of gears. Now let's see how thrust should be addressed when applications call for the use of bevel and miter gears.

THRUST OF STRAIGHT– TOOTH BEVEL OR MITER GEARS

When a pair of straight tooth bevel or miter gears runs together, they have a tendency to push each other apart. This pushing action – thrust – is always backward toward the hub. *(See Figure 5.7A)*

THRUST OF SPIRAL– TOOTH BEVEL AND MITER GEARS

Thrust is a very important consideration when it comes to the operation of spiral miter gears. Why? With spiral miter gears there is a backward thrust on one gear and a forward thrust on the mating gear (depending upon the rotation direction and gear hand). The *sudden stopping of a pair of spiral miter gears causes a momentary reversal of thrust. (See Figure 5.7B)*

To prevent the hub of the gear from rubbing against an adjoining surface, thrust bearings or washers should be mounted on the shaft – in back of the hub – to absorb the thrust load.

Since spiral miter gears have both forward and backward thrust – depending upon the direction of rotation – provision must be made to absorb this thrust. Often this is accomplished through the use of *combination radial-thrust bearings*. *(See Figure 5.7C)*

DIRECTION OF ROTATION

A pair of bevel or miter gears will rotate in opposite directions (as viewed from the hub end of the two gears). Thus, as bevel or miter gears transmit motion around a 90-degree corner, one will rotate clockwise and the other counterclockwise. *(See Figure 5.7D)*

CATALOG CHECK!: Thrust Bearings for Bevel and Miter Gears Boston Gear manufactures a variety of bearings to absorb thrust, including Bost-Bronz thrust type bearings, AO steel and SOA stainless steel (for light loads) bearings. Check out the Gears catalog.

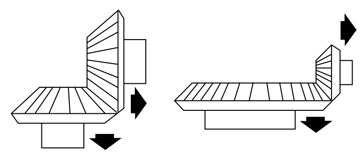


Figure 5.7A

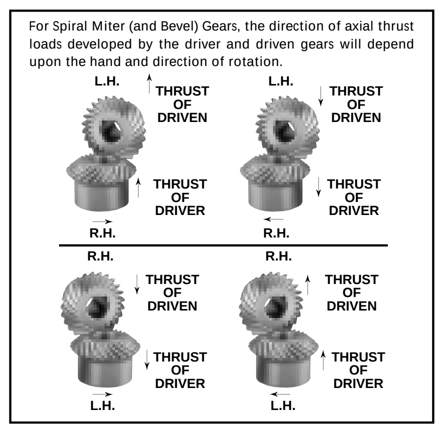


Figure 5.7B

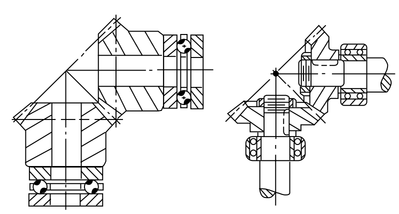


Figure 5.7C

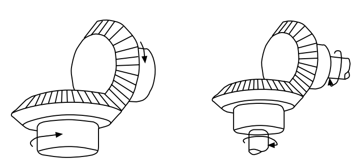


Figure 5.7D

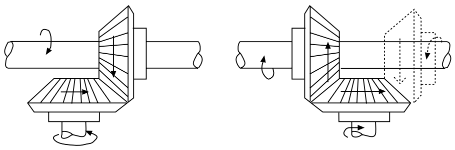


Figure 5.8

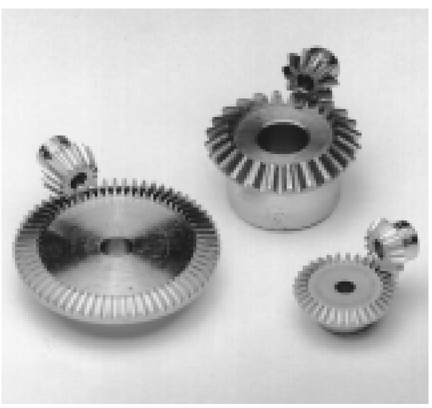
Take Note: By changing the driven gear from one side of the driver to the opposite side, the rotation of the shaft will be reversed (in both open and enclosed bevel gearing). This is important to remember whenever shaft rotation is important to an application. *(See Figure 5.8)*

RATIO

Ratio may be determined when any of the following factors is known:

- Numbers of Teeth (T)
- Pitch Diameters (PD)
- Revolutions per Minute (RPM)

GEAR RATIO—QUANTITY OF TEETH



The gear ratio is the number of teeth on the gear divided by the number of teeth on the pinion. It is always the larger number of teeth (as found on the gear) divided by the smaller number of teeth (as found on the pinion). Thus, the ratio of a pair of gears with 72 teeth on the gear and 18 teeth on the pinion is 4 to 1.

Now let’s apply those factors to some sample problems.

Problem: Find the ratio of a pair of bevel gears with a 15-tooth pinion and a 60-tooth gear.

- Ratio = Number of Teeth in Large Gear (60) ÷ Number of Teeth in Small Gear (15)
- 60 ÷ 15, or
- 4 to 1

VELOCITY

Velocity (V) is distance traveled in a given time, usually noted in feet per minute (FPM). Velocity is determined by dividing the distance (feet) traveled by the time (minutes) required to travel that distance.

- Velocity (in ft. per min.) = Distance (in feet) ÷ Time (in minutes)

Important: When referring to gears, velocity usually means pitch line velocity or the velocity of a particular point on the pitch line or circle. Gear speed is usually given in revolutions per minute (RPM), and in each revolution a point on the pitch circle moves a distance equal to the circumference of the pitch circle. The pitch line velocity, then, equals the circumference multiplied by the RPM.

As the circumference is πD inches, then:

- $\pi D \div 12$ feet, or .262D (feet)
- V = .262D x RPM

Sample Problem: Calculate the velocity of a gear with a pitch diameter of 4.5" turning at 800 RPM.

Velocity (V) =.262D x RPM =.262 x 4.5 x 800 =943 FPM

LUBRICATION

As emphasized throughout our introduction to Gearology, gears should be lubricated to minimize wear, prevent excessive heat generation, and improve efficiency by reducing friction between the surfaces of mating teeth. Lubrication also tends to reduce noise and retard the formation of rust (oxidation).

Good lubrication depends on the formation of a film thick enough to prevent contact between the mating surfaces. The relative motion between gear teeth helps to produce the necessary film from the small wedge formed adjacent to the area of contact.

It is important that an *adequate supply* of the *correct lubricant* is *properly applied*. Keep the following lubrication guidelines in mind:

- The use of a straight mineral oil is recommended for most straight tooth bevel and miter gear applications.
- Mild extreme pressure (E.P.) lubricants are suggested for use with spiral miter and bevel gears or heavily loaded straight tooth gears.
- Extreme pressure lubricants are recommended for spiral miter gears subjected to heavy loads and/or shock conditions.
- SAE80 or SAE90 gear oil should be satisfactory for splash lubricated gears. Where extremely high or low speed conditions are encountered, consult a lubricant manufacturer. An oil temperature of 150º F should not be exceeded for continuous duty applications. Oil temperatures up to 200º F can be safely tolerated for short periods of time.

SELECTING THE RIGHT MITER AND BEVEL GEARS

To select the correct bevel or miter gears for any application, the following must be known:

- Horsepower required to be transmitted by gears
- Pinion (driver – high speed) shaft RPM
- Gear (driven – slow speed) shaft RPM
- Ratio required
- Mounting distance of gear and pinion
- Space limitations (if any)
- Duty cycle

NOTE: Duty cycle refers to the operating conditions. The bevel and miter gear ratings in your Boston Catalog should be satisfactory for gears that are properly mounted, properly lubricated, and carrying a smooth load (without shock) for 8 to 10 hours a day.

SELECTING THE RIGHT MITER OR BEVEL GEARS–A SAMPLE PROBLEM

(See Chart 4)

Let's see if we can select the right bevel gear using the following information:

- HP to be transmitted by gears: 2.5
- Pinion (driver – high-speed) shaft RPM: 300
- Gear (driven – slow-speed) shaft RPM: 100
- Ratio required (to be determined in Step 1 below)
- Mounting distance of pinion: 5-7/8"
- Mounting distance of gear: 3-3/4"
- Duty Cycle: Normal – 8 to 10 hours per day smooth load (without shock).

Step 1 – Finding the Required Ratio

Use the following formula to determine the ratio:

- Ratio = High speed shaft RPM ÷ Low speed shaft RPM, or
- 300 ÷ 100 = 3
- Ratio required: 3 to 1

Step 2 – Selecting the Right Bevel Gear

Referring to the "Approximate Horsepower Ratings for Bevel Gears" heading on the facing chart (taken from your Boston Gears catalog), find the 300 RPM column. Go down the column until you find bevel gears strong enough to transmit 2.5 HP, keeping in mind that the ratio of your gears must be 3:1, as we figured above. If you have followed along correctly, you have selected a PA935Y gear.

Step 3 – Checking the Selection in Your Catalog

Find the page in your Boston Gears catalog that lists the specifications of PA935Y bevel gears. Here's what you should find:

Pinion (Steel)

- Number of Teeth: 15
- Pitch Diameter: 3"
- Hole: 1"
- Mounting Distance: 5-7/8"

Gear (Cast Iron)

- Number of Teeth: 45"
- Pitch Diameter: 9"
- Hole Size: 1-1/4"
- Mounting distance: 3-3/4"

BOSTON BEVEL GEARS

Approximate Horsepower Ratings — **Steel & Iron** — **Pressure Angle 20°**

Ratio	Revolutions per Minute of Pinion: 50	100	200	300	450	600	900	1200	1800	Pitch	Cat. No.
2:1	.26	.50	.99	1.5	2.2	2.8	4.2	5.5	8.0	8	SS82
	.40	.75	1.3	1.8	2.4	2.9	3.5	4.0	–	6	PA626Y
	.43	.82	1.5	2.0	2.6	3.1	3.8	4.3	–	5	PA625Y
	.34	.67	1.3	2.0	2.9	3.8	5.6	7.3	10.7	10	SH102
	.48	.89	1.6	2.1	3.2	3.9	–	–	–	6	PA726Y
	.59	1.1	2.0	2.7	3.6	4.2	5.2	5.9	–	6	L158Y
	.63	1.2	2.0	2.7	3.4	4.0	4.8	–	–	6	PA826Y
	.44	.88	1.7	2.5	3.8	4.9	7.3	9.5	13.8	8	HL156Y
	.64	1.3	2.5	3.7	5.4	7.1	10.5	13.7	20.0	8	SH82
	.98	1.8	3.2	4.2	5.4	7.3	7.5	–	–	4	PA824Y
	.77	1.5	3.0	4.4	6.5	8.5	12.5	16.4	23.8	6	HL158Y
	2.1	3.8	6.4	8.4	10.5	12.0	–	–	–	3	PA1023Y
3:1	.02	.04	.08	.11	.16	.20	.27	.33	.42	16	PA3116Y
	.06	.12	.22	.31	.43	.53	.70	.83	1.0	12	PA45312Y
	.13	.24	.45	.63	.85	1.0	1.3	1.5	1.8	10	PA6310Y
	.16	.31	.57	.79	1.1	1.3	1.7	2.0	2.3	8	PA638Y
	.19	.36	.67	.94	1.3	1.6	2.0	2.3	2.8	10	L157Y
	.33	.62	1.1	1.6	2.1	2.5	3.1	3.6	–	6	PA7536Y
	.57	1.1	1.9	2.6	3.4	4.1	5.0	5.7	–	5	PA935Y
	.87	1.6	2.9	3.9	5.0	5.9	7.1	–	–	4	PA10534Y
4:1	.02	.05	.09	.13	.18	.23	.32	.38	.49	16	PA4416Y
	.06	.12	.23	.33	.45	.56	.74	.87	1.0	12	PA6412Y
	.08	.16	.30	.43	.59	.73	.92	1.1	1.4	10	PA6410Y
	.16	.31	.58	.81	1.1	1.3	1.7	2.0	–	8	PA848Y
	.28	.54	1.0	1.4	1.9	2.2	2.8	3.3	–	8	PA948Y
	.38	.72	1.3	1.8	2.4	2.9	3.6	4.1	–	6	PA1046Y
	.76	1.4	2.6	3.5	4.6	5.4	6.6	7.5	–	5	PA1245Y
	1.1	2.0	3.5	4.7	6.1	7.1	8.6	–	–	4	PA1444Y
6:1	.03	.07	.13	.18	.26	.33	.44	.54	.69	16	PA6616Y
	.05	.09	.17	.25	.36	.45	.61	.75	.96	12	PA6612Y
	.11	.21	.40	.56	.78	.96	1.3	1.5	1.8	10	PA9610

Chart 4

Keypoints

- Miter gears are always 1:1 ratio
- Bevel gears range from 1.5:1 to 6:1 ratio
- Miters and bevels are for 90º applications only
- Spiral miter and bevel gears are more suitable for higher speed applications
- Miter and bevel gears are measured on the large end of the tooth when using a gear gauge
- Boston Gear miter and bevel gears are made to the Coniflex™ tooth form

Quiz

CLICK HERE or visit http://www.bostongear.com/quiz to take the quiz