

Artificial Lift Application Formulas

EXAMPLE			SPM STROKES PER MINUTE	
INPUT	1150	RPM of Prime Mover	$SPM = \frac{RPM}{G_R} \times \frac{P_d}{P_D}$	
INPUT	30.12	GR Gear Reducer Ratio		
INPUT	12	Pd Pitch Diameter of Prime Mover Sheave		
INPUT	47	PD Pitch Diameter of Reducer Sheave		
OUTPUT	10	Strokes Per Minute		

EXAMPLE			d PRIME MOVER SHEAVE DIAMETER	
INPUT	9.92	SPM Strokes Per Minute	$d = \frac{SPM \times G_R \times P_D}{RPM}$	
INPUT	30.12	GR Gear Reducer Ratio		
INPUT	47	PD Pitch Diameter of Reducer Sheave		
INPUT	1170	RPM of Prime Mover		
OUTPUT	12.00	Prime Mover Sheave Diameter		

Use nearest size available depending upon belt selection and number of grooves in sheave

EXAMPLE			v BELT VELOCITY	
INPUT	14.5	Pd Pitch Diameter of Prime Mover Pulley	$v = \frac{\pi \times P_d \times RPM}{12}$	
INPUT	1170	RPM of Prime Mover		
OUTPUT	4441.43	Feet Per Minute		
		Limit Between 2000 FPM and 5000 FPM		

Belt velocity less than 2000 fpm results in poor belt life. Belt velocity more than 5000 fpm requires dynamically balanced sheaves

EXAMPLE			CD CENTER DISTANCE	
INPUT	31	BB Horizontal Distance from Reducer Input Shaft to Front Motor Mount	$cd = \sqrt{\left(BB + \frac{CC}{2} \right)^2 + (AA - DD)^2}$	
INPUT	33.25	CC Horizontal Distance from Front Motor Mount to Rear Motor Mount		
INPUT	54	AA Vertical Distance from Reducer Input Shaft to Top of Motor Mount		
INPUT	8	DD Vertical Distance from Top of Motor Mount to Prime Mover Output Shaft		
OUTPUT	66.21	Inches		

EXAMPLE			PL BELT LENGTH	
INPUT	66.21	G Center Distance of Prime Mover Shaft to Reducer Input Shaft	$PL = 2G + 1.57 (P_D + P_d) + \frac{(P_D - P_d)^2}{4 \times G}$	
INPUT	47	PD Pitch Diameter of Gear Reducer Sheave		
INPUT	14.5	Pd Pitch Diameter of Prime Mover Sheave		
OUTPUT	232.97	Inches		

Use nearest belt size depending on type of sheaves selected

EXAMPLE			HP HORSEPOWER OF PRIME MOVER (FORMULA: A) For high slip (NEMA D) electric motor and slow speed engines	
INPUT	400	BPD Barrels Per Day @100% Pump Efficiency	$HP = \frac{BPD \times Depth}{56,000}$	
INPUT	7500	Depth Feet Pump Setting		
OUTPUT	53.6	Use Next Even Horsepower		

EXAMPLE			HP HORSEPOWER OF PRIME MOVER (FORMULA: B) For normal slip electric motor and multi-cylinder engines	
INPUT	400	Barrels Per Day @100% Pump Efficiency	$HP = \frac{BPD \times Depth}{45,000}$	
INPUT	7500	Depth Feet Pump Setting		
OUTPUT	66.7	Use Next Even Horsepower		

EXAMPLE			SPM MAXIMUM STROKES PER MINUTE FOR CONVENTIONAL PUMPING UNIT	
INPUT	100	L Stroke of Pumping Unit	$SPM = .7 \sqrt{\frac{60,000}{L}}$	
OUTPUT	17	Strokes Per Minute Max.		