Motor & Gearbox Pairing

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Originally, gears and the structure that houses them (called gearheads, gear reducers or gearboxes) were created for two main reasons:

1. To increase motor torque
2. To enable more adjustments to be made to a motor's speed.

However, advancements in technology has enabled gearheads to make additional progress in permissible inertia and vibration reduction. These changes are largely dependent upon the types of gearwheels operating inside in each gearbox.

What gearing types are typical of fractional horsepower motors (FHP)?

GEARS

Spur: a high-efficiency, straight-toothed gearwheel in which the wheel axis and teeth run parallel to each other. In other terms, this is what typically comes to mind when a person thinks of a gear. It's the simplest and most common type and is what you would find if you tore apart your wristwatch or opened up your washer and dryer set.

Helical: a more expensive, high-efficiency gearwheel with angled teeth that allow for smoother and quieter interaction of the moving gears. In a simple breakdown, this means that the angle (usually somewhere between 1°- 45°) allows for a more gradual connection between gears, because unlike the spur gears, helical ones slide instead of click. This is why a car full of passengers, which has many helical gears, rattles less than a clothes dryer full of laundry.

Worm: a non-backdrivable gear and gearwheel (depending on gear ratio and load, they will be incapable of reverse motion) that are held together by friction and is ideal for heavy shock load applications. Simply put, this spiraled gear part (which looks much like the threaded body of a screw) has more teeth in contact than a helical or spur gear, so it more successfully combats sudden changes in movement. The threaded component, the steel worm, interacts with a worm gearwheel (which looks like an actual gear instead of a screw and is typically bronze or copper) in order for movement to occur.

Bevel: a spiral-, straight-, or hypoid-shaped gearwheel specifically designed to shift the rotational direction of a shaft. More or less this type is either a straight- or angle-toothed gear that is used when a right-angle orientation is necessary. A bevel gear's 90° design uses less room than other gear types, so

when placed in applications such as car differentials or power transmissions, more space is available for passengers and cargo storage.

Feel free to check out our Gearing Up illustration for additional information.

What gears are paired with what fractional horsepower gearboxes?

GEARBOXES

Parallel shaft: Spur and helical

Planetary: spur and helical

Right Angle: worm

Right Angle Planetary: spur, helical, and bevel

Parallel Shaft

Because of these gear pairings, fractional horsepower motors are considered to have overall increased reliability and torque as well as improved speed reduction and low speed drive capabilities. On the flipside, just as every gearbox type hosts general advantages, each carries disadvantages that customers should keep in mind. Gear strength is effected by material selection & processing, tooth size, and changing face width. Spur and helical gears are the most efficient, but depending on space requirements, a right angle gearbox might be necessary. For example, to avoid having a motor awkwardly (and rather unsafely) protruding from the side of a conveyer belt, a worm or bevel gear would be necessary to meet measurement or orientation restrictions. Finally, bevel and worm gears have a high price differential—worm gears are much cheaper but are also the most inefficient)—so price and efficiency must be weighed when deciding between Right Angle gearboxes and Right Angle Planetary ones.

Planetary

Right Angle

Because of these fluctuating factors, Groschopp offers various customizations, such as gear ratio modifications, to help make this process easier and to aid in the selection of the optimal gearbox-to-application pairing.

Right Angle Planetary