

Worm drives are commonly used in gearbox applications requiring a high reduction ratio and/or a 90-degree change in the drive axis but they have many shortcomings. Many of these have now been addressed by an innovative bevel gearhead that incorporates enhanced crown gear technology. Chris Robinson reports

The worm has had its turn!

Worm drives are undoubtedly compact and inexpensive, but equally undoubtedly they have a whole range of disadvantages. Among the most significant is very poor efficiency, since the teeth of the driving gear effectively slide over the surface of the worm, leading to high frictional losses. In addition, worms cannot be back driven. Any attempt to turn the output shaft when the input is not being driven results in the worm drive locking solid and, even with moderate levels of torque, damage is inevitable.

Bevel spur gears are sometimes used as an alternative to worm drives, but these also have limitations. They often have limited power-handling capacity for a given size and, while more efficient than worm drives, typically they still have comparatively high losses.

To address these shortcomings in right-angle drives, gearmotor specialist, Zeitlauf, has developed a new form of bevel gearhead that incorporates crown gear technology. While it is not yet possible to discuss in detail the key features of these new gearheads, in general terms they achieve their superior performance by taking advantage of new materials and by adopting an 'intelligent' gear tooth technology,



An exploded view of the new gearhead

which optimises tooth gripping and minimises frictional losses.

While the details of exactly how the new gearheads operate may be scant, their benefits are extremely clear. Perhaps the most important of these is their enormously improved efficiency. With an average efficiency in excess of 85% over a wide range of sizes, and some models reaching 90% or more, the new gearheads cut power losses by up to 70% compared with worm drives of a similar size.

This is not just a matter of cutting energy consumption.

In many applications, it means that a smaller motor can be used, which costs less and takes up less space - an important consideration in today's

equipment with its invariably compact design. For battery powered equipment, the benefits are even greater, as lower losses and the possibility of using smaller motors means extended operating time before the battery needs to be recharged or replaced.

The new gearhead design is also extremely compact, typically reducing space requirements by as much as 30% compared with worm or conventional bevel spur gearheads. In addition, it has a much longer operational life, under similar operating conditions, than a comparable worm drive. Equipment therefore lasts longer and operational reliability is improved.

Enhanced safety

A more significant benefit of the new gearhead is that it

offers enhanced safety, as it does not lock or suffer damage if it is accidentally back driven. This eliminates the need for additional couplings or clutches that are often required with worm gears. In addition, there is no motor overhang, which means that no spacers or recesses are needed for installation, and the symmetry of the design further facilitates installation as well as doing away with the need for the different left- and right-stop versions that are often required with worm drives.

As well as making a significant contribution to energy savings, the optimised tooth profile adopted in the new gearheads delivers the important bonus of smooth running, with no snatch at start-up, thanks to the rolling tooth grip. The smooth operation and efficient gear meshing brings a further benefit of their own: the gearheads are exceptionally quiet in operation, a decided advantage in medical and similarly critical applications.

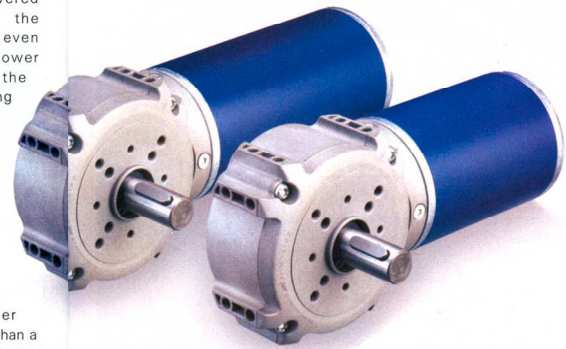
“ It offers so many benefits over more conventional technologies - in particular the worm drive - that it's fair to say that the worm has now, without doubt, had its turn! ”

At present, these gearheads are available, as standard, in one- and two-stage versions with ratios from 4:1 to 113:1, although custom models with higher ratios and even three-stage versions can be produced to meet special requirements. All products in the range feature dual high-performance deep-groove ball bearings to support the output shaft. These allow the units to handle high radial loads irrespective of the drive speed, and they also make a major contribution to the long life service life of the gearheads, which is typically around 20,000 hours with light and moderate loads.

This new bevel gearhead development from Zeitlauf combines efficiency with convenience and longevity. It offers new options for design engineers, and supports the trend towards ever more compact equipment designs. In fact, it offers so many benefits over more conventional technologies - in particular the worm drive - that it's fair to say that the worm has now, without doubt, had its turn!

Chris Robinson is with Zeitlauf

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This schematic gives us a glimpse inside Zeitlauf's new bevel gearhead, which features crown gear technology

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