

Introducing the Ball Screw

The Swiss Army Knife of PT Components

Matthew Jaster, Senior Editor

The ball screw drive is an assembly that converts rotary motion to linear motion (or vice versa). It consists of a ball screw and a ball nut packaged as an assembly with recirculating ball bearings. According to Thomson, the interface between the ball screw and the nut is made by ball bearings which roll in matching ball forms. With rolling elements, the ball screw drive has a very low friction coefficient and is typically greater than 90 percent efficient. The forces transmitted are distributed over a large number of ball bearings, giving a low relative load per ball comparatively.

But did you know that it's a jack-of-all-trades in the mechanical power transmission market? They can carry a tune, assist in commercial aircraft/space travel and help doctors on the operating table. They keep machine tools running on the shop floor and help turn solar panels toward the sun. It's rather interesting how such a little thing can provide so many different purposes in manufacturing applications.

Name That Tune: Ball Screw Addition

The NSK Ball Screw Music Player is a magical power transmission jukebox of sorts that can play a variety of songs. Every ball is grinded differently in the NSK Ball Screw Music Player. By utilizing six different rotational speeds, the ball screws create a musical scale that can perform a variety of musical numbers including "Amazing Grace," which was playing during my visit to the NSK booth during IMTS 2018 in Chicago. By applying unique micro-fabrication to the surface of a ball screw, the music player can create any kind of melody.

"We always like to showcase our products and technologies in different and unique ways," said Paulo Bragoni, application engineer, linear and mechatronic products at NSK Precision America. "It's a fun way to show off our grinding techniques and gives attendees something interesting to see at our trade show booths."

Aviation Actuation

Steinmeyer develops solutions for many applications in the aerospace industry. Whether it's braking systems, flap applications, or air-conditioning and door actuators, it's a safe bet you'll find a customized ball screw somewhere on a commercial airliner. Titanium ball screws are also used in space travel applications for the control of fins on missiles and unmanned air vehicles.



It's Alive! (And Beneficial on the Operating Table)

Ball screws seem to also have an outstanding record for meeting the stringent requirements of medical and laboratory equipment. You'll find ball screws in the pump for a blood separation device used in cardiac surgery, a dialysis machine and even in an automated system that analyzes lab samples. In short, ball screws convert most of a motor's torque into thrust and can handle higher dynamic loads even with their reduced size. The ball screw can handle the load, speed, acceleration, and accuracy requirements needed for high-tech medical equipment and help save lives in the process.

Unnecessary Machine Maintenance

NSK Ball Screws have also been utilized in a variety of machine tool applications where a double seal structure combines high dustproof performance with grease retention performance. This contributes to longer machine tool life, less maintenance and a reduction in the environmental impact. But one of the most important aspects of a ball screw in a machine tool application is that it helps to maintain low vibration and noise.

Locating the Sun

Thanks to the ball screws ability to move high loads with incredible accuracy, it's no surprise that you'll find them in solar arrays that track the sun. By using a high-efficiency ball screw/ball nut combination, a solar energy system can bypass hydraulic fluids and minimize environmental risks such as wind, rain and snow to minimize maintenance and service intervals.

Have an interesting application for ball screws? We'd like to hear about it. Send your story to mjaster@powertransmission.com. Thanks to NSK, Steinmeyer, THK and Thomson Industries for providing information for this article. **PTE**