

# GEARS WITH EARS

**W**hen you're manufacturing fun, very often you need gears.

The Addendum team recently went on a behind-the-scenes gear-finding mission with Jerold S. Kaplan, Principal Engineer, Show/Ride Mechanical Engineering at Walt Disney Imagineering in Lake Buena Vista, FL. We found that at least part of Disney's magic comes from good, old-fashioned mechanical engineering.

Kaplan's job is to help design, build and maintain a wide variety of mechanical devices. Gears are everywhere at Disney World, helping to power roller coasters, theme rides, animated characters and other attractions, Kaplan says. The gears range in size from very tiny up to several feet in diameter, and they're made of a variety of materials, from plastic to case-carburized steel.

One of Kaplan's recent gear-related projects is a four-story floating video display in the shape of the Earth. The globe is part of the Epcot theme park's *IllumiNations: Reflections of Earth* show. The nightly show includes a fireworks and laser display above Epcot's World Showcase Lagoon, where the giant globe takes center stage.

During the show, the globe, which was built atop a custom-manufactured barge, is piloted to the middle of the lagoon. It rotates on its axis and opens up like a flower as color video images flash across the continents. As an added feature, the barge spews flames in all directions as fireworks explode overhead.

Thankfully, the flames were turned off when we visited. But we did get to see the giant sphere in action, and we even got to peek inside. At the base of the sphere is a large, toothed turret bearing, driven by two pinions with redundant 10-hp hydraulic motors. According to Kaplan, there's nothing particularly fancy or high-tech about the gears that drive the video globe. The biggest con-



cern in designing the gear drive was reliability, he says. Because the globe is such a central part of the show, it has to work every night during a single 15-minute show window.

We don't care if the gears are fancy or plain, but the *IllumiNations* video globe proves something we've known all along: *Gears* make the world go around.

Many Disney attractions place high demands on their gears. For example, one of the attractions at Epcot is called Test Track by General Motors Corp. The ride simulates an automotive proving ground, where visitors ride over bumpy terrain, through freezing weather and around steeply banked turns at speeds up to 65 mph.

Test Track has proven to be one of the most demanding rides on its gears. Each car is powered by a rear differential transmission with a fully reversing load, and they are ridden approximately 50,000 miles per year, Kaplan says. "From that perspective, we really work the equipment. It has to be able to take an incredible amount of abuse, because it's in operation 365 days a year, for up to 18 hours a day."

Reliability is one of the most critical aspects of gear engineering for most of the projects Kaplan works on. Some rides, like Test Track, are in constant use while the theme park is open. Others,



like the *IllumiNations* globe, are required to perform night after night without a hitch. The globe, for example, was developed with a design life of 10 years. "We're always looking for something that gives us better life or durability," Kaplan says.

However, Kaplan and the engineering team aren't involved in creating all the park's gears. A separate design team usually creates gears used as display elements. Although they aren't functional, those display gears are some of Disney World's most impressive gears. For example, giant gears adorn the outside of the Mouse Gear retail store in Epcot. That building also has large cement planters in the shape of gears outside the entrance. Now that's what we call decorating. ⚙️

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