

Disney Magic, Ride Automation Combine to Create Speed and Smiles

Case Application

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Automation World was allowed a peak behind the scenes of the Radiator Springs Racers ride, whose innovative ride control design is enough to make any automation professional giddy as a child.

By Grant Gerke, Digital Managing Editor





Animation and automation usually don't go hand-in-hand down the road, but when the Walt Disney Company is involved, anything is possible. Especially when the story revolves around venerable Route 66 and some lovable car characters from the "Cars" movie.

Early this summer, Disney California Adventure Park in Anaheim, Calif. unveiled a new park attraction called Cars Land based on the popular children's movie, Cars. The featured ride at the new park is the Radiator Springs Racers and, in late 2011, Automation World was given a peak behind the scenes of its innovative ride control design and infrastructure. The machine design, safety systems and wireless Ethernet technology is enough to make any automation engineer or technician giddy as child.

Disney started working on the Cars Land attraction for the Anaheim, Calif. park back in 2006, after the success of the Cars movie. “The project came together quickly. We (Disney) already had the street laid out for us in the form of a movie set,” says Kathy Magnum, vice president and executive producer for Cars Land Imagineering. “So, all we had to do was think about scale and proximity of buildings to each other.”

Scale was a key component to Cars Land. The new attraction is a 12-acre expansion of the California Adventure Park, which is next to the original Disneyland. The entire Cars Land park uses three energy substations. Cars Land’s rides include Radiator Springs Racers, Luigi’s Flying Tires and Mater’s Junkyard Jamboree, along with a main street. The design of Cars Land took 2 years in total ([click here to for more information](#)) and Disney broke ground in July 2008.

Imagineering the project

Back in the 1940s, Alcoa popularized the term “Imagineering” and Disney adopted the management practice in the 1950s when it started building Disneyland Park. Imagineering can be described as the blending of imagination and engineering, and 140 different disciplines fall under the umbrella of Imagineering. Some of these disciplines at Disney include illustrators, architects, engineers, lighting designers, show writers and many more.

Two key imagineers for the Cars Land project were Magnum and Jim Kerns, vice president of project management for Walt Disney Imagineering. For the Cars Land project, Disney’s team of imagineers designed the control architecture and then worked with its Alliance Partners, which are automation suppliers that make recommendations on hardware and other design issues.

The Disney Imagineering team is the main automation contractor (MAC) for all Disney projects and they contract out using their own project management team. Kerns heads the project management team and says, “Disney writes a very thorough specification. We tell them what component tree that we’ll allow them to use, and then the automation suppliers deliver the hardware, which we then install. Once that’s done, then it’s our ride control engineers and ride engineer’s job to make sure that the system is performing the way it was designed.”

For the main attraction, the Radiator Springs Racers ride uses **Siemens Industry Inc.’s** (www.usa.siemens.com) Simatic S7 319F failsafe controller, Sinamics G120 variable-frequency drives (VFDs) on the actual cars and Scalence W wireless access points.

With the 319F modular controller, Disney can do “show” control—the story-telling component with most Disney rides—and safety in the same controller. Safety control signals are sent over a Profinet wireless Ethernet backbone and it monitors all the switches and wireless access points.

Unlike other theme park rides, such as Six Flags, Disney unleashes thematic story telling into the actual rides while providing a thrill aspect to each ride. With the Radiator Springs Racers ride, sandstone cliffs surround the race track as this ride takes up nine of the twelve acres of Cars Land. The artificial rock formation tops out at 128 feet, the highest rock formation for Disney in the U.S.

The ride starts by loading passengers into an open-top convertible—a pseudo Lightning McQueen car—that winds its way up three or four stories to the story-telling “caves,” where the story begins to unfold. The story includes multiple vignettes with the entire cast of Cars having fun and sharing movie moments with riders.

After a couple of minutes of story telling in the caves and garages, the convertibles weave their way to the starting line for the race. Two tracks emerge and another car arrives at the same time for a race down the bluffs. This is also where the ride control from Siemens kicks in.

Disney adopted a Siemens design with a two-piece setup for the power and control of the cars using the Siemens’ Sinamics G120 VFD for the power module. Under the car’s hood a programmable logic controller (PLC) sits on top of the VFD, which controls the motor and provides the power. The PLC communicates to ride control via the Universal Serial Interface (USS) protocol and analog signals to the VFD. Wires are hardened from the drive to the control unit to help reduce vibration that could affect the electronics.

With this modular design for the power and control of the cars, PLC inventory can be reduced by specifying just one control unit—and this appealed to Disney. John Hunt, automation business development for Siemens Industry, says, “The nice thing about these drives is no matter what size that motor is, the power module might change but the control unit is the same. If the control unit fails, you just snap it off, put another control unit on. You don’t have to pull your whole drive out and disconnect all the power wires. The inventory is much less, it’s not a different control unit for every drive.”

Ethernet innovation

When you hear the word “leaky coax,” you don’t immediately think innovation in engineering; however, Walt Disney imagineers have been using this engineering technique since the introduction of the Toy Story Mania ride back in 2008—also located in California Adventure Park. As Hunt explains it, “The leaky coaxial cable is unique for Disney. Basically, it’s a way to build a wireless Ethernet backbone without worrying about communication gaps to the centralized ride control. It allows communication control signals to jump across segments of the race track and follow the movement of the racer.”

>> **VIDEO: Pay the Ticket, Take the Ride:** Watch this video of the Radiator Springs Racers ride and how it feels to be in the front car. Visit bit.ly/aroundweb190

In order to keep track of 30 concurrent vehicles on the Radiator Springs Racing track, Disney uses a wireless data link product from Siemens, called the Scalence W access point. Both the ride and show control systems use this access point module from the car in conjunction with Scalence W access points on the leaky coaxial cable on the track.

Hunt adds, “If you did it with just separate antennas, you could develop gaps and drops in the communication. With the leaky coax, it can be a 2.5- or 5 gigahertz signal and you have an access point and an antenna on the car as it goes by. The access points read the car location data and send (signals) back to show and ride control, separately.”

The entire racetrack is wired with the “leaky coax” technology—which refers to the slits in the cable that emit the frequency—and the track has approximately 10 segments. The technology allows Disney to communicate to the car along the entire length of the track and in a real-time manner. Ride control also receives diagnostics and data from the car to maintain ride uptime.

“With the success of the leaky-coax in other Disney attractions, this is becoming a standard for all of Disney,” says Hunt. The ride control does not use a PLC, but control software running on an industrial PC to communicate with the drives that controls the speed. The proprietary software comes from Disney and is used throughout the park, he adds.

“At the end of the day, the guest experience is really important, but safety is paramount. All of the control systems are geared with that in mind. Constant knowledge of where vehicles are, what speed they’re at, and playback so that if there’s any anomaly at all, the right system comes to basically a safe stop. That’s the heart of what our ride control systems do,” says Kern.

Companies in this article: Supplier:

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