Case Study

Rail RFID Solutions - IUH PeopleMover

The Indiana University Health (IUH) PeopleMover is an elevated train that transports patients, families, and IUH team members between IU Health Methodist Hospital, University Hospital, and Riley Children's Hospital at the Indiana University-Purdue University campus.

The fully-automated, 1.4-mile long transit system was fast-tracked from conception to completion in just two years, opening to the public in June, 2003. It is the only private transportation system in the United States constructed to run above public streets.

The rail system consists of two separate concrete tracks running in parallel, and allows concurrent travel in both directions. Each track supports its own fully automated train. Each train weighs approximately 45,000 pounds and consists of three cars with seating for 24, plus standing room for a total combined capacity of 81 passengers.

The system operates daily, free of charge, with one train arriving at each station every seven minutes. The average speed is 17 mph, with a top speed of 30 mph.

The PeopleMover system, designed and constructed by California-based Schwager Davis Inc. (SDI), is technically not a monorail. Instead it is based on a dual rail design known in the industry as the Unitrak standard.

SDI continues to operate and maintain the system, and recently installed significant design changes.

Train Positioning Challenge

The original positioning system for the PeopleMover used proximity sensors in combination with metal plates, or 'flags,' at various points coupled with limited use of encoders for various purposes to 'detect' position. Corrections were made at inconsistent locations, based on flag count and direction of travel. Many physical conditions, including tire wear, mid-track direction changes, missed count of flags, resulted in difficulty maintaining correct train position. This often led to reduced functionality and possible complete system shutdown.

The Solution

The goal of the new system was to provide improved functionality, redundancy, reliability, and ease of operation and maintenance. This was achieved with TransCore radio frequency identification (RFID) components, redundant encoder selection, and software algorithms that self-correct to compensate for missed flags, tire wear, and weather-induced scaling and offset errors.

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Designing for Extreme Weather

The system was designed from the ground up at the Indianapolis division of SDI. The heart of the design is based on TransCore RFID technology integrated with controls manufactured by Allen Bradley, in conjunction with the existing Allen-Bradley PLC.

"We required proven technology that was as durable as it was reliable. We operate in a harsh environment with a lot of extreme conditions," said Tim Jared, Controls Specialist responsible for the design. The system continuously operates in all kinds of weather, from below zero to 110 °F.

TransCore components, which are used in heavy rail and transit systems worldwide, were selected as the natural choice, and included:

- Multiprotocol Rail Readers (MPRR's) which provide power to up to four RF antennas each. The MPRR's also receive, validate, and decode data received from the pre-programmed tags.
- AA3233-004 Heavy Rail Antennas, which are high gain (10dbi) directional antennas of industrial grade and designed for harsh environments as those found in the rail industry. These focused-beam antennas allow maximum positioning accuracy.

- AT5411 Hardened Rail Tags which are self-contained, fully sealed, harsh environment RFID tags that provide data to the system. Tags are passive, requiring no battery to maintain, and radiate only when power is received from a passing antenna. Tags are mounted to metal backing plates attached to existing guideway diaphragms.

The Result

Added functionality now includes:

- Automatic Error Correction: compensating for inclement weather conditions, tire wear and pressure, expansion/contraction of the track, and a host of other factors.
- Precision: when coupled with the offset correction provided with the RFID tags, the system is able to maintain position accuracy within 12 inches or less for the entire length of track. Feedback is used by every aspect of an unmanned control system, with accurate positioning data being one of the most critical.
- Enhanced safety and automatic track profiling: speed limits and track detail can be automatically encoded into the RFID tags. Encoding is also verified to ensure misreads or coding errors do not adversely affect operation.
- Redundancy: the new design is incredibly fault tolerant. In the unlikely failure of a single component, the system will not likely encounter so much as a delay.

The Future

As IUH continues to expand, the enhanced PeopleMover is likely to be integral to that growth. The new design can accommodate up to 113 additional miles of track, and well positions SDI to improve existing systems and to propose new projects that can benefit from TransCore RFID technology.

For more information:
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