

## **Method for an RFID system with magnetic exciters and a retrieval-tag communication protocol**

Disclosed is a method for a radio-frequency identifier (RFID) system with magnetic exciters and a retrieval-tag communication protocol. Benefits include improved functionality and an improved manufacturing environment.

### **General description**

The disclosed method is an RFID system with magnetic exciters and a retrieval-tag communication protocol. Its purpose is to enable easy lot retrieval and production lots transference in high volume manufacturing.

The key elements of the disclosed method include:

- Magnetic exciter embedded in the reader and the production machine
- RFID tag with embedded approximated magnetic sensor
- Database of production results
- Colored LEDs for active lot searching
- Hand-held readers for lot searching

### **Advantages**

The disclosed method provides advantages, including:

- Improved functionality due to providing an RFID system with magnetic exciters and a retrieval-tag communication protocol
- Improved manufacturing environment due to improving lot tracking and retrieval during high volume manufacturing

### **Detailed description**

The disclosed method is an RFID system that is used for two functions:

- Tracking the transfer and storage of lots during production
- Retrieving the lots

#### *Tracking the transfer and storage of lots during production*

The RFID system includes magnetic exciters embedded in tag readers and production machines. The tags have embedded proximity magnetic sensors. When a tag comes to an area with a magnetic field, the tag receives a signal from the reader to set a flag bit in an echo status byte. A remote reader receives the ID number of the tag, its status byte, and a significant unique ID. The information is sent as input to a production results database.

This activity is applied to the lots binding process and production results transference process. In the lots binding process, each tag is bound to the number of the lot. In the production results

transference process, information about the lot produced at a station is written to the database and read by the next station. The information is used to determine the next processing step.

### *Retrieving the lots*

Each RFID tag has different colored LEDs for use in active lot retrieval. Searches are conducted by small numbers and larger numbers of people. When a few searchers retrieve lots in an area, a different color code is assigned for each searcher, who finds the lot blinking with his/her color code. When a larger number of people retrieve lots in an area, each of the searchers is issued a handheld reader. The searcher can turn the LEDs on or off by pushing/releasing the button of the handheld reader, so that each searcher can find the lot that responds to his/her reader.

### *Layout*

A tag is bound to each lot and put on the side of a cart in the work-in-progress area. The reader is installed on the top of the ceiling and has a large radius, such as 20 meters.

### *Process*

Each time a new lot number is created, the operator assigns a tag to the lot by binding the tag ID with the lot number. The lot number is entered using the RFID user interface. The tag is put onto the reader and is kept with the lot during its production processing until the lot number is no longer valid.

When an operator wants to find a lot, he/she gets the lot number using the RFID user interface. The system provides information about the lot, such as whether the lot physically exists and which area it is located. The operator walks to the area and looks for the tag blinking the color code. The operator pulls the cart to the production machine and puts the RFID tag onto the magnetic exciter on the machine. The process step for the lot is automatically chosen according to the lot information.

When the lot finishes production, the operator puts the RFID tag onto another magnetic exciter on the machine. The production results are written to the record for the tag in the database. When production is complete, the tag is recycled and moved to the original station.

The RFID reader/writer can be implemented in several ways, including the following:

- Modulation: Gaussian Frequency Shift Keying
- Data rate: 1000kbit/s
- Frequency: 2.4 GHz ~2.4835 GHz
- Power: -40 dBm ~0dBm

The RFID tag can be implemented in several ways, including the following:

- Modulation: Gaussian Frequency Shift Keying
- Data rate: 1000 kbit/s
- Frequency: 2.4 GHz ~2.4835 GHz

- Power: -20 dBm ~-5 dBm

**Disclosed anonymously**