RFID - Recognize your car

RFID - The concepts of the "transparent" individual and continuous observation are a nightmare scenario. However observation cannot be stringent enough in manufacturing. There is never enough - in fact there is too little – in this area. Turck has presented a new RFID system which will allow for transparent manufacturing.


Picture: Volkswagen Sachsen GmbH

“Radio Frequency Identification” (RFID) is a method for reading and saving data by non-contact and non-visual means. Four factors decide if an RFID system is suitable for an application: the distance, the speed, the data quantity and the ease of integration into the existing automation system.

The purchaser makes the final decision

The pioneer in the field of RFID systems is - as so often before - is the car manufacturing industry which is following the trend to the “personalized automobile”. Today the purchaser decides what is fitted to the car and practically every car has individual extras. It is necessary to somehow mark every car with the desired individual features in order provide transparency at all times through out the manufacturing process.

This is undertaken using various methods, as a universal solution for the entire manufacturing process does not yet exist, as a further special feature of automobile manufacturing is the utilisation of almost all classical manufacturing processes. In addition to mechanical engineering it is possible to encounter elements of transport technology, handling technology and logistics as well as general metal processing techniques, presses etc., as well as a wide variety of different interlinked processes with varying demands, which partly differ significantly from those associated solely with the distribution of goods.

Regardless of all differences in the processes, the detection systems should be fast and secure, as well as being robust, insensitive to every type of interference and extreme temperature influences. An RFID system always consists of data carriers (TAGs), read-write heads (transceivers), interface modules, the higher-levels of control, and if required, logistics systems as well as the software required for implementation. At first glance there is a direct comparison between RFID and barcode systems.

If TAGs were replaced by barcode labels and transceivers by scanners, the well-known barcode system with all its benefits and drawbacks would be the result. However, the large differences become evident as soon as the individual components of the RFID system are closely examined and are compared to those of the other systems.

Hot and cold

Barcode labels regardless of if they are one or two dimensional can only be read in one direction. RFID technology could do little more at the very outset as the first data carriers featured a pure read memory only. The most important features such as insensitivity to dirt and humidity as well as the recognition through non-transparent media were benefits in comparison to conventional barcode systems. RFID has also made some major advances. The TAGs of modern data carriers feature multi-write capable memory based on EEPROMs, and in more recent times, even FRAM technology is available with memory sizes up to 2 kBytes.

FRAMs can be written to at least 1010 times and EEPROMs only up to 105 times and even feature a significantly higher speed. If considerable demands are placed on speed, or if data must once again be stored on the TAG, the only choice of data carrier can be FRAM memory. If for example data were written onto an EEPROM every second, the memory is no longer safe to use after just 1 day whereas this would only be the case after 300 years with the FRAM. The transmission features have also developed in a similar way. Whereas initially the transfer of data according to the quasi-standard was undertaken at 125 kHz, or alternatively proprietary frequencies such as 1.5 MHz have been used, there are currently different frequencies in use. Only three common frequencies are permitted world-wide and these are 125 kHz, 13.56 MHz and 2.45 GHz,

i.e. for companies who operate world-wide only one of these frequencies is worthy of consideration. In the field of industrial system technology the emphasis is being placed more often on the ISO 15693 standardised 13.56 MHz technology, as it provides for a direct powering of the data carrier via the RF field. In comparison to the 125 kHz technology it provides transmission rates which are several times faster and which are also well outside the range of industrial interference fields.

In addition to the these sources of interference, these data carriers are also subject to extreme temperatures in many manufacturing environments. The temperature ranges for -40 ... +210 °C are supported. Solutions are provided by special data carriers which are protected against these temperature ranges.

The BL-ident HT solutions feature extremely small dimensions and the use of standard data carriers and thus enable universal use. Accordingly the same read-write heads can both read and write the HT data carriers as well as the more attractively priced "normal versions".

Better with sensor technology

Writing and reading of data is possible, in contrast to the pure scanning operation involved with the barcode system or some outdated RFID systems, which still only use read heads from the times when just "read-only data carriers" were used. And the term "Transceiver" states nothing more than it is comprised of "Transmit" and "Receive". For industrial use, the standardised housing designs used in the field of sensor technology which have evolved over the years are ideal. They can be integrated optimally in the corresponding environment, every technician knows how to install them and an entire range of attachment accessories are available.

During the installation you must only consider restrictions similar to those which apply with the use of inductive sensors, such as flush or non-flush or the necessary clearances to each other to avoid mutual interference. Functions which provide for exclusive switch on and off are also helpful. Thus the clearances between write-read two heads in the application can be matched without influencing one another. Interaction between data carriers and write-read heads, or the question posed regarding: “achievable distances, speeds and data quantities“, the "crucial question" for many users.

This is the first question with which you are confronted, as these are the known parameters from the application which the user can define. Variables such as: "recommended write-read distance = 40 mm“ or "data transfer with 2kbps“ etc. are only helpful if complex calculations are to be solved as every combination of data carrier and write-read head delivers different variables. Simulations are useful here, such as for example the configurator of BL-ident which automatically completes the corresponding calculations and which allows the user to "play" with the application variables, and provides the user with a possible selection for his or her application.

Direct connection to higher level via the interface module

The interaction between the data carriers and the transceivers is one of the primary factors of all RFID systems, however the connection to the control world is not without its own difficulties. They are sometimes the subject of delays and difficulties in the communication channels. Accordingly, the reaction times and the application speeds are reduced and the manufacturing costs are increased unnecessarily.

BL-ident relies on the separation in this case, i.e. the asynchronous processing of individual commands. Accordingly, read and write commands can be saved independently of the physical presence of the data carrier in the so-called "air-interface" of the transceiver in the interface modules. As soon as a data carrier enters the "air-interface" they are processed without delay.

Theoretical application speeds of up to 30 m/s are possible. The read data is stored in interface modules and can be requested successively from the higher control levels without a time lag occurring in the application. Reading and writing "on the fly" - in motion - becomes possible and the manufacturing speed can be increased significantly. With the integration into the control world, the BL-ident has the option in most applications to fall back on standards used such as Profibus, DeviceNet or Ethernet.

The so-called standard function module simplifies the integration into the control world. The system also offers a simple solution with extensions. The addition of interface modules allows the capacity of a fieldbus node to be increased to up to 8 write-read heads and enhances the planning security by these potential reserves. All transceivers connected in this fashion are processed in parallel.

FACTS

Even though relatively new, there are already two applications, one at VW in Saxony and the other at Ford with 4,000 data carriers in use. Walter Hein, the product manager concerned at Hans Turck GmbH is proud of the result which the development engineers at Turck have produced: “With BL-ident we have introduced an RFID system which fully complies with the customers wishes. BL-ident combines the benefits of existing RFID systems with numerous technological improvements.

We have thus developed a system in which the demands of modern production are combined with "more" functionality and flexibility and the need for cost optimisation.” BL-ident reads as the products pass by at their normal unreduced speed. Walter Hein: “It is the fastest system on the market.” Multiplex operation is possible without mutual interference for the readers. The system is suitable for extreme temperature conditions. The read-write heads feature a technically-perfected sensor housing design. “They save space and are smaller than all other devices on the market”

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