RFID for Diagnostics Testing Applications

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The In Vitro Diagnostics Industry is growing rapidly with technological advancements in Molecular Diagnostics, DNA Sequencing, Tissue Diagnostics, and an increasing variety of Point of Care processes aimed at detecting, diagnosing and preventing disease. In each case, a human specimen such as blood, saliva, tissue, urine or other biological sample is collected for analysis and processing in laboratories, hospitals or in facilities offering the specialized test procedures that result in a diagnosis that is specific to a unique specimen.

Secure tracking is key to efficiency

In each of these diagnostics applications, the tracking of the specimen is paramount in importance. A barcode identification has been used for many years to ensure that a unique identifier associates the specimen with each of the diagnostic processing steps, and results in a secure record linking the processes together in an efficient manner. The process typically includes automated steps and system redundancy to ensure patient safety and a high quality diagnosis.

RFID gives each specimen read/write data capability

In recent years, radio frequency identification (RFID) has been used to supplement the barcode identification used in diagnostics track-and-trace applications. RFID enables some of the data to be stored with the specimen itself in addition to the database that has historically stored the relevant records associated with the unique identifier on the specimen. It is possible, for example, to use RFID to identify a specimen that is in a standardized package that is shipped to a testing company for analysis, enabling the identification of the contents without opening the package. In this application, a special portal is designed to read all specimen packages passing through a doorway or a shipping door. RFID consists of a special antenna connected to an integrated circuit (IC) chip with user memory that can be used to track the arrival of the specimen to the testing company. Data may be read from the contents of the IC chip and data may also be written to the chip to track, for example, a time and date code associated with the specimen shipment. Most diagnostics processes begin with accessioning where RFID can be used. The automation of this stage can lead to a high quality, efficient process with numerous opportunities for process improvement, resulting from the ability to write information to the RFID memory associated with the specimen.

Hybrid RFID-barcode labels add useful diagnostics functionality

The contents of the specimen package may also contain a label set—a group of labels that each have a unique identifier associated with the specimen, applied at different stages in the diagnostics process. One (or more) of the labels in this label set could also include the RFID transponder; the antenna and IC chip attached to a substrate and ‘sandwiched’ in between other layers of a label that may also have a barcode and human readable information. This hybrid RFID-barcode label can be a powerful addition to a diagnostics process where it is important to measure quality at various stages in the process. Ultra-High Frequency (UHF) RFID products are generally used in this application, as these are capable of long read distances (up to 10m), are commercially available, and are subject to global communication standards. UHF RFID products operate at frequencies between 900 and 928 MHz in the United States.

Other diagnostics applications may involve processing in instruments that also use RFID for specimen tracking, as well as the identification of reagents, diagnostics substances, or valuable consumables used in the process or platform. In these applications, the reading distances are typically shorter (no more than a few centimeters) and a High Frequency (HF) solution is usually a better fit. The HF products operate at 13.56 MHz and may also be combined with barcode labels containing human readable information. These products are suitable for automation

on a tabletop instrument scale, and many of these instruments have become highly evolved machines that allow visibility to the diagnostic processes and high quality specimen processing.

NFC can bring smart phones into the diagnostics equation

There is a special category of HF RFID called Near Field Communication (NFC). NFC RFID products can be used with the communication technologies commonly found in modern smart phones. This offers the possibility that the phone itself could be the user interface at some stages of the process, one that can also be linked to a secure, cloud-based database where additional information may be accessed. In short, NFC may enable the expansion of the system beyond the boundaries of the diagnostic laboratory and the Lab Information Management System (LIMS) that has historically been used to manage specimen samples. In the future, passive sensors can be integrated with these RFID devices, to track condition information at different stages in the process such as temperature, moisture content, or other sensed data associated with specimen quality.

RFID as an analytical tool

RFID can be used to improve the throughput in a diagnostics test facility by enabling high value information to be stored with the specimen directly. Statistical analysis may be applied to existing processes to identify bottlenecks, sources of errors and quality improvements. The technology is especially attractive to diagnostics testing laboratories that still use many manual processes and can be helpful in identifying automation opportunities.

Mike Sanislo is the Global VP of RFID Systems at Computype. His development and integration team are constantly working to evolve the way tracking technologies are utilized in industries like diagnostics. For more information on adopting an RFID solution to suit your diagnostic process or platform, please contact us at 800-328-0852 or visit www.computype.com

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