

## NON-METALLIC CONVEYORS FOR RFID APPLICATIONS

### Are Non-metallic Conveyor Sections Required for All RFID Applications?

It all depends on environment, the need for precision sortation accuracy, and, the RFID deployment goals. Applications requiring a gross-count of homogeneously labeled items (where the RFID tag is uniformly located and read), most likely will not require non-metallic conveyors. Deployments requiring precision, high-speed singulation, or where RFID tag location can vary from item to item (including underneath), then the answer is probably “yes”. If you have applications requiring read-write-verify RFID zones, then the answer is definitely ‘yes’.

### The Physics Between RF and Metal

Large amounts of metallic components in close proximity to an RFID antennae array can amplify or scatter radio waves, thereby compromising the ability of the reader to accurately identify individual items. As a result, RFID engineers, designers, integrators and manufacturers may require a portion of the conveyor in close proximity to the RFID reader be non-metallic to enhance read-rates. Non-metallic materials used in these conveyor sections must meet stringent attenuation and reflectivity requirements by chip, reader and/or antennae manufacturers to minimize or eliminate false or null readings.

Additionally, materials must be thoroughly tested and approved before deployment since the chemical and physical properties of the conveyor section may affect the functionality and performance of an RFID system due to:

- RF Proximity Detuning
- RF Attenuation
- RF Reflectivity

RF Proximity Detuning is the negative effect that the bed section material has on the readability of an RFID tag that is in contact with, or is very close to, the bed section material. The bed section material through which the RF energy is propagating can affect the wavelength of the RF energy. If this effect is sufficiently pronounced, an RFID tag designed to capture RF energy in free air will fail to do so in proximity to the offending material. Through extensive lab and field testing it has been determined that non-metallic/non-conductive bed section materials that possess “free-air” RF properties are best suited to prevent RF tag detuning.

RF Attenuation is the loss of RF signal strength through material. Very low attenuation is necessary in order to obtain complete coverage of the interior area of the conveyor bed section. Extensive lab and field testing by one of the major RFID manufacturers has shown that non-metallic/non-conductive bed section materials that attenuate RF signals to such a small degree that it is considered negligible is highly recommended.

RF Reflectivity is a property that often goes hand-in-hand with RF Attenuation. A material that has significant reflectivity will cause a number of problems in a conveyor system such as: 1) unwanted distribution of RF due to reflections and; 2) possible return loss (feedback) into the antennae. Through extensive lab and field tests from one antennae manufacturer, it has been determined that non-metallic/non-conductive bed section materials that exhibit low RF reflectivity (to be virtually unobservable in the field) are required for adequate RFID system performance.

## **WHAT IS THE REQUIRED LENGTH FOR NON-METALLIC SECTIONS?**

Generally speaking, the accuracy of the RFID system will be enhanced if longer sections of non-metallic conveyor are used. However, non-metallic sections as short as 20" (51 cm) have been shown to be adequate in certain applications. The proper length for a non-metallic conveyor section is generally a function of:

- Line-speed
- Signal/antennae strength and ability to adjust/focus antennae read zone
- Item singulation and read-rate accuracy requirements
- Proximity and power level of adjacent RFID reader stations
- Other environmental considerations (i.e., placement limitations)

Extensive lab and field testing have demonstrated that optimal read rates are generally obtained when the minimum length for non-metallic conveyor sections is four feet (1.22 meters). At this length, reflections and tag "de-tuning" will not significantly degrade system performance. Increasing the bed length allows for more robust system performance, particularly in environments with:

- Extreme interference issues
- High sorter speeds
- Applications requiring Read-Write-Verify zones.

## **ARE THERE ALTERNATIVES FOR NON-METALLIC RFID CONVEYORS?**

Some integrators and conveyor manufacturers have attempted to “carve-out” bottom sections of existing metallic conveyors and replace them with commercially available plastic materials, creating a “hybrid” configuration. The decision to use hybrid sections is generally driven by the desire to forego the additional cost of non-metallic bed sections.

Although hybrid configurations may provide minimally sufficient RF coverage in limited applications, hybrid conveyors generally fail to attain comparable read rates over non-metallic conveyor sections and may be potentially unsafe for item handlers.

The surrounding metallic components (such as the metallic cross members or side frames) contained in a hybrid conveyor section, causes RF interference and RF reflectivity causing misreads and degrading system performance. Additionally, reflected energy can produce uneven RF fields that can be severe enough to produce “null” spots, or dead zones. This results in insufficient energy directed upon the chipset, causing the tag to be unread.

Lastly, significant static electricity may build-up with hybrid sections as the item or conveyor belt creates friction across the plastic section which is unable to dissipate the static charge. As a result, tags can be destroyed or de-tuned when it comes into contact with a hybrid section, or emit a potentially hazardous electric shock when an individual comes in contact with the hybrid section.

## **WHO MAKES NON-METALLIC CONVEYORS?**

Globe Composite Solutions, Ltd. is the leading manufacturer of non-metallic conveyors and components designed to dramatically improve RFID system performance for manufacturing, parcel, distribution, airport and industrial applications. Globe is the only manufacturer of patented non-metallic conveyor sections (US Patent No. 6,581,759) specifically designed for RFID use. All Globe conveyors are manufactured using Brandonite® high-performance polymers. These composite materials are ideally suited for RFID systems because of its superior performance for strength, durability, non-conductivity, signal attenuation and reflectivity.

Globe manufactures non-metallic tilt-tray sorters, slider bed conveyors, roller conveyors, drive chains, track and actuator mechanisms in a variety of sizes. Globe has designed and produced non-metallic slider bed conveyors in lengths up to 10 feet (3.05 meters) and widths up to 39" (.99 meters).

Additionally, Globe manufactures RF-friendly products to enhance the performance of existing RFID-enabled systems. It recently introduced the Tuff Tote™ Composite Tray, a 100% non-metallic composite tray that is virtually indestructible and made with Brandonite® composite materials. This resilient and lightweight tote is transparent to RF waves, making it the perfect choice for transporting materials within a factory or distribution center.

### **NEED MORE INFORMATION?**

If you have questions, please feel free to call us at 781-871-3700 ext. 211 or e-mail at [info@globecomposite.com](mailto:info@globecomposite.com). Or, you may visit the Globe Composite Solutions website at [www.globecomposite.com](http://www.globecomposite.com).