

METAL-DETECTABLE AND WASHDOWN RESISTANT IDENTIFICATION SOLUTIONS FOR THE FOOD & BEVERAGE INDUSTRY



Introduction

Finding durable safety and hazard labeling products is extremely difficult for food and beverage production facilities. The standard cleaning and sanitizing practices required to guarantee food purity and quality precludes the use of most common signage and labeling products that are often found in industrial manufacturing facilities. In particularly sensitive areas; environment, health & safety (EH&S) managers are forced to either:

- 1) Frequently replace failing labels which creates a risk of contamination in food and beverage products
- 2) Opt against labeling their facilities, potentially putting employees at risk of injury and their plants at risk for fines

Current identification solutions fall short in two areas. They neither remain intact under the harsh cleaning processes common to the industry nor are they detectable via the standard in-line metal detector contamination prevention systems. In order to better protect the customer and employees of the food and beverage processing industry, Brady has developed two new print-on-demand safety and identification materials specifically designed to endure the harsh washdown process and to alert in-line metal detectors if unwanted product enters the food stream (Figure 1).

Harsh washdown cleaning process

To ensure cleanliness, most food and beverage facilities undertake routine washdown processes for production machinery and other surfaces that are potential sources of air and waterborne bacteria that may come into direct contact with food products.

These cleaning processes often involve spray washing with extremely high temperature and pressure water jets, exposure to acidic and/or alkaline detergents and sanitizers, and scrubbing with the aid of abrasive tools. These procedures create an extremely harsh environment where only materials with adequate thermal, chemical, and mechanical durability will survive.

Most label constructions that are commercially available fail to provide all of these attributes. Many plant managers often resort to using steel markings or employing undependable labels that need to be replaced monthly or sometimes even weekly, as failure to catch a defective label can result in food contamination.

Metal detection

Metal detection is used in many of these facilities as a last resort to protect against product contamination. Many of the metal detectable label stocks that have been developed use aluminum foil for metal detectability. However, aluminum has poor alternating current (AC) field generation in comparison to steel and is not a recommended material for food & beverage facilities.

Aluminum also exhibits a strong potential for oxidative corrosion upon exposure to chemicals like acids and bases and potential for galvanic corrosion. This occurs when aluminum is placed in contact with the steel surfaces, which are ubiquitous in food and beverage production facilities. Additionally, layered constructions are prone to delamination failures due to the difficulty in engineering interfacial strength between different materials

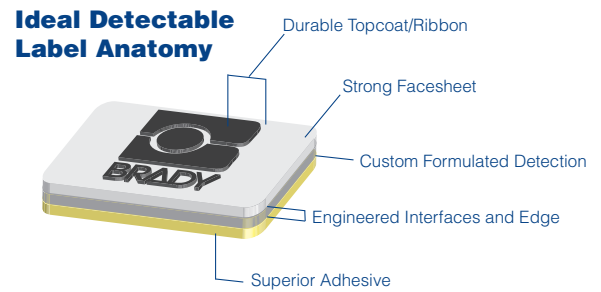


Figure 1. Anatomy of the ideal metal-detectable label for use in the stressful environment of food and beverage manufacturing facilities.

Highly Engineered Solutions

The two available print-on-demand identification materials for the food and beverage industry developed by Brady are engineered to be extremely durable in the presence of environmental stresses. Brady also offers a metal-detectable construction using standard in-line detection equipment. Working directly with customers to understand their challenging environments, the new identification products Brady has developed will set the standard for performance and durability. These development efforts began by understanding and simulating the surfaces, exposures, and processes found in food and beverage production facilities, innovating around the company's current technology and product offerings, and refining its solution through customer testing and feedback. Brady constructed an applications lab that allowed researchers to test simulated chemical exposure, the forces of abrasion and the harshest spray conditions exemplified in the Ingress Protection Rating for DIN 40050-9 IP69K (Figure 2).

Through this battery of testing and in partnership with actual food production facilities, each element of the harsh washdown resistant product has been engineered and optimized to provide both extreme durability and metal-detectability for worry-free adhesive backed safety identification.

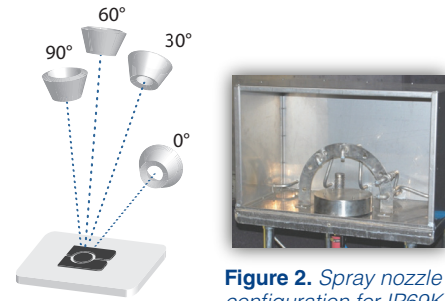


Figure 2. Spray nozzle configuration for IP69K capable simulation systems and image of actual spray system.

Abrasion-resistant ribbons and top-coat

The main feature of any label is the printed information contained on the surface. These labels are designed to be printed using thermal heat transfer (THT) printable ribbons. While these ribbons are available in a variety of printer platforms, it is critical that the ribbon and topcoat are engineered to work together to produce the most permanent printed legend. To stand up to the abuses of common washdown processes, Brady designed its washdown resistant labels to be printed with ribbons that are constructed using robust inks and resins that will hold up to direct impinging sprays over 1000 pounds per square inch (PSI), in addition to rigorous scrubbing with abrasive pads. These ribbons and Brady's washdown resistant labels are available on both smaller portable printers and larger units that can print a label the size of small sign.

Brady's food and beverage label constructions allow the user to print custom labels for their facility and safety identification needs. Alternatively, factory preprinted labels are also available. Throughout exposure to extreme washdown conditions, Brady's engineered print-on-demand solutions consistently outperform all other preprinted options, including those that use protective over laminates.

Tough and durable facesheets

Simulations have indicated that the choice of facesheet, which is the film that marries the topcoat to the adhesive, has a great impact on the durability against the forces and stresses present during cleaning. Understanding this relationship has allowed Brady to develop two label materials that are extremely durable and that can be printed on demand. One of the solutions allows for a metal detectable element that is integrated into the construction of the label that avoids the delamination issues that plague similar products.

Brady Label Detectability Compared to Ball Bearing Standards

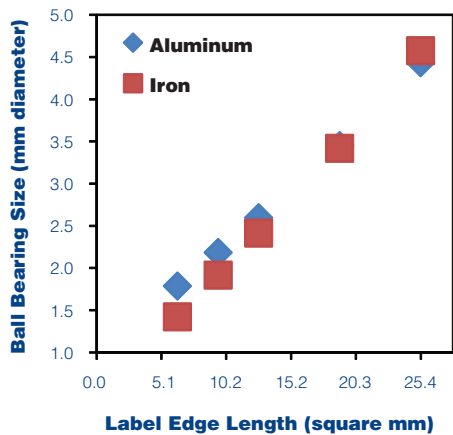


Figure 3. Modeled signal magnitude equivalence for Brady detectable label compared to standard detectable spheres of Aluminum or Iron. Data were obtained on a Mettler Toledo PowerPhase Pro equipped with a 14" x 7" aperture running at 60 ft/min, 300 kHz, and full sensitivity. This graph is intended to provide general expectations of performance. Your specific results may vary based on instrument, setup, and background signals.

adhesives found on labels will not endure these stresses for long. These forces allow more and more water to penetrate the edges of labels until complete removal occurs.

In a one-year simulation test, results indicated that labels using Brady's newly developed design principles show dramatically improved durability in comparison to competitive offerings.

Controlled failure

Metal detectable labels provide peace-of-mind to customers in the event that a label becomes detached or is tracked into an area from human movement, or in the unlikely situation that the label fails. The metal detectable feature of the label acts as an insurance policy to identify foreign debris that has made its way into the food production stream.

Brady's material is designed to remain durable in harsh washdown situations. However, the survival rates are dependent on actual processes used and can be highly variable.

With that in mind, it is important to focus on two important criteria when selecting your washdown labels. First, the label must be engineered to remain in as large of a piece as possible to assist in detection. Second, the metal detectable component must remain with the label. Brady's ToughWash™ metal detectable label incorporates both of these elements.

Brady's food and beverage identification products leverage strong, aggressive adhesives, durable label stocks and abrasion-resistant THT ribbons and topcoats to deliver a print-on-demand, washdown resistant, and metal-detectable solution that meets or exceeds many of the environmental challenges in the industry. For more information, visit www.BradyID.com/food.

Metal detection layer

Metal detectable labels have been designed by Brady to meet two criteria:

- 1) The detection layer cannot be removed from the remainder of the label
- 2) A ¼" by ¼" piece of the label should have an AC field signature greater than a 2 mm ball bearing (Figure 3).

Brady, as experts in formulation and coatings technology, has developed a custom detectable coating to meet these criteria. This patent pending design and carefully engineered interface resists the stresses of a harsh washdown environment. Through development and testing with Mettler Toledo, an industry leader in the area of metal detection. Brady has developed a solution capable of exceeding industry expectations.

Washdown-resistant adhesive

The aspects of a harsh washdown that cause the most failures in identification products include the high water pressures and temperatures used to remove dirt, plaque, and food residues. Most traditional pressure-sensitive

Meet the authors



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References

Cramer, M. M. *Food Plant Sanitation : Design, Maintenance, and Good Manufacturing Practices*; CRC Press: Boca Raton, FL, 2006.

Deutsche Insitut fur Normung e. V. Retrieved July 15, 2013 from <http://www.din.de/cmd?level=tpl-home&contextid=din&languageid=en>

Edwards, M. C. *Detecting Foreign Bodies in Food*; CRC Press ; Woodhead Pub.: Boca Raton; Cambridge, England, 2004.

Etienne, G. *Principles of Cleaning and Sanitation in the Food and Beverage Industry*; iUniverse Inc: New York, N.Y., 2006.

Marriott, N. G.; Gravani, R. B. *Principles of Food Sanitation; 5th Ed.*; Springer: New York, N.Y., 2006.

Pearsio, D. *Preventing Foreign Material Contamination of Foods*; Blackwell Publishing: Ames, Iowa, 2006.

Yamazaki, S.; Nakane, H.; Tanaka, A. *IEEE Transactions on Instrumentation and Measurement 2002*, 51, 810–14.