Evaluating Actuators for Washdown in Food Applications, Part 1

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Production of food and beverages on today’s industrial scale would not be possible without a high level of automation. Pneumatic, hydraulic and electric actuators are critical moving components in equipment used for processing and packaging food and beverage products for world markets. In addition to efficient production, machines used to process food must keep food safe by not harboring or introducing bacteria, lubricating fluids or other contaminants that could harm consumers. That is why actuators used in the food and beverage industry must be manufactured from appropriate materials and designed in a way that eliminates collection points where bacteria can flourish. Suitable actuators must also be capable of withstanding frequent washdowns with water, detergents, steam, caustic soda, citric acid or other types of sanitary cleaning solutions.

The Food & Beverage Environment

The most critical food and beverage processing applications involve dairy, meat and egg processing; the United State Department of Agriculture (USDA) [1] is charged with regulating sanitary conditions in these facilities. However, many other types of facilities involved in food and beverage processing do not fall under USDA jurisdiction, and yet they tend to follow the general USDA guidelines for safe equipment selection and operation. These types of facilities include large bakeries, food packaging operations and many different types of bottling plants.

Machinery used in food and beverage processing may use several types of actuators, including rod-style, rotary or rodless. However, the rod-style actuator is

the most common type due to its versatility and because it is inherently sealed better to handle washdown. Pneumatic rod-style actuators are still widely used in the food and beverage industry due to their low cost points, but electric rod-style actuators are gaining momentum for a variety of reasons including flexibility of control (multiple positions and motion profiles), efficiency (elimination of compressed air) and higher performance (precision, accuracy, repeatability).

While the working parts of a typical rod-style actuator may not ever come in direct contact with the food product or its packaging, there are invariably spills, drips and spatters that collect on various parts of the processing machinery, including the actuators. Unless this residue is removed from the equipment on a regular basis, it can become a reservoir of dust, bacteria, fungi and other spoilage organisms that may contaminate the food product or packaging.

Materials Suitable for Washdown Environments

Actuators used in washdown environments either have to be properly sealed and made of corrosion-resistant materials or be carefully shielded to prevent water, food products or chemicals from reaching the actuator mechanism. While shielding of more economical actuators not designed for washdown is widely practiced, shields complicate equipment design and may interfere with maintenance. Moreover, the recent emergence of catalog-listed stainless steel rod-style electric actuators designed for washdown will likely reduce the popularity of shielding as a money-saving strategy.

Actuators intended for washdown environments need to be made of corrosion-resistant metals, and other parts such as seals, connectors and lubricating fluids need to be compatible with food processing as well. Ideally, actuators used in washdown environments should be constructed of AISI 300 series stainless steel (excluding type 301 and 302), with 304 and 316 being the most popular.

Aluminum alloy as an actuator construction material may be satisfactory for some dry-product processing applications as long as it is not subjected to strong caustic cleaning solutions or to the corrosive action of dissimilar metals. While metal alloys other than stainless steel or aluminum may be suitable under certain conditions, alloys containing lead, leachable copper or other toxic metals must be avoided in food and beverage applications. Certain surface treatments or coatings may be used to reduce corrosion on components that have product contact, but the coatings need to be approved for food and beverage use by the U.S. Food and Drug Administration [2] (FDA).

Plastic or rubber parts on actuators, such as seals, gaskets or accessories, need to be suitable for food and beverage applications if they are in contact with the product. In addition, these seals, gaskets and accessories must also be capable of withstanding the effects of the cleaning solutions used. While the FDA maintains a list of approved plastic and rubber materials, some of the most popular of the approved products are Viton® O-rings and seals and Ultra High Molecular Weight (UHMW) polyethylene for some mechanical parts.

Lubricants used on actuator rods that may be subject to incidental food spatters or contact need to be food-grade oils and greases as approved by the FDA. Proper seals between the actuator body and the rod on an IP67- or IP69k-rated product typically keep lubricant exposure to a minimum.

For information on 3-A Sanitary Standards, please visit www.3-a.org *[3].*

For USDA guidelines on sanitary equipment design, please visit www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5048589 *[4].*

Links:
[1] http://www.fsis.usda.gov/Regulations_&_Policies/index.asp
[2] http://www.fda.gov/Food/FoodSafety/default.htm
[3] http://www.3-a.org/
[4] http://www.ams.usda.gov/AMSv1.0/getfile?dDocName=STELPRDC5048589