CABLE REQUIREMENTS FOR THE FOOD AND BEVERAGE PROCESSING INDUSTRY

Food and beverage production and processing must keep up with the ever-growing demand by the world's population. Industrial food production has become more complex ranging from small artisan ventures to multinational enterprises.

The industry must also balance regulation to protect consumer interest in food quality, food security, food safety, animal well-being, environmental protection and health.[i]

Failure to protect consumer safety can be costly, if not devastating to the enterprise and therefore the industry has adopted several processes and best practice to avoid public health failures.

Some of these practices are self-regulated by industry standards which is common practice in Europe [ii] while most practices in the USA are governed by the Food and Drug Administration (FDA) which is a federal agency of the United States Department of Health and Human Services.

When LUTZE decided to expand the product offering for cables specific to the food and beverage industry, we started by talking to machine builders, system integrators and food processors to learn about their cabling challenges.

It turned out that some machine builders have accepted the status quo that it can be difficult to find cables that would fulfill all application requirements. In addition, the industry has often adopted cables that were initially developed for other markets such as Europe but may not fulfill all requirements in the USA.

It has proven to be particularly difficult to find flexible cable that can satisfy the three main application requirements at once. Especially some of the European import cables that are marketed as food safe and are popular because of their flexibility, would fall short on some USA customer expectations such as compliance with UL tests. Flexibility is important because many cables are routed in sections of conduit for additional protection.

BREAKDOWN OF THE CABLE REQUIREMENTS:

FDA COMPLIANT

It is important to state that the FDA does not approve cables or machine components to be used in food and beverage applications. However, compliance with FDA regulation can be achieved by third party testing and certifying a product per the applicable Code of Federal Regulation (CFR) Title 21. CFR is the codification of the general and permanent rules published in the Federal Register by the executive departments and agencies of the Federal Government. Title 21 of the CFR is reserved for rules of the Food and Drug Administration and is commonly referred to as 21 CFR.

FLAME RETARDANCY

Equipment and machines designed for the food and beverage industry are required per 21 CFR to be sanitary, easy to clean, and safe for food contact. However, most industrial cables contain flame retardants which do not meet food contact requirements. These flame retardants allow cables to pass testing for UL approvals. Because UL approval is needed to meet NFPA 79 and NEC requirements, there can be a tough choice between meeting FDA or UL requirements with some cables.

1. NEC Article 300.21 *Spread of Fire or Products of Combustion* states that electrical installations “be made so that the possible spread of fire or products of combustion will not be substantially increased.” [iii]
2. NFPA 79 Article 12.9.2(b) states that cables “have flame-resistant properties in compliance with applicable standards for intended use such as FT2 (horizontal wire) flame test or VW-1 (vertical wire) flame test in accordance with UL 1581” [iv]

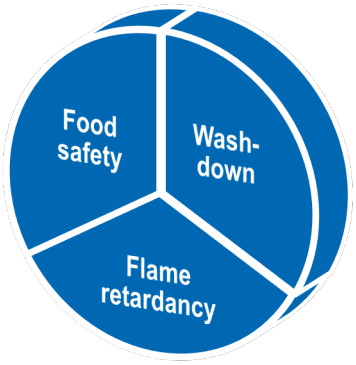
Most of the flame retardants and additives used in standard industrial cables are considered unsafe per 21 CFR. These chemicals are used to reach UL standards for flame behavior, ease of processing, or improving cable performance. Because these chemicals can leech out overtime when exposed to water, heat, and even air they pose a risk of introducing contaminants into the processing area. Thus, such cables are not suited for use in food and beverage applications. Flame retardant cables specifically developed and approved for 21 CFR should be used instead.

WASHDOWN RESISTANCE

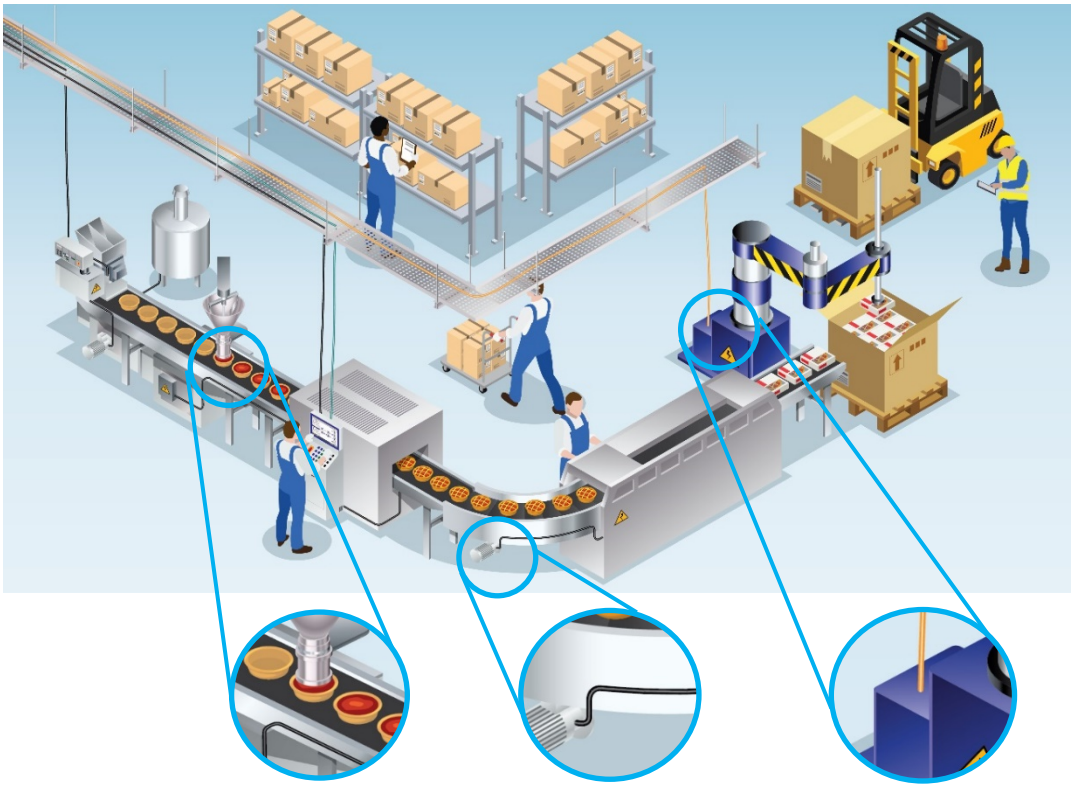
In addition to the requirements from UL and the FDA, cables in food and beverage applications must be able to withstand repeated washdown with a wide variety of chemicals. If a cable cannot withstand frequent washdown cycles, the cable jacket may become degraded. A damaged cable jacket can quickly lead to cable failure and may pose a safety hazard. For this reason, cables for the food and beverage industry should be certified for washdown resistance.

THREE REQUIREMENTS TO BALANCE

This creates a link between three requirements that can be difficult to achieve in a cable construction. There are several factors such as choice of materials, overall construction of the elements and processing of a cable to meet all three requirements. And each requirement will need to be validated by their own independent testing and certification by their respective 3rd party laboratories.



ZONES IN FOOD AND BEVERAGE APPLICATIONS



	Contact Zone	Splash Zone	Non-Contact Zone
Food Contact	Direct food contact with machinery expected and intended as part of processing	Incidental food contact with machinery possible, but not intended during processing	No machinery contact with food expected; product may already be packaged or otherwise protected
Contamination Risk	High	Moderate	Low
Washdown Procedure	Subject to frequent washdown with pressurized water, steam, and industrial cleaning agents	Regular washdown with industrial cleaning agents	No regular washdown procedure; may be exposed to cleaning agents through splashes or atmospheric exposure
Equipment requirements	Highest requirements per FDA regulations. Must be sanitary, safe for food contact, easily cleaned and resistant to repeated washdown	Subject to some FDA requirements. Must be sanitary, easily cleaned, and resistant to washdown procedure	Machinery and components should be suitable for industrial applications, oil resistant, EMC compliant, and may require washdown resistance
What regulations apply?	21 CFR, NFPA 79 for industrial machinery, and other industry specific requirements	21 CFR, NFPA 79 for industrial machinery, and other industry specific requirements	NFPA 79 for industrial machinery or the National Electric Code (NFPA 70)

CABLING REQUIREMENTS FOR EACH ZONE

The different zones may have different requirements on the cabling in terms of food safety, but not in terms of flame retardancy. According to the scope definition from NFPA 79 Electrical Standard for Industrial Machinery, Article 1.1 “Scope”, it applies to the electrical and electronic equipment, apparatus, or systems of industrial machines supplied from a nominal voltage of 1000 V or less and commencing at the point of connection of the supply circuit to the electrical equipment of the machine.[v] Therefore, the NFPA 79 Standard for industrial machinery is applicable to all three food contact zones and the certified flame retardancy per UL 1581 applies in all zones.

The washdown procedure may be applicable in all three zones but is most likely in the contact and splash zones. Ideally cables should be able to resist washdown procedures to be safely used in any of the three zones. Safe food contact certified per 21 CFR is most critical in the contact zone and splash zone but may also be advantageous in the non-contact zone. One way to certify washdown resistance is to conduct a material resistance test to make sure that the chemical used in washdown will not break down the cable materials.

Machine builders and system integrators as well as processors will appreciate their cabling being certified for all three aspects: FDA compliance, flame retardancy and washdown resistance. This permits a new approach to the wiring practice as the cable will no longer be an area of concern for food safety.

Another aspect is the use of conduit in food and beverage installations. Careful consideration should be given to the flexibility and dimensions of any cable that is installed in conduit. Cables that are designed with flexibility in mind are easier to install and pulled into conduit as they can be bent and routed easily. This will help to cut down on labor and installation time. Cables with smaller ODs may allow the use of a smaller size conduit and can help to reduce conduit costs. Considering the cost of stainless-steel conduit these savings can be significant.

LUTZE SOLUTION FOR FOOD AND BEVERAGE CABLING

LUTZE SILFLEX® FBP - THE ULTIMATE CABLE FOR FOOD AND BEVERAGE APPLICATIONS

- LUTZE SILFLEX® FBP cables are an innovative, patent pending cable solution that is food safe, flame retardant per UL 1581 and is resistant to commonly used cleaning agents in washdown procedures
- Cables meet both UL and FDA requirements, streamlining inspections and reducing the need for exceptions to 21 CFR
- Evaluated by Ecolab for resistance to commonly used cleaning agents
- Reduced diameter for more efficient conduit fill
- Flexible cable design for easy routing
- Low capacitance insulation with high voltage breakdown resistance
- Rated for 1000V 90C per UL 20886
- Cables may be run without conduit in some areas due to the external wiring approval, washdown certification, and food contact rating
- Food safe design per 21 CFR 175.300 reduces cabling as a contamination risk
- LUTZE SILFLEX® FBP cables are proudly made in the USA and are designed per US specifications

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Sources:

[i] [i] Source Szajkowska, Anna. Regulating Food Law: Risk Analysis and the Precautionary Principle as General Principles of EU Food Law. Wageningen Academic Pub. ISBN 9789086861941. Retrieved 22 January 2017

[ii] The Food Industry and Self-Regulation: Standards to Promote Success and to Avoid Public Health Failures

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[iii] NFPA 70, National Electrical Code (NEC), 2020 edition available on nfpa.org

[iv] [iv] NFPA 79 NFPA 79: Electrical Standard for Industrial Machinery, 2018 edition