

EHEDG Guidelines

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Doc. 1 – Continuous Pasteurization of Liquid Food

Second edition, May 2017 (21 pages)

Pasteurization is a heat treatment aimed at reducing the number of harmful microorganisms to a level at which they do not constitute a significant health hazard. There are however many reasons why, in practice pasteurized products may present a microbiological health hazard. Due to the pasteurizer process design, the operation and control or inspection and maintenance of the pasteurizer there are a risk of unpasteurized or recontaminated product may reach the consumer. This document provides guidelines to avoid these issues.

Doc. 2 – A method for assessing the in-place cleanability of food processing equipment

Third edition, June 2007 (16 pages)

The method is intended as a screening test for hygienic equipment design and is not indicative of the performance of industrial cleaning processes (which depend on the type of soil). See Doc 15 for a test procedure designed for moderately-sized equipment.

Doc. 3 – Microbiologically safe aseptic packing of food products

First edition, January 1993 (15 pages)

NOTE: Document was withdrawn in April 2018. Doc. 3 has been integrated into Doc. 46.

This guideline stresses the need to identify the sources of micro-organisms that may contaminate food in the packaging process, and to determine which contamination rates are acceptably low. It clarifies the difference in risk of infection between aseptic processing and aseptic packing and recommends that aseptic packing machines be equipped with fillers that are easily cleanable, suitable for decontamination and bacteria-tight. Requirements for the machine interior include monitoring of critical decontamination parameters. See also Doc. 21 on challenge tests.

Doc. 4 – A method for the assessment of in-line pasteurisation of food processing equipment

First edition, February 1993 (12 pages)

NOTE: Document was withdrawn in March 2016

Food processing equipment that cannot be or does not need to be sterilised may need to be pasteurised to inactivate relevant vegetative micro-organisms and fungal spores. It is important to test the hygienic characteristics of such equipment to ensure that it can be pasteurised effectively. This document describes a test procedure to determine whether equipment can be pasteurised by circulation with hot water.

Doc. 5 – A method for the assessment of in-line sterilisability of food processing equipment

Second edition, July 2004 (9 pages)

Food processing equipment may need to be sterilised before use, and it is important to ensure that the sterilisation method applied is effective. Thus, it is necessary to determine under which conditions equipment can be sterilised. This paper details the recommended procedure for assessing the suitability of an item of food processing equipment for in-line sterilisation. It is advisable to conduct in-place cleanability trials (ref. Doc.2) prior to this test in order to verify the hygienic design of the equipment.

Doc. 6 – Continuous UHT Sterilization of Liquid Food

Second edition, May 2017 (31 pages)

Sterilization is a heat treatment aimed at destroying all vegetative microorganisms and spores to create a product which can be stored at ambient temperature yet minimizing public health hazard. There are however many reasons why, in practice sterilized products may present a microbiological health hazard. Due to the sterilizer process design, the operation and control or inspection and maintenance of the sterilizer there are a risk of untreated or recontaminated product may reach the consumer. This document provides guidelines to avoid these issues.

Doc. 7 – A method for the assessment of bacteria tightness of food processing equipment

Second edition, July 2004 (10 pages)

This document details the test procedure for assessing whether an item of food processing equipment, intended for aseptic operation, is impermeable to micro-organisms. Small motile bacteria penetrate far more easily through microscopic passages than (non-motile) moulds and yeasts. The facultative anaerobic bacterium *Serratia marcescens* (CBS 291.93) is therefore used to test bacteria-tightness or the impermeability of equipment to micro-organisms. The method is suitable for equipment that is already known to be in-line steam sterilisable (see also Doc. 5).

Doc. 8 – Hygienic Design Principles

Third edition, March 2018 (13 pages)

This document describes the principles for hygienic design of equipment and factories intended for food manufacturing. The fundamental reason for applying hygienic design principles is to prevent contamination of food products. Equipment and factories of poor hygienic design are difficult to clean.

The document details the hygienic design principles that shall be followed when designing and constructing equipment and factories for manufacturing of foods. It gives guidance on design, construction and installation so that it does not adversely affect food safety and quality. These principles apply to open and closed manufacturing operations, surrounding facilities, all being cleaned either wet or dry.

Doc. 8 is used as a basis for hygienic design evaluation within the EHEDG equipment certification program.

The content of this document covers functional requirements, intended use, materials of construction, hygienic design and construction and assessment methods.

Doc. 9 – Welding stainless steel to meet hygienic requirements

First edition, July 1993 (21 pages)

This document describes the techniques required to produce hygienically acceptable welds in thin walled (< 3 mm) stainless steel applications. The main objective was to convey the reasons and requirements for hygienic welding and to provide information on how this may best be achieved. This document is superseded by Doc 35, recently published. The subgroup will continue with a guideline on inspection of the quality of welds in food processing machinery.

Doc. 10 – Hygienic design of closed equipment for the processing of liquid food

Second edition, May 2007 (22 pages)

Using the general criteria for the hygienic design of equipment identified in Doc 8, this paper illustrates the application of these criteria in the construction and

fabrication of closed process equipment. Examples, with drawings, show how to avoid crevices, shadow zones and areas with stagnating product, and how to connect and position equipment in a process line to ensure unhampered draining and cleaning in-place. Attention is drawn to ways of preventing problems with joints, which might otherwise cause leakage or contamination of product.

Doc. 11 – Hygienic packing of food products

First edition, December 1993 (15 pages)

NOTE: Document was withdrawn in April 2018. Doc. 11 has been integrated into Doc. 46.

Products with a short shelf-life, or whose shelf life is extended by cold storage or in-pack heat treatments, do not have to conform to such strict microbiological requirements as aseptically packaged foods (Doc 3 discusses aseptic packing). This paper discusses the packing of food products that do not need aseptic packing but which nevertheless need to be protected against unacceptable microbial contamination. It describes guidelines for the hygienic design of packing machines, the handling of packing materials and the environment of the packing machines. See also Doc. 21.

Doc. 12 – The continuous or semi-continuous flow thermal treatment of particulate foods

First edition, March 1994 (28 pages)

Thermal sterilisation is a process aimed at eliminating the risk of food poisoning and, when used in conjunction with aseptic filling, it aims to extend product storage life under ambient conditions. This is achieved by the destruction of vegetative micro-organisms and relevant bacterial spores.

Liquid foods containing particulates are inherently more difficult to process than homogenous liquids due to heat transfer limitations in particulate-liquid mixtures and the additional problems of transport and handling. This paper presents guidelines on the design of continuous and semi-continuous plants for the heat treatment of particulate foods. Ohmic heating techniques are not covered. See also Doc. 1 on continuous pasteurisation and Doc. 6 on sterilisation of liquid products without particles.

Doc. 13 – Hygienic design of equipment for open processing

Second edition, May 2004 (24 pages)

It is important that the plant design takes into account factors affecting the hygienic operation and cleanability of the plant. The risk of contamination of food products during open processing increases with the with the concentration of micro-organisms in the environment and their opportunity to grow in poorly designed equipment. This means that in open plants, environmental conditions, in addition to appropriate equipment design, have an important influence on hygienic operation. The type of product and the stage of the manufacturing process must also be taken into consideration.

This paper deals with the principal hygienic requirements for equipment for open processing and applies to many

different types, including machines for the preparation of dairy products, alcoholic and non-alcoholic drinks, sweet oils, coffee products, cereals, vegetables, fruit, bakery products, meat and fish. It describes methods of construction and fabrication, giving examples as to how the principal criteria can be met. See also guidelines on hygienic design criteria Doc 8, hygienic welding Doc 9, and the hygienic design of equipment for closed processing Doc 10.)

Doc. 14 – Hygienic design of valves for food processing

Second edition, July 2004 (17 pages)

Valves are essential components of all food processing plants and the quality used strongly influences the microbiological safety of the food production process. These valves must therefore comply with strict hygienic requirements

The guidelines apply to all valves used in contact with food or food constituents that are to be processed hygienically or aseptically. Aside from general requirements with regard to materials, drainability, microbial impermeability and other aspects, additional requirements for specific valve types are also described. See also Doc. 20 on double-seat mixproof valves.

Doc. 15 – A method for the assessment of in-place cleanability of moderately-sized food processing equipment

First edition, February 1997 (12 pages)

NOTE: Document was withdrawn in March 2016

This document describes a test procedure for assessing the in-place cleanability of moderately sized equipment, such as homogenisers. The degree of cleanliness is based on the removal of a fat spread soil, and is assessed by evaluating the amount of soil remaining after cleaning by visual inspection and swabbing of the surface. This method is not as sensitive as the microbiological method described in Doc. 2.

Doc. 16 – Hygienic pipe couplings

First edition, September 1997 (21 pages)

This paper identifies and defines critical design parameters for welded pipe couplings: easily cleanable in-place; easily sterilisable in place; impervious to micro-organisms, reliable and easy to install.

Gaskets of various types were tested for reliability and hygienic aspects using EHEDG cleanability test methods and repeated sterilisation. The objective was to provide a reliable dismountable joint which is bacteria-tight at the product side under the conditions of processing, cleaning and sanitation.

Doc. 17 – Hygienic design of pumps, homogenizers and dampening devices

Fourth edition May 2020 (49 pages)

This paper sets the minimum requirements for pumps, homogenisers and dampening devices for hygienic and

aseptic applications. The scope includes all pumps intended for use in food processing, including centrifugal, piston, lobe rotor, diaphragm, screw and gear pumps. The requirements also apply to valves integral to the pump head and the complete homogeniser head. Design aspects and the characteristics of materials, surfaces and seals are discussed and additional requirements for aseptic equipment are identified.

Doc. 18 – Chemical treatment of stainless steel surfaces

Second edition, January 2014 (19 pages)

This guideline supersedes Doc. 18 "Passivation of Stainless Steel" (1998) and includes new sections on pickling and electropolishing of stainless steels.

Chemical surface treatments such as pickling, passivation and electropolishing can help to assure the successful functional and corrosion-resistant performance of stainless steels for product contact surfaces in the food and beverage industry. This document explains the general principles of those three processes above: Why they are necessary, when and how they should be applied, how they work and which chemicals are used.

Doc. 19 – A method for assessing the bacterial retention ability of sterilizing grade hydrophobic membrane air filters

Second edition, June 2012 (9 pages)

Research over the last years has found that the currently used sterilizing grade hydrophobic membrane filters, with a pore size of 0.22 µm, do not retain micro-organisms under all process conditions. Investigations have been conducted into risk assessment of sterilizing hydrophobic membrane filters, and evaluating the performance of the filters under a range of operating conditions. The main topics of the research were carried out at TNO, Zeist, Netherlands, including the aspects of operating conditions encountered in a fermenter exhaust gas system.

To validate the performance of sterilizing grade hydrophobic membrane filters, a bacterial aerosol challenge test methodology (TBAC) was developed.

Doc. 20 – Hygienic design and safe use of double-seat mixproof valves

First edition, July 2000 (20 pages)

This document describes the basic hygienic design and safe use of single-body double-seat mixproof valves. Today, food process plants incorporate various multifunctional flow paths. Often one piping system is cleaned while another still contains product. This simultaneous cleaning can potentially result in the dangerous situation where product and cleaning liquid are separated by just one single valve seat. Any cleaning liquid that leaks across such a seat will contaminate the product. Therefore, often two or three single seat valves in a "block-and-bleed" arrangement are applied.

Doc. 21 – Challenge tests for the evaluation of the hygienic characteristics of packing machines for liquid and semi-liquid products

First edition, July 2000 (32 pages)

NOTE: Document was withdrawn in April 2018. Doc. 21 has been integrated into Doc. 46.

It discusses how packing machines should be designed to comply with hygiene design criteria and thereby with the requirements specified in Annex 1 of the Machinery Directive¹. To determine whether those criteria are met requires validation of the design and measurement of essential parameters. Proven methods for testing the performance of the various functions of packing machines are described.

These methods may also be used by the manufacturer to optimise or redesign a packing machine and by the food processor who may want to compare different packing machines.

Upon delivery, a packing machine needs to be checked by a commissioning procedure to be agreed in advance between the food processor and the supplier. Commissioning may include physical as well as microbiological tests. Additional tests are specified for commissioning of machines for aseptic packing.

¹ Machinery Directive 98/37/EC – Annex 1, point 2.1, Agri-foodstuffs machinery

Doc. 22 – General hygienic design criteria for the safe processing of dry particulate materials

Second edition, March 2014 (28 pages)

In the food industry many different types of dry particulate food related materials are produced and handled. This requires different design criteria for specific process equipment and process lines in relation with the various food safety requirements of each material.

This general and updated document relates to processing of powders, agglomerates and granular materials. Fluid and moist solid materials like slurries and wet cakes are not taken into account. Typical aspects of hygienic equipment design involve cleaning of equipment, prevention of any physical, chemical or biological contamination and microbial survival and growth, all in relation to dry particulate materials. If wet cleaning is applied, the design criteria are similar to those as described in other EHEDG documents. Sometimes other procedures (such as dry cleaning) need to be used and these are described in this document.

Doc. 23 – Production and use of food-grade lubricants, Part 1 and 2

Second edition, May 2009 (Part 1: Use of H1 Registered Lubricants - 23 Pages / Part 2: Production of H1 Registered Lubricants - 10 Pages)

Lubricants, grease and oil are necessary components for the lubrication, heat transfer, power transmission and corrosion protection of machinery, machine parts, instruments and equipment. Incidental contact between

lubricants and food cannot always be fully excluded and may result in contamination of the food product. This risk applies to all lubricants equally. PART 1 of this guideline covers the hazards that may occur when using food grade lubricants and describes the actions and activities required to eliminate them or to reduce their impact or occurrence to an acceptable level. PART 2 of this guideline lays down the general requirements and recommendations for the hygienic manufacturing and supply of food-safe lubricants.

Doc. 24 – The prevention and control of legionella spp (incl. legionnaires' disease) in food factories

First edition, August 2002 (21 pages)

There are many locations in food industry sites where the potential for the proliferation of Legionella spp in water systems exists. These bacteria can give rise to a potentially fatal disease in humans, which is identified as legionellosis or legionnaires' disease.

This document applies to the control of Legionella spp. in any undertaking involving a work activity and to premises controlled in connection with a trade, business or other undertaking where water is used or stored and where there is a means of transmitting water droplets which may be inhaled, thereby causing a reasonably foreseeable risk of exposure to Legionella spp.

The guidelines summarises the best practice for controlling Legionella in water systems. It consists of two parts; namely, Management Practices and Guidance on the Control of Legionella spp. in Water Systems.

The first section describes a management programme: risk identification and assessment; risk management (incl personnel responsibilities); preventing or controlling risk of exposure to the bacteria; and record keeping.

The second part provides guidance on the design and construction of hot and cold water systems as well as the management and monitoring of these systems. Water treatment programmes, with attention to cleaning and disinfection, are also discussed.

Doc. 25 – Design of mechanical seals for hygienic and aseptic applications

First edition, August 2002 (15 pages)

This guideline compares the design aspects of different mechanical seals with respect to ease of cleaning, microbial impermeability, sterilisability or pasteurisability. It can serve as a guide for suppliers and users of this important component. Using EHEDG definitions, mechanical seals are classified according to use in the food industry into three categories: Aseptic, Hygienic equipment Class I, and Hygienic Equipment Class II. Both single and dual mechanical seals fall under the first two categories, which by definition, are subject to more stringent hygienic demands. General design criteria and basic material requirements for food applications are explained. Materials covered include carbon-graphite, ceramics, elastomers and metals. Hygienic implications of seal elements and components are also discussed. Finally, installation requirements are described and illustrated, taking into account the product environment side, the flushing side and the cartridge design.

Doc. 26 – Hygienic engineering of plants for the processing of dry particulate materials

First edition, November 2003 (30 pages)

NOTE: Document was withdrawn in March 2016. Doc. 26 has been integrated into Doc. 44.

This document describes general engineering guidelines to be applied to ensure that buildings, individual equipment items and accessibility of equipment when integrated within the plant layout are designed so that aspects of the process operation, cleaning and maintenance comply with hygienic design standards. It details requirements related to plant enclosure, including hygienic zoning, building structures and elements (from floor to ceiling) as well as process line installation. Attention is also given to air stream and water related aspects within the plant as well as cleaning and contamination aspects. See also Doc. 22.

Doc. 27 – Safe storage and distribution of water in food factories

First edition, April 2004 (16 pages)

Water is a vital medium used for many different purposes in the food industry. Systems for storing and distributing water can involve hazards, which could cause water quality to fall below acceptable standards. It is therefore critical to ensure that water storage and distribution in a food manufacturing operation takes place in a controlled, safe way. This Guideline summarizes the best practice for three water categories used in the food industry: product water, domestic water and utility water. See also Doc. 24.

Doc. 28 – Safe and Hygienic Treatment, Storage and Distribution of Water in Food and Beverage Factories

Second edition, March 2018 (51 pages)

Since water treatments can be directly or indirectly part of the production process, this treatment should render the water microbiologically and toxicologically safe. Likewise, systems for storing and distributing water can involve hazards, which could cause water quality to fall below acceptable standards. It is therefore vital that water storage and distribution in a food manufacturing operation takes place in a controlled, safe way.

This Guideline is meant to provide guidance on hygienic and safety related issues concerning water management (sourcing, storage and distribution) and provides recommended practices for two water categories used in the food industry: product water, and utility water. Furthermore, it summarises appropriate practices for controlling Legionella in water systems.

Doc. 29 – Hygienic design of packing systems for solid foodstuffs

First edition, December 2004 (24 pages)

This document addresses packing systems of solid food products and supplements earlier guidelines. Solid food is characterised as having a water activity of >0.97 , low acid, not pasteurised or sterilised after packaging, and

distributed through the cool chain. Examples include fresh meat and some meat products, cheeses, ready meals, cut vegetables, etc. Hygiene requirements of the packaging operations, machinery as well as personnel, are described and reference is made to the American Meat Institute's principles of sanitary design. See also Docs. 3 and 11.

Doc. 30 – Guidelines on air handling in the food industry

First edition, March 2005 (43 pages)

NOTE: Document was withdrawn in September 2016

The controlled properties of air, especially temperature and humidity, may be used to prevent or reduce the growth rate of some micro-organisms in manufacturing and storage areas. The particle content - dust and micro-organisms - can also be controlled to limit the risk of product contamination and hence contribute to safe food manufacture. Airborne contaminants are commonly removed by filtration. The extent and rate of their removal can be adjusted according to acceptable risks of product contamination and also in response to any need for dust control.

These guidelines are intended to assist food producers in the design, selection, installation, and operation of air handling systems. Information is provided on the role of air systems in maintaining and achieving microbiological standards in food products. The guidelines cover the choice of systems, filtration types, system concepts, construction, maintenance, sanitation, testing, commissioning, validation and system monitoring. They are not intended to be a specification for construction of any item of equipment installed as part of an air handling system. Each installation needs to take account of local requirements and specialist air quality engineers should be consulted, to assist in the design and operation of the equipment.

Doc. 31 – Hygienic engineering of fluid bed and spray dryer plants

First edition, May 2005 (19 pages)

Because these plants handle moist products in an airborne state, they are susceptible to hygiene risks, including a possible transfer of allergens between products. It is therefore critical to apply hygienic design considerations to both the process and machinery to prevent occurrence of such risks.

Starting from the basics with regard to design, construction materials, layout, and zone classification of the drying systems to meet hygienic requirements, this paper outlines component design aspects of the processing chamber, with particular attention to the atomization assembly and the distribution grids for fluidization. Systems for both supply and exhaust air should operate in a hygienic manner and recommendations for the use and installation of various types of filters are listed. Finally, operational aspects, including sampling, control and general housekeeping are briefly discussed.

Doc. 32 – Materials of construction for equipment in contact with food

First edition, August 2005 (48 pages)

This guideline aims to offer a practical 'handbook' for those responsible for the specification, design and manufacture of food processing equipment. It offers guidance on the ways in which materials may behave such that they can be selected and used as effectively as possible. The properties and selection procedures with regard to metals, elastomers and plastics are covered in detail. Potential failure mechanisms and influenced of manufacturing processes are also discussed. A more general overview of composites, ceramics and glass and materials is provided.

The guideline can serve as an aide-memoir during the design process, so that equipment manufacturers and end-users can together ensure that all aspects of materials behaviour are taken into account in designing safe, hygienic, reliable and efficient equipment which can be operated, maintained and managed economically.

Doc. 33 – Hygienic engineering of discharging systems for dry particulate materials

First edition, September 2005 (16 pages)

The introduction of the product into the processing system is a key step in maintaining the sanitation and integrity of the entire process. Discharging systems are designed to transfer, in this case dry solids, from one system into another without powder spillage, contamination or environmental pollution. Many dry systems do not have any additional protective heating steps, as they are merely specialty blending processes. Therefore, any contamination that enters the system will appear in the finished product.

Guidelines for the design of bag, big bag, container and truck discharging systems are presented. They are intended for use by persons involved in the design, sizing, and installation of bag, big bag and truck discharging systems operating under hygienic conditions.

Doc. 34 – Integration of hygienic and aseptic systems

First edition, March 2006 (45 pages)

Hygienic and/or aseptic systems comprise inter alia individual components, machinery, measurement systems, management systems and automation that are used to produce for example food products, medicines, cosmetics, home & personal products and even water products. This horizontal guideline is about the hygienically safe integration of hygienic (including aseptic) systems in a food production/ processing facility.

Systems and components are frequently put together in a way that creates new hazards, especially microbiological ones. Deficiencies during the sequence of design, contract, design-change, fabrication, installation and commissioning are often the cause of these failures, even when specific design guidelines are available and are thought to be well understood. Errors in sequencing and content can also result in major penalties in terms of delays and in costs of components and construction. This document examines integration aspects that can affect hygienic design,

installation, operation, automation, cleaning and maintenance and uses system flow charts and case studies describing the integration processes and decision steps. It does not provide detailed guidance on specific manufacturing processes, products, buildings or equipment.

Doc. 35 – Welding of stainless steel tubing in the food industry

First edition, July 2006 (29 pages)

Abundantly illustrated, this paper provides guidelines for the correct execution of on-axis hygienic (sanitary) welding between pipe segments, or between a tube and a control component (e.g. valve, flow meter, instrument tee, etc.) It deals with tube and pipe systems with less than 3.5 mm wall thickness, built in AISI 304(L) (1.4301, 1.4306 or 1.4307), 316(L) (1.4401, 1.4404 or 1.4435), 316Ti (1.4571) or 904L (1.4539) and their equivalents. The requirements for a weld destined for hygienic uses are first described, then the possible defects which can affect the weld are listed, and at the end the procedure for a state-of-the-art welding execution is illustrated, including preparation of pipe ends, final inspection and a troubleshooting guide.

It mainly refers to the part of the weld in contact with the finished or intermediate product and the only welding method considered is the GTAW (Gas Tungsten Arc Welding, commonly known as TIG) without filler material (autogenous weld), since this technique is capable of assuring the best performance in the execution of welds for the fabrication of thin wall stainless steel tubing. Inspection of welds will be covered in more detail in the next project.

Doc. 36 – Hygienic engineering of transfer systems for dry particulate materials

First edition, June 2007 (21 pages)

Transfer (also known as transport or conveying) of dry particulate materials (products) between or within plant components in a process line is well practiced in the food industry. The transfer operation must be carried out in a hygienic and safe manner and the physical powder properties must not be affected during this operation. In this document, hygienic transfer systems for transport of bulk materials within a food processing plant are described. This document also covers situations where transfer systems are used as a dosing procedure.

In principle, the less the need for product transfer within a food processing plant, the easier it is to make a factory hygienically safe. Furthermore, with a minimum of product transfer between equipment, there are the added advantages of a more compact plant, lower energy consumption and reduced cleaning time. Less product handling results in less adverse effects on product properties.

This guideline is intended for use by persons involved in the design, technical specification, installation and use of transfer systems for dry bulk particulate materials operating under hygienic conditions.

Doc. 37 – Hygienic design and application of sensors

First edition, November 2007 (35 pages)

According to their working principles, all sensors rely on an interaction with the material to be processed. Therefore, the use of sensors is commonly associated with hygiene risks. In many cases, the basic measuring aspect of a sensor and the optimum hygienic design may conflict.

This guideline is intended to advise both, sensor designers and manufacturers as well as those in charge of production machinery, plants and processes about the appropriate choice of sensors and the most suitable way for application in dry and wet processes.

Sensors are crucial in the monitoring of the critical process steps as well as the CCP's as established by the HACCP study of the process. Therefore, validation and calibration of sensors in time sequences are essential.

This guideline applies to all sensors coming into contact with liquids and other products to be processed hygienically. However, it focuses upon sensors for the most common process parameters, particularly temperature, pressure, conductivity, flow, level, pH value, dissolved oxygen concentration and optical systems like turbidity or colour measurements.

Doc. 38 – Hygienic Engineering of Rotary Valves in Process Lines for Dry Particulate Materials

Second edition, May 2017 (16 pages)

Rotary valves are widely used in the food processing industry for continuous discharging, metering and dosing of dry particulate materials from or into attached plant components. Such applications involve hygienic material handling and therefore only rotary valves of approved hygienic design should be used. This document describes the design and operational features of rotary valves that are of importance when rotary valves operate in a hygienic processing environment.

Doc. 39 – Design principles for equipment and process areas for aseptic food manufacturing

First edition, June 2009 (14 pages)

In many areas there is an increasing demand for self stable products. However, microbial product contamination limits the shelf life of sensitive products which are not protected by any preservatives or stabilised by their formulation. Products which fail this inherent protection have to be sterilised and in consequence, the equipment must be cleanable and sterilisable. Micro-organisms which are protected by product residues or biofilms are very difficult or impossible to inactivate and the same applies to process areas if resulting in a recontamination risk. This guideline is intended to describe the basic demands for equipment and process areas for aseptic food manufacturing.

Doc. 40 – Hygienic engineering of valves in process lines for dry particulate materials

First edition, October 2010 (26 pages)

Every process plant is equipped with valves. In dry particulate materials processing, valves fulfil numerous functions: shut-off and opening of flow lines, direction and flow control, protection against excessive or insufficient pressure and against intermixing of incompatible media at intersection points in the process. The quality of the valve has a considerable influence on the quality of the production process and hence, the product itself. Hygienic deficiencies resulting from poor valve design must be regarded as a production risk in the food industry which must ensure that only valves strictly conforming to hygienic requirements are used. This Guideline describes in detail the hygienic requirements of butterfly valves, slide gate valves and ball segment valves. It also briefly mentions pinch-off valves, ball and plug valves as well as cone valves. The hygienic design requirements of rotary and diverter valves are subject of separate EHEDG Documents (Doc. 38 and 41).

Doc. 41 – Hygienic engineering of diverter valves in process lines for dry particulate materials

First edition, February 2011 (23 pages)

Every process plant is equipped with valves, which fulfil numerous functions. These include line shut-off, opening, change-over and control of product flow, while also giving protection against both excessive or insufficient pressure and intermixing of incompatible media at intersection points in the process line.

When dry particulate material (product) flow has to be diverted into several directions during processing or product coming from different lines converges into one line, diverter valves are applied. In the area of dry product handling, these valves need a dedicated design.

This Guideline deals with the hygienic aspects of diverter valve design.

Valve construction, however, has a considerable influence on the quality of the production process and hence, the product itself. Hygienic deficiencies resulting from poor valve design must be regarded as a production risk in the food industry which must ensure that only valves strictly conforming to hygienic requirements are used.

Doc. 42 – Disc stack centrifuges

First edition, February 2013 (24 pages)

Special demands are made with regard to CIP-capability of disc stack centrifuges used in the food processing and pharmaceutical industry. These requirements, their implementation and related design principles are handled in detail in this guideline.

This guideline covers the hygienic aspects of disc stack centrifuges used to separate fractions of liquid food products or to remove dense solid matter from products. The hygienic operation of a disc stack centrifuge, which is a complex machine with the purpose of collecting non-milk-solids (NMS) or other solid matter from liquid products,

relies on proper cleaning by CIP/COP. Therefore, this guideline deals with cleaning as well as design.

The guideline does not cover cyclonic types of separators, decanters, basket centrifuges or other types of devices.

Doc. 43 – Hygienic design of belt conveyors in the food industry

First edition, April 2016 (76 pages)

This document provides guidance to the hygienic design of belt conveyors specifically for use in an environment where wet cleaning is mandatory, and is supplementary to the general requirements and standards for hygienic equipment. The guidance is relevant where the foodstuff is in direct contact with the conveyor and also in areas where there is a hygienic risk from indirect contamination. Although applicable for use in all food production environments, care must be taken when using these guidelines in considering the actual conditions, product types and the hygienic risks of contamination. Similarly, where a dry application precludes the use of water and liquids in cleaning, different systems may be suited, as described in EHEDG guideline, document 22.

Doc. 44 – Hygienic design principles for food factories

First edition, September 2014 (133 pages)

To ensure safe food and adequate sanitation programs, BOTH THE EQUIPMENT AND THE FACTORY used for processing and handling food products must be designed, fabricated, constructed, and installed according to sound hygienic design principles.

This document builds upon the minimum hygienic design requirements for the construction of food manufacturing sites as referenced from national food legislation, international and national general food hygiene guidance, international audit bodies approved by GFSI and food industry best practices.

The publication of an earlier EHEDG guidance document, Guideline 26 "Hygienic engineering of plants for the processing of dry particulate materials" (2003) is noted. The essential building design elements from this publication have been incorporated into this guideline, with the intention that, with the publication of this guideline, Guideline 26 will be withdrawn.

Doc. 45 – Cleaning validation in the food industry - General Principles, Part 1

First edition, April 2016 (14 pages)

The objective of cleaning validation is to prove that the equipment is consistently cleaned of product, microbial residues, chemicals and soiling, including allergens to an acceptable level, to prevent possible cross-contamination of hazards between products. This document focuses on the overall concept of cleaning validation and is intended as a general guideline for use by food manufacturers and inspectors. It is not the intention to be prescriptive in specific validation requirements. This document serves as general guidance only, and the principles may be considered useful in their application in the production of

safe food, and in the development of guidelines for the validation of specialized cleaning or inactivation processes.

Doc. 46 – Aseptic and Hygienic Filling Machines - Planning, Installation, Qualification and Operation

First edition, April 2018 (40 pages)

This document on hygienic and aseptic filling machines for liquid products (foods as well as beverages) replaces EHEDG documents 3, 11 and 21. It gives guidance to manage and to monitor hygienic risks related to this kind of machines. This guideline gives guidance for selecting the appropriate machine class and determines the machine class according to design principles implemented. It includes a summary of decontamination requirements and gives an overview on microbiological tests used when qualifying hygienic filling machines.

Doc. 47 – Guidelines on Air Handling Systems in the Food Industry - Air Quality Control for Building Ventilation

First edition, September 2016 (55 pages)

The "Guidelines on air handling systems in the food industry - air quality control for building ventilation" have a focus on air handling systems installed for food factory building ventilation and its air quality control. Supply systems for process air, compressed air and exhaust air systems such as grease filter systems or dust removal units are excluded from the scope of this document.

These guidelines are intended to assist food producers in the design, selection, installation, and operation of air handling systems to meet the air quality and hygienic requirements of the food manufacturing process. Information is provided on the role of air systems in achieving and maintaining microbiological standards in food products. The guidelines cover the choice of systems, air filtration types, system concepts, construction, maintenance, sanitation, testing, commissioning, validation and system monitoring.

Doc. 48 – Design of Elastomeric Seals

Will be published soon

Doc. 49 – Hygienic Design Requirements for Processing of Fresh Fish

First edition, October 2017 (44 pages)

The guideline is intended to provide guidance on hygienic design criteria for equipment manufacturers (when designing the equipment) and the plant for the fish industry (during the procurement process and installation, plant design and microbiological sampling). It stresses the current best practices in design of fish processing equipment and plant to highlight typical hazards and challenges of fish processing and emphasizes the importance of control of the environment.

This document applies to the processing of salmon, white marine fish and freshwater fish during grading/sorting, stunning, gutting, deheading, slicing, filleting, trimming, deboning, pin-boning, skinning (including its ice producing

system) until packaging in boxes with ice but excluding further processing. It includes the processing of fish on the fishing vessels as well.

Doc. 50 - Hygienic Design requirements for CIP Installations

First edition, July 2019 (94 pages)

This guideline contains recommendations and requirements for hygienic design, user requirement specifications, management and validation of hygienic CIP installations that will assure a CIP of the different objects to be cleaned.

Doc. 54 – Testing of Hygienic Weld Joints

First edition, May 2020

The statements in this guideline can be applied to existing weld joints as well as to welds performed during fabrication or installation of new plant. The only materials considered herein are stainless steels in compliance with the requirements of the EHEDG guidelines. At the same time, this guideline can also be applied by plant operators who wish to carry out weld testing on existing equipment within the course of a specified maintenance program.

Doc. 55 – Hygienic Design Requirements for Bakery Equipment

First edition, May 2020 (73 pages)

This guideline describes requirements for the hygienic design of equipment and production lines used in the bakery industry. It stresses the current best practices in the design of machinery and highlights typical hazards and challenges. It also assigns the dry or wet cleaning procedures to the different types of equipment.

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