

3-A® Accepted Practices for Spray Drying Systems, Number 607-05

*Standards Developing Organizations
3-A Sanitary Standards, Inc. (3-A SSI)
in collaboration with
United States Public Health Service (USPHS)/
United States Food and Drug Administration (USFDA)
United States Department of Agriculture (USDA)
European Hygienic Engineering & Design Group (EHEDG)*

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Foreword

This 3-A Accepted Practice is to establish minimum sanitary (hygienic) requirements for Spray Drying Systems. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

This 3-A Accepted Practice is for voluntary use by directly and materially affected organizations such as equipment and machinery fabricators, processors, regulatory agencies and by 3-A SSI to assure adequate public health protection exist for the devices and covered products. 3-A SSI use these documents as the source for sanitary criteria as part of 3-A Symbol authorization.

This 3-A Accepted Practice was developed jointly by 3-A SSI, the United States Public Health Service (USPHS)/United States Food and Drug Administration (USFDA), the United States Department of Agriculture – Dairy Programs (USDA), and the European Hygienic Engineering & Design Group (EHEDG).

It is our purpose to encourage inventive genius and provide a forum to discuss new developments. Suggestions for improvement and new technology are welcome any time for consideration by the 3-A Sanitary Standards Committees. Please forward comments to the 3-A SSI, 1451 Dolley Madison Boulevard, Suite 210, McLean, VA 22101-3850, USA. By fax: 703-761-6284. By e-mail to: 3-ainfo@3-a.org.

A SCOPE

- A1 These 3-A Accepted Practices shall pertain to the sanitary aspects of equipment for spray drying milk and milk products, and include all equipment necessary for spray drying milk and milk products beginning with the discharge of the final pump which delivers the liquid product to the atomizers and terminates at the point the finished product leaves the system for conveying either to the packaging system or to bulk storage. The drying system may include but shall not be limited to the equipment used for moving and cleaning air, heating and/or cooling air, fluid product handling, fluid product heating, fluid product atomizing, gas injection into the product, atomized product dispersion into the heated air, dry ingredient introduction into the process air or product, product reintroduction, agglomeration, dry or partially dry product retention, additional product drying, separating dry product from the air, exhausting the air, dry product cooling and/or conveying, dry product sifting and classifying, dry product particle size reduction, metallic particle detection and separation, internal vibration, air locks, fire suppression appurtenances, pressure relief (explosion venting), product sampling, heat recovery, permanently installed mechanical cleaning devices, instrument sensor fittings, observation ports and any other equipment that may become a part of the spray drying system for handling processing air or product.
- A2 Pneumatic and/or mechanical conveyors which are an integral part of a spray drying system are subject to the same material, fabrication, design, and processing air requirements of 3-A Sanitary Standards for Pneumatic Conveyors for Dry Milk and Dry Milk Products, Number 39- and 3-A Sanitary Standards for Mechanical Conveyors for Dry Milk and Dry Milk Products, Number 41- both of which apply to such conveyors that are not an integral part of a dryer system.
- A3 In order to conform to these 3-A Accepted Practices, spray drying system components shall conform to the following criteria for design, material, fabrication, air supply and the applicable documents referenced herein.¹

B DEFINITIONS

- B1 *Product*: Shall mean fluid milk or milk products, dry milk or dry milk products, and similar products.
- B2 *Processing Air*: Shall mean air prepared by filtration which is intended to be used in contact with the product for such purposes as heating, cooling, drying, conveying, or similar purposes.
- B2.1 *Air to be Heated*: Shall mean processing air to be heated to at least 240°F (116°C).
- B2.2 *Air not to be Heated*: Shall mean processing air which either will not be heated or will be heated to a temperature less than 240°F (116°C).
- B3 *Pressurized Air*: Shall mean air which has been compressed by mechanical means (excluding fans and blowers) to exceed atmospheric pressure.
- B4 **Surfaces**
- B4.1 *Product Contact Surfaces*: Shall mean all surfaces which are exposed to the product and surfaces from which liquids and/or solids may drain, drop, diffuse or be drawn into the product.
- B4.2 **Air Contact Surfaces**
- B4.2.1 *Processing Air Contact Surfaces (for Air to be Heated or Air not to be Heated)*: Shall mean all surfaces in contact with filtered air prior to coming in contact with the product, commencing at the frame of the final inlet air filter(s) and ending at the first downstream product contact surface.
- B4.2.2 *Exhaust Air Contact Surfaces*: Shall mean the surfaces of the air ducts, plenum chamber(s) (if provided) and appurtenances from the final product contact surface through the exhaust system.
- B4.3 *Nonproduct Contact Surfaces*: Shall mean all other exposed surfaces.
- B5 **Cleaning**
- B5.1 *Mechanical Cleaning or Mechanically Cleaned*: Shall mean soil removal by impingement, circulation, or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned by mechanical means in equipment or systems specifically designed for this purpose.

¹ Use current revisions or editions of all referenced documents cited herein.

B5.1.1 *Cleaned-In-Place (CIP)*: Shall mean mechanical cleaning of equipment, the cleanability of which has been sufficiently established such that all product or solution contact surfaces do not have to be readily accessible for inspection (for example, silo-type tanks or welded pipelines).

B5.2 *Manual (COP) Cleaning*: Shall mean soil removal when the equipment is partially or totally disassembled. Soil removal is effected with chemical solutions and water rinses with the assistance of one or a combination of brushes, nonmetallic scouring pads and scrapers, high or low pressure hoses and tank(s) which may be fitted with recirculating pump(s), and with all cleaning aids manipulated by hand.

B6 Sanitizing or Sanitization

B6.1 *Sanitizing or Sanitization*: Shall mean a process applied to a cleaned surface which is capable of reducing the numbers of the most resistant human pathogens by at least 5 log₁₀ reductions (99.999%) to 7 log₁₀ reductions (99.99999%) by applying accumulated hot water, hot air, or steam, or by applying an EPA-registered sanitizer according to label directions. Sanitizing may be effected by mechanical or manual methods.

B7 Component Equipment

B7.1 *Porous Belt Conveyors*: Shall mean flexible, porous, product-handling devices used to convey products through a spray drying system.

B7.2 *Dry Product Sifters/Classifiers*: Shall mean equipment in which products are separated into different size fractions. This equipment includes, but is not limited to, vibratory and rotary sifters.

B7.3 *Dry Product Particle Size Reducers*: Shall mean equipment in which product particle size is reduced by mechanical means. This equipment includes, but is not limited to, comminuter, hammer, and roller mills.

B7.4 *Metal Detectors*: Shall mean equipment for detecting metallic particles in the product.

B7.5 *Magnetic Separators*: Shall mean equipment in which metallic particles are removed from the product by magnetic attraction.

B7.6 *Air Locks*: Shall mean equipment in which product is transferred between areas of differing pressure while maintaining the pressure differential. This equipment includes, but is not limited to, rotary and double flapper valves, and venturis.

B7.7 *Fire Suppression*: Shall mean equipment which will suppress possible product fire by means of a suppressant material.

B7.8 *Pressure Relief*: Shall mean equipment which will vent excessive pressures in the drying system so that structural and mechanical damage is avoided or minimized.

B7.9 *Fluid Beds*: Shall mean equipment which suspends and moves product particles using processing air forced through a fluid bed screen.

B7.10 *Fluid Bed Screens*: Shall mean thin metal sheets, which have perforations for the transmission of processing air for conveying, drying and/or cooling of product.

B7.11 *Product Conveyors*: Shall mean equipment which mechanically or pneumatically conveys product.

B7.12 *Product Diverter Valves*: Shall mean valves which divert flow between two or more destinations.

B7.13 *Easily or Readily Removable*: Shall mean quickly separated from the equipment with the use of simple hand tools, if necessary.

B7.14 *Easily or Readily Accessible*: Shall mean a location which can be safely reached by an employee from the floor, platform, or other permanent work area.

B7.15 *Inspectable*: Shall mean all product contact surfaces can be made available for close visual observation.

B7.16 *Simple Hand Tools*: Shall mean implements normally used by operating and cleaning personnel such as a screwdriver, wrench or mallet.

B7.17 *Nontoxic Materials*: Shall mean those substances that under the conditions of their use are in compliance with applicable requirements of the Food, Drug, and Cosmetic Act of 1938, as amended.

C MATERIALS**C1 Product Contact Surfaces**

C1.1 The materials of product contact surfaces of equipment included in the spray drying system for which there are 3-A Sanitary Standards or 3-A Accepted Practices shall conform to the materials criteria of the applicable standards or accepted practices. (See Appendix, Section O.)

C1.2 Metals

C1.2.1 Product contact surfaces shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series² (except 301 and 302) or corresponding Alloy Cast Institute (ACI)³ types (See Appendix, Section F), or metal which under conditions of intended use is at least as corrosion-resistant as stainless steel of the foregoing types, and is nontoxic and nonabsorbent, except that:

C1.2.1.1 Aluminum alloys conforming to the Aluminum Association⁴ designations 5052 and 6061 may be used as dry product contact surfaces for supporting or reinforcing members in lightweight moving parts of product removal (drag) systems, provided they are removable for cleaning.

C1.3 Nonmetals

C1.3.1 Rubber and rubber-like materials may be used for conveyor belts, short flexible connectors, hose assemblies, gaskets, scraper blades, sealing applications, rollers, or as a coating on rollers, plugs for pressure relief and fire suppression devices and parts having the same functional purposes.

C1.3.1.1 Rubber and rubber-like materials when used for the above-specified application(s) shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Rubber and Rubber-Like Materials Used as Product Contact Surfaces in Dairy Equipment, Number 18-.

C1.3.2 Plastic materials may be used for spray cleaning devices, scraper blades, sight and/or light openings, bearings, bushings, short pieces of transparent tubing in dry product areas for observation purposes, short flexible connectors, sealing applications, diverter valve vanes, a coating for air lock parts, conveyor belts, a coating on the edges of conveyor belts, wear strips, pressure relief port membranes, coverings for pressure relief and fire suppression devices and parts having the same functional purposes.

C1.3.2.1 Plastic materials when used for the above-specified application(s) shall conform to the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-.

C1.3.3 Rubber and rubber-like materials and plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformational characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.

C1.3.4 The final bond and residual adhesive, if used, on bonded rubber and rubber-like materials and bonded plastic materials shall be nontoxic.⁵ (Also see Sections C3.1.2 and D5.1.)

C1.3.5 Cotton, wool, linen, silk, synthetic fibers, or expanded PTFE membrane laminates composed of these materials may be used for separation of product from exhaust air and for short flexible connectors used in contact with dry product. These materials shall be nontoxic, relatively insoluble in water, easily cleanable and shall not impart particulate material or a flavor to the product.

C1.3.5.1 All plastic materials referenced in C1.3.5 shall be:

C1.3.5.1.1 Constructed of materials meeting Title 21, Part 170.199 of the Code of Federal Regulations, or

C1.3.5.1.2 Otherwise accepted by the Food and Drug Administration for food contact.

² The data for this series are contained in the *AISI Steel Products Manual, Stainless & Heat Resisting Steels*, Table 2-1. Available from the Iron and Steel Society, 186 Thorn Hill Road, Warrendale, PA 15086.

³ Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016.

⁴ Aluminum Association, 900 19th Street, Suite 300, NW, Washington, D.C. 20006.

⁵ Adhesives shall comply with 21 CFR 175 - Indirect Food Additives: Adhesives and Components of Coatings. Document for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.