

3-A[®] Sanitary Standards for Milk and Milk Products

Evaporators and Vacuum Pans, Number 16-05

Formulated by
International Association of Food Industry Suppliers (IAFIS)
International Association for Food Protection (IAFP)
United States Public Health Service (USPHS)
The Dairy Industry Committee (DIC)

It is the purpose of the IAFIS, IAFP, USPHS, and DIC in connection with the development of the 3-A Sanitary Standards Program to allow and encourage full freedom for inventive genius or new developments. Milk and milk products evaporators and vacuum pan specifications heretofore or hereafter developed which so differ in design, materials, and fabrication or otherwise as not to conform to the following standards but which, in the fabricator's opinion, are equivalent or better, may be submitted for the joint consideration of the IAFIS, IAFP, USPHS, and DIC at any time. **NOTE:** Use current revisions or editions of all referenced documents cited herein. Standard English is the official language of 3-A Sanitary Standards and 3-A Accepted Practices.

A SCOPE

A1 These standards cover the sanitary aspects of evaporators and vacuum pans used for milk and milk products.

A2 In order to conform with these 3-A Sanitary Standards, evaporators and vacuum pans shall comply with the following design, material, and fabrication criteria.

B DEFINITIONS

B1 *Product:* Shall mean milk and milk products.

B2 *Evaporators and Vacuum Pans:* Shall mean equipment in which product may be concentrated in vacuo.

B3 *Evaporators:* Shall mean equipment in which the heat exchange surface is not located within the vapor-liquid separation chamber.

B4 *Vacuum Pans:* Shall mean equipment in which the heat exchange surface is that of a steam jacket and/or a series of steam coils or other heating surfaces within the vacuum chamber.

B5 *Product Contact Surface:* Shall mean all surfaces that are exposed to the product, or from which liquid may drain, drop, or be drawn into the product.

B6 *Non-Product Contact Surface:* Shall mean all other exposed surfaces.

B7 *Mechanical Cleaning or Mechanically Cleaning:* Shall denote cleaning, solely by circulation

and/or flowing chemical detergent solutions and water rinses onto and over the surfaces to be cleaned, by mechanical means.

C MATERIALS

C1 Product contact surfaces shall be of stainless steel of the American Iron and Steel Institute (AISI) 300 Series¹ or corresponding Alloy Cast Institute (ACI) types² (See Appendix, Section E), or equally corrosion resistant metal that is nontoxic and nonabsorbent, except that:

C1.1 Rubber and rubber-like materials may be used for gaskets, seals, O-Rings, and parts having the same functional purposes. These materials shall comply with 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-.

C1.2 Plastic materials may be used in sight and/or light openings and for gaskets, seals, scraper blades and parts having the same functional purposes. These materials shall comply with the applicable provisions of the 3-A Sanitary Standards for Multiple-Use Plastic Materials Used as Product Contact Surfaces for Dairy Equipment, Number 20-.

¹ The data for this series are contained in the *AISI Steel Products Manual, Stainless & Heat Resisting Steels*, November 1990, Table 2-1, pp. 17-20. Available from the American Iron and Steel Society, 410 Commonwealth Drive, Warrendale, PA 15086 (412) 776-1535.

² Steel Founders Society of America, Cast Metal Federation Building, 455 State Street, Des Plaines, IL 60016 (708) 299-9160.

- C1.3 The final bond and residual adhesive, if used, of bonded rubber and rubber-like materials and bonded plastic materials shall be non-toxic.
- C1.4 Bonded rubber and rubber-like materials and bonded plastic materials having product contact surfaces shall be of such composition as to retain their surface and conformation characteristics when exposed to the conditions encountered in the environment of intended use and in cleaning and bactericidal treatment.
- C1.5 Glass may be used in sight and/or light openings and shall be of a clear heat resistant type.
- C2 Non-product contact surfaces shall be of corrosion-resistant material or material that is rendered corrosion-resistant. If coated, the coating used shall adhere. Non-product contact surfaces shall be relatively nonabsorbent, durable and cleanable. Parts removable for cleaning, having both product contact and non-product contact surfaces, shall not be painted.

D FABRICATION

- D1 Product contact surfaces shall have a finish at least as smooth as a No. 4 ground finish on stainless steel sheets and be free of imperfections such as pits, folds and crevices in the final fabricated form. (See Appendix, Section F.)
- D2 Permanent joints in metallic product contact surfaces shall be welded, except that tubes may be either expanded and rolled or welded into tube sheets or distributor plates. Welded areas on product contact surfaces shall be at least as smooth as a No. 4 ground finish on stainless steel sheets free of imperfections such as pits, folds and crevices. When tubes are expanded and rolled into tube sheets and distributor plates, the resulting joint shall be completely rigid and without pockets or crevices. All joints, except for distributor plates with protruding tubes, shall be flush.
- D3 Product contact surfaces designed to be mechanically cleaned shall be accessible for inspection.
- D3.1 Product contact surfaces not designed to be mechanically cleaned shall be easily accessible for cleaning, and inspection either when in an assembled position or when removed. Removable

parts shall be readily demountable.

- D3.2 A vacuum pan, to comply with the requirements of this section, shall have spaces between coils at least as great as the following:
Between coils - 2 1/2 in. (63.50 mm);
Between coils and vacuum pan walls - 3 in. (76.20 mm);
Between coil banks - 3 1/2 in. (88.90 mm).
- D3.3 A product heater designed to be mechanically cleaned in which the heat exchange surface is one continuous tube shall be considered to be in compliance with the requirements of this section.
- D4 Evaporators and vacuum pans that are to be mechanically cleaned shall be designed so that the product contact surfaces of the evaporators and vacuum pans and non-removable appurtenances thereto can be mechanically cleaned.
- D5 Product contact surfaces except heaters, pumps and pertinent sanitary piping shall be self-draining except for normal clingage. Heaters, pertinent sanitary piping and pumps shall be drainable.
- D6 All internal angles of 135° or less on product contact surfaces shall have minimum radii of 1/4 in. (6.35 mm), except that:
- D6.1 Minimum radii for fillets of welds in product contact surfaces may be 1/8 in. (3.18 mm) where the thickness of one or both parts joined is less than 3/16 in. (4.76 mm).
- D6.2 Where smaller radii are required for essential functional reasons such as rolled gas tubes in distributor plates and distributor and support pins, such joints shall be readily accessible for cleaning and inspection.
- D6.3 The minimum radii in gasket grooves or gasket retaining grooves other than those for standard 1/4 in. (6.35 mm) and smaller O-rings shall not be less than 1/8 in. (3.18 mm).
- D6.4 The minimum radii in grooves for standard 1/4 in. (6.35 mm) O-rings shall be not less than 3/32 in. (2.38 mm) and for standard 1/8 in. (3.18 mm) O-rings shall be not less than 1/32 in. (0.794 mm).
- D7 Gaskets having product contact surfaces shall be removable or permanently bonded to the surface. Any gasket groove or gasket retaining groove,