



SANITARY DESIGN, INDUSTRIES, LLC.

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Soils in the Dairy Plant

Knowing and understanding the different types of soils and the nature of the soils equipment is exposed to is the first step in determining the proper cleaning products and procedures to use in the dairy plant. Soils can pose difficult challenges but, for the most part, using the proper cleaning products and procedures will get the job done. There are many cleaning products, and choosing the right one is becomes easier when one understands the nature of the soils in the plant. In the case of procedures, they are fairly standard and easy to implement. Procedures for difficult soil challenges can, very simply, be adjusted to address the need.

Soils can come from milk, personnel, improperly functioning or improperly designed equipment and product transfer circuits, the environment, and the water supply, just to mention a few. Awareness of these sources and understanding the nature of these sources is necessary in identifying the potential soils one might encounter in the plant. There is one major reason for focusing on soils...they harbor bacteria. The goal is to significantly reduce the presence of bacteria to safe levels. We never completely remove all bacteria. It is an ongoing battle that never ends. But, by reducing the presence of soil on equipment surfaces we stand a much better chance of reducing the risk of bacterial contamination.

So, to start, milk is made up of fats, proteins, sugars, salts, and minerals. Each one of these becomes a soil, in itself, if left as a residue on equipment surfaces. When these components combine as a residue they can become more difficult to remove. Some of these residues can be seen by the naked eye and some, those at a microscopic level, cannot be seen at all. Most soils on dairy equipment are residues from milk.

Fats, proteins, and minerals present a unique challenge in that they are not soluble in water, meaning they do not dissolve in water. What does this mean? It means they will have a tendency to be attracted to and attach to the surface of equipment rather than dissolve in and be carried away by water.

1. Fats solidify under 115 degrees F and, when they do, they coat the surface of your equipment with a thin film of soil that will attract bacteria.
2. Proteins start to denature in dairy processing temperatures of >105 degrees F. When they denature they become insoluble. Again, like fat, they will tend to attach to equipment surfaces creating another place for bacteria to take up residence.
3. And, finally, minerals have a tendency to bond with fats, proteins, and other organic material to form scales on equipment surfaces. Scales can be very difficult to remove and require the proper product and procedure to remove them.



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Sugars and salts are soluble in water and only present a challenge when they are burned on a surface by excessively high heat in processing.

It should be noted that if milk is allowed to dry on equipment it becomes a much more difficult soil to remove and a more aggressive approach need be taken to remove it. Soils from personnel and the environment can present a large number of potential challenges. Exposing equipment to hands, sweat, dirty clothes, coughing, sneezing, hair, pests, machines, conveyors, etc. puts soils on the equipment. Fortunately, these soils can and will be removed when using the same products and procedures used to clean milk soils. But, there is one soil that comes from the environment that requires a specific product to remove it. Petroleum products like grease and lubricants can only be removed with petroleum based solvents. Conventional products used to remove milk, organic, and mineral soils are capable of removing this soil. They are not at all like petroleum products and one must be aware of this when a petroleum based soil is present in the plant. The proper implementation of GMPs (good manufacturing practices) and SSOPs (sanitation standard operating procedures) and a thorough and effective HACCP (hazard analysis critical control point) plan will greatly reduce the risk of contamination from personnel and the environment.

Improperly functioning or improperly designed equipment and product transfer circuits also presents a myriad of potential challenges. Valves, heating and cooling systems, HTST systems, pumps, "hot spots" in vats, seals, and gaskets, etc. that are not working or just worn out can leave entire sections of equipment with product in them resulting in significant risk for soil build-up and contamination of product. Periodic inspection and maintenance (preventive maintenance programs) of equipment, including CIP and COP systems plays a very large part in reducing the risk of soil build-up and contamination from equipment failure.

Finally, water presents specific challenges related directly to the mineral content. Mineral content is commonly called water hardness. Almost every water supply has some level of hardness. Hard water inhibits the cleaning and sanitizing processes. It must be taken into account when choosing the products and procedures to be used in the plant.

All of the soils mentioned here represent the major contributors of soils in the dairy plant. Yes, there are others, but in almost all cases they will be removed when addressing those mentioned above. So, in summary, knowing and understanding the nature of the soils in the plant will make it significantly easier for one to choose the product and procedure necessary to effectively clean the plant.