HOW A DETERGENT WORKS

A detergent most simply defined is a material that removes soil. This material may be a soap, which is produced by the action of an alkali, such as sodium or potassium hydroxide and a fat or fatty acid, such as coconut oil or tall oil fatty acid. A detergent may also be completely synthetic material, which acts to remove soil.

The word detergent implies other properties that are necessary for soil removal.

The detergent must have the ability to "wet out" the substrate in which it is intended to clean. This necessitates that the material reduce the interfacial tension between water and the substrate, so that the detergent will spread out the water to cover a much larger area than water would alone. Therefore, the detergent must be a wetting agent and a spreading agent.

Now that the material has "wet out" the surface, it must now remove the soil. In order to accomplish this, the detergent must contain a portion of molecules that is lipophilic or "loves oil" and will then become part of it. At the same time this molecule must have a portion of it that "loves water" or is hydrophic in order to bring the lipophilic portion and the soil into the water of dilution. Hence the detergent must be an emulsifier.

During the operation, the detergent must "hold onto" it in order to keep it form responding onto the substrate. Therefore, the detergent must have soil suspension properties.

There are many surface-active agents or "surfactants" available today. There are those, which are good wetting agents but not good emulsifiers, and there are those that are good emulsifiers but cannot suspend soil.

Therefore, it is necessary in the formulation of a detergent type cleansing agent to use only those materials that posse all of the necessary properties needed and that this material is compatible with any additives that are part of the formulation.

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HOW A DETERGENT WORKS (continued)

This is the way in which a soap or detergent removes soil from hard surfaces, fabrics, and skin. Several or all of these processes can be working at same time.

WETTING ACTION: Breaks down the surface tension.

PENETRATION ACTION: Gets down into dirt film. Breaks the oil into small bits and keeps the bits suspended in the solution to allow for removal from the surface.

EMULSIFICATION ACTION: The cleaning agent breaks up these clumps of small dirt bits and keeps the bits apart.

SOIL SUSPENSION: Causes an attraction between the soil and cleaning agent making it easier to pull the dirt out of cracks and crevices without re-depositing.

The formulation of a detergent would normally have all four basic qualities, directed to the type of soils to clean. Certain actions will achieve greater cleaning effect on specific types of soils.

CLEANING AGENTS: Water, synthetic detergents, solvent cleaners acid cleaners, and abrasive cleaners.

CLEANING AGENT	MAY CONTAIN	AWARENESS
Synthetic	Petroleum products, sulfur, alcohol, amines	Works well in hard water. Will not leave a dull or sticky film.
Solvent	Kerosene, alcohol, benzene, methylene chloride, butyl cellosolve	High VOC content. Can damage surfaces. Hazardous to skin and eyes.
Acid	Hydrochloric, phosphoric hydrofluoric	For removing mineral deposits and or rust stains left by water. Can damage surfaces. Hazardous.
Abrasive	Fine ground bits of hard material, such as silica, calcium carbonate	Add mechanical friction, and can damage the surface.