

Kinetronics Technical Notes for Cleaning Optics

Cleaning an optical surface safely and effectively requires some knowledge of the optical surface and the nature of the contaminant to be removed. Additionally, as in most endeavors, the task is greatly facilitated if proper tools are available to accomplish the task. Each of these factors is discussed below.

Nature of the Optical Surface

Two materials are commonly used to produce optical components for cameras and other optical consumer devices. These are glass and clear plastic. Furthermore, these materials may or may not be coated with another material. Glass is the hardest and most durable material, and therefore the least likely to be damaged while cleaning. Coated optics are somewhat more delicate, (most camera lens are coated), and plastic lens are the most vulnerable to damage. Image sensors, found in small video cameras and all digital cameras are comprised of coated silicon. While these devices are not extremely fragile, the surrounding camera restricts access to the optical surface. Any damage is permanent and replacement is very costly.

Nature of the Contaminant

Contaminants are impurities and tend to be mixtures, so the appropriate question is “what does the impurity contain” rather than “what does the impurity consist of”. Commonly, contaminants include:

- 1) Water-soluble salts (residue from rain or salt spray, etc)
- 2) Non-water soluble greases and oils (finger prints, etc)
- 3) Soft particulates (lint, hair, dust)
- 4) Hard particulate material (sand, grit, etc.)

These contaminants can also differ in age – old dried or encrusted material or fresh wet material.

Tools for the Job

Lens Brush: A soft clean, (either washable or disposable), electrically conductive (to prevent dust attracting static charge from developing on the surface being cleaned), fine bristled of at least $\frac{3}{4}$ ” length. The **Kinetronics StaticWisk** anti-static brush is a good example.

Lens Cleaning Cloth: A soft, clean, lint free, electrically conductive, non-impregnated, absorbent material such as the **Kinetronics ASC** anti-static “Tiger” cloth.

Lens Cleaning Solution: A neutral solvent solution capable of dissolving ionic and non-ionic residues without affecting lens coatings, and having no appreciable impurities that would add contamination. The **Kinetronics PLC** precision cleaning solution is formulated to exactly meet these criteria.

Lens Cleaning Solution Removal: A clean, lint free, highly absorbent, soft and pliable material that can conform to a lens shape and remove the lens cleaning solution, along with the loosened contaminants. This should be accomplished quickly without requiring rubbing or applied pressure. The **Kinetronics MFC** (microfiber cleaning cloth), **ASC** (anti-static cleaning cloth) and **OQC** (optical quality chamois) are all good choices for this task.

SpeckGRABBER particle remover: This is a new tool from **Kinetronics** that allows a single particle of contaminant to be removed from a surface by touching the particulate with the tool. The contaminant will adhere to the tool and not the optical surface allowing it to be removed rather than just moved.

Cleaning Techniques

Time is an important consideration: some contaminants such as fingerprints can chemically react with a lens in less than an hour producing a blemish that can then only be minimized, not eliminated. Less dramatic but still annoying, the longer contamination is left unremoved, the better the chance of producing lower quality images.

The first line of defense for particulate contamination is either a lens cleaning brush or **SpeckGRABBER**. If there are several particles, the brush should be used, moving across the optical surface lightly (the bristles should not bend more than 10 degrees due to applied pressure). Use a rolling motion of the wrist starting with the brush almost perpendicular to the lens and ending with the brush at 30-45 degrees to the lens surface. This motion enhances the brushes capability to entrap and remove particles from the lens surface. If there are only one or two particles to be removed, use the **SpeckGRABBER**. Simply place the blue tip directly on the particle and remove. Do not rub, twist or otherwise move the tip while in contact with the lens surface. The contaminant can be removed from the **SpeckGRABBER** with a lens cloth or by washing (don't use the **SpeckGRABBER** on a lens while it is wet).

Raindrops should be removed immediately with a lens cleaning cloth.

Any impure liquid should be removed immediately with a lens cleaning cloth and lens cleaning solution. Apply the solution directly to the contaminated surface and absorb the resulting mixture with the cloth (do not rub). Repeat until all the contaminant has been removed.

Kinetronics has produced a handy pocket size kit. The **OFA** or Optics First Aid Kit contains all the necessary tools to perform these operations in the field when they are most effective.

If it becomes necessary to remove dried or encrusted contaminants, a different technique, taking a little more time should be employed. Soak the contaminant with lens cleaning solution for several minutes to an hour, depending on the severity of the contamination. (If soaking periods of more than 5 minutes are required, treat the lens by placing a piece of **OQC** chamois directly against the lens and saturate it with lens cleaning solution.

After soaking, flush a lens with additional lens cleaning solution and absorb the mixture with either cleaning cloth or chamois. Repeat as necessary. **DO NOT** rub the lens as any coating may have been softened by the soaking and particulates, including salt crystals, may scratch the coating.

A more recent cleaning challenge, the removal of dust from CCD arrays in digital cameras, prompted the development of the **Kinetronics SpeckGRABBER**. Due to the small size of this component, a piece of dust causes an enormous blemish on the image. The placement of the CCD in the camera renders effective brush technique impossible, and air jets more often move dust rather than remove it. The **SpeckGRABBER** can be safely and effectively employed to remove particulates from the CCD by lightly “dabbing” the particle with the blue tip of the **SpeckGRABBER**. This will instantly, and safely, remove the offending particle while leaving no residue on the CCD surface.