An operating system is at risk whenever the critical contamination level is exceeded

Contamination levels determine the individual component's wear rate (useful life) and ability to perform as intended (functionality).

System design, filter performance and maintenance practices largely determine the contamination level in a system.

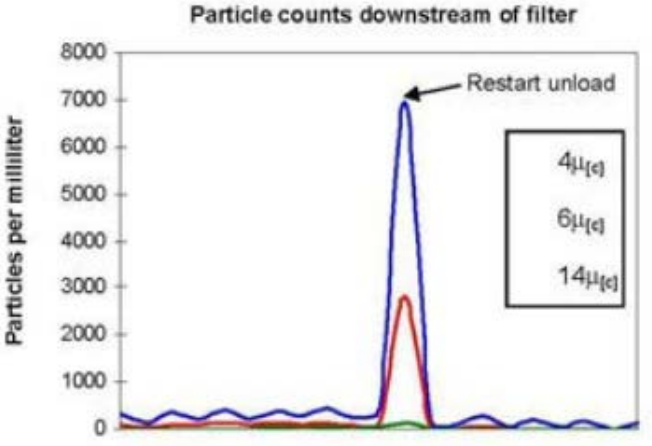
Filters are expected to maintain contamination below critical tolerance levels. Filter performance in a dynamic operating system is variable based upon flow rate and flow density, changes in flow rate (duty cycle), viscosity, fluid and structure borne vibration (Hz), contamination levels, ingression rate and several other conditions. All filters are subjected to some form of system dynamics.

Filters encounter frequent and rapid changes in flow rate accompanied by frequency changes. Bulk tank filters typically experience dynamic conditions during start up and shut down.

Two key characteristics of filter performance are capture efficiency and retention efficiency.

Capture *efficiency* can be thought of simply as how effectively a filter captures particles while Retention efficiency is a measure of how effectively that filter retains the particles it has captured. A filter is not a black hole, and its performance must not be based solely on how efficiently it captures particles. If not properly designed and applied, a filter can become one of the most damaging sources of contamination in a system.

- The phenomenon of releasing captured contaminant is called unloading, and can result in temporary contamination levels, that are well above the critical contamination tolerance level of a system.
- This phenomenon can best be described as “contaminant unloading”. As the Filter element captures more dirt, greater amounts may be released back into the system that it is installed to protect when the element is subjected to a dynamic flow condition and change in differential pressure across the element. Unloading may also occur when the flow rate changes from high flow to low flow, represented by the alternating smaller peaks . The filter element typically recovers shortly after the dynamic condition, but highly contaminated clouds of fluid from contaminant unloading can cause severe component damage and unreliable system performance.
- Excessive unloading in the early stage of element life may be symptomatic of an element that will eventually fail and lose it’s efficiency all together (media breakdown).



Downstream Element A3	4µ[c] particles/ml	6µ[c] particles/ml	14µ[c] particles/ml	ISO Code per ISO4406:1999
Before Restart	429	136	25	16/14/12
During Restart	6973	2802	139	20/18/14

- During the restart-Cold start test there is no contaminant being injected so any particles measured were already in the system or were released by the element (unloading). The result is a temporary state of highly contaminated fluid that has resulted because the filter element did not properly retain the dirt.

Filter element performance is at it’s worst during flow changes isolating those sequences can help predict performance in dynamic flow systems

The advantages of using ceramic filters:

- *Multi- functional* wear resistant (Pyrites) ceramic filtration medium – ideal for air, gas & liquids or any combination of these and for industrial applications.
- There is surety of *sustainable cleanliness* levels, compared to other market filtration mediums, as iCerMax™ ceramic’s don’t form channels, don’t have medium migration and there is no severe unloading or

element collapse. iCerMax™ ceramics possess a non-flexi depth medium.

- *Structural integrity*, iCerMax™ eliminates filtration medium breakdowns or compromise caused by multiple surges , hammering effects, operating pressures (high or low), severe pressure variances, extreme heat -800 degrees plus , chemicals, surfactants, water, acids, biocides or expiry dates, etc.
- Excellent sustainable *Capture efficiency* –unsurpassed Micron ratings even under severe pressures and surges.
- *Holding capacity and dirt retention* (the main “Achillis heel” of various filtration mediums) are exceeded, as dirt remains in the filter due to the unsurpassed structural integrity of the filter medium i.a.w there is no costly dirt surges or any seepage that negatively affect or compromise the cleanliness levels.
- *Reliable filtration monitoring* sensors/ pressure gauges. As the medium does not compromise the filtration monitoring sensors reflect the actual real time status of the filtration process thus eliminating estimated change intervals based on shifts, volume, or on hourly or distance monitoring.
- *Process applications efficiencies*: the inherent characteristics of iCerMax™ allow for a functional optimisation design of processes, which requiring a superior multi functional filtration solution.
- With higher pressures/ flow rates and their vast dirt holding capacity iCerMax™ ceramics set new standards in *bulk filtration* sustainable cleanliness levels and totally in a league of their own.