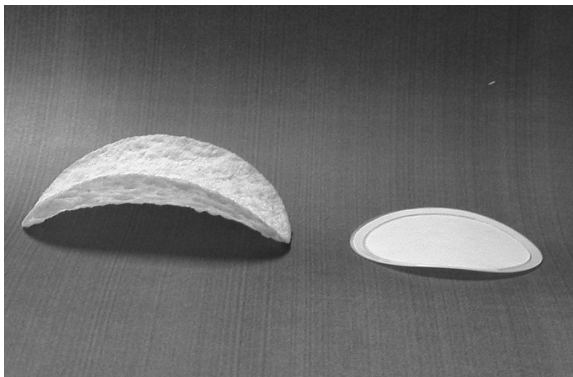




Massachusetts DEP Air Assessment Branch

2006 Filter Problems



The “Pringle” Effect

THE PROBLEM

Early in the first quarter of 2006, DEP filter weighing staff noted an increased number of anomalous and inconsistent tare weights coming from the MTL Auto-Handling system. An

investigation was conducted to ascertain the most likely cause for such an increase with static electricity and humidity control being the expected culprits. As it turns out, the problem was not with the environmental conditions in the weighing chamber, but rather with the routine (2006) filter distribution Massachusetts received from EPA. All of the 2006 filters exhibit a very distinct curl which, it was found, can cause the filters to rock or shift position as they are moved during the weighing process, resulting in erroneous tare weights.

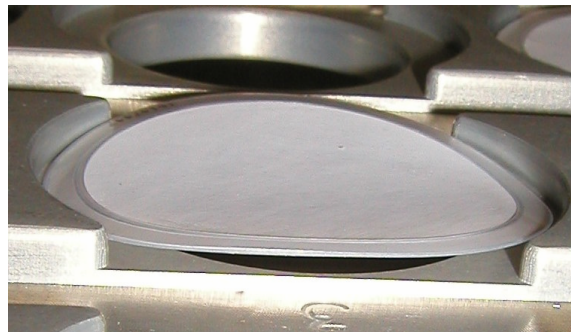


Fig. 1 Filter in position in the weighing tray. Note the open space beneath the filter due to warping of the filter ring.

THE CAUSE

DEP has looked into the cause of the warping seen in the filters, including consultation with EPA and a representative of Whatman, Inc. Results so far are inconclusive. Perhaps the Teflon membrane is stretched tighter or the ring material or sealing technique has changed.

THE SOLUTION

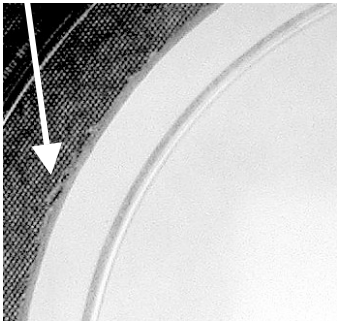
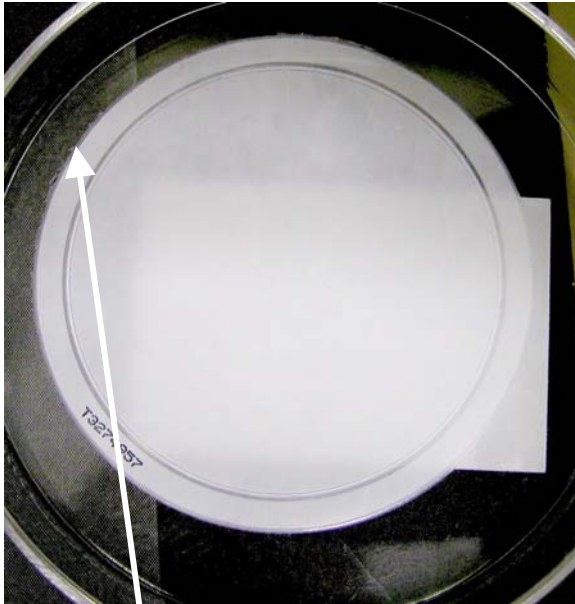
During routine filter weighing, either new filters or exposed filters are weighed as a batch. New filters and exposed filters are never weighed together. The filters are loaded into special filter weighing trays which are then positioned in the automated weighing system which sequentially weighs the filters and records the results.

To load the weighing tray, a member of the Laboratory staff positions each individual filter over an opening in the tray which is especially designed to accommodate the Sartorius MC5 balance. Before the problems with the warped filters began, the weighing tray could be loaded quite quickly without having to worry about orienting each individual filter based on its unique curvature. Now, in order to avoid the problems associated with the warped filters, the scale operator orients each filter in its weighing position in the weighing tray based on the amount and the way it curls.



Fig. 2 Filters set up in the weighing tray ready for weighing.

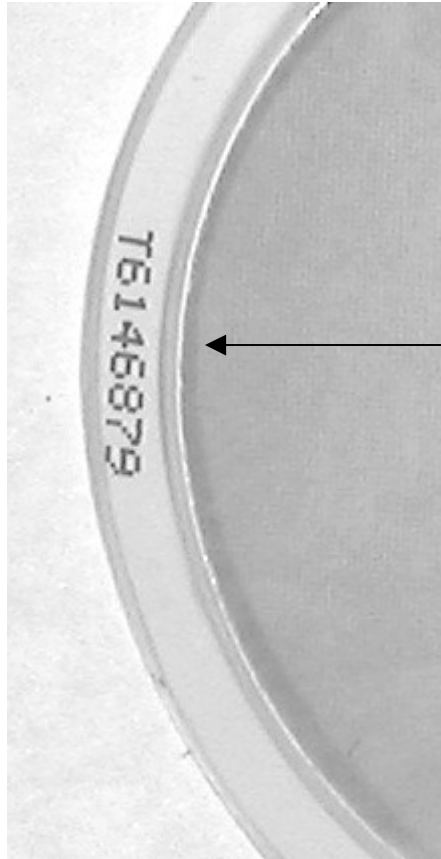
FILTER FRINGE



Filter Fringe

We have had a few filters hang up in the weighing system due to fringe around the edge of the support ring left over from manufacturing.

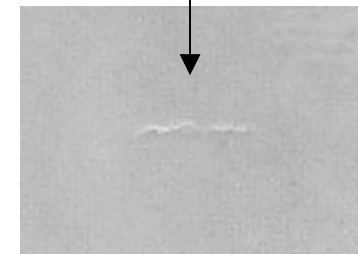
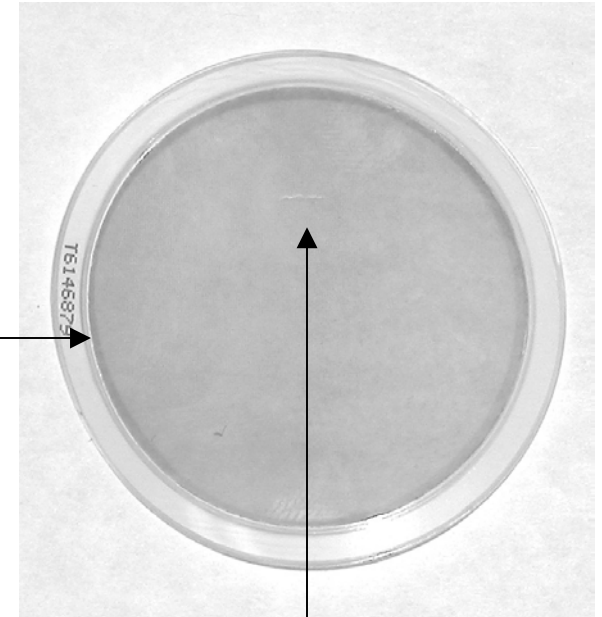
EDGE LOADING



Edge Loading

It has been noted that there is an area of distinctly darker material around the perimeter of the filter next to the support ring. In some instances it extends around the entire perimeter, in others it only partially appears around the filter. It is not fully understood why we are seeing this phenomenon or what the ramifications are.

FILTER TEARS



Filter Tears

We have begun to see an increasing incidence of what looks like tearing on the surface of filters coming back from the field. The damage is caused when the piston in the take up cassette on an R & P sampler is not returned to the top of the column and filters drop on top of each other.