

## Enhancement in CMP slurry filtration for achieving low COO solution

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To meet the growing demand for CMP steps, slurry manufacturers have developed many different formulations targeting specific CMP step needs. The importance of CMP slurry filtration has been experienced and recognized as an increasing number of fabs are implementing point-of-use (POU) filtration and tighter filters at various locations in the fabs.

To use the filter for maximum length of time without negative impact on wafer defect and polishing performance, an optimum filter lifetime detection method is recommended. To ensure precise slurry dispense, CMP users are implementing newer devices at POU branch such as flow controllers, pressure transducers and dispense pumps. These devices consume pressure.

Considering this, and using various filter characterization methods, several design advantages of a new POU filter have been compared with the well-established Entegris POU filters; the new **Solaris® CL** is capable of achieving *particle removal performance at lower pressure drop for longer period of time*.

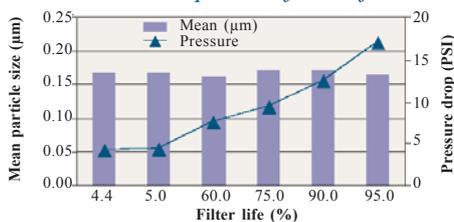
### Retention efficiency

Typically depth media is rated on removal efficiency of test dust standards. Using these test dust as standards, a very high removal efficiency number can be achieved, but it is not a true representative of slurry particle distribution. For providing retention rating of CMP Filters, Entegris uses PSL (Polystyrene Latex) beads, which are also mostly used as calibration standards for liquid particle counters.

When comparing Solaris® CL 1.0 µm and “classical” Solaris® 1.0-1.5 µm, the two filters have a similar retention efficiency of 0.99 µm PSL beads (55-60 %) with a flow resistance more than 4 times higher for the first generation of Solaris® (1.1 against 4.8 psi/l.mirr<sup>1</sup>).

### Mean particle size distribution over Solaris® CL disposable filter lifetime

Pressure drop and mean particle size over Solaris® CL disposable filter lifetime



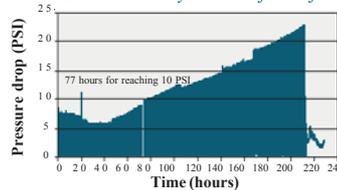
As Solaris® CL disposable filter gets plugged or loaded with particles over time, there is no negative impact on slurry mean particle size. This suggests that filter plugging should not have any

negative impact on polishing performance (MRR).

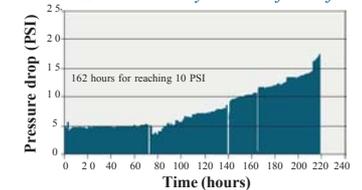
### Relative lifetime of Solaris® CL 1.0 and Solaris® 01 disposable filters in recirculation mode

There is rapid increase in pressure drop with Solaris® 01 disposable filter design, while pressure drop increase in Solaris® CL 1.0 disposable filter is slower at the beginning, ensuring a better flow and longer lifetime.

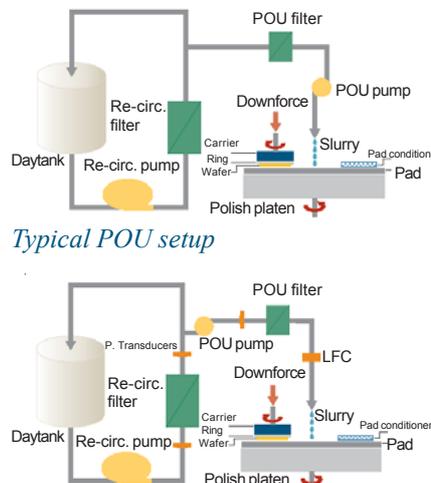
Pressure drop profile of Solaris® 01 filter with 12% silica slurry over the filter life



Pressure drop profile of Solaris® CL 1.0 filter with 12% silica slurry over the filter life



### Recommended POU configuration for accurate filter life monitoring



Suggested POU setup

For filter lifetime monitoring, the key is to have precise sensitivity to filter loading. For CMP applications, maintaining precise slurry dispense is a primary goal. By analyzing historical pressure drop data, filter can be used to its maximum lifetime before it reaches the saturation with loading and has impact on flow rate decrease.

Without pressure drop monitoring, direct impact of decrease in system pressure can be seen on the dispense rate. This could result in scrap wafer. Pressure drop and flow signals should be utilized as a part of process control loop for maintaining constant flow rate during the planarization process. With this control loop, CMP users can adjust their system pressure if needed and the filter can be used for a longer period of time. This reduces the change-out frequency, minimizing the tool downtime cost. In addition to implementing these steps, installing a filter such as **Solaris® CL** will further enhance filter lifetime and allow meeting the lower cost of ownership model. ■

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