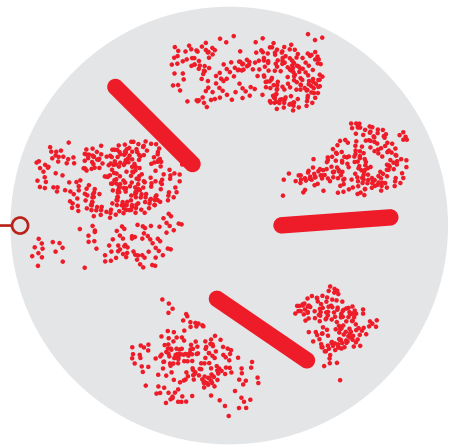
Hiding in Plain Sight

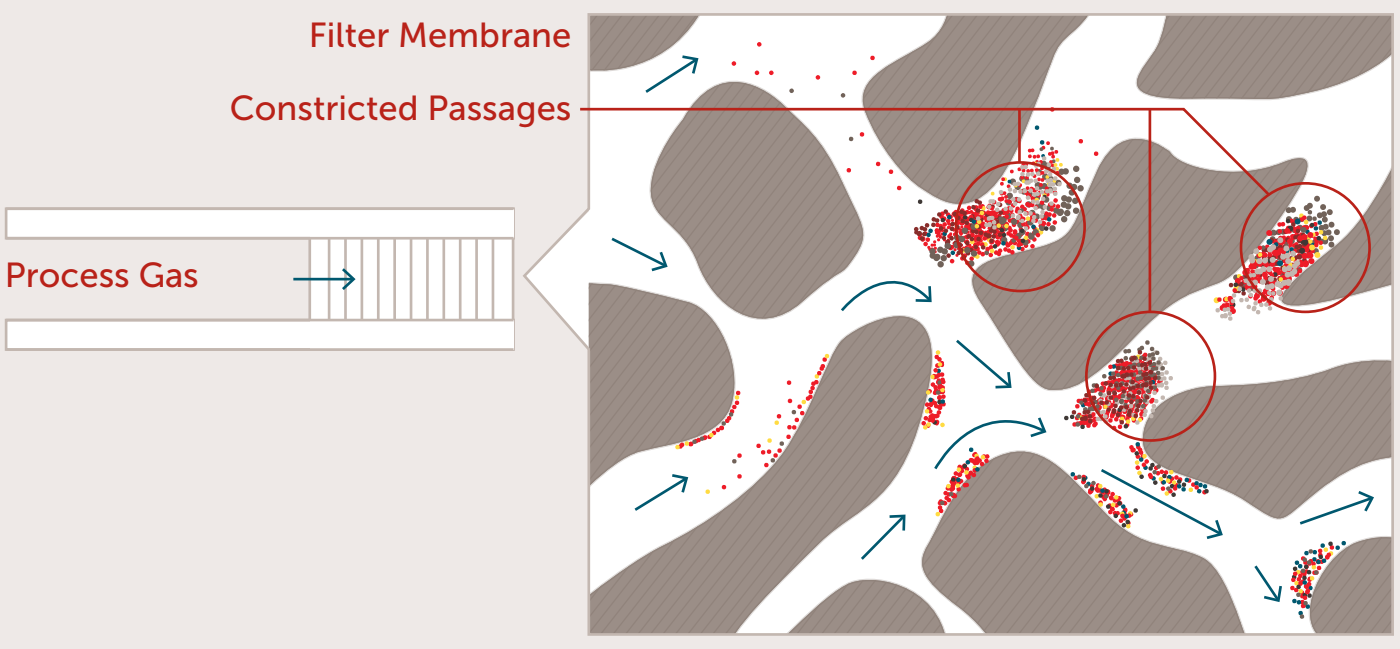
Understanding Gas Filtration to Reduce Defectivity



For a semiconductor fab, a **contaminated wafer** is a mystery to be solved. The impact on wafer yield and device performance is significant. In this case, the combination of an aged gas filter in an automated delivery system are prime suspects.

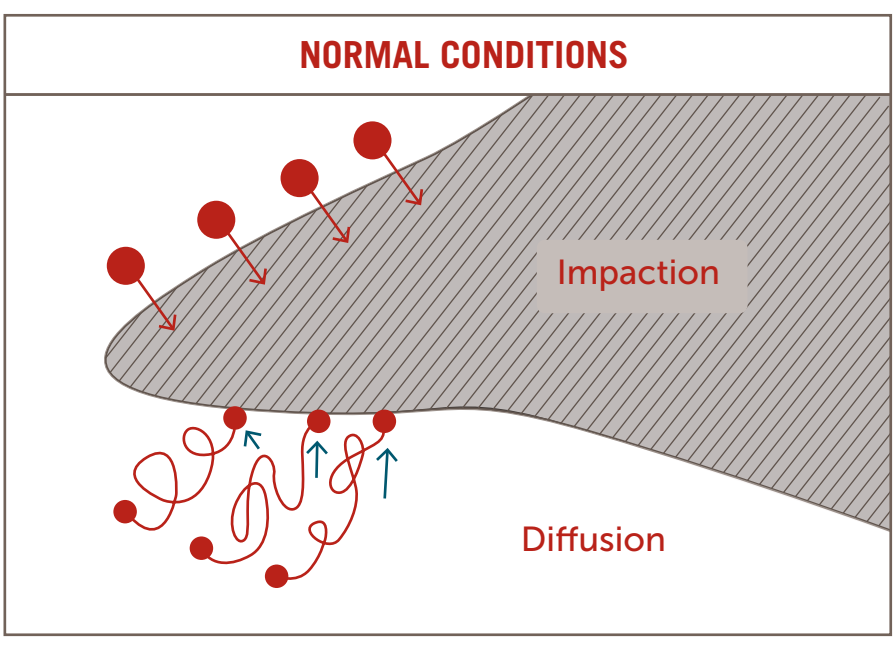
STEP 1: GAS FLOW MECHANICS IN FILTERS

Filters have a finite lifetime as particles accumulate on the membrane. This lifetime will be determined by the level of contaminants introduced by the process gas over time.



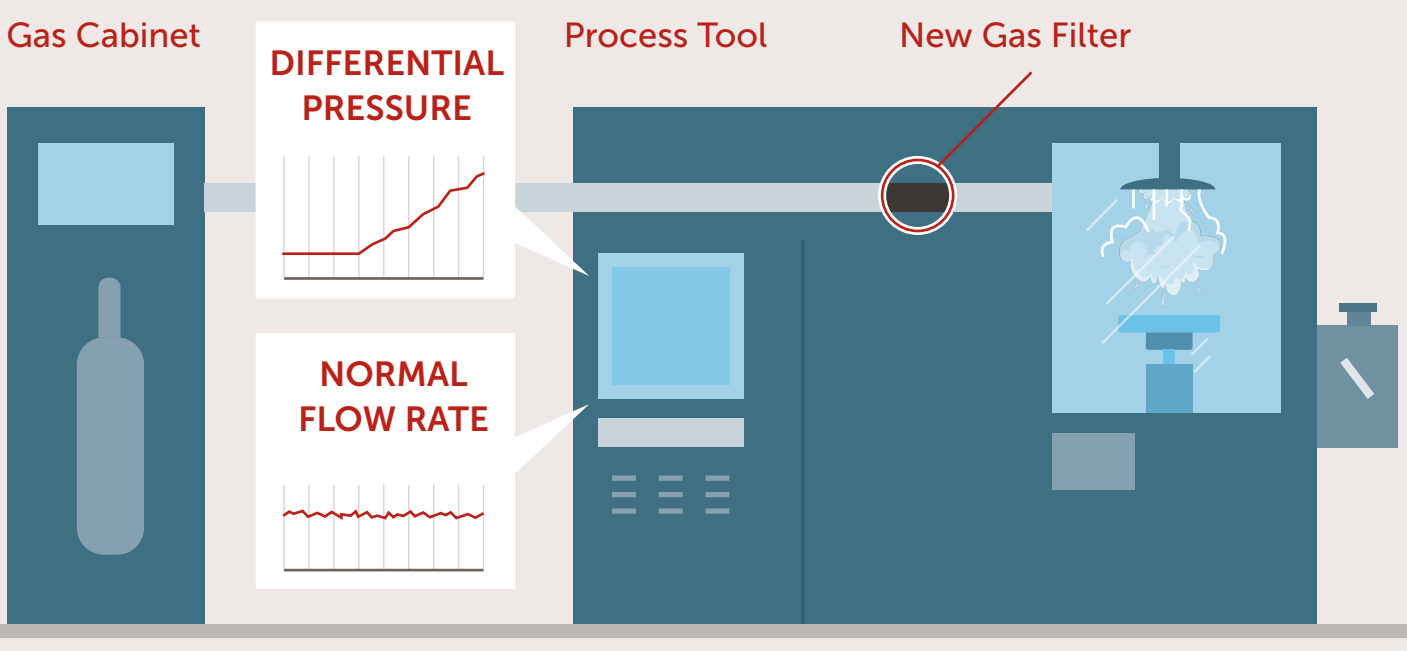
STEP 2: PARTICLE CAPTURE

Tiny particles are removed from the gas stream through a combination of inertial impaction, adhesion through weak chemical bonds called Van Der Waals forces, and diffusion where the tiniest particles are caught in Brownian motion.

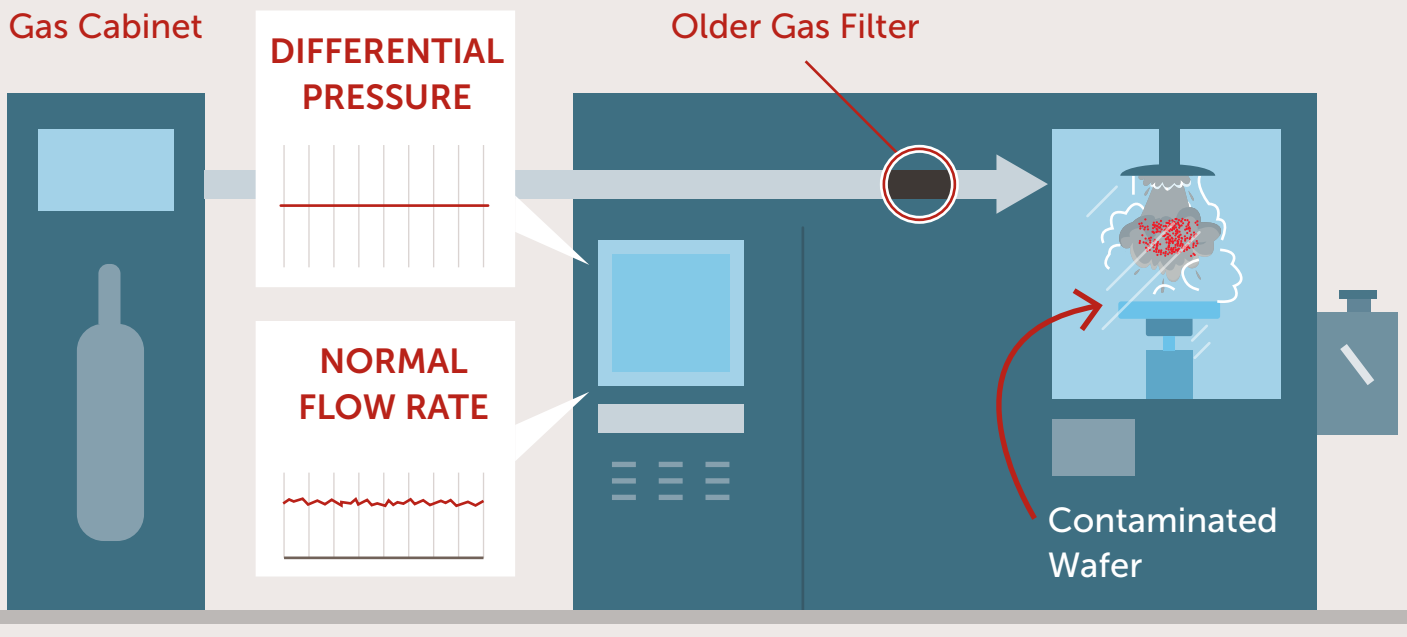


STEP 3: PRESSURE DROP AND AN AUTOMATED RESPONSE

As particles accumulate over time, differential pressure increases as constriction points develop. In an automated response, pressure increases to maintain flow rates to a chamber.

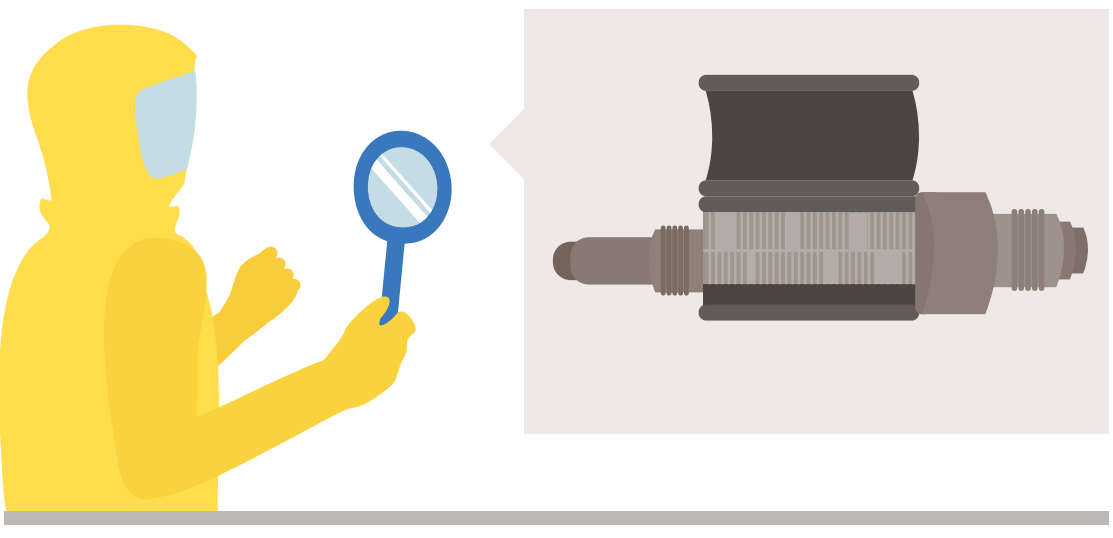


The system senses that the gas flow rate has been maintained and no risk exists. However, as pressure increases and gas velocity increases through the remaining open pores, the risk of particle liftoff increases. These particles may pass to the wafer and could be carried through further process steps, leading to wafer defects that weaken device performance.



SOLUTION: REPLACE YOUR FILTERS!

All filters, including gas filters have a useful lifetime. Using them beyond that lifetime or in an application beyond the filter's capability may actually do more harm than good. Replacing filters during scheduled downtime is the surest way to prevent costly yield excursions.



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