

Getting it Right from
the Start...that's
Optimization
Particle Contamination



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(A member of Darco Water Technologies Limited)



Effective Particle Contamination Control Key to High Volume Semiconductor Fab Yield.

A clean, contamination free semiconductor wafer processing environment is critical to maximize yield. As wafer circuitry and geometries shrink, particles becomes more likely to cause defects and yield loss. Particles are generated during wafer processing by equipment components movement, wafer handling, excessive vibration, or any process irregularity that can all contribute to defects.

The reduction or eliminating of particle contaminants is an important step in tool qualification and chip manufacturing monitoring. Semiconductor tool operators must identify particles inside fab tools, as well as wafer storage and transport environments for optimum operating conditions.

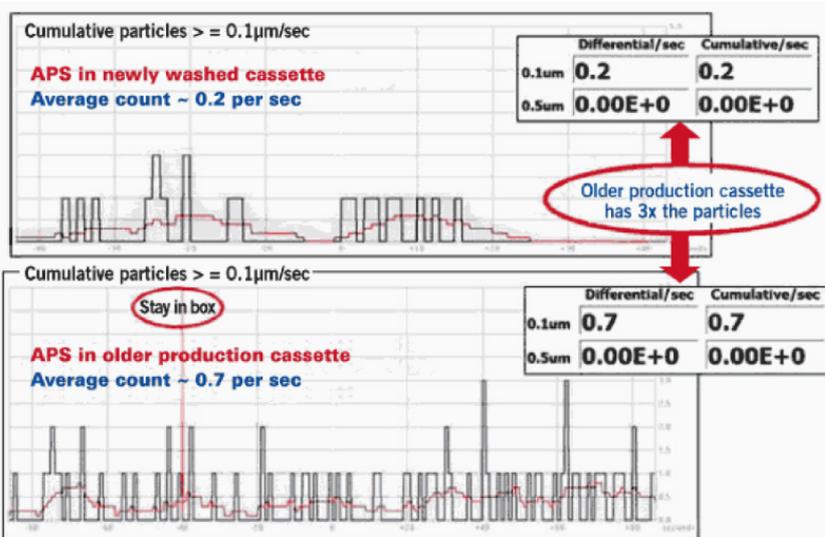


Figure 2. APS test results when comparing newly washed cassette vs. older production cassette in new lot box. Results show that cassettes remaining in production too long have excessive particles.

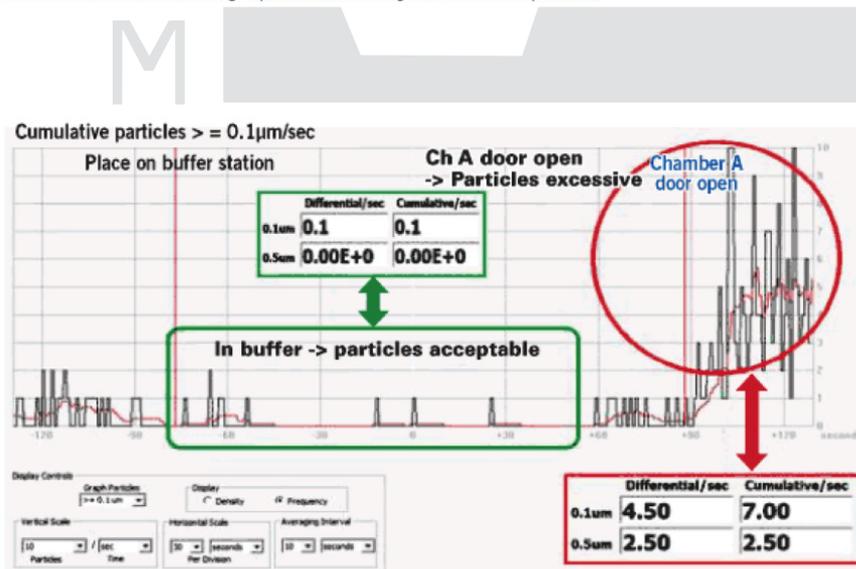


Figure 3. The APS discovers the source of particle contamination within a 300mm fab in real-time.

Hence, it is most important to have a Contamination Control Vacuum System which is designed to effectively capture such particles.

The use of small regenerative or side channels exhauster which is station close to the source of dust generation is a popular method. This is because it is simple and an economical way.

However, this is more of a wishful thinking contributed partly by traditional approach that it will do the job right. Traditional approach which had been used in time where contaminants particle are NOT so small.

The inability of a small filter system that can be effective to capture such particle is one of the key reason.

Particles smaller than 1 micron do not follow the lines of flow around the filter fibre. They are influenced by the Brownian motion of the air molecules, ie: they are made to vibrate by the air molecules and attach to the filter fibre if they come into contact with them.

The probability of the particles coming into contact with the fibres increases as velocity, particle diameter and fibre diameter decreases.

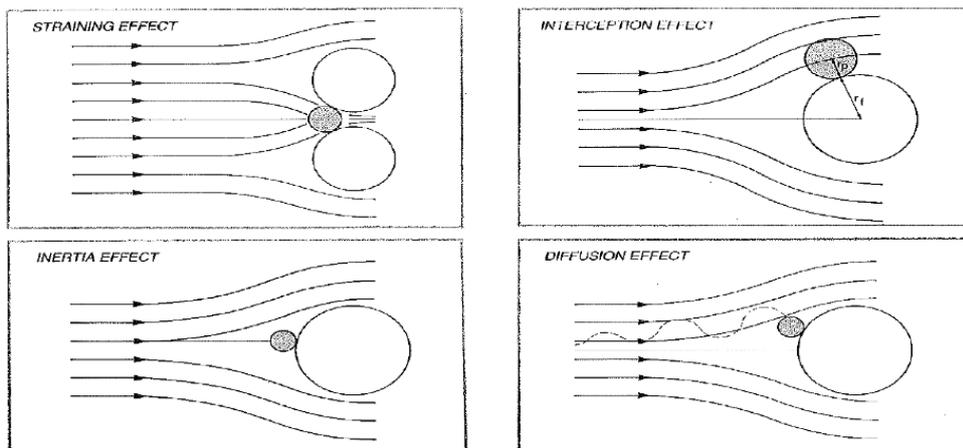


Fig. 5 Particle collection as achieved by different filtration effects.

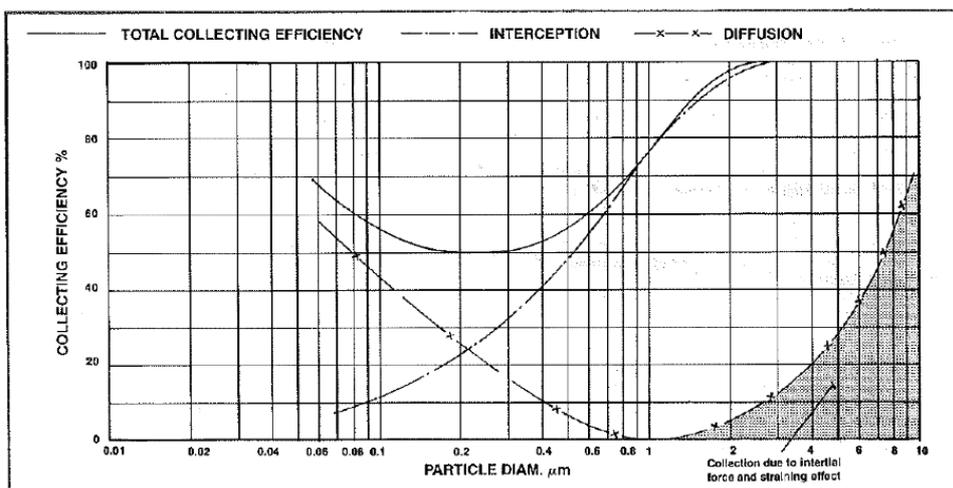


Fig. 6. Influence of filtration effect and particle size on collecting efficiency of fine filter with glass fibre mat.

Therefore, it is wishful thinking that a small filter cartridge at the inlet or exhaust of the local exhauster will be able to capture these particles.

In actual fact, these particles escape the local exhauster together with its exhaust which disturb the flow condition of the clean room too.

In some situations, people realize this and decided to pipe the exhaust from these local exhauster out of the cleanroom.

The unfortunate things is that such exhauster are usually considered to be a differential pressure machine. In other words, the total static at the exhaust side and inlet side had to be considered in order for it to work properly.

For example, if the suction at the point requires about 2"Hg Vac with a suction flow of 100 scfm, the exhauster cannot be selected based on this alone. The static loses causes by the 100 scfm in the exhaust pipe of it have to be taken into consideration.

Otherwise, there will be a reduced capability at the suction.

PV Contamination Control Vacuum System does not have these problems. In fact, it is especially designed or developed to solve these constraints in Modern High Volume Semiconductor Plant.

PV Contamination Control Vacuum System, effectively ensure that the appropriate vacuum required for suction is continuously maintain at the source of dust/particle generation. Capture particle are conveyed at the appropriate conveying velocity within duct/pipe to a Central Filter Separator, where the particle can be effectively capture using the correct technology, before the air leave via the Exhauster to outside the factory.

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