

SIDEPAK™ AM520 AND AM520i PERSONAL AEROSOL MONITOR CYCLONE AND IMPACTOR PENETRATION EFFICIENCY CURVES

APPLICATION NOTE EXPMN-012 (A4)

The SidePak™ AM520 and AM520i Personal Aerosol Monitors are designed to use different size-selective inlets to attain specific mass fractions for the sampled aerosol. The TSI SidePak model AM520 and AM520i Personal Aerosol Monitor kits include a 0.8 µm cyclone for Diesel Particulate Matter (DPM), a Dorr-Oliver Cyclone for respirable(4 µm) size fraction, and single stage impactors for PM₁, PM_{2.5}, PM₅ (China Respirable), and PM₁₀. These cyclones and impactors are designed to provide the specified cut size at a constant flow rate of 1.7 L/min.

The single stage impactors use an impaction disk made of sintered metal soaked with a few drops of impactor oil. Impactor oil has much lower viscosity than grease. Capillary action will wet the particles deposited on the impactor disk and eliminate particle bounce, even after the impactor disk is coated with particles and continues to load during sampling.. The oil saturated sintered impactor disk design of the SidePak AM520 and AM520i monitor allows much larger particle mass loading and longer sampling times.

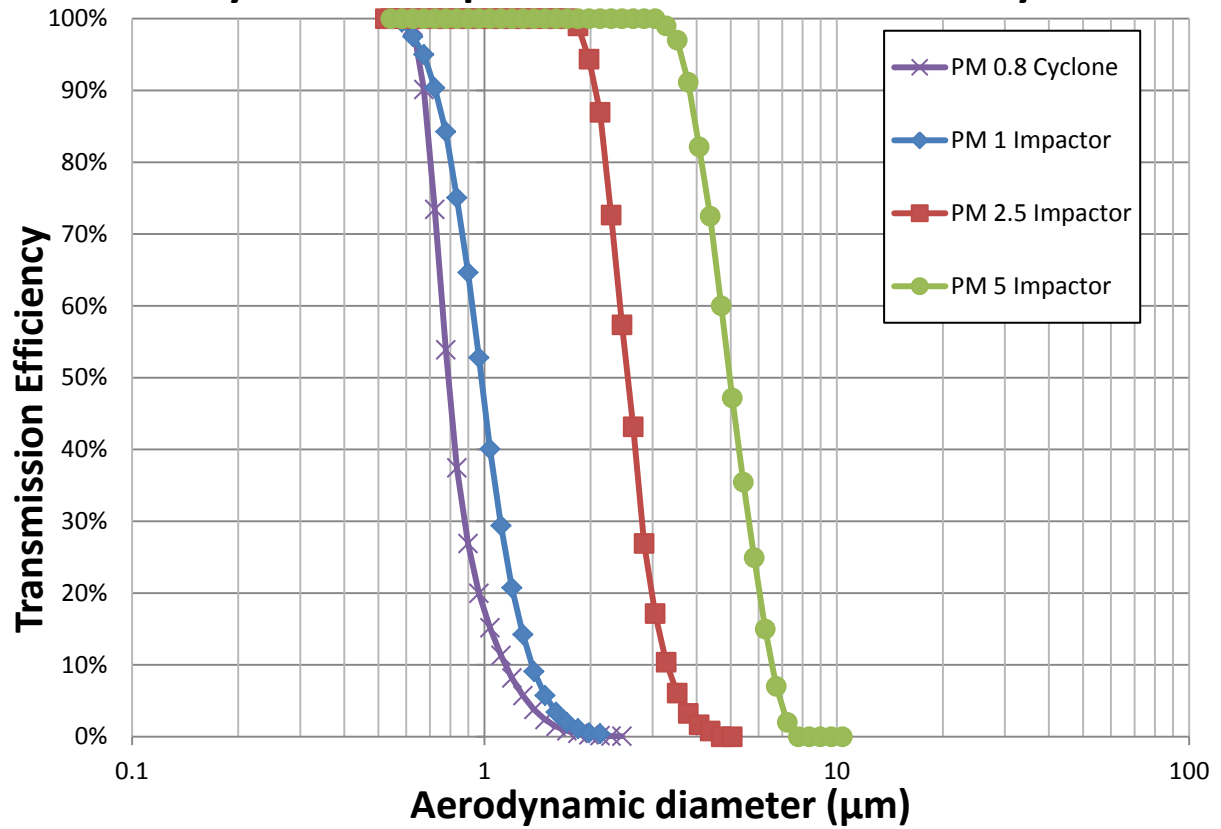
The Diesel Particulate Matter cyclone uses a 0.8 µm cyclone coupled with a Dorr-Oliver cyclone. The upstream Dorr-Oliver Cyclone effectively filters out particles larger than 4 µm. The 0.8 µm DPM cyclone effectively filters out the remaining particles that are larger than 0.8 µm. This design increases loading capacity by preventing large particles from clogging the inlet of the 0.8 µm DPM cyclone. The result is the first real-time DPM measurement using a 0.8 µm cyclone.

The performance of the 0.8 µm DPM cyclone and impactors was characterized using ISO Fine Test Dust 12103-1, A2 (aka A2 Test Dust), along with a TSI Aerodynamic Particle Sizer® APS™ Spectrometer Model 3321. The test dust is aerosolized using the TSI Fluidized Bed Aerosol Generator Model 3400A. The cyclone and impactor penetration efficiency curves are shown below.

Note: *PM₁₀ impactor was also designed using the same design principles as the other impactors. However, no data exists because of the difficulty of generating polydisperse particles greater than 10 µm for a sustained period of time.*



Cyclone & Impactor Penetration Efficiency



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