

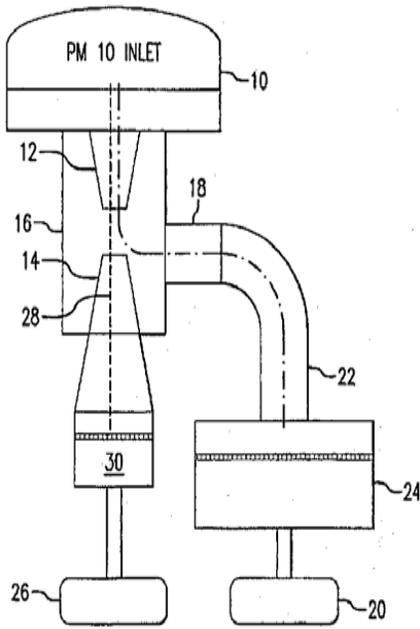
Multi-Filter Coarse Particle Chemical Speciation Sampler Using Virtual

Objective: Develop a Coarse Particle Chemical Speciation Sampler to Obtain Filter Samplers Similar to the Current Fine Particle Chemical Speciation Sampler Used In EPA's Fine Particle Monitoring Network with the Goal of Obtaining a Nearly Complete Mass Balance on the Collected Coarse PM

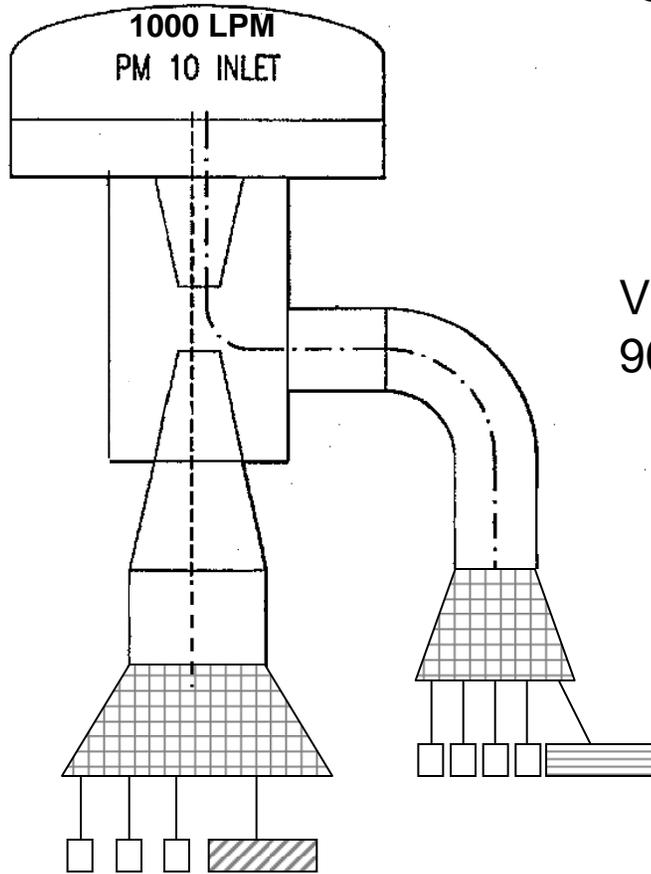
Design

- **Premise**
 - Need to Separate Fine and Coarse Particles for All the Usual Reason
 - Better Understand Health Effects of PM_c vs PM_f
 - Source Apportionment
 - Not Mixing Fine and Coarse Chemistry (fine acidic, coarse basic)
 - Obtain Separation with a Virtual Impactor
 - Design Around the Current PM_c and PM_f FRM Flow Rates (16.7 LPM), Option for 6.7 LPM to Match the Current MetOne PM_f Speciation Sampler
 - Include Design Flexibility for Additional Measurements
- **Flexibility**
 - Allows Multiple Filters, Denuders, Back Up Filters as Needed to Minimize Interferences
 - Bypass Allows for Large Samples to Be Collected for Toxicological Testing, Organic Speciation, Trace and Ultra-Trace Metals Speciation, Including Valance States
 - Virtual Impactor Can Have 5% Coarse, 95% Fine to Minimize Gas Phase Artifacts on Coarse Filter*

Modified Sampler for PMc Chemical Speciation General Schematic



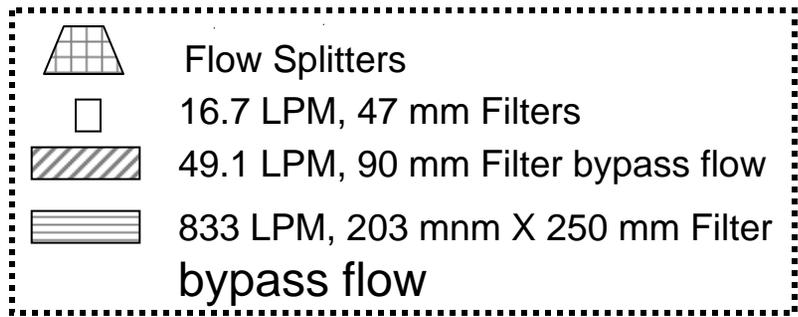
Existing Commercial High Volume Fine and Coarse Sampler Based on Virtual Impaction



Virtual Impactor
90% Fine, 10% Coarse*

Fine Particles

Coarse Particles



Design and Evaluation by Clarkson University and U.S. EPA Underway Currently.

Commercialization by Greentech Environmental. Available Prototype for OAQPS Testing, May 15, 2009