Recent Inlet Developments

13th Annual AMS Users Meeting
10/13/2012

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Inlet to transmit particles > 1 μm in diameter:
- Critical orifice holder
- Relaxation chamber
- Custom valve
- Aerodynamic lens
  - Higher pressure keeps larger particles flowing with gas streamlines
  - Achieve higher pressure with smaller apertures/exit nozzle
Transmission Efficiency measured with size selected particles and PSLs.
Williams et al., 2012

But, very difficult to machine
• 3 out of 18 function well, another 2 are ok
• Swiss machinists are the best!
CFD modeling \(\rightarrow\) semi-analytical model \(\rightarrow\) new design for standard lens.

Larger particles lost at 2\textsuperscript{nd} and 3\textsuperscript{rd} aperture.
TE on large particle side starts to drop at 2.5 microns. Small particle side about the same as published standard lens, not quite as good as current standard lens with shorter vacuum chamber.

Velocity curve does not flatten at large sizes the way the HP lens does.
Lens alignment -- different size particles (300 nm to 2.5 micron) focus in roughly the same place!

Two worrisome details:
• The lens is off center with respect to the vacuum chamber centerline.
• Large NaNO3 particles are breaking up. See in both pToF and LS, so not something about the vaporizer.

Next steps:
• Test with new critical orifice holder, relaxation chamber and valve
• Improve machining – better small particle transmission, better alignment