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SEED PARTICLE GENERATION
BY THE MODEL 9302
ATOMIZER

The model 9302 aerosol generator is specifically designed to generate particles in droplet and solid forms, for LDV and PIV applications. The generator can be used to disperse various types of matter, including water droplets, salt or sugar particles, polystyrene latex particles and oil droplets.

Principle of Operation

A supply of laboratory compressed air is connected directly to the input of its built-in pressure regulator; the pressure gauge shows the air pressure at the output side of the pressure regulator. In this aerosol generator, the compressed air expands through a small orifice (0.5 millimeter in diameter) in the form of a high velocity jet located in the jet-nozzle assembly. The jet creates an area of low pressure near the orifice which, in turn, causes the liquid in the reservoir to be sucked up into the orifice. The liquid is then broken into tiny liquid droplets and the compressed air carries the droplets through the outlet tube.

Connect the ¼-inch-diameter (6.35 mm) compressed air hose to your laboratory air supply. Fill the reservoir half-full with the selected liquid. Set the pressure regulator to 25 pounds per square inch (172 kPa). The aerosol output rate is a function of the pressure setting and the atomizer can be operated at any pressure between five and 55 pounds per square inch (34 and 379 kPa, respectively). The table below shows the relationship between pressure, as indicated by the pressure gauge and output rate.

Relationship Between Input Pressure and Aerosol Output Rate		
Pressure		Aerosol Output
psi	kPa	L/min
5	34.5	2.4
10	68.9	3.7
15	103	4.7
20	138	5.7
25	172	6.6
35	241	8.3
45	310	10.2
55	379	12.0

Generating Water Droplets

The most common way to use the atomizer is to generate water droplets by filling the liquid reservoir with tap water. The diameter of the water droplets at the outlet depends on the pressure setting—droplet diameter decreases with increased pressure. A setting of 25 pounds per square inch (172 kPa) will yield a number mean diameter of approximately 1.5 micrometers

Generating Salt or Sugar Particles

The atomizer generates solid particles from water-soluble materials such as salt or sugar. Fill the reservoir with an aqueous solution of the desired material. The atomizer will then generate droplets of that solution. Smaller diameter particles of the solute will result if sufficient time is allotted, allowing the water to evaporate from the droplets. The resultant particle size depends on the concentration of the solute in the solution.

Dispersing Polystyrene Latex Particles

A common method of generating monodisperse aerosols is to atomize a hydrosol that contains monodisperse particles. For this application, add a drop of monodisperse particles to one liter of distilled water in the reservoir. Such a large dilution is necessary to ensure that each droplet contains only one polystyrene latex particle. The atomizer output must be mixed with a large volume of dry air. When all the water from these droplets is evaporated, polystyrene latex particles of the original diameter are obtained.

Generating Oil Droplets

The atomizer can also generate particles from silicon oil, dioctyl phthalate and various vegetable oils such as corn and peanut oil. To generate these particles, fill the reservoir with the selected oil. The diameter of the droplets depends on the setting of the pressure regulator. For a setting of 25 pounds per square inch (172 kPa), the number mean diameter of the particles will be approximately 0.8 micrometer.

Adjusting the Dilution Air

A rough-adjustment screw allows some of the pressure to bleed off as dilution air. (This is useful if the seeding concentration is too high.) Now, a portion of the pressure drop is across the nozzle and the rest of the pressure drop is across an orifice that supplies dilution air to the flow and decreases the concentration of particles out of the larger exit nozzle.

The rough adjustment screw is factory-set to provide no dilution air. To change this setting, follow these steps:

1. Remove the plastic reservoir bowl from the bottom of the atomizer.

2. Located along the outside diameter of the black aluminum cylinder (attached to the plastic cap) is a no. 10-32 setscrew. Turn it counterclockwise to open the orifice for dilution. Since slight rotation increases the dilution air substantially, withdraw the setscrew slowly. Several adjustments may be necessary before you achieve the correct particle density. Again, this adjustment is useful only if you want to decrease the particle concentration at the exit of the nozzle. This feature may be useful if you are looking at signals from the flow produced by the Atomizer.

3. To shut off the dilution air flow, turn the setscrew clockwise and tighten firmly.