Generation and droplets size distribution of propylene glycol/water dissolution used as tracer particle for PIV measurements in air

M. Legrand¹, J. Nogueira⁰, P.A. Rodriguez¹, A. Lecuona¹, R. Jimenez¹
1: Dept. of Thermal and Fluids Engineering, Universidad Carlos III de Madrid, Spain
* Correspondent author: mlegrand@ing.uc3m.es

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HIGHLIGHTS

• Generation of micrometric droplets from propylene glycol/water dissolution.
• Harmless to health alternative for particle tracer seeding.
• Droplet size distribution measured by means of laser diffraction technique (Malvern Spraytech®)
• Narrow banded droplet size distribution: ~1.5 µm.
• Deliver suitable seeding for PIV up to 0.2 kg/s air

ABSTRACT

This work proposes a simple alternative to current designs of liquid seeding generators into air, usually used in Particle Image Velocimetry (PIV), or other tracer particles based optical measurements. Air is injected inside a propylene glycol – water mixture through 0.5 mm discharging orifices bubbling in the solution. This fluid presents the advantage of being food-grade and harmless to health, according to literature. In addition, the characteristic time of evaporation of the residues is in the order of hours, so that lesser concern about cleaning or protecting delicate devices subjected to settling is needed, compared with other fluids like oil. Droplet size distribution at the outlet of the seeding generator is performed by means of a laser diffraction analyzer Malvern Spraytech®. Measurements reveal narrow-band, single distribution micrometric droplet sizes, suitable for seeding highly turbulent air flows. The study shows that the volumetric concentration of the tracer particles in the generated aerosol is almost independent on feeding air pressure, thus allowing to easily control the seeding density.

![Fig. 1](image)

Fig. 1 Droplet size volumetric distribution varying propylene glycol mass concentration in water $y_{PG} = [60\%, 100\%]$ and feeding pressure $P = [1, 2, 4]$ barg. $h = 6$ cm. Left: pdf distribution; Right: cumulative distribution.