



Image Credit: NASA

## TECHNOLOGY SOLUTION

### Instrumentation

# Generation of Polystyrene Latex Spheres with Incorporated Fluorescent Dyes

[Use in wind tunnel experiments to monitor airflow](#)

Polymeric particles are used extensively for seeding airflows in wind tunnels, biological and histological staining, among other applications. For wind tunnel applications, particle image velocimetry is often used to determine the interaction of various models and surfaces with surrounding airflows. Measurements near the wall are particularly relevant and unfortunately exceptionally challenging due to the large level of background noise arising from reflection of incident light off the surface of the model being studied. Thus, the ability to seed the airflow with a material that can be used to accurately portray the airflow properties (i.e., minimal particle lag) while enabling near wall measurements with improved signal to noise ratio is of high interest to wind tunnel researchers.

#### BENEFITS

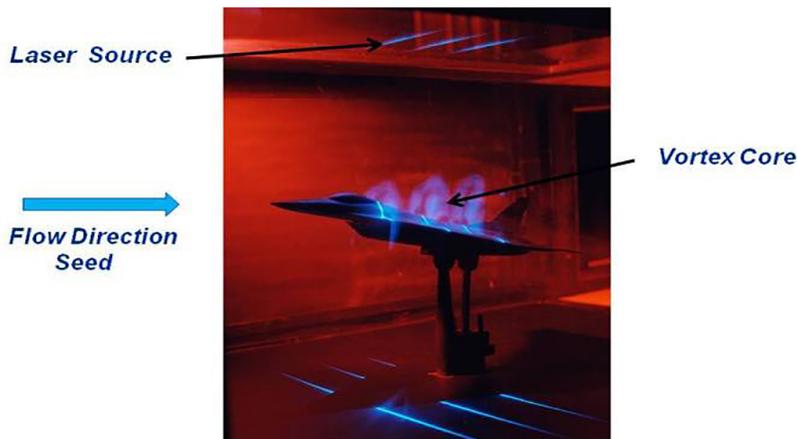
- Enables measurements closer to surfaces
- Enables simultaneous measurement of velocity and temperature
- Enables simultaneous measurement of pressure
- Direct visualization of 2 or more fluid flows mixing



## THE TECHNOLOGY

Although polystyrene microspheres are often the seed material of choice for subsonic airflow studies. These seed materials, however, do not provide any benefit for near wall measurements compared to other state-of-the-art seed materials. Consequently, in this innovation NASA scientists have developed this method of generating dye-doped polystyrene microspheres using novel synthetic approaches.

The novel features of this invention are the utility of specific chemical functionalities, monomeric species, environmental additives (buffers), and polyelectrolytes to promote incorporation of dye molecules into developing polystyrene microspheres while enabling control of the spectral properties of the dye relative to pH dependence. These particles will have great utility for wind tunnel measurements near the wall where the state-of-the-art seed materials are not able to collect data. Additionally, the incorporation of these dyes will offer other avenues of data collection including temperature and pressure of the airflows and wind tunnel regions. Likewise, the ability to selectively filter the data collected from these dye-doped polystyrene microspheres can have further applications including the direct visualization of 2 or more fluid flows mixing, among other applications.



Laser air flow shown with micro-spheres. Image Credit: NASA

## APPLICATIONS

The technology has several potential applications:

- Seed materials for wind tunnel applications
- Staining of histological or other biological sample
- Time-delayed drug release
- A broad variety of government-sponsored research projects and high impact academic research to new product development and process innovation in industry, across a wide variety of applications and disciplines

## PUBLICATIONS

Patent No: 9,957,336; 10,669,360; 9,550,873