Particle In Cell Consulting LLC

Contamination Transport Simulation Program

CTSP (Contamination Transport Simulation Program) is a PIC-C developed Microsoft Windows / Linux code for simulating a wide range of free molecular flow and particulate transport phenomena. Typical applications include:

- Modeling molecular contaminant transport during thermal vacuum bakeout or on-orbit operations
- Simulating particulate fallout in cleanrooms or within launch vehicle fairings
- Analyzing pumping speed and pressure distribution inside a vacuum chamber
- Simulating purge flows and chamber repressurization

CTSP is based on methods common in rarefied gas modeling such as PIC and DSMC and concurrently models the entire contaminant population. The code can thus take into account external forces and inter-particle interactions. This also allows the end user to generate plots of contaminant plume density. Features include:

- Support for complex, multi-million element triangular and/or quadrilateral surface meshes in common formats such as UNV, Abaqus, OBJ, TSS, and STL
- Implementation of a detailed surface model with all objects consisting of a bulk and a surface region, with each containing an arbitrary mixture of trapped materials
- Molecular adhesion controlled by material activation energy and surface temperature
- Particulate release fraction based on published experimental data with user defined coefficient of restitution controlling particle bounciness
- Dynamic world environments with time-varying gravitational acceleration, pressure, and temperatures
- Support for point sources based on analytical effusion and plume models
- Spatially varying data can be loaded to take into account aerodynamic drag, electrostatic return, or radiation solar pressure
- Simulation results include: surface element level variation of molecular film height and particulate percent area coverage; volumetric gas partial pressures and bulk velocities; particle traces and scatter plots; and global time varying data on total deposited mass in various surface zones. Results in Tecplot or Paraview format.

About PIC-C: Particle in Cell Consulting LLC is a small Los Angeles based firm providing services to the electric propulsion, space environment, and contamination control communities. We specialize in: performing molecular and particulate contamination transport analyses for vacuum or aerospace industries; simulating pumping speed and pressure distribution in vacuum chambers; modeling particle-based instruments such as ion spectrometers, and developing plasma simulation codes for modeling electric propulsion devices.

For more information, visit:
https://www.particleincell.com/ctsp/
or contact us at info@particleincell.com