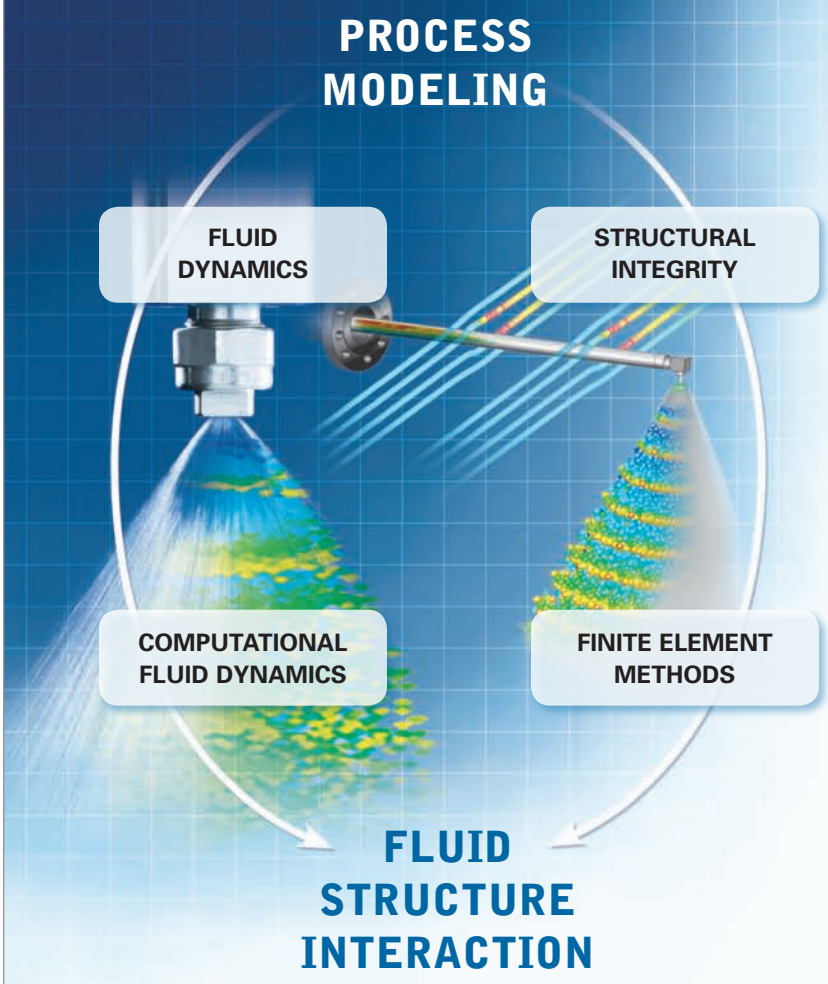
Spray Analysis
and Research Services
From *Spraying Systems Co.*

Optimizing Spray Performance with Process Modeling



Simulation of spray environment and operating conditions validates performance and structural integrity of fabricated components.

Benefits

- Eliminates unanticipated problems caused by process conditions in spray applications
- Validates spray and injector performance when physical testing is not feasible
  - In complex applications, scale, safety issues and structure size often prohibit accurate physical testing
- Allows efficient examination of different spray solutions and variations in operating conditions to optimize performance
- Examines the interaction between fluid dynamics and structural integrity to determine Fluid Structure Interaction (FSI)
  - Fluid dynamics studies simulate all aspects of spraying based on pre-determined operating conditions:
    - Fluid delivery systems
    - Nozzle characteristics such as atomization
    - Mass transfer (evaporation)
    - Heat transfer (cooling)
    - Gas species (mixing)
  - Structural integrity modeling uses Finite Element Methods (FEM) to evaluate mechanical stresses to determine:
    - Proper materials
    - Resistance to thermal stresses
    - Ability to withstand high loads and pressures
    - Ability to withstand vibration caused by turbulence
    - Corrosion resistance
    - Safety measures

Typical Applications

- Gas Conditioning
- HVAC
- Web Coating
- Spray Drying

Spraying Systems Co.®
Experts in Spray Technology

Spray Nozzles | Spray Control | Spray Analysis | Spray Fabrication

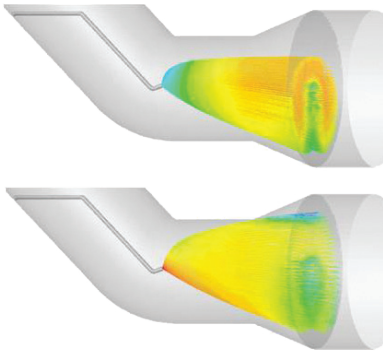
Problem-Solving with Process Modeling

Computational Fluid Dynamics (CFD)

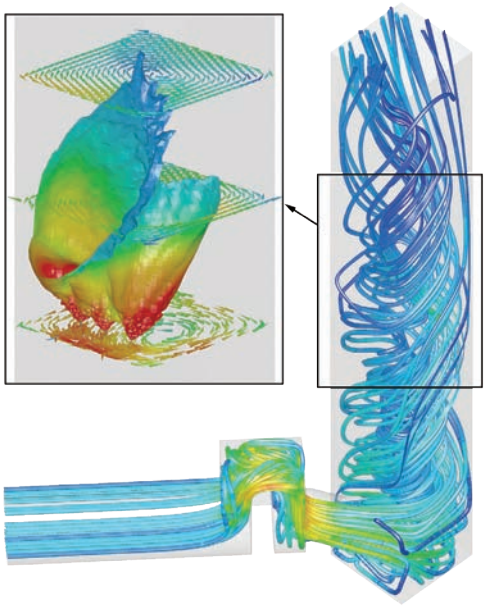
Used to analyze:

- Liquid and gas flow in scrubbers, towers, ducts and dryers
- Internal flow characteristics in spray nozzles
- Gas and liquid mixing in two-fluid nozzles
- Wall impact and shadowing

CFD models illustrate flow patterns of droplets and their velocities at two different spraying conditions.



Spray plume formation caused by swirling flue gas inside cooling tower.

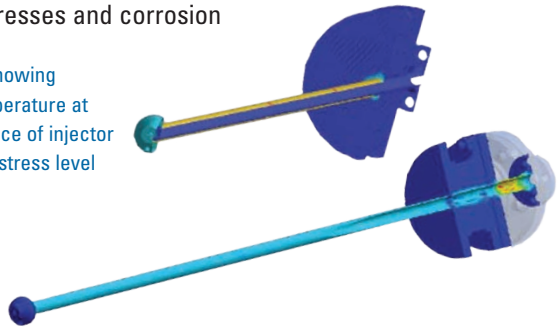


Finite Element Methods (FEM)

Used to analyze:

- Spray injector design
- Material suitability with effects of pressure loads, thermal stresses and corrosion

FEM models showing maximum temperature at the outer surface of injector and maximum stress level on injector.

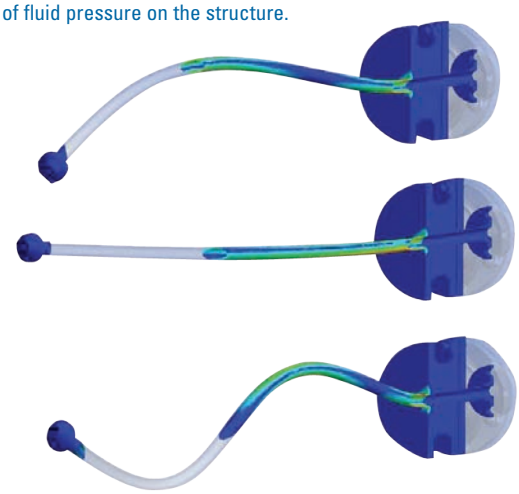


Fluid Structure Interaction (FSI)

Used to analyze:

- The interaction between fluid flow at given conditions and the affected solid structure
- Vibration analysis, thermal failure, fatigue
- What-if scenarios to determine the effects of various design parameters or process condition changes

Modal analysis of mechanical design showing stresses caused by vibration which are represented as fluctuations of fluid pressure on the structure.



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