CFD Software for Airflow Simulation in a Clean Room

by

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Electronics Manufacturing (1/4)

Cleanroom: 104 m x 52 m x 3 m
Electronics Manufacturing (2/4)
> 800 Air-inlets
> 40 Air-outlets
• **CFD software for cleanroom:**
  – CAMETA version 2.0
  – Time-independent (steady-state) solution
  – Three-dimensional domain
  – Cartesian coordinate system

• **Two-equation turbulence models**
  – Low-Re $k-\varepsilon$ model (Launder-Sharma)

• **Physical quantity of interest:**
  – Airflow velocity
“CAMETA” CFD Software (2/6)

- Cleanroom test case

1. Wind channel
2. Light
3. HEPA (High Efficiency Particulate Air Filters)
4. Air return
5. Workbench
6. Laminar flow hood
“CAMETA” CFD Software (3/6)

- Cleanroom test case: $z = -1.7 \text{ m}$
"CAMETA" CFD Software (4/6)

- Cleanroom test case: \( z = -4.8 \text{ m} \)
• Cleanroom test case: $y = 0.6 \text{ m}$
• Cleanroom test case: $y = 1.0 \text{ m}$
How is CAMETA validated? (1/9)

• Commercial CFD software:
  – FLUENT version 6.1.22
  – Structured & uniform grid
  – Unstructured & non-uniform grid

• Two-equation turbulence models
  – High-Re $k-\varepsilon$ models (Standard, RNG, Realizable)
  – High-Re $k-\omega$ models (Standard, SST)
  – Wall functions (Standard, Non-equilibrium, Enhanced)
• **FLUENT**: Structured & uniform grid
How is *CAMETA* validated? (3/9)

- **FLUENT**: Unstructured & non-uniform grid
How is CAMETA validated? (4/9)

- **FLUENT:** Structured & uniform grid
How is CAMETA validated? (5/9)

- FLUENT: Unstructured & non-uniform grid
How is CAMETA validated? (6/9)

- **FLUENT**: Structured & uniform grid
How is *CAMETA* validated? (7/9)

- **FLUENT:** Unstructured & non-uniform grid
How is *CAMETA* validated? (8/9)

- **FLUENT**: Structured & uniform grid
How is \textit{CAMETA} validated? (9/9)

\textbf{• FLUENT: Unstructured & non-uniform grid}

![Graph showing velocity magnitude](attachment:graph.png)
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Thank you for your interest