Donaldson
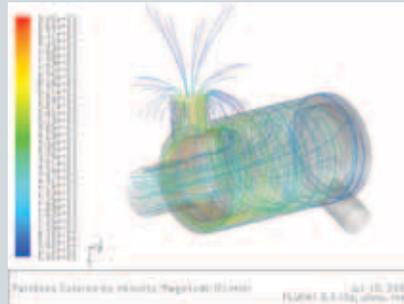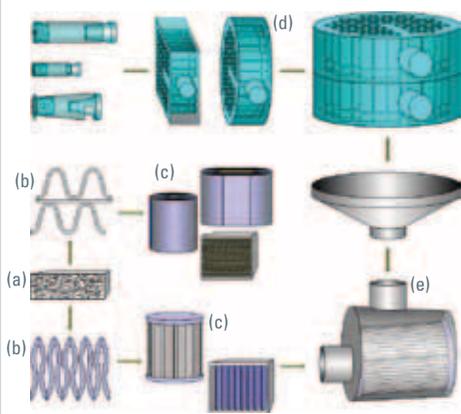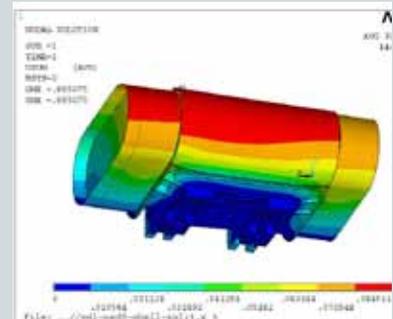FILTRATION SOLUTIONS

Prediction, Simulation & Analytical

$$E_I \propto St / (2Ku^2)$$

$$Pe^{-1} = \left[\frac{(1/2)\, rms\ Brownian\ displacement}{fiber\ diameter}\right]^2 = \frac{D}{D_f U}$$

Modeling Capability

- Proprietary, internally developed filter modeling software (Design Tool)
  - Allows performance predictions based on design variables
- Theoretical modeling based on
  - Fundamental filtration theory
  - Propriety advanced filtration theory
  - Fundamental fluid mechanics
  - Computational fluid dynamic methods
- Scope
  - Filter media definition (a) and configuration (b)
  - Filter configuration (c)
  - Inertial separation configuration (d)
  - System configuration (e)
  - Environmental conditions
  - Validated with lab testing

Flow

FLUENT

- Computational fluid dynamics (CFD)
- Predicts airflow performance of components, including:
  - fluid flow, pressure loss, flow distributions, velocity distribution

MACROFLOW

- Predicts performance of systems by component
- Predicts fluid flow, pressure loss, flow velocity, flow rates, heat transfer rates
- Considers transient and steady-state flow

Structural

- ANYSYS® and Abaqus™
- Finite Element Analysis (FEA)
- Stress analysis on components
- Modal sweep analysis to assess resonant frequencies

Acoustics

COMET

- Acoustic modeling software
- Enable prediction of transmission loss
- Considers impact of shell noise from system surfaces
- Includes impact of shell material
- Works in conjunction with ANSYS

Particle Characterization

- Scanning Electron Microscope
- Automated Particle Sizing and Counting
- Energy Dispersive Spectroscopy

Chemical Analysis Laboratory

- Temperature Programmed Desorption (TPD; TGA-MS) - loading and desorption profiles as a function of temperature
- Liquid Chromatography, Gas Phase
- Gas Chromatography-mass Spectrometry (GC-MS)
- Fourier Transform Infrared Spectroscopy (FTIR)
- Thermogravimetric Analysis (TGA)
- Differential Scanning Calorimetry (DSC)
- Breakthrough Test Benches
  - NO_x bench conducts dynamic evaluation of NO_x loading and regeneration
  - Ammonia bench used for dynamic evaluation of NH_3 loading and regeneration
  - Sulfur dioxide bench performs dynamic evaluation of SO_2 loading and regeneration.
  - VOC's bench dynamic evaluation of NO_x loading and regeneration

Acoustical Analysis

HEMI-ANECHOIC CHAMBERS (2)

- Used for transmission loss analysis

HEAD® ACOUSTICS

- Used for sound quality analysis
- Identifies objectionable sounds to human hearing

IN-CAB ACOUSTICS

- Allows analysis of in-cab noise based on cab design
- Considers affects of noise frequency

United States	**South Africa**
Canada	**South East Asia**
Mexico	**Greater China**
Latin America	**Japan**
Caribbean	**Australia**
Brazil	**India**
Europe	

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FILTRATION SOLUTIONS