Donaldson is an established leader in the development of advanced air filtration intake systems for original equipment manufacturers.

With locations throughout the world, we have the people, tools, and experience to develop and deliver unique and high performance concepts that enhance your equipment designs.
Markets Served
- Medium- and Heavy-duty Truck and Bus
- Construction
- Industrial
- Mining
- Agriculture
- High Performance Automotive
- Military/Defense

Technology
- PowerCore™ Filtration Technology
- Ultra-Web® Nanofiber Filtration Technology
- Pleatloc® Media Spacing
- Radial Seal Sealing

Products
- PowerCore™ Air Cleaners
- Spiracle™ filtration system for open and closed engine crankcase ventilation
- Radial Seal Air Cleaners
  - EPG, ERA, EPG, ERB, FKB, FPG, FRG, XRB, SSG, SPB, SRB
- Disposable Air Cleaners
  - DuraLite™ Air Cleaners (ECB, ECC, ECD models)
- Axial Seal Air Cleaners
  - EBA & ECG Konepac™, EBB, FLB, FTG, FVG, STG, STB, SRG
- Cabin Air Ventilation Filters
- Pulse Jet Air Cleaner (PJAC™), V-Pac™
- Intake Accessories
  - Hoods, pre-cleaners, TopSpin™ pre-cleaner, filter service indicators, Informer™, elbows, moisture eliminators, breathers, Donaspin™ pre-cleaner

Aftermarket Experience
- Differentiated designs to retain aftermarket revenue
- Route to market through OE Dealer networks
- Donaldson brand products available for engine/vehicle applications
**Wide Selection**
- Proprietary formulations
- Cellulose, synthetic, blends and specialty
- Media types available for:
  - Primary filters
  - Safety filters
  - Cabin vent filters
  - Flame retardant applications

**Media Characterization Testing**
- Permeability
- Efficiency
- Submicron loading (soot)
- Tensile strength
- Burst strength
- Basis weight
- Thickness
- Stiffness

**In-House Media Capabilities**
- Wet-laid media production
  - For application development
  - Trial media runs
  - Development of proprietary formulations
- Ultra-Web media production

**Filter Performance**
- Efficiency testing
  - gravimetric
  - fractional
- Capacity testing per ISO5011, SAE J726
Development Tools
Prediction & Simulation

Modeling Capability
- Proprietary, internally developed filter modeling software
  - 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
  - Media fiber definition (a)
  - Media configuration (b)
  - Element configuration (c)
  - Inertial separation configuration (d)
  - System configuration (e)
  - Environmental conditions
  - Validated against lab testing

Flow
FLUENT
- Computational fluid dynamics (CFD)
- Predicts performance of components
- Predicts fluid flow, pressure loss, flow distribution, 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
Ansys and Abaqus
- Finite Element Analysis (FEA)
- Stress analysis on components
- Modal sweep analysis to assess resonance issue

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

\[ P_e^{-1} = \left( \frac{1}{2} \text{rms Brownian displacement} \right)^2 = \frac{D}{D_U} \]

\[ E_1 \propto \frac{St}{(2Ku^2)} \]
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
  - NOx bench conducts dynamic evaluation of NOx loading and regeneration
  - Ammonia bench used for dynamic evaluation of NH3 loading and regeneration
  - Sulfur dioxide bench performs dynamic evaluation of SO2 loading and regeneration.
  - VOC's bench dynamic evaluation of NOx 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
Development Tools
Prototype & Performance Testing

Air Test Labs
- Test facilities in U.S., Europe and Asia
- Environmentally-controlled test conditions
- Efficiency, capacity, pressure loss, water separation testing
- Capabilities to 28,000 CFM (793 m²/min)
- Automatic flow control and data acquisition
- Multiple standardized contaminants
- Multiple contaminant feed systems

Crankcase Ventilation Tests
- Flat sheet scale ambient temperature bench
- Filter scale ambient temperature bench
- Filter scale elevated temperature benches
- Generate proposed ISO standard aerosol
- Measure efficiency vs. particle size vs. time
- Measure filter differential pressure vs. time

Soot Loading Bench
- Use highly controlled diesel engine exhaust to measure soot loading capacity and retention of media

Prototype capabilities
- Media hand sheet prototyping
- Rapid prototyping: 3-D Printer (project team can go from concept to testable plastic parts overnight)
- Machining: cutting, bending, turning and welding of plastics, steel, aluminum and stainless. Computerized plasma cutting station
- Vacuum forming
- Element fabrication
Test and Evaluation

Vibration Tables
- Used to stress hardware to assess durability
- Applies sine, random, shock or computerized vibration profiles
- Capability to conduct hot or cold test
- Capability to test under flow conditions
- Multiple tests cells - U.S. and Europe

Tensile/Compression Tester
- Used to test material, component and assembly properties

Temperature Chambers
- Allows testing at hot or cold temperature, with humidity control
- Static or temp/RH cycles

Design Validation / Field Test

Variety of Vehicles
- Medium- and Heavy-duty Truck and Bus, Construction, Industrial, Mining, Agriculture, Military/Defense

Extreme Geography and Climate
- Extreme hot and cold climates
  - Arizona summers to Minnesota winters
- High and low altitudes

Data Collection
- Filter weight
- Visual and mechanical inspection
- Collect run-time data from data logger
- Operational check

Performance Monitoring
- Telemetry data acquisition with GPS for real-time data collection
Production Facilities

Locations
- United States, Mexico, Europe, Asia-Pacific, South America, India, South Africa and Australia
- Located strategically with global partners

Quality Certification
- All global facilities are ISO/TS certified (refer to Donaldson web site for complete listing)

A History of Innovation

- 1910's first air cleaner “the Twister” designed for Bull Tractor Co.
- 1930s - Oil-washed air cleaners introduced to Ford, Caterpillar and John Deere.
- 1940's Donaldson supplies air filters to the U.S. Army
- 1950s Donaldson introduces the first dry-type air cleaner.
- 1960s - Donaldson expands operations to Japan, Belgium, Australia, S. Africa and France
- 1980s - Pleatloc® and fine fiber filtration and urethane filters introduced
- 1990s - PowerCore® technology introduced in engine air applications

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