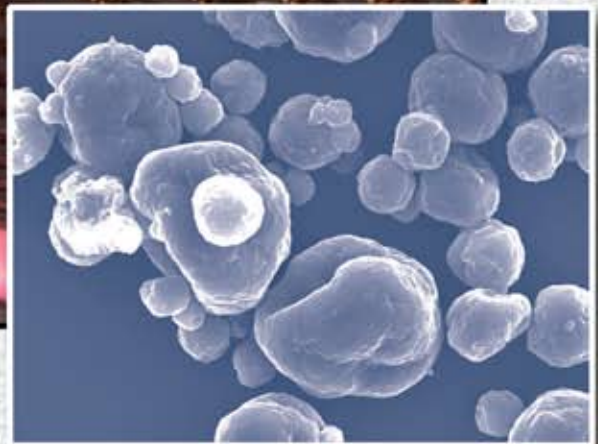
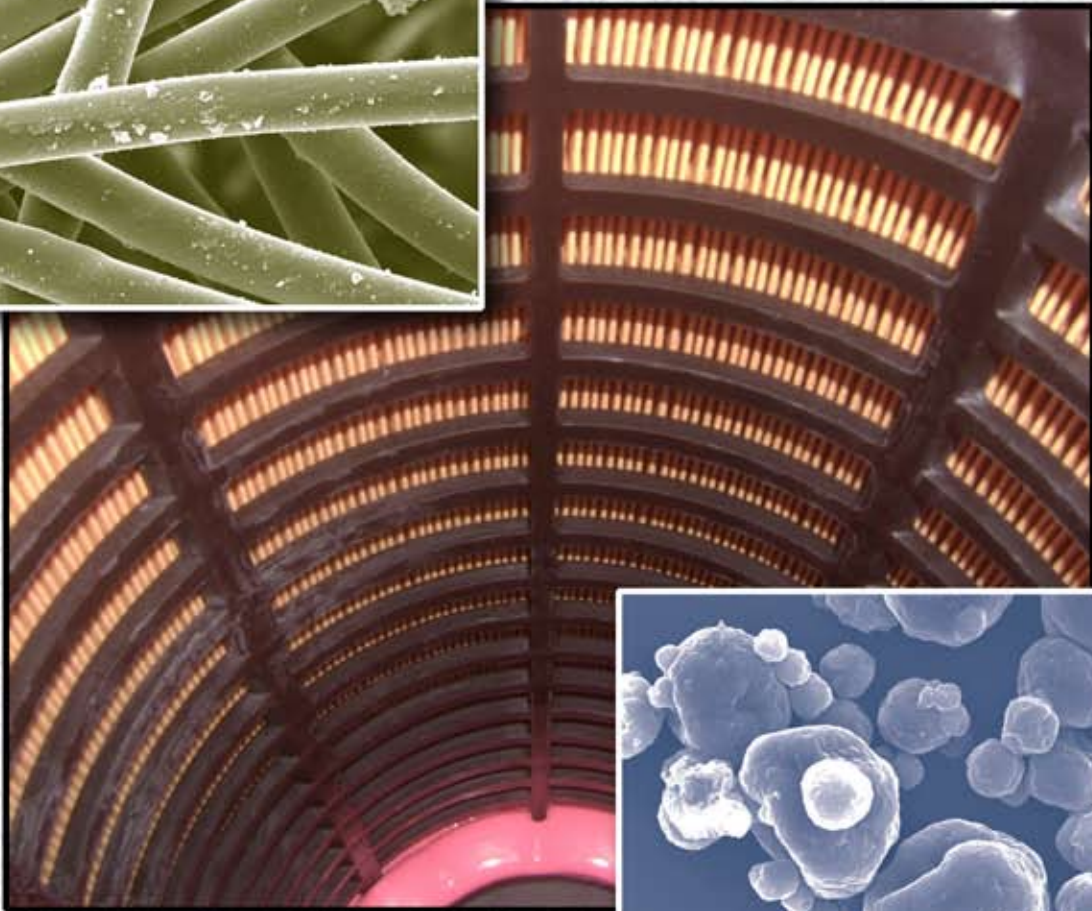
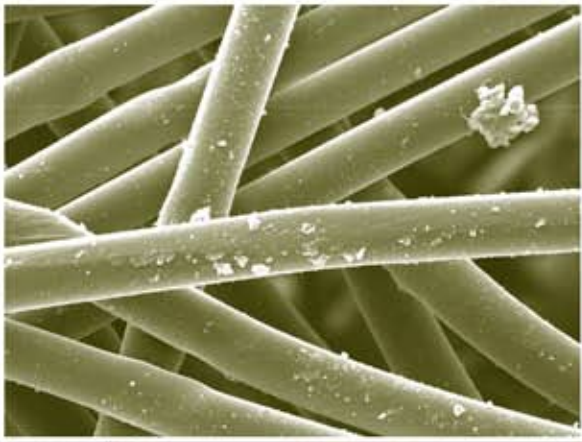


Filtration and Fine Particle Technology



Southwest Research Institute®
San Antonio, Texas

Founded in 1947 as an independent, nonprofit research and development organization, Southwest Research Institute provides a significant research, engineering and testing resource for industry, business and government. SwRI's 12 technical divisions, ranging from automobile research and space science to bioengineering and intelligent systems, *swri.org*, use a multidisciplinary, integrated approach to solve complex problems in science and applied technology. As part of a long-held tradition, patent rights arising from sponsored research at the Institute are often assigned to the client. SwRI generally retains the rights to Institute-funded advancements.

For almost 50 years, Southwest Research Institute® (SwRI®) has been involved in filtration and fine particle technology, serving commercial, industrial and military clients worldwide. The Institute performs evaluations in accordance with industry, military, and commercial standards and specifications. While SwRI has extensive experience and has a major focus in evaluating automotive and heavy-duty vehicle air filters, Institute engineers and technicians also perform evaluations for a large range of filters and applications, including the development and testing of novel technologies.

SwRI provides research, development and evaluation services in:

- Air filters and filtration systems
- Automotive air induction systems and components
- Filter qualification to industry, military and government specifications
- Mechanical pre-cleaners and inertial separators
- Engine intake air/water spray separation testing
- Failure analysis of air filters, systems and components
- Smaller-scale wind tunnel testing using blowing dust and water sprays
- Contamination sensitivity assessment of mechanical and electrical systems and components
- Structural integrity of filtration systems and components (combined vibration and thermal cycling)
- Field testing to develop vibration spectra for laboratory filter testing
- Air filter test stand development and fabrication
- Air filter laboratory design, layout and equipment specification
- Evaluation of equipment protection from blowing and settling dust and blowing sand

A motor scooter and anthropomorphic dummy are prepped prior to dust testing.



DO 15544



DO 17342

A small-scale wind tunnel is used for water spray testing of a motor scooter.

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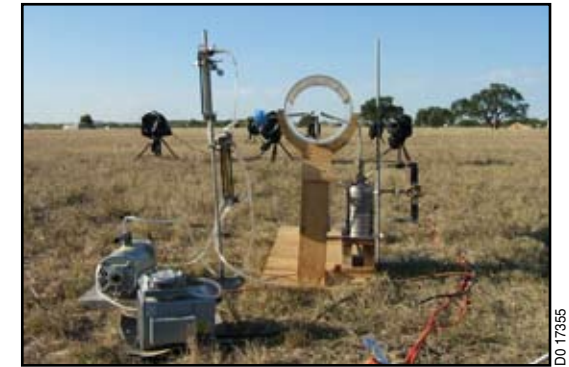
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More research, development and evaluation services provided by SwRI:

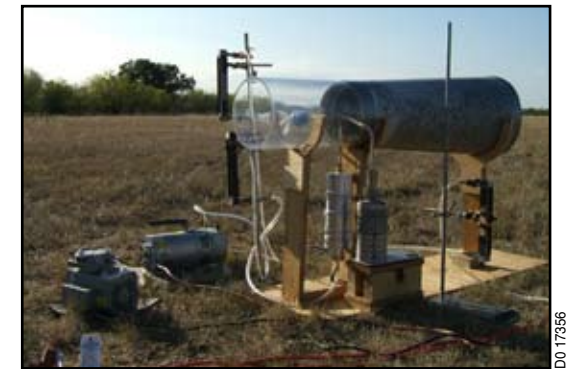
- Novel filtration technologies
- Filtration specification development
- Filtration sensor system development
- Aerosol technology and mechanics
- Aerosol sampler development and analysis
- Particle transport and multi-phase flows
- Small particle interactions and mass transfer
- Low and zero gravity separation studies and technology investigations
- Dispersion studies using bioaerosol simulants and tracers
- Near-field particle transport and dispersion
- Real-time wear measurement in operating engines and mechanical systems
- Thermal efficiency and heat rejection evaluation of air and liquid-side heat exchangers and radiators

In addition to qualification and third-party comparative testing, Institute laboratory and field evaluation programs are implemented to support component and systems research and development. These programs aid in developing strategies to solve specific filtration problems.

SwRI engineers also perform assessments of filtration levels on operating equipment and component life, including radioactive tracer technology assessments.



DO 17355



DO 17356

A wind tunnel, sampling probes and aerodynamic particle size analyzers are used to obtain particle size distribution data and to size specific samples for laboratory culturing during near-field dispersion testing.



DO 17357

A simulated bio agent is dispersed and carried by the wind into the inlet of a wind tunnel and high-volume air samplers during near-field dispersion studies.

Filtration Systems Development and Evaluation

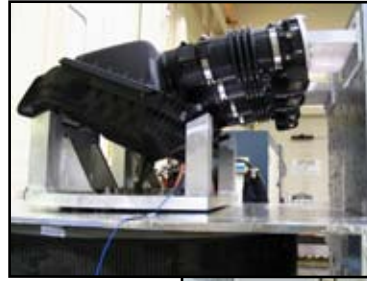
SwRI maintains a modern air filter research and testing facility for air filter and air cleaner systems research, development and evaluation. Work ranges from basic research in particle mechanics and aerosol science, to qualification testing to industry, commercial and military specifications. Capabilities range from bench top stands of a few cubic feet per minute (cfm) to primary flow stands of up to 4,500 cfm.

The laboratory's environment is humidity and temperature controlled. Its modular design accommodates a variety of test setups and equipment configurations. Analysis and experimentation are accomplished using a variety of dusts and challenge contaminants, depending on client requirements and objectives. Efficiency measurements are based on gravimetric analysis, aerodynamic impactor data, and upstream and downstream optical particle counting.

Air filtration work at the Institute is supported by other on-site facilities with capabilities in dry and wet chemistry, optical and scanning electron microscopy, combined vibration evaluation and temperature cycling, flammability and smoke measurement, mechanical integrity and material properties determination, and environmental conditioning. Field testing is also accomplished to examine real-world problems and obtain actual real-world data.

Laboratory and field program support includes:

- Performing qualification and third-party comparative evaluations
- Providing component and systems research and development
- Aiding in developing strategies for demonstrating specific levels of performance
- Solving specific problems



D0 17343

SwRI conducts environmental testing of automotive air induction systems (unit enclosed in thermal chamber for combined thermal cycling and vibration testing).



DE131509



DE131333

An Institute technician replaces a heavy-duty air filter element during a laboratory test.

- Performing standardized tests to manufacturer, industry, government and military specifications
- Developing and implementing specialized test plans
- Advancing knowledge and understanding
- Providing filtration efficiency, dust capacity and life measurement

Qualification testing to specifications include:

- Industry
- Automotive and heavy-duty vehicles: ISO 5011, SAE J726, and JIS D 1612 plus OEM specifications and standards
- Nuclear
- Power plant
- Gas turbine
- Railroad
- Military
- Tactical and combat vehicles (developmental, conformance, verification and first article testing): MIL-PRF-62048C and MIL-PRF-46736E

Fine Particle Technology

Capabilities in fine particle technology include:

- Ultrasonic nucleation and agglomeration of bubbles in liquids and agglomeration of particles in gases
- Particle transport and deposition in piping systems and near-field open spaces
- Engine wear as a function of concentration and size distribution of ingested dust
- Component operability in adverse environments
- Dust ingestion contamination studies
- Structural integrity testing of air induction systems and components
- System and component failure mode analysis
- Particle transport, deposition and multi-phase flows
- Particle sizing and analysis
- Specification development
- Automotive and heavy-duty air filtration
- Off-highway and severe dust evaluations
- Filter failure analysis
- Environmental testing and evaluations
- Dust and small particle analysis
- Small particle interactions and mass transfer
- Agglomeration
- Coalescence
- Coagulation
- Condensation
- Low and zero gravity separations
- Product design and redesign



D0 17344



D0 17345

SwRI engineers conduct detailed laboratory testing of novel air filtration technologies.



D0 17346

Institute engineers perform examinations and failure analysis of heavy-duty air filter elements.

Air Filter Laboratory and Test Stand Design, Development & Fabrication

Institute engineers develop, design and fabricate air filter test stands for industry and government clients worldwide. These stands include:

- Semi-automatic operation with real-time display
- Closed loop control of dust feeding and airflow management
- Post-test report generation

Institute engineers also provide laboratory design, layout and equipment specification services.

Institute engineers perform evaluations of automotive and heavy-duty engine and vehicle air filtration components and systems, including testing, analysis and design with emphasis on real-world operation and real-life laboratory simulation.

SwRI performs laboratory testing of used and new radiator cores, including heat transfer calculations and analysis. Contamination analysis, testing, modeling and simulation methodologies are significant. Technical strengths include real-time engine and mechanical system wear measurement, test system development, and laboratory design, layout and equipment specification, as well as filtration and environmental testing.

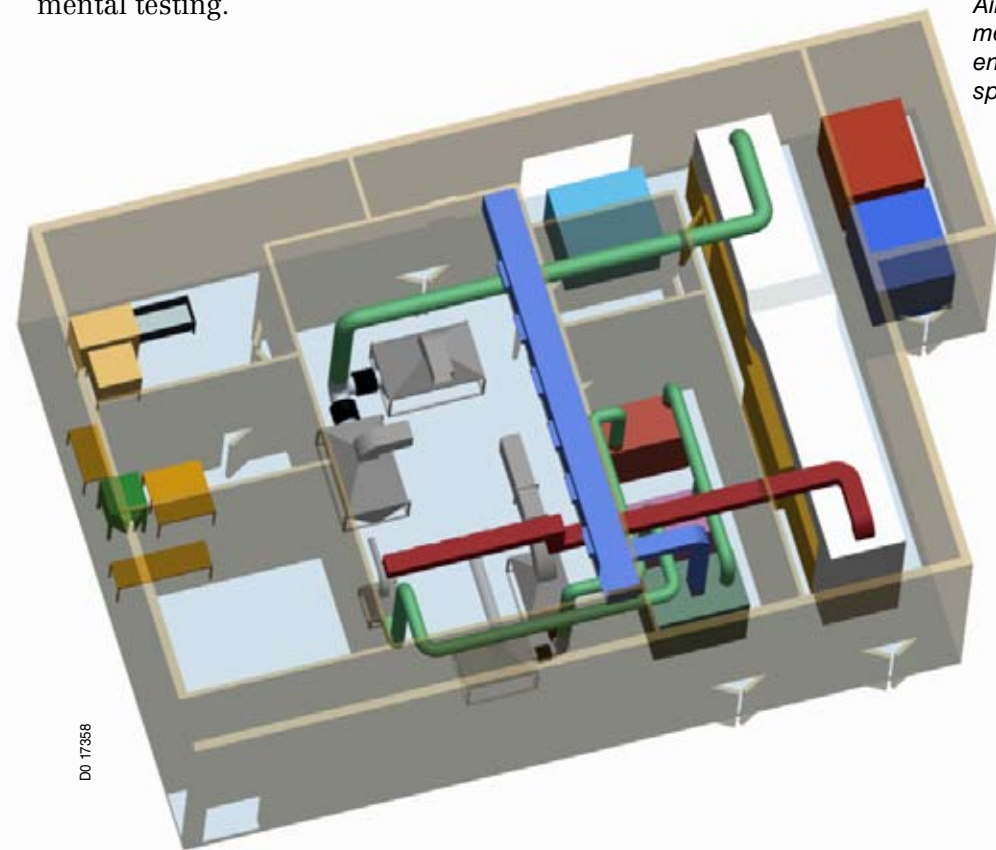


DO 17352



DO 17353

Air filter test stand design, development and fabrication capabilities enable custom designs to meet specific client requirements.



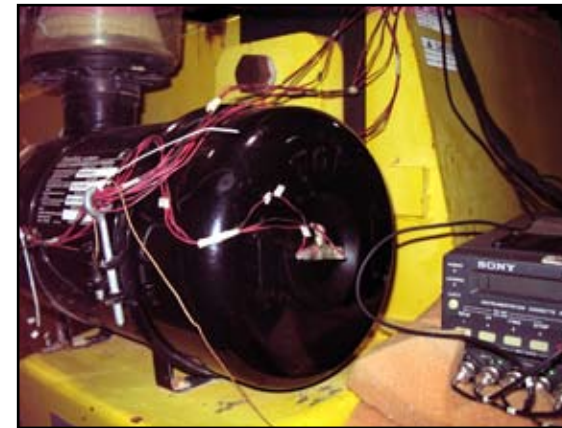
DO 17358

SwRI engineers designed the air filter laboratory for the U.S. Army TARDEC Ground Systems Power and Energy Laboratory (GSPEL) with flow bench capabilities from 50 cfm to 12,000 cfm.

Equipment Capabilities

A variety of state-of-the-art equipment is available, including:

- Four primary test stands with capability to 4500 scfm
- Isokinetic sampling
- Optical particle counting (0.3–10 μm)
- Air cleaners, elements, flat sheets and components
- Multi- and single-stage systems
- Materials lab, high-resolution optical and SEM examination and photography
- Radiator/heat exchanger test loop



DO 17347

Institute engineers apply instrumentation to a filter housing for field testing of construction equipment to develop vibration spectra.

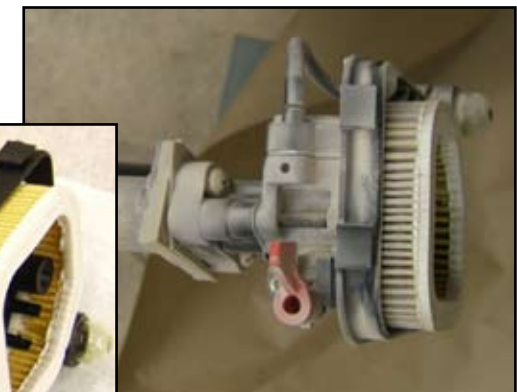


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SwRI developed a new test cell to evaluate, under a variety of conditions, vehicle radiators, coolants, and related components and fluids from vehicles ranging in size from compact cars to Class 8 trucks and military vehicles.



DO 17348



DO 17349

SwRI engineers measure the performance of small-engine filters such as those for lawnmowers, chain saws and string trimmers.



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres and provides more than 2 million square feet of laboratories, test facilities, workshops and offices for more than 3,200 employees who perform contract work for industry and government clients.



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innovative science
and technology***

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For more information, please contact:***

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