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AF03-121

TOPIC TITLE:
Filter for Airborne
Pathogens and Toxic
Liquids

**CONTRACT
NUMBER:**
FA8651-04-C-0338

**SBIR
COMPANY
NAME:**
eSpin Technologies
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Chattanooga, TN

**TECHNICAL
PROJECT
OFFICE:**
AFRL Materials
and Manufacturing
Directorate
Wright-Patterson
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Tennessee-based eSpin Technologies leveraged its work on Air Force SBIR topics to create a line of commercially competitive products (photo courtesy of eSpin).

FILTER TECHNOLOGY FUELS NEW COMMERCIAL PRODUCTS

What started as an effort to develop better filtering systems to protect warfighters from airborne threats has been a springboard to commercial growth for a small business.

Tennessee-based eSpin Technologies has been adding jobs because its nanofiber-based air filtration products are gaining traction in a variety of industries. Most notably, the company's "exceed with nanofibers" brand filters have significantly improved indoor air quality while lowering energy costs in several automotive plants in North America.

Conventional air filters employ a matrix of relatively large fibers to capture particles from passing air, which causes resistance to airflow and fills up relatively quickly. However, a network of much smaller nanofibers provides more capturing surface and volume at similar

or lower flow resistance. The latter also translates to longer service life and the need for less fan power.

BEHIND THE TECHNOLOGY

Particles in a flowing air stream are captured when they encounter a fiber of any size. Large fibers cause the air stream to deflect around them so the velocity at the fiber surface is zero. Air movement past small fibers is less affected - causing less loss of air pressure (fan power) and air is still moving at the fiber surface - so fine particles are captured more efficiently.

Additionally, the larger empty volume around the small fibers is able to accumulate more particles before flow resistance increases and the filters have to be replaced.

The theory of particle capture on nanofibers was established long ago, so eSpin's task was to develop a practical embodiment of it for industrial process control. Filters made by the company are being used to capture a wide variety of waste and contaminants including paint drops, weld fumes, machine oil, smoke, pollens, fine dust particles, sand and bacteria.

INDUSTRIAL SAVINGS

Officials from eSpin report being a Tier 1 supplier to select major automotive manufacturers, one of which cut its rate of filter changes by a factor of four since switching from conventional filters. This reduction translates to less hazardous waste for disposal; lower labor costs to change filters and prepare them for disposal; and lower acquisition costs.

Another customer is the Oak Ridge National Laboratory in Tennessee, whose energy management strategy is a multifaceted approach to drive down building energy use and improve sustainability. A big piece of that plan revolves around mechanical ventilation and the need to maintain good indoor air quality while reducing associated energy and maintenance costs.

"Exceed brand filtration has demonstrated (to the laboratory) a solution for conquering this challenge," said Bryce Hudey, energy and sustainability manager in the

Oak Ridge National Laboratory's Facilities Management Division. "Exceed's HVAC filters have proven to have a significantly longer service life with less pressure drop creating potential for maintenance and energy cost savings."

Additionally, the filters have improved air quality at a major university and in several commercial complexes of large corporations, thereby helping to lower the rate of absenteeism.



Nanofiber-based air filtration products from eSpin are being used in a variety of industrial and commercial applications (photo courtesy of eSpin).

SBIR/STTR SUPPORT WAS CRITICAL

The Air Force SBIR contract provided eSpin the equipment it needed to scale up production and the commercial market success of eSpin's filters has greatly improved the company's financial position, said Jayesh Doshi, president and CEO of eSpin.

Along the way, another federal agency invested SBIR funding in eSpin to extend the development of nanofiber-based filter media. That contract involved the use of activated-carbon-based material in individual and collective protective gear for troops operating in environments contaminated by chemical or biological weapons.



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