



■ The new Next catalytic element substrate is designed primarily for application in round catalyst element housings.

TWO NEW CATALYST SUBSTRATES FROM MIRATECH

Company Said Next and Vortex are More Efficient and Durable than Traditional Industrial Engine Catalyst Substrates

Miratech Corp. has released two new industrial engine catalyst substrates. The new Next substrate is designed primarily for round catalyst elements, and the Vortex substrate is designed to serve primarily for rectangular catalyst elements (see **COMPRESSOR Tech^{Two}**, May 2008).

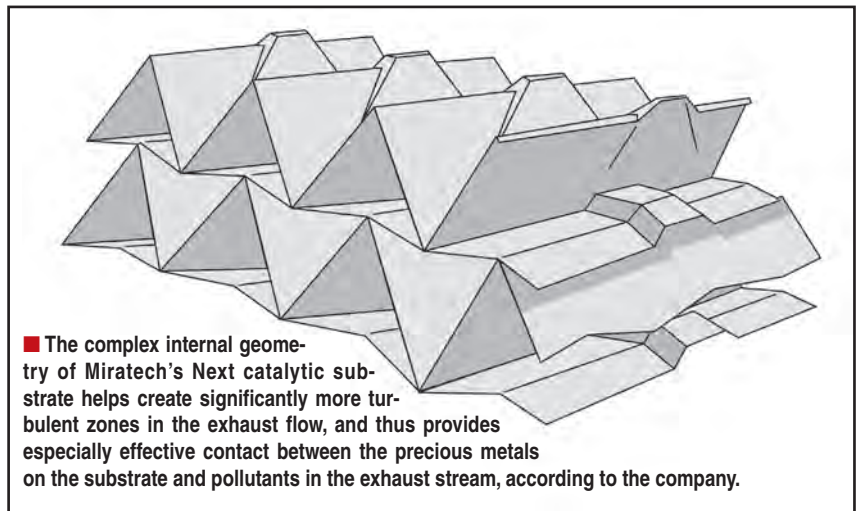
A catalyst substrate is the material on which catalytic precious metals are applied, usually via a wash coat, to create catalytic converter elements.

Next and Vortex both give end users two important category improvements, according to Bill Clary, Miratech vice president of sales, marketing and engineering. "Because of their designs, Next and Vortex provide industrial engine operators greater catalyst element strength, durability and resistance to telescoping, as well as increased catalyst performance and efficiency. Both benefits come while

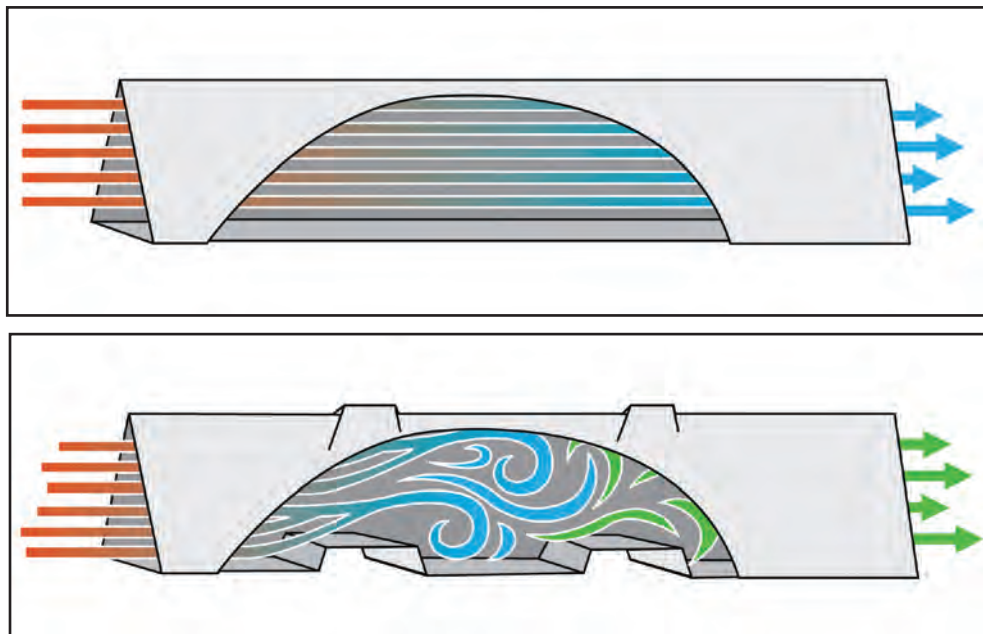
still accommodating backpressure limits," Clary said.

Viewed through a microscope, the

surface of a catalyst substrate's coating appears rough and uneven and looks something like the surface of a



■ The complex internal geometry of Miratech's Next catalytic substrate helps create significantly more turbulent zones in the exhaust flow, and thus provides especially effective contact between the precious metals on the substrate and pollutants in the exhaust stream, according to the company.



■ Straight-line exhaust flow in a traditional substrate compared to the turbulent flow resulting from the design of the Next catalyst substrate.

sponge. The microscopic, sponge-like surface where the catalyst's precious metals reside is full of nooks, crannies, pockets and pores. It's a design that is anything but flat, but ideally suited for supporting the catalyst, which is usually some combination of platinum, palladium and rhodium. To reach the precious metals embedded in this uneven surface, and thus achieve catalysis, good mixing of the engine exhaust with the catalyst precious metals is essential. "Good mixing comes from turbulent exhaust flow," Clary explained.

Laminar (straight-line) exhaust flow across and through most traditional substrates produces mixing only in the first fraction of the total catalyst substrate, Clary said. With no obstructions or changes in the velocity of flow, traditional catalyst exhaust goes quickly from turbulent at the beginning of the substrate to laminar flow through the rest of the substrate.

Clary said that with traditional catalyst substrates (sometimes called "open-foil" substrates) exhaust flow is turbulent for less than 15% of the length of the substrate channel. The flow through the remaining 85% of the substrate channel length is straight-line laminar flow in which little, if any, mixing occurs. The result is that fewer pollutants are directly exposed to the precious metal compound that lines the walls of the substrate.

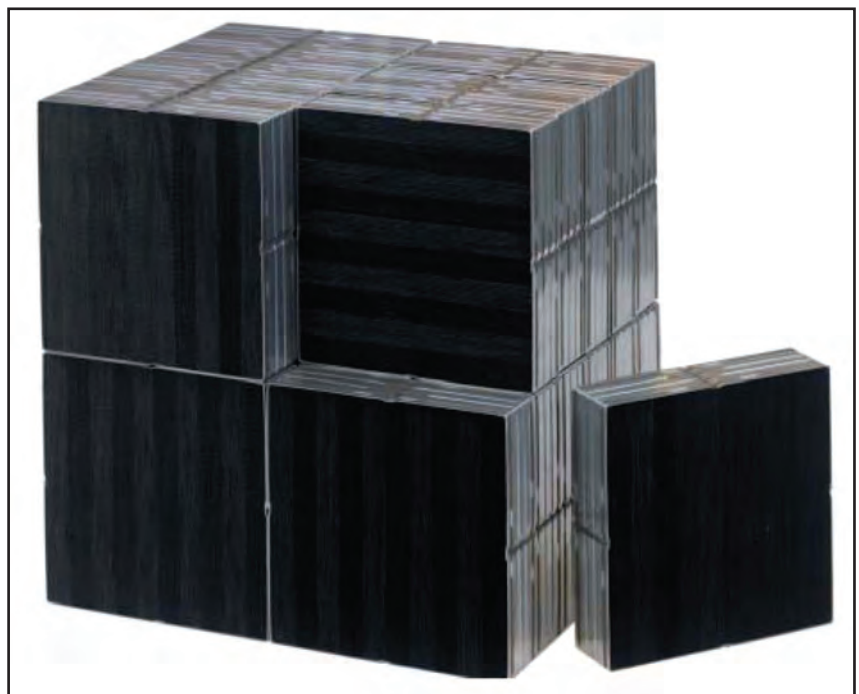
"Using two very different designs," Clary explained, "Next and Vortex substrates increase catalyst performance and efficiency by maintaining a higher percentage of turbulent exhaust flow across the entire length of each catalyst substrate." Both Next

and Vortex produce what Miratech calls a high Turbulence Factor — the percent of turbulence across the length of the substrate — he said.

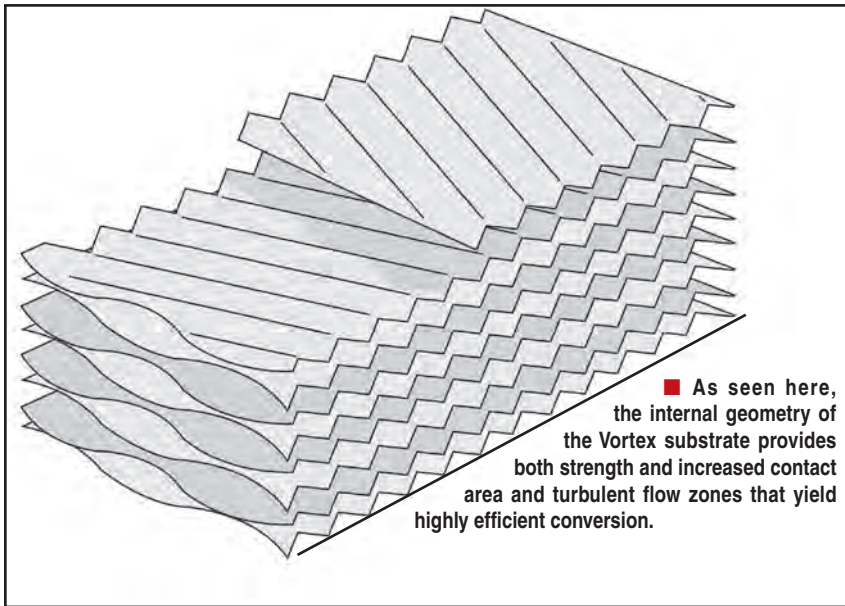
Next substrate is designed and manufactured with creases or grooves in the foil to interrupt exhaust flow and create more zones that are turbulent. Each groove in the Next substrate creates a downstream turbulent zone in the channel. Multiple grooves produce multiple turbulent zones, which boost catalyst performance because more mixing means more pollutants react with more precious metals. Next also

creates a lower backpressure than traditional substrates, said Clary. "Next uses 60° triangular channels that give a higher percentage of open substrate frontal area than traditional straight-line flow substrates," he said. "That means Next is optimized not only for maximum catalyst reactivity, but also for low backpressure."

Compared to the Next substrate that is designed primarily for application in round catalyst element housings, Vortex substrate, because of its rectangular shape, uses a different strategy to obtain a high Turbulence



■ The Vortex catalytic substrate is especially well suited to square or rectangular element housings.



Factor. Vortex achieves a high Turbulence Factor thanks to superior static mixing and mass transfer.

The Vortex product is a corrugated foil substrate that is layered and stacked in an offset, overlapping, angled-channel pattern in which each overlap point is electronically resistant welded. The angled overlapping channels, combined with the resistant weld-points design, create turbulent exhaust flow through the entire length of the Vortex substrate, Clary explained.

According to Miratech, not only do both of its new substrates achieve better turbulence for enhanced per-

formance, but both substrates also offer benefits many industrial engine end users would say is even more important for catalytic converters. Those valuable benefits are increased strength and durability. Just as the very different designs of Next and Vortex each produce better mixing, their designs also make each substrate stronger, more durable and less prone to nesting or telescoping than traditional straight-line flow substrates, said Clary.

The grooves in Next substrate elements that create multiple turbulent zones for better performance also in-

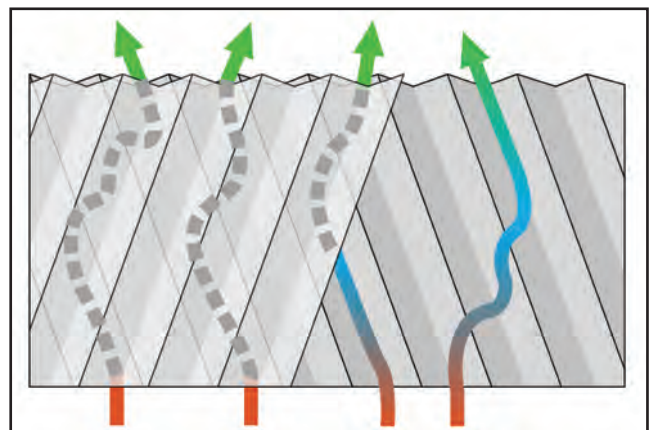
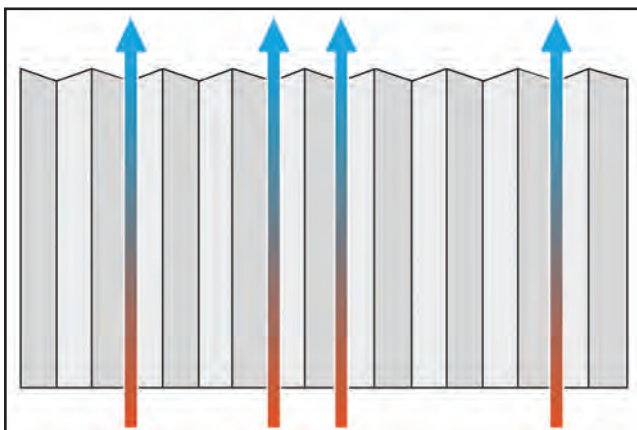
crease substrate strength. The Next grooves interlock every layer of the catalyst substrate in a layer-by-layer pattern across the entire diameter and length of the substrate. This self-locking system joins the flat and corrugated strips together and makes the entire matrix stronger and more stable.

Miratech's Vortex rectangular substrate likewise traces its strength and durability to the same design that also creates its increased turbulence. The offset angled channel pattern provides many thousands of electronic resistant weld-points and makes Vortex a superior strength substrate when compared to straight-line substrate products.

Clary said that Next and Vortex substrates will be incorporated in Miratech products as well as non-Miratech products. A stocking inventory will often allow same-day shipping of elements.

Next elements will be used in Miratech's round product lines, including MN, MBA, IQ elements and housings and RC and QC series converter/silencers. Next raw materials will be kept in stock, as will a wide inventory of finished ready-to-ship elements.

Vortex elements' rectangular structure permits Miratech engineers to design catalyst elements of any size while providing off-the-shelf availability for many common sizes. In addition, Vortex elements will be compatible with many catalyst element housings manufactured by companies such as GT Exhaust Systems, Johnson Matthey and Maxim Designs. ■



■ The design of the Vortex catalyst substrate differs from that used in the Next substrate, but it, too, provides an internal geometry that results in greatly increased turbulent zones when compared to traditional straight-line design substrates.