



MIRATECH
EMISSIONS SOLUTIONS

NEXT™ and VORTEX™

Greater Turbulence for Better Performance
Increased Strength for Enhanced Durability



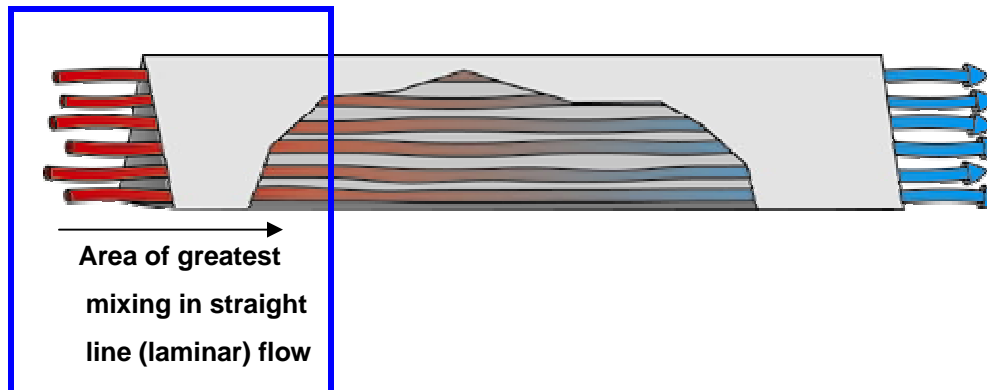
▶ NEXT - Round Substrate



▶▶ Turbulence is Important

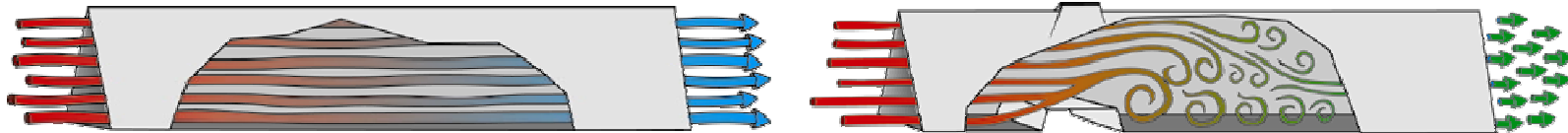
Catalyst Reaction Basics

- ▶▶ Turbulent exhaust flow moving across the catalyst substrate yields better mixing with the catalyst precious metals in the substrate wash-coat.
- ▶▶ Laminar (straight-line) exhaust flow produces mixing only in the first fraction of the total catalyst substrate



▶▶ NEXT – Excellent Turbulence Factor

NEXT Has a superior Turbulence Factor (the percent of Turbulence across the length of the substrate)

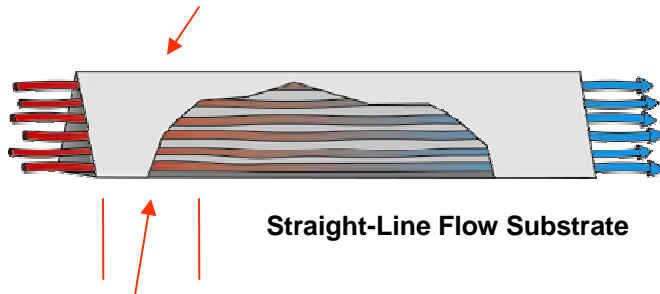


▶▶ **Straight line flow substrates** - Lack the turbulence-generating grooves found in NEXT. Airflow is primarily laminar. Laminar exhaust flow diminishes catalyst capability because fewer pollutants are exposed to the precious metal compound that lines the walls of the substrate.

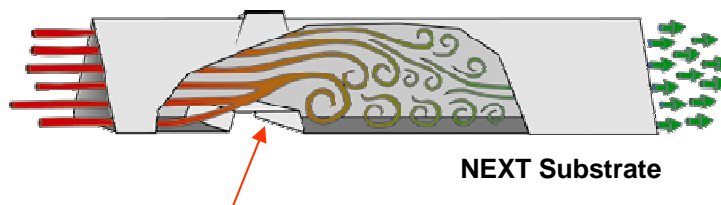
▶▶ **NEXT Catalyst Substrate** – Each groove in the NEXT substrate creates a separate turbulent zone in the channel. Multiple turbulent zones boost catalyst performance because more pollutants are allowed to react with the precious metal compound that lines the substrate.

▶▶ How NEXT Creates Turbulence

- ▶▶ 90% of chemical reactions happen in the turbulent area (the more the exhaust comes in contact with the catalyst, the better the reductions).

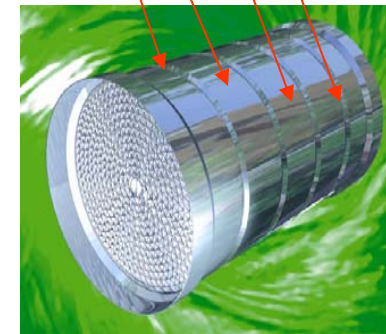


- ▶▶ The turbulent area occurs in only the first few millimeters of the substrate.



- ▶▶ NEXT substrate has creases in the foil to create more turbulent zones (in turn improving performance).

NEXT Turbulent Zones



▶▶ Element Durability is Critical

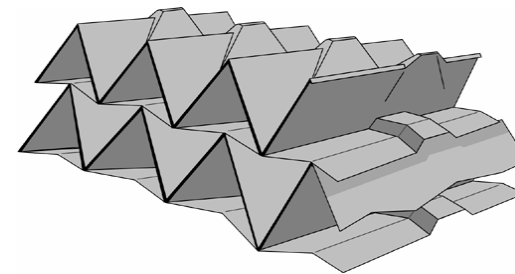
Two Critical Issues of Sagging or Telescoping

- ▶▶ Catalyst performance: Sagging or telescoping of catalyst elements leads to gaps or leaks in the catalyst substrate channels - and untreated exhaust.
- ▶▶ Removing or replacing a sagging or telescoped catalyst element can be time-consuming, costly and difficult.



▶▶ NEXT Minimizes Telescoping/Sagging

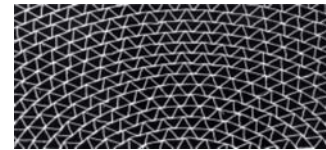
- ▶▶ The grooves or creases in the MIRATECH NEXT enable every layer of the catalyst substrate to be interlocked.
- ▶▶ This feature not only strengthens NEXT, it reduces incidences of telescoping while still accommodating back-pressure limits.
- ▶▶ The self locking system joins the flat and corrugated strips together, making the matrix strong and stable.
- ▶▶ NEXT prevents the strip layers from telescoping.



▶▶ Open Frontal Area - Less Backpressure

Why NEXT has lower backpressure than traditional substrate

- ▶▶ **NEXT has higher percentage of open substrate frontal area (OFA) than traditional straight-line flow substrates. NEXT is optimized for maximum reactivity with low back pressure.**



NEXT has high percentage of open frontal area

- ▶▶ **The NEXT 60° triangular channels offer a maximum Open Frontal Area.**



NEXT 1.7 OFA = 85 - 90%
Channel height = 1,7 mm

- ▶▶ **A same sized traditional substrate will have more backpressure than NEXT.**



Conventional Substrate
OFA = 70 - 80%
Channel height = 1,3 mm

▶▶ NEXT Integration

NEXT Crosses Across Round MIRATECH Product Lines

- ▶▶ NEXT substrate will be used in the MN, MBA, QCC, QCH, IQ, RCS and RHS elements (MN and IQ element lines)
- ▶▶ Mantles will be required for the QCC, QCH, IQ, RCS and RHS elements



IQ Element



MN



MBA



IQ Housing



RCS/RHS

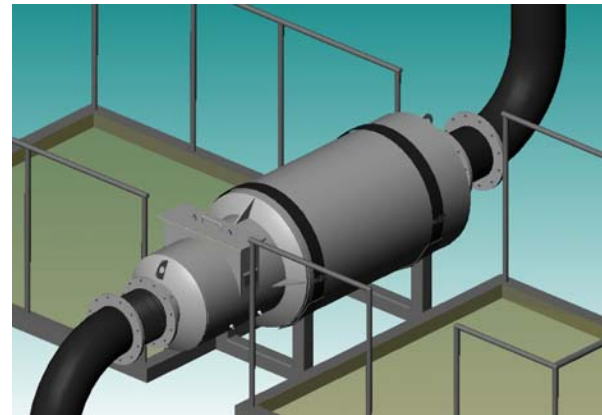
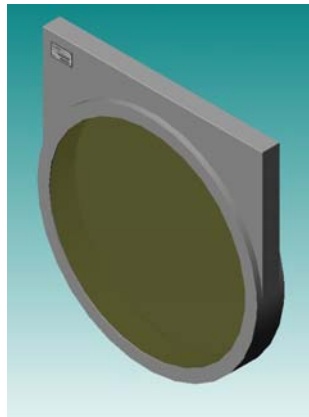
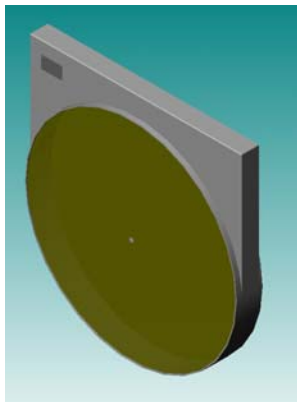


QCC/QHS

▶▶ NEXT Field Test – Gills Onions

Gills Onions - California

- ▶▶ **Caterpillar 3512 TA**
 - 815 hp @ 1200 rpm
- ▶▶ **MEC-2001-1**
- ▶▶ **RCS-3626-14-C2 (Prototype Housing)**
 - 25.345” Exposed Diameter “C” Elements
 - 22.875” Exposed Diameter NEXT elements



▶▶ NEXT Field Test Data

NEXT Exceeds SCAQMD Limits for NOx and CO

Gills Onions Round NEXT Prototype Testing Form

INSTALLATION DATE: August 16, 2002

ENG. INSTALLATION HOURS: 8719

ENGINE SET-UP INFORMATION

Date:	August 16, 2002
Actual Load:	100%
Actual RPM:	1190
Avg. Exhaust Velocity (ft/min):	
Pipe ID (in):	12
EGO Target:	768 / 700

PACKAGE INFORMATION

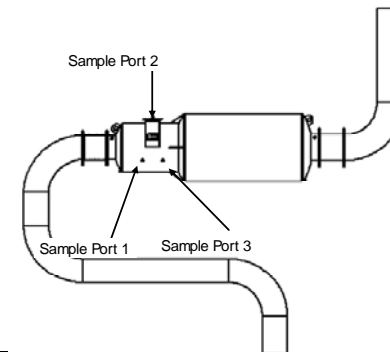
Engine Make:	Caterpillar
Engine Model:	G3512TA
Rated Power:	815
Rated RPM:	1200
Air/Fuel Controller:	MEC-2001-1

SCAQMD LIMITS

Nox	30 ppm
CO	200 ppm

EXHAUST GAS DATA

	Engine Out Port	NEXT Layer 1 Port	Next Layer 2 Port
NO (ppm):	29.54.2	77.7	2.5
NO2(ppm):	81.2	0.0	0.0
NOx (ppm):	3035.4	77.7	2.5
CO (ppm):	3583.5	30.6	0.0
CO2 (%):	11.6	11.7	11.7
O2 (%):	0.2	0.0	0.0
Combustibles (%):	0.00	0.00	0.00
Temp (F):	833	895	874
Exhaust Back Pressure(in Hg):			



ENGINE RUN DATA

Intake Man Press (psia/kpa):	25.4		
Intake Manifold Temperature:	127		
Valve Position:			
Engine Hours:	9261		
MEC Hours:			
Installation MEC Hours:	7737	MEC Run Hrs:	-7737.0
Ambient Conditions:	Clear calm 76 f		

	REDUCTION	MID	POST
NOx	97.44	96.78	
CO	99.15	100.00	
CO2	-0.86	0.00	
O2	100.00	#DIV/0!	
Combust	#DIV/0!	#DIV/0!	
Temp	62	-21	
Exhaust BP	0.00	0.00	
Operating Hrs.			

NOTES

▶▶ NEXT Availability – IQ Replacements

NEXT Inventory Means Better Element Availability

- ▶▶ **NEXT Raw Materials On-Hand**
 - Past sales history plus 50%
- ▶▶ **NEXT Finished Elements**
 - 1-6 elements based on sales history for each IQ element size
- ▶▶ **Better Availability**
 - Increased raw materials on-hand, plus
 - Increased finished materials in stock, plus
 - Fabrication lead times are shortened, plus
 - Equals: **OUT THE DOOR SOONER**

▶▶ NEXT Marketing Materials

- ▶▶ Sales Flyer
 - Printed
 - [.PDF](#)
- ▶▶ Web Site Download Availability
- ▶▶ PowerPoint
- ▶▶ Press Release



The MIRATECH NEXT uses a revolutionary substrate, with cascading turbulent zones, to create an element that is more efficient and durable than comparable industrial engine catalysts with a traditional open-foil design.



THE BENEFITS OF MIRATECH NEXT

- Creates turbulent airflow through the length of the substrate
- Improves catalytic reaction within the substrate channel
- Reduces pollutants more effectively than open-foil catalysts
- Stronger than conventional open-foil catalysts
- Compatible with non-MIRATECH housings (including DCL, Johnson Matthey, Sud-Chemie, and other competitor catalyst substrates)
- Off-the-shelf availability for many sizes
- Round structure allows MIRATECH to engineer catalysts with unique diameters (large or small)

In addition to creating turbulent exhaust flow, the grooves in the MIRATECH NEXT enable every layer of the catalyst substrate to be interlocked. This feature not only strengthens the NEXT, it reduces incidences of telescoping while still accommodating back-pressure limits comparable to open-foil catalysts.

NEXT CATALYST



Each groove in the NEXT substrate creates a separate turbulent zone in the channel. Multiple turbulent zones boost catalytic performance because more emissions are allowed to react with the precious metal compound that lines the walls of the substrate.

OPEN-FOIL CATALYST



Open-foil catalysts lack the turbulence-generating grooves that are found in the NEXT. Consequently, open-foils generate airflow that is primarily laminar. The laminar flow of exhaust diminishes the catalytic capability of open-foils because few or emissions are exposed to the precious metal compound that lines the substrate wall.

MIRATECH INDUSTRY SOLUTIONS

- Gas Compression
- Power Generation
- Locomotive
- Marine
- Water Pumping
- Air Compression
- Drilling Riggs

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▶▶ NEXT – Features/Benefits

NEXT FEATURE

NEXT has a superior Turbulent Factor (T-Factor). Four Turbulent Zones (entrance and three grooves) creates turbulent exhaust flow through the length of the substrate.

NEXT spreads ash and poison deposits over four zones.

Every layer of catalyst is mechanically interlocked with NEXT's grooved design.

Top Hat With Easy Grab Handle

Interlocked grooved foil design eliminates the need for pinning.

NEXT finished elements in stock and on the shelf for MIRATECH IQ and RCS/RHS.

NEXT is compatible with non-MIRATECH housings (including DCL, Johnson Matthey, Sud-Chemi and others).

Low pressure drop. Lower backpressure than traditional substrates

24 month warranty of catalyst

NEXT BENEFIT

NEXT has greater turbulence and less backpressure across the length of the catalyst substrate. In straight line foil substrates, 90% of the catalyst reaction occurs in the first half-inch of the element. NEXT's grooved design and four turbulent zones means improved mixing for better catalyst performance.

Longer lasting catalyst, longer intervals between washings.

NEXT is stronger than conventional open foil catalyst. NEXT reduces catalyst sagging with increased structural durability. NEXT Virtually eliminates telescoping which means easier insertion and removal.

Easier handling and serviceability

Eliminates durability problems associated with pinning.

Best in industry availability for new or replacement elements. Same day shipping on orders received as late as 3 p.m. CST.

MIRATECH is your one-stop-shop for catalyst elements.

Engines breathe easier plus better exhaust system flexibility.

Durable and dependable performance you can trust



▶ VORTEX - Rectangular Substrate



VORTEX

▶▶ VORTEX Products/Markets

Rectangular Elements for Targeted Markets

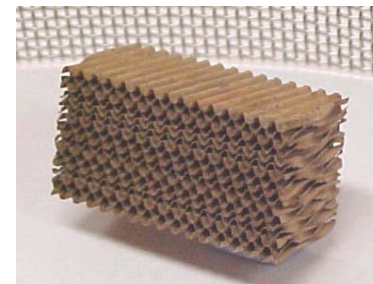
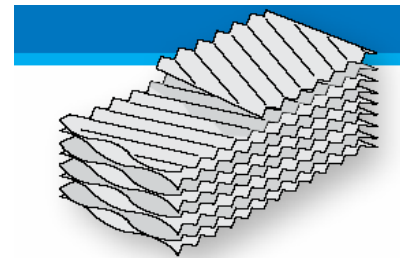
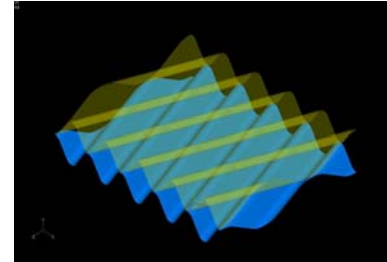
- ▶▶ **V-CAT - Locomotive Marine Engine Applications**
 - Large Horsepower/Diesel Oxidation
- ▶▶ **Ground Access – Gas Compression Applications**
 - Large Horsepower/Oxidation
- ▶▶ **VXC – Gas Compression with Integrated Silencing**
 - Low Horsepower (50 to 240 hp) 3-Way
- ▶▶ **ZCS/ZHS**
 - Mid-range Horsepower/3-way and Oxidation
- ▶▶ **GT/Maxim/Englehard replacement**
 - Mid-range Horsepower (1,000 – 3,000 hp) 3-Way



▶▶ VORTEX – Turbulence & Strength

VORTEX Design Provides Turbulence & Strength

- ▶▶ VORTEX's corrugated foil substrate yields superior static mixing, mass transfer and stability.
- ▶▶ VORTEX is layered and stacked in an off-setting angled-channel pattern. This prevents nesting
- ▶▶ Each overlapping point is electronically resistant welded for superior strength.
- ▶▶ The angled overlapping channels combined with resistant weld-points creates turbulent air-flow through the length of the substrate.



▶ VORTEX Marketing Materials

- ▶ Sales Flyer
 - Printed
 - [PDF](#)
- ▶ Web Site Download Availability
- ▶ PowerPoint
- ▶ Press Release



The MIRATECH VORTEX incorporates an advanced corrugated foil substrate technology to create a catalyst with static mixing, mass transfer and stability characteristics that are superior to any rectangular-shaped element in the marketplace.



THE BENEFITS OF MIRATECH VORTEX

- Creates turbulent airflow through the length of the substrate
- Improves catalytic reaction within the substrate channel
- Reduces pollutants more effectively than open-foil catalysts
- Stronger than conventional open-foil catalysts
- Compatible with non-MIRATECH housings (including GT Exhaust Systems, Johnson Matthey and Maxon Designs)
- Off-the-shelf availability for many sizes
- Rectangular structure allows MIRATECH to modularly design catalysts of any size

The VORTEX's corrugated substrate allows every layer of the catalyst to be stacked in an off-setting pattern. The off-set, side fins producing beneficial turbulence, forms overlapping points that are fused together by resistive welding. This makes the VORTEX significantly more efficient and durable than conventional open-foil catalysts.

VORTEX CATALYST



VORTEX's corrugated substrate is layered in an off-setting hermaphrodite pattern that creates turbulence through the entire channel. The VORTEX's static mixing increases catalytic reaction because more emissions are allowed to react with the precious metal compound that lines the substrate wall.

OPEN-FOIL CATALYST



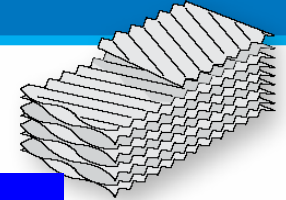
Open-foil catalysts lack the turbulence-generating corrugated substrate that is found in the VORTEX. Consequently, open-foils generate air flow that is primarily laminar. The laminar flow of exhaust diminishes the catalytic capability of open-foils because their emissions are exposed to the precious metal compound that lines the substrate wall.

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▶ VORTEX – Features/Benefits



VORTEX FEATURE

Superior Turbulent Factor (T-Factor).

Multiple turbulent zones.

Electrical resistant welding at contact points.

Offset layers.

Compatible with non-MIRATECH housings (including GT, Maxim and WPI , Johnson Matthey.

Lower backpressure than traditional substrates.

24 month warranty of catalyst

Banding

VORTEX BENEFIT

Angled overlapping channels combined with resistant weld-points creates turbulent air-flow through the length of the substrate.

Opposing layers are offset to create turbulent airflow and static mixing of gases through the length of the substrate for improved catalytic reaction, reducing pollutants more than traditional straight-line flow substrates.

Tougher more durable substrate. Reduced telescoping issues.

Eliminates element nesting.

MIRATECH is your one-stop-shop for catalyst elements.

Engines breathe easier plus better exhaust system flexibility.

Durable and dependable performance you can trust

Provides operator protection and sealing support.