

Catalyst Basics: Platinum, palladium, and rhodium – key ingredients that make converters tick

By: Dr. Jeff Rieck

Senior Technology Manager, Johnson Matthey

It takes a precise combination of precious metals to help make catalytic converters an effective method for emission control.

Here's how they work:

Automotive exhaust contains three harmful pollutants, which are formed due to inefficiencies in the fuel combustion process. Hydrocarbons (HC) and carbon monoxide (CO) are formed as a

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Ceramic substrates are coated with a washcoat containing precious metal catalysts prior to installation into the converter can.

New Eastern-Dorman to build manifold converters

As you may know, integrated exhaust manifold/ catalytic converters are quickly becoming the converter standard as carmakers strive for faster light-off of the catalyst in order to achieve the lowest emissions possible. Our recent joint venture with Dorman Products Inc., which helped create Eastern-Dorman LLC, will make more integrated exhaust manifold and converter products available to our U.S. and Canadian customers.

Early manifold converters now reaching replacement cycle.

As the OEM use of manifold converters in today's engine designs increases, so will the demand for replacement units. In fact many of the early applications are already in need of replacement, and more will come. Eastern is making sure that you will be ready to meet that demand. Working with Dorman will help us to add many more products to our growing manifold line and make them available to our customers.

George Schafer, President of Eastern Manufacturing, notes, "This new partnership with Dorman is helping us to further expand our business and increase sales. We have combined our

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CNC manufacturing equipment speeds manifold converter production.



George Schafer, President, inspects a development prototype of a new manifold converter.

result of the incomplete combustion of gasoline. Oxides of nitrogen (NO_x) are created from the burning of the nitrogen present in the intake air at the high temperatures and pressures encountered in the cylinders during ignition. HC and NO_x are major contributors to smog formation, and CO reduces the ability of the blood to pick up and transport oxygen through the body. As a result, catalytic converters were developed as an after-treatment to reduce these harmful emissions. Platinum, palladium, and rhodium have historically been the key active components used in these catalytic converters.

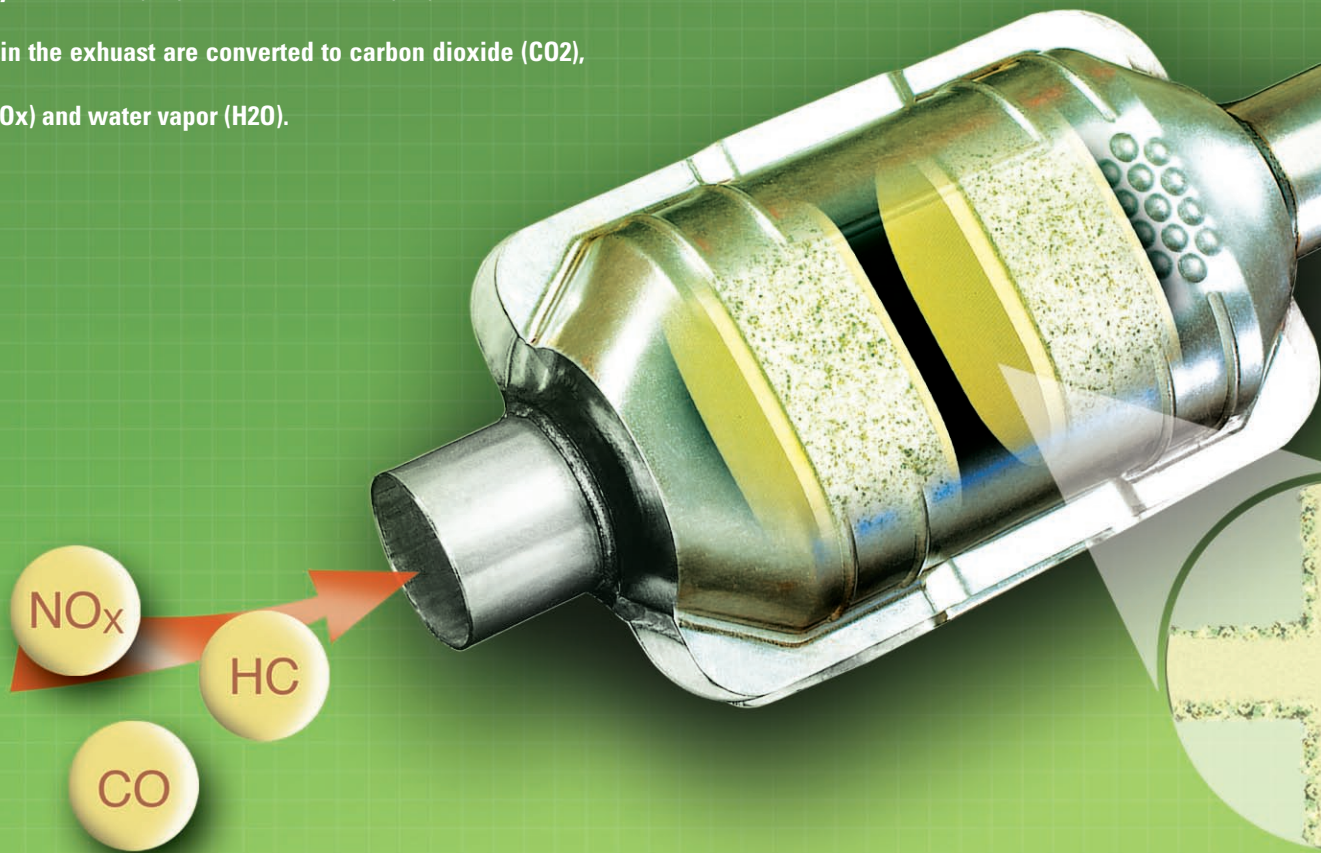
These precious metals are unique in their ability to facilitate the reactions of HC and CO with oxygen to produce water and carbon dioxide and to promote the reaction of CO with NO_x to convert the NO_x to harmless nitrogen gas. With the combination of a properly tuned engine and a properly designed catalytic converter, it is theoretically possible to have complete removal

of these pollutants. The precious metals are typically dispersed in a washcoat, which is then coated on a flow-through ceramic or metallic substrate which supports them in the exhaust stream. The washcoat contains various components and additives to promote the activity and durability of the precious metals.

These three precious metals each have their own unique properties that come into play in determining which ones must be used for a particular application. Platinum is a very good oxidation catalyst and has good resistance to poisons such as sulfur, phosphorus, or lead, which may be present in the exhaust. Two drawbacks to platinum are its low activity for the conversion of NO_x and its high price relative to palladium. In addition, platinum is sensitive to the high temperatures which may occur in the catalytic converter during high engine loads.

Palladium, which is currently the cheapest of the three metals, has excellent activity for the oxidation of hydrocarbons as well

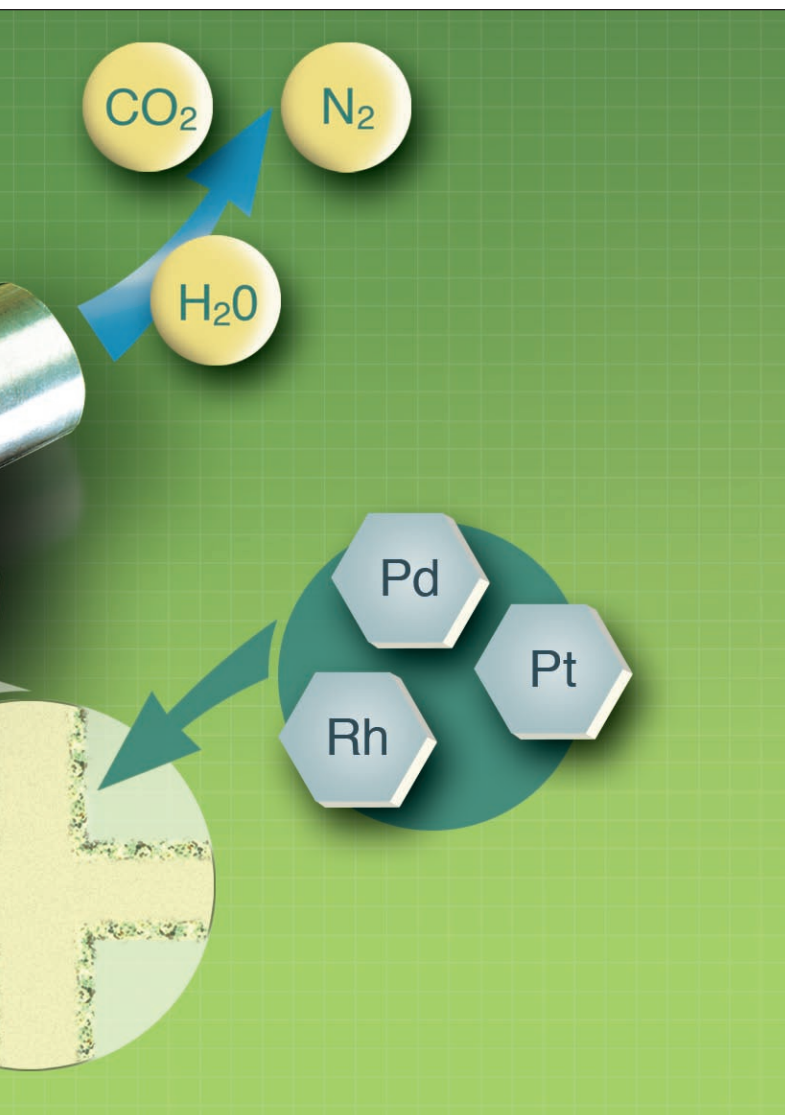
Exhaust gasses pass through the catalytic converter substrate, which is coated with a washcoat containing platinum (Pt), palladium (Pd), or rhodium (Rh). Hydrocarbons (HC), carbon monoxide (CO) and oxides of nitrogen (NO_x) in the exhaust are converted to carbon dioxide (CO₂), nitrogen gas (NO_x) and water vapor (H₂O).



as very good thermal durability. In addition, with a well-designed washcoat, palladium can have very good activity for the removal of NOx. Drawbacks to palladium include its sensitivity to poisons.

Rhodium, currently the most expensive of the three, has by far the highest activity for the removal of NOx from the exhaust. In addition, it has significant activity for the oxidation of HC and CO and very good resistance to the poisons present in the exhaust stream. Its primary drawback is its high cost.

Most catalytic converters today consist of some combination of palladium and rhodium. With current precious metal prices, this gives a good trade-off between cost and performance. While efforts continue to find cheaper alternatives to the precious metals, the tightening aftermarket and OEM emission standards make it likely that they will remain the key components of catalytic converters in the future.



Automotive Edge / Hermoff Acquisition Opens Canadian Market

Eastern's recent acquisition of The Automotive Edge / Hermoff from Dorman Products, Inc., puts us in a great position to serve and grow our business in the Canadian market. Based in Ontario, Hermoff manufactures and distributes high-quality exhaust manifolds, catalytic converters and components in Canada and the United States. So the purchase not only enhances our domestic product line but also expands our Canadian distribution.

Eastern continues to grow and develop new business at a rapid pace. The acquisition of a prestigious brand such as The Automotive Edge / Hermoff adds even more high-quality exhaust products to our already extensive lineup.



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exceptional manufacturing capabilities with Dorman's formidable distribution system and will be bringing important new catalytic converter products to a wider range of markets across the United States and Canada."

Dorman Products, Inc. is a leading supplier of OE automotive replacement parts, automotive hardware, brake products, and household hardware to the automotive aftermarket and mass merchandisers. The partnership will also allow Dorman to add Eastern's full line of direct-fit converters to their product lineup and make it available to their customers.

