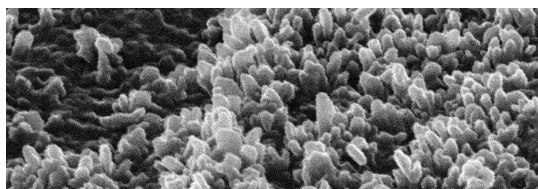
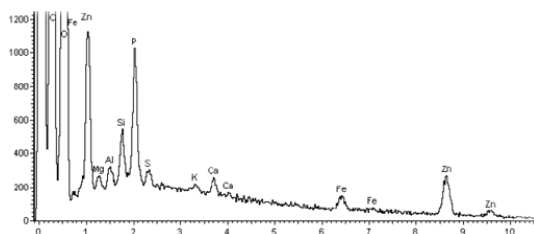
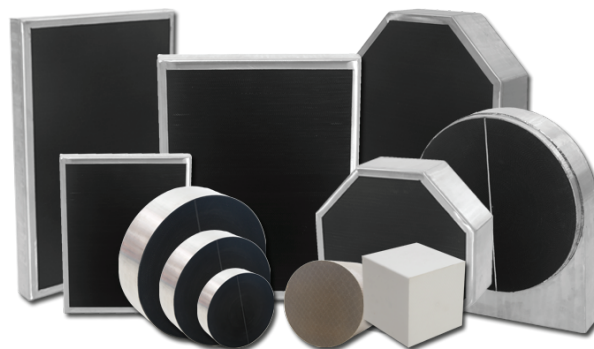


Lifecycle Catalyst Management Services

A precious metal catalyst is a costly investment with long-term value. Like any piece of equipment, a catalytic system benefits from routine inspection and maintenance. As an OEM catalyst developer and manufacturer, EmeraChem offers complete catalyst lifecycle services to help you manage your investment.

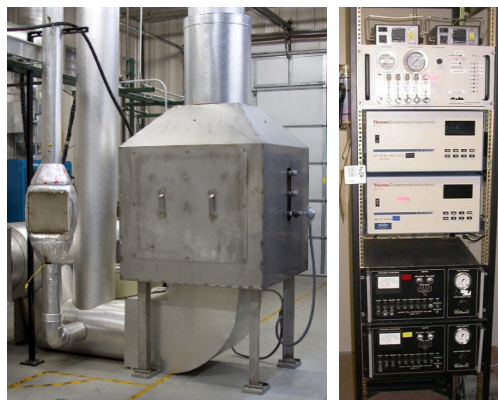
Once a catalyst enters the operating phase of its life we can help you get the most from your catalyst. We can help you set up a catalyst monitoring program that includes performance testing, laboratory evaluations, washing and regeneration.

A combustion exhaust stream is not a pristine environment. Normal and abnormal engine operation exposes the catalyst to chemical compounds that affect the catalyst's surface and its active ingredients. These contaminants hinder catalyst performance through a number of mechanisms and cause catalyst performance to degrade over time. Rather than replacing the catalyst prematurely, it's cost effective to evaluate the catalyst's performance and its chemical and physical properties to understand the root causes. Chemical washing is often an effective and cost efficient way to remove contaminants, regenerate the catalyst surface, and restore catalytic activity and performance. At the end of its service life, EmeraChem will recover the precious metal and apply it to your replacement catalyst.



Catalyst Chemical and Physical Analysis:

- Characterizing catalyst properties identifies causes for lower performance such as masking of active catalytic sites, excessive temperatures, and precious metal poisoning.
- In the hands of our engineers and chemists, these tools provide clear root cause answers to forensic investigations and enable us to help customers avoid or minimize the causes, reverse them, and extend catalyst operating life.
- EmeraChem uses sophisticated laboratory techniques to characterize a catalyst's chemical and physical properties, such as nano-scale microscopy, ICP, SEM-EDS, XRD, and many others.
- Diagnostic analyses are applied in an economical stepwise sequence based on the type of catalyst, operating service, and other factors.
- EmeraChem characterizes the performance of full-size commercial catalyst elements using large pilot-scale reactors.
- Actual field operating conditions are reproduced including temperature, flow rate, and inlet emission levels. Real-world test conditions produce real-world performance results.
- CO, SO₂, NO, VOCs, and other gases are metered into the system and measured. EPA methods and protocols and a CEM system are used to measure catalyst performance.
- Three-way (NSCR) catalysts are tested under rich air-to-fuel ratio conditions. The reactor system measures and records catalyst performance on NO_x, CO and VOC over a range of air-to-fuel ratios, operating temperatures, and flow rates. Dithering conditions are accurately simulated.
- Oxidation catalysts are tested under lean air-to-fuel ratio conditions. Measurements are made and recorded for the oxidation of CO and VOCs, and the oxidation of NO to NO₂ and SO₂ to SO₃ over a range of temperatures and flow rates.
- EmeraChem interprets and reports the analytical results and recommends expected life and actions to reverse catalyst degradation and restore lost performance.



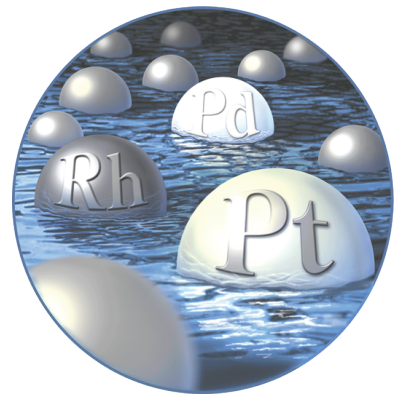


Catalyst Chemical Cleaning:

- Catalyst performance can oftentimes be restored using EmeraChem's proprietary 4-step chemical cleaning process. All catalyst washing systems are NOT alike!
- Ours was developed by EmeraChem's chemical engineers and chemists, and is carried out by our trained chemical technicians using modern chemical processing equipment.
- Ours is effective because it's the correct chemical solutions, applied in the correct sequence, for the optimal amount of time, using a recirculation process to flush the catalyst.
- Fresh chemical solutions are always used to prevent cross-contamination.

Catalyst Precious Metal Reclaim:

- Emission control catalysts utilize precious metals such as platinum, palladium, and rhodium. You own these valuable precious metal assets – keep control of them.
- At the end of the catalyst's service life, these precious metals can be reclaimed and recovered and used to manufacture replacement catalyst or redeemed for their monetary value.
- The process involves meticulous material handling to avoid losses, and a modern metal refining process to chemically extract the precious metals at the highest recovery efficiency.
- EmeraChem manufactures precious metal chemical products – that's our business and we know how to handle them.
- Trust EmeraChem to consistently return the highest value to you.



Lifecycle Catalyst Monitoring Services:

- The goal of monitoring services is to extend the life of your catalyst and minimize your catalyst lifecycle cost.
- We track the condition and performance of catalyst through periodic performance testing and analytical services.
- This reveals any decline in performance, points to the root causes, and directs catalyst maintenance services such as chemical washing.
- Provides a basis for estimating catalyst life.
- The scope of catalyst monitoring is scaled to the size of the installation – from a single reciprocating engine with one catalyst element, all the way up to a plant with multiple.



Let us demonstrate our solid products, operational excellence, experienced application engineering, responsive customer support before and after the sale, rapid manufacturing and delivery, low life-cycle cost, the best warranties in the industry, and long-term emission compliance.

