



ZEOCHEM®



Zeochem Molecular Sieve Adsorbents  
**ETHANOL DEHYDRATION**

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Chemistry. Pure. Efficient.

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# ZEOCHEM

Zeochem is a premier global manufacturer of molecular sieve products. With our roots in Switzerland, we have a culture of quality and customer service. As such, Zeochem provides excellent, responsive service, high-quality products, and the expertise to help you find the product and service solutions you need.



Zeochem's technical sales and service teams have decades of experience and are available to answer operational questions, troubleshoot units and find solutions for your ethanol dehydration needs. Our team of industry experts provides product recommendations and designs that optimize performance and improve the reliability of your units. We consider our customers as partners throughout the life of the sieves and pride ourselves on our responsiveness.

With manufacturing facilities in Louisville, KY, USA and Donghai, China, Zeochem offers a range of high-performance products and global support. Timely answers and troubleshooting are provided by our sales and technical experts located strategically around the world.

**Consistent.**

**Responsive.**

**Innovative.**

*"We work together with our customers to provide the best solution for their needs. Our technical sales and service personnel are known for their responsiveness to our customers."*

# Applications

Zeochem Z3-03 adsorbent is used for removing water from ethanol in a wide range of applications, ranging from fuel and industrial ethanol grades, to beverage and pharmaceutical grades. In these latter applications, high purity ethanol is required, and the presence of byproducts is undesirable.

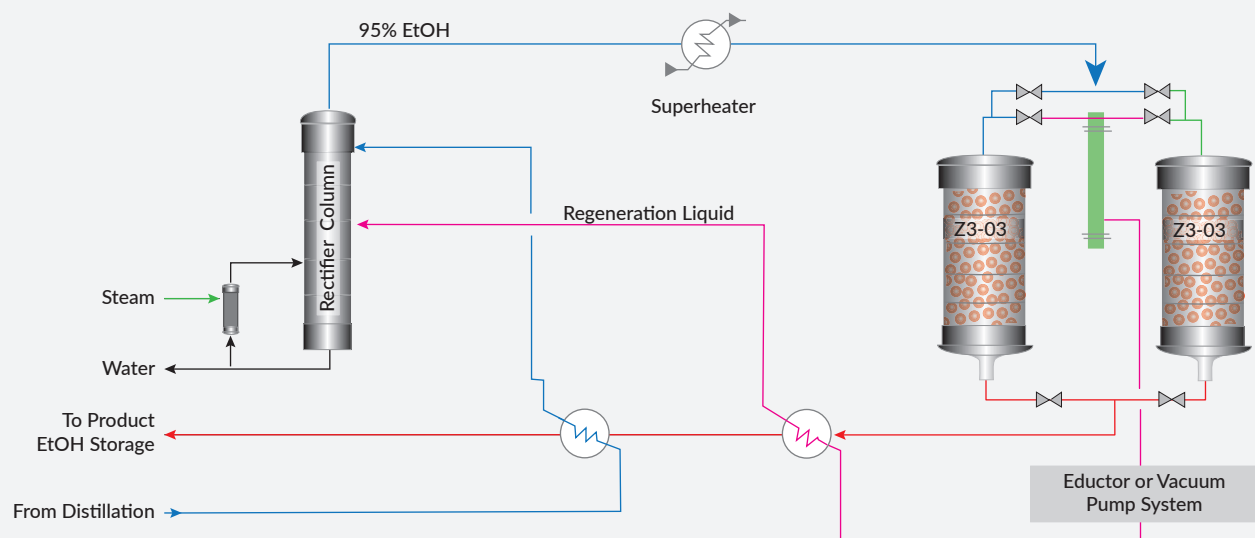
When ethanol is used in fuel, it is blended with gasoline. For the blend to be stable, water must be removed; yet because ethanol and water form an azeotrope, not enough water can be removed from the ethanol solution using simple distillation. When ethanol purity above 95% is required, molecular sieves are the most widely used and globally accepted solution.

By partnering with engineering companies that have built, and still build, the majority of all ethanol plants worldwide, we have developed and continue to supply Z3-03, the preeminent type molecular sieve for ethanol dehydration. Zeochem Z3-03 is typically used in traditional vapor phase pressure swing plants, but can also be used in small liquid phase units.

*“Our Zeochem molecular sieves have been performing flawlessly”.*

*Ethanol Operations Manager  
in the United States*

## Ethanol Dehydration Unit Example



*“I have never been at a plant that can produce such low ppm water product as the ones that contain Zeochem’s molecular sieves”.* *Ethanol Plant Manager in Europe*

# ZEOCHEM MOLECULAR SIEVES

## Z3-03

Zeochem Z3-03 is the potassium form of the A type zeolite structure and has an effective pore opening of 3 angstroms (0.32 nm). This molecular sieve is designed for high water content in the feed stream, elevated temperatures, and quick cycling – all factors inherent in the ethanol drying processes.

**Zeochem Z3-03 is installed in more than 250 ethanol plants around the globe and offers:**

### **Longer Life**

Zeochem Z3-03's hydrothermal stability yields longer life in ethanol service than the standard 3A molecular sieve. Many plants operate for more than 10 years using Z3-03 with no noticeable performance loss. This helps avoid costly sieve change outs, unexpected shut-downs, and the resulting downtime of each.

### **Excellent Mechanical Properties – Bead Crush Strength and Attrition**

The spherical shape of the product ensures that all physical forces applied are compressive. Molecular sieve adsorbent beads are much stronger under compressive forces as compared to the tensile forces acting on extruded (rod or pellet) shapes.

The smooth, hard outer surface resists attrition, thereby minimizing dust formation and bead weakening. As a result, the product as packaged contains very low dust and generates very little dust during loading.



*“So far, our Zeochem sieves have lasted longer than our vessels.” Ethanol Plant Manager in the United States*

# Typical Properties

## Physical Integrity

The high feed water content in ethanol drying causes both fast rates of water adsorption and a resulting fast temperature rise in the adsorbent bed, all of which can be detrimental to the physical integrity of the sieve. Zeochem Z3-03 molecular sieve is designed to withstand these extreme conditions and test results show low particle breakup over the range of operating temperatures.

## Better Flow Distribution

Zeochem Z3-03's high particle density and narrow bead size distribution result in high volumetric efficiency and superior mass transfer characteristics.

## Low Pressure Drop

The spherical shape and smoothness of Zeochem Z3-03 beads provide low pressure drop that rises only minimally when operated according to Zeochem recommendations.. This low, stable pressure drop allows higher throughputs and also contributes to Zeochem Z3-03's minimal product breakup and superior attrition resistance.

Typical Properties (all nominal values)	Value		Unit
Bead Diameter	1/16 1.6-2.6	1/8 2.5-5.0	inch mm
Tapped Bulk Density	46 735	46 735	lb/ft <sup>3</sup> kg/m <sup>3</sup>
Bead Mesh Size	8x12	4x8	mesh
Crush Strength	10 40	20 90	lb N
Equilibrium Water Adsorption Capacity*	21	21	weight %
Residual Water Content (550 °C as shipped)	< 1.0	< 1.0	weight %
Heat of Adsorption	1,800 4,200	1,800 4,200	BTU/lb H <sub>2</sub> O kJ/kg H <sub>2</sub> O
Specific Heat	0.23 1.07	0.23 1.07	BTU/lb °F kJ/kg °C

\* @ 20°C & 50% rH

# TECHNICAL SUPPORT



For decades, Zeochem's Technical Service engineers have supported ethanol plants around the world with many different designs and process conditions. This experience has given Zeochem the data and know-how necessary to offer unmatched technical support.

From the start, our technical service engineers can provide conceptual advice and design support for your project. As the project moves forward, we can review the detailed designs and answer any questions regarding our products and their use in your operation. Our team provides support with consultation, training and startup assistance when the unit is commissioned. After sales service is available if service is required.

Optimization of an ethanol plant's molecular sieve beds can be critical to meeting economic and production objectives in today's ethanol market. To help meet that need, Zeochem offers optimization services that can result in increased ethanol production and significant cost savings for the producer. Zeochem also offers sample testing services to help evaluate the condition of the molecular sieve and determine the remaining life on the installed beads.



Call us when you are ready to start your next project or to review the operations of your current unit prior to your next reload.

*"We really appreciate Zeochem's suggestions, guidance, and the time dedicated to make this project go well".*

*Ethanol plant in India*

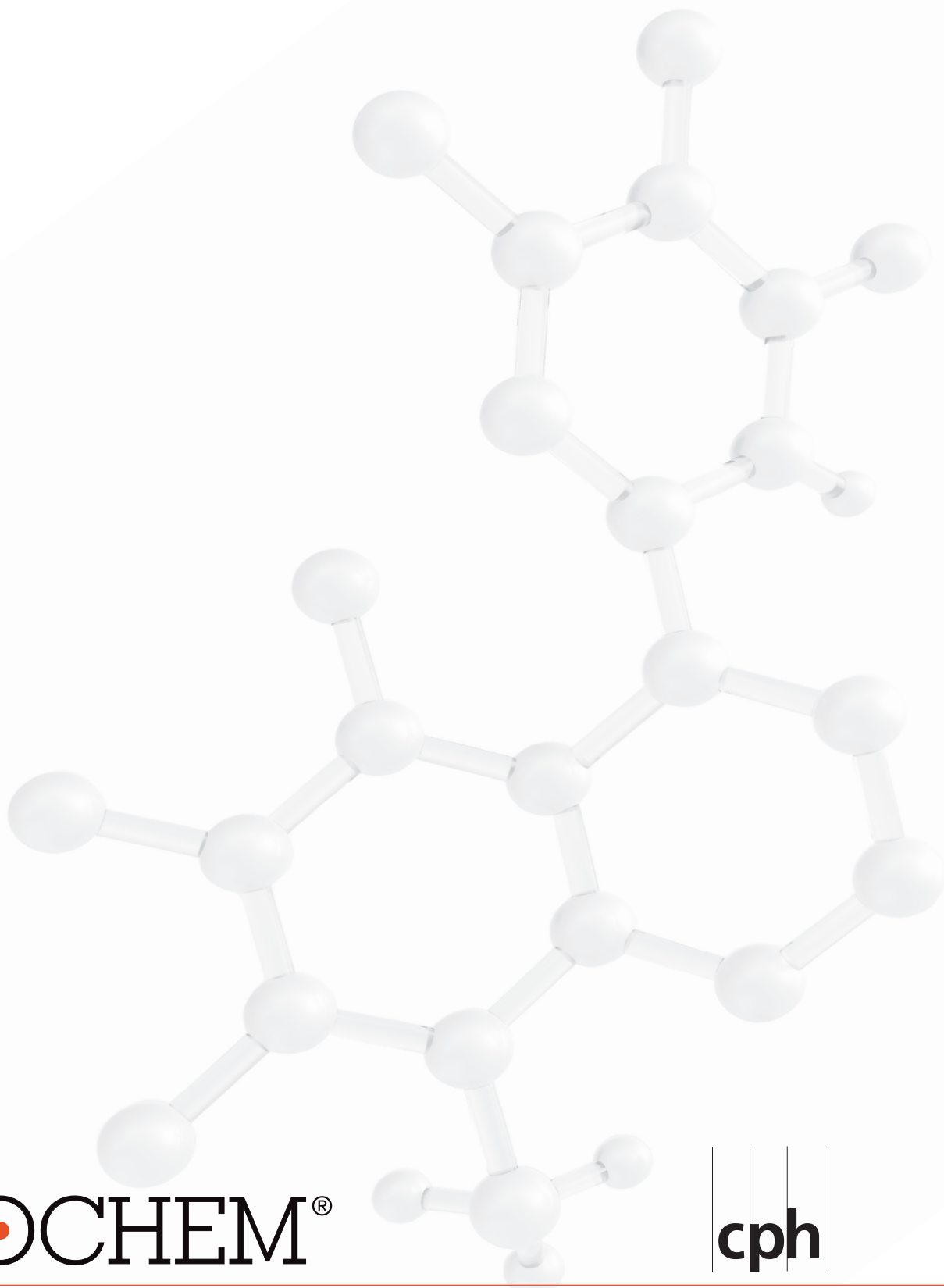
# ZEOCHEM Locations

Zeochem has Sales, R&D, and Manufacturing locations throughout the world to better serve our customers.

● Sales ● Manufacturing ● Research & Development



Please contact your local Zeochem sales office or visit [www.zeochem.com](http://www.zeochem.com) for more information. Let Zeochem help make your Ethanol plant more efficient and reliable.



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