

پتروتات مہام  
(شرکت سهامی خاص)  
Petrotat Co.

# Adsorbents & Purifications

*Technology-based trade | Quality-based survival*





**Welcome to  
World of  
PETROTAT**





# ABOUT PETROTAT

*PETROTAT is one of the largest adsorbents suppliers in Iran. Stable quality and professional technique service are our sign which wins all of our consumers' reputation. To ensure our consumers' product setup to stably and efficiently work, PETROTAT helps to consumer to select right product and we also could help customers to design the process. Base on the idea "Technology-based trade, Quality-based survival" PETROTAT supplies the highest quality of the products and technical support.*

*This catalog is designed for your primary selection. The products are listed by process along with the recommended applications and some physical descriptions. Our commercial contacts are available any time to help you with the optimal choice, and full consideration of performance and costs. PETROTAT is reliable for performance, pricing, delivery and support.*

*You can find out more about PETROTAT by visiting [www.petrotat.co](http://www.petrotat.co), or contact us through our office listing on the last page.*

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# Products at a Glance

## ADSORBENTS

- Molecular Sieves
- Activated Alumina
- Activated Carbon
- Carbon Molecular Sieve (CMS)
- Alumina – Silica Gel

## PURIFICATIONS

- Olefin Purification
- Propylene Purification
- Ethylene Purification
- Mercury Removal
- Sulfur Removal
- CO<sub>2</sub> Removal
- Chloride Removal



# Services

**At PETROTAT, we provide a comprehensive range of specialist technical services for our customers. Our strengths are summarized as follows:**

## **Adsorption Process Design:**

PETROTAT technical team will provide the whole design package for the adsorption unit on customer's particular adsorption application after receiving the feed characteristics as well as the site technical data/information and give extensive details on design parameters such as (1) unit configuration and beds geometry, (2) adsorbent(s) characteristics (type, size, and weight), (3) cycle times (adsorption, heating, cooling, and standby modes), and (4) regeneration/cooling requirements.

## **Improving/Optimizing Existing Design:**

Inappropriate designs as well as any upset or change in process conditions can lead to severe duty and extra challenges to an adsorption unit. PETROTAT technical team will review the existing process design and recommend best practical ideas to improve general unit operations, focusing on small changes in the existing unit.

## **Process Start Up and Performance Testing:**

In order to handle, start up, and operate the adsorption unit in a safe and appropriate way, PETROTAT technical/commissioning team will be on site during the startup and operation phases and will complete all necessary performance tests and will warranty that an optimum unit operating status is quickly attained.

## **Follow-up Technical Service:**

With the in-depth experience of its technical team members, PETROTAT will provide consulting services and technical assistance for the adsorption unit operation after commissioning so that competent advice is readily available on site.



## Unit Revamping Services:

In addition to adsorption engineering services, PETROTAT performs the troubleshooting and revamping of Air/Gas units.

- PSA H2 Plant
- PSA N2 Plant
- PSA O2 Plant
- PSA Medical O2 Plant
- PSA/TSA Air Dryers
- Dehydration / Sweetening Plants
- Hydrocarbon Dewpointing & Recovery Plant

Sweetening

Drying

Dehydration

# Adsorption

Treatment

Purification

Separation



# WHY PETROTAT?

## QUALITY

All finished products are analyzed and certified against specifications by quality control laboratory using testing methods according international norms.

## LOWER COST

PETROTAT offers catalysts, adsorbents and purifications at lower cost than most famous competitors in the market, to help you to reduce your investment on catalysts significantly.

## DELIVERY

PETROTAT always keeps a large inventory of some products which are often used such as, the Activated Alumina, Molecular Sieves, Active Carbon. We can also provide short delivery time for most of the products in our portfolio to meet your timeline.

## PERFORMANCE

PETROTAT unites the leading experts in Iran on catalysts and adsorbents. We continue our investment in product development & service improvement.

## EXPERIENCE

Our products have been commercially applied to more than 200 local references.

## QUICK

No business is too big or too small for us. We will respond to you within six hours (24/7) by email or telephone.



# Product Reviews

# ADSORBENTS





# Molecular Sieves

## PETROTAT Molecular Sieve - The Adsorbents with a Special Crystalline Structure:

PETROTAT Molecular Sieve Adsorbents are crystalline aluminosilicates with frameworks that contain monovalent or multivalent cations from the alkali or alkaline earth group, as well as water in its as-synthesized form.

This crystal water can be removed by thermal treatment without damaging the crystalline structure to create the conditions for a reversible process such as water adsorption/desorption.

### Molecular Sieve Adsorbents are Available in the Following Forms:

- 3A-** K-Na zeolite A with a nominal pore opening of 3 Å (0.3 nm)
- 4A -** (as-synthesized) Na zeolite A with a nominal pore opening of 4 Å (0.4 nm)
- 5A -** Ca-Na zeolite A with a nominal pore opening of 5 Å (0.5 nm)
- 13X -** Na zeolite X with a nominal pore opening of 10 Å (1.0 nm)

### Properties of PETROTAT Molecular Sieve Adsorbents:

- The adsorption surface area of a zeolite is around 800–900 m<sup>2</sup>/g.
- The specific (cavity) volume is approximately 0.3 cm<sup>3</sup>/g for zeolite A and 0.35 cm<sup>3</sup>/g for zeolite X. This provides sufficient space for holding a wide range of atoms or molecules with a high capacity.
- Polar and polarizable molecules and non-saturated hydrocarbons are preferably adsorbed as a result of the existence and accessibility of freely moving cations that act as adsorption sites within the zeolite framework.
- The precisely defined pore openings of 3Å, 4Å, 5Å, or 10 Å make it possible to separate substances with different molecular diameters.

# Molecular Sieve Adsorbents Overview

Product	Bead Size	Main Application Areas
3A	1.6 – 2.5 mm 2.5 – 5.0 mm 3.0 – 5.0 mm	<ul style="list-style-type: none"> <li>Drying of gases and polar liquids (methanol, ethanol) and easily polymerizing substances, such as unsaturated hydrocarbons (ethylene, propylene, acetylene and butadiene)</li> </ul>
4A	1.6 – 2.5 mm 2.5 – 5.0 mm 3.0 – 5.0 mm	<ul style="list-style-type: none"> <li>Drying of organic liquids (solvents, oils, gasoline and other saturated hydrocarbons), air, liquid gases (propane, butane), as well as technical and noble gases (H<sub>2</sub>, N<sub>2</sub>, He, Ar, etc.)</li> <li>Thermo-chemical energy storage</li> </ul>
5A	1.6 – 2.5 mm 2.5 – 5.0 mm 3.0 – 5.0 mm	<ul style="list-style-type: none"> <li>Drying and desulfurization (removal of H<sub>2</sub>S) of natural gas</li> <li>Purification of technical hydrogen</li> <li>Separation of n-paraffins from branched and cyclic hydrocarbons</li> <li>Removal of carbon dioxide</li> <li>Non-cryogenic oxygen enrichment</li> </ul>
13X APG, APGII, APGIII, HP, HP II, LPG, LiX	0.5 – 1.0 mm 1.0 – 1.5 mm 1.6 – 2.5 mm 2.5 – 5.0 mm 3.0 – 5.0 mm	<ul style="list-style-type: none"> <li>High performance purification of air and other gases (removal of trace contaminants)</li> <li>Desulfurization (sweetening) of natural gas and other fluids</li> <li>Non-cryogenic oxygen enrichment</li> <li>Removal of carbon dioxide</li> <li>Thermo-chemical energy storage</li> </ul>



# Molecular Sieves - Range of Applications

## PETROTAT Molecular Sieve Adsorbents Cover a Wide Range of Applications:

PETROTAT Molecular Sieve Adsorbents are successfully utilized in gas and fluid purification, separation and drying processes by:

- Drying gases and fluids to water levels significantly below 1 ppm
- Removing:
  - CO<sub>2</sub>
  - NH<sub>3</sub>
  - Alcohols
  - H<sub>2</sub>S and other polar sulfur compounds
  - Nitrogen

### Application examples include:

- The treatment of feed air to cryogenic air separation systems
- The treatment of mineral oil components before their catalytic conversion
- Separation of n- and iso- paraffins or aromatic substances
- Removal of CO and N<sub>2</sub> from hydrogen reformer gas
- Direct extraction of oxygen from air

# ADSORBENTS





# Activated Alumina

## PETROTAT L/F-200 Activated Alumina for Liquid and Air/Gas Drying

**PETROTAT Activated Alumina Adsorbent** is an excellent desiccant for drying a wide variety of liquids and gases. Although all molecules are adsorbed to some extent on L/F-200 activated alumina, those molecules having the highest polarity are preferentially absorbed.

Stream conditions such as pressure, concentration and molecularweight of the molecules, temperature and site competing molecules affect the efficiency of adsorption. L/F-200 is available in nominal sizes of 1/16", 1/8", 3/16" and 1/4" spheres.

### Product Applications:

**1. Drying:** Nearly all gases and liquids can be dried with L/F-200. Water removal is often necessary for efficient processing, storage and transportation of fluids. L/F-200 is appropriate for gas dehydration in both thermally regenerative (350 to 600°F) and pressure swing (PSA) modes.

**2. Acid removal:** Using transformer oils, lubricating oils, and refrigerants forms degradation acids. L/F-200 will remove these acids during use. In the manufacture of chlorinated and/or fluorinated hydrocarbons, removal of these residual halides and water is essential for a non-corrosive product.

**3. Process Stream Purification:** L/F-200 is excellent for removal of highly polar compounds such as water and alcohol. It also readily adsorbs TBC ad heavy metal ions from hydrocarbons.

**4. Hydrocarbon adsorption:** Under proper operating conditions, the pore size distributions and surface chemistry of activated alumina are conducive to the adsorption of hydrocarbons.

#### Product Benefits:

- Uniform ball size
- High crush strength
- Low abrasion
- High adsorptive capacity

# ADSORBENTS



# Activated Carbon

## PETROTAT Coal and Coconut Shell Activated Carbons for Gas & Water Treatment

Activated carbon is used in a wide range of industrial applications including gas and air treatment. Heightened environmental awareness and the enactment of strict emissions guidelines have led to the development of new applications, most notably in the area of air pollutant removal.

Activated carbon is also being used to an increasing extent in the treatment of water, including drinking water, groundwater, service water and waste water. Its primary role in this context is to adsorb dissolved organic impurities and to eliminate substances affecting odour, taste and colour in halogenized hydrocarbons and other organic pollutants. Yet another broad field of application for activated carbon is the treatment, purification and decolourization of liquids, which is of particular importance in the pharmaceuticals, food, beverage and other industries.

The selection of the most suitable type of activated carbon for a specific application depends on the physical and chemical properties of the substances to be adsorbed. Aside from this material data, other process related factors also play a role in the adsorption process.





# Activated Carbon

## Granular Activated Carbon Applications:

- Air purification
- Automotive cabin air filtration
- Treatment of compressed air
- Ozone elimination
- Household applications
- High performance separation processes
- Separation processes in chemistry (e.g. glycerine purification)
- Process media treatment in refineries (e.g. amine solutions)
- Potable water purification in waterworks
- Potable water purification in households (cartridges)
- Groundwater remediation
- Sand filter replacement
- Equipment of cartridge systems
- Water pre-treatment for beverages
- Separation processes in the foodstuff industry
- Sulphite and peroxide elimination
- Dechlorination
- Purification of swimming pool water
- Waste water treatment
- Gold recovery
- Deoiling of condensates
- Treatment of landfill waste water

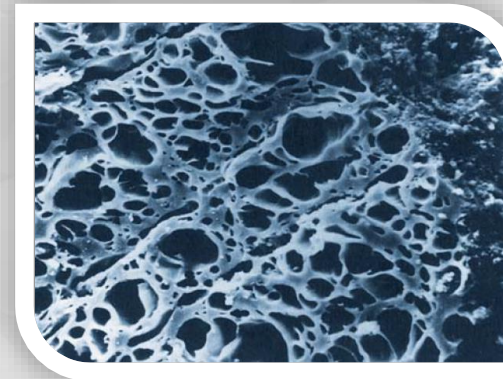
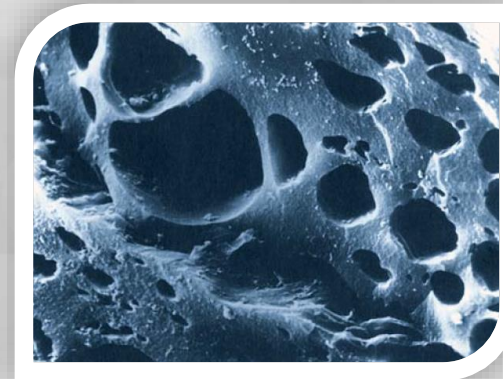
## Powder Activated Carbon Applications:

- Flue gas cleaning
- Separation processes in chemistry and pharmaceutical industry
- Rapid Kinetic-Adsorption
- Separation processes in the foodstuff industry
- Potable water purification in waterwork
- Sulphite and peroxide elimination
- Waste water treatment

# Activated Carbon

## Extruded Activated Carbon Applications:

- Catalyst carrier
- Solvent recovery
- Vapor recovery units (VRU)
- Decaffeination
- Respiratory filter
- Air purification
- Elimination of acid gases
- Elimination of alkaline gases
- Odor control
- Soil vapor extraction
- Nicotine adsorption, tobacco pipe filters
- Desulfurization natural gas
- Desulfurization biogas
- Combination Desulfurization/DeNO<sub>x</sub>
- DeNO<sub>x</sub>
- Treatment of radioactive gases
- Phosphine and Arsine removal
- Ozone elimination
- Treatment of compressed air
- Mercury elimination
- Aquaristics
- Decolourisation of liquids
- Iron and manganese removal



*Activated Carbon BET Surface*

*Photos taken using a scanning electron microscope*

# ADSORBENTS





# Carbon Molecular Sieve (CMS)

## PETROTAT Excellent Grade CMS for Nitrogen Generation

Carbon Molecular Sieves (CMS) are the crucial element of any PSA-Plant for the Generation of Nitrogen.

The PSA process provides an in-house, independent nitrogen supply at low cost for inertizing storage tanks, pipelines and tankers, processing and storing perishable foods and beverages, heat treatment of metals, processing plastics and fibres, in microchip production and many other applications. PSA Nitrogen is always available, whenever and wherever you need it, because with the Pressure Swing Adsorption-system (PSA) you simply generate nitrogen from air.

### Product Series:

- CMS-240
- CMS-260
- CMS-300 (New Grade – Excellent)
- CMS-330 (New Grade – Excellent)

# ADSORBENTS





# Alumina-Silica Gel

## PETROTAT Alumina-Silica Gels for Dehydration and Hydrocarbon Recovery

Natural gas is a complex mixture of hydrocarbons and often contains impurities like CO<sub>2</sub> and nitrogen. Natural gas can also be saturated with water.

At PETROTAT, we realize that natural gas needs to be treated to remove the water, impurities and higher hydrocarbons. This will avoid hydrate and ice formation, as well as corrosion in the pipeline.

### PETROTAT Offers Unique Products for Natural Gas Treatment

- **SG-H:** Mainly used for controlling dew point and recovery of heavy hydrocarbons from natural gas. Simultaneously, SG-H dehumidifies the natural gas. SG-H is protected from liquid condensation by approximately 20% of SG-WS.
- **SG-WS:** This type is the only 100% water-resistant adsorbent with a high adsorption capacity. It is most frequently used as a protective layer in combination with SG-R and SG-WS or other adsorbents such as molecular sieves, activated alumina, activated carbons and catalysts in order to increase the reliability of the system. With its high resistance against hydrothermal aging and low regeneration temperature, SG-WS is ideal for applications where adsorbent regeneration with humid gas occurs (e.g. Heat-of-Compression and Blower- Purge air dryers, air separation plants).
- **SG-R:** Mainly used for the continuous drying of compressed air, technical gases (e.g. N<sub>2</sub>, O<sub>2</sub>, CO<sub>2</sub>) and liquefied gases. It is protected from eventual liquid condensate by app.20% of SG-WS.

#### Properties and Benefits:

- Reduced energy consumption
- Minimal hydrothermal aging
- Lower operational costs
- High abrasion resistance
- Low pressure drop
- Reduction of energy and operational costs
- Decreased adsorbent replacement expense
- Lower service and operational costs
- Greater adsorption capacity
- Increased drying performance
- Low pressure dew points (minus 70°C)
- Reduction of plant size
- Increased capacity of existing equipment
- Improved operational benefits due to
- longer regeneration cycles



# PURIFICATION



# Olefin Purification

## Be Confident in PETROTAT Adsorbents for Olefin Purification

**Solid bed adsorption is the preferred separation technology for the removal of trace contaminants (typically polar or polarizable) from olefin.**

**Molecular sieves, promoted activated aluminas, and Metal oxides based adsorbents have the advantage of being able to operate in reactive environments without special processing steps.**

**They are capable of removing detrimental impurities to extremely low levels to avoid endangering plant equipment, achieving design throughput, or poisoning sensitive downstream catalysts.**

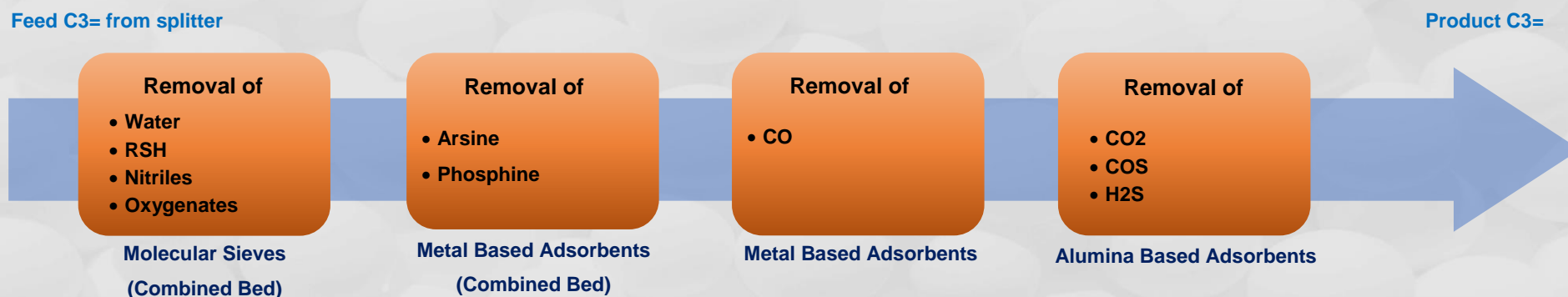
**The process typically involves passing the contaminated stream through one or more beds at ambient temperature to remove (adsorb) the contaminants and simultaneous heating a previously contaminant loaded bed with hot gas at a high temperature (250-290°C) to desorb the contaminant. The hot bed is then cooled and is ready for another adsorption step. Recent years there has been a growing need for the removal of water and other contaminants in ethylene and propylene production.**

## PETROTAT Offers Unique Products for Ethylene & Propylene Purification:

- **Metal Based Adsorbents**
- **Alumina Based Adsorbents**
- **Molecular Sieves**

# Propylene Purification

## Adsorbents Portfolio for *Propylene* Purification



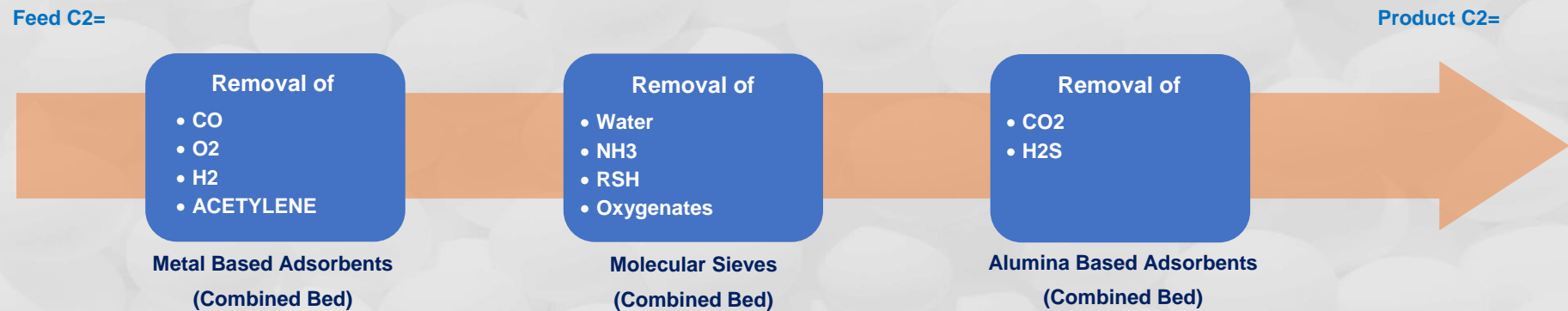
### Attainable Contaminant Effluent Specifications

Contaminants	H <sub>2</sub> S, COS	H <sub>2</sub> O	Nitriles, Oxygenates, Sulfur compounds	Arsine, PH <sub>3</sub> , SbH <sub>3</sub> , CO
Effluent Limitation	30 ppbw	0.1 ppmw	1 ppmw	20 ppbw
Adsorption type	Chemisorption	Physisorption	Physisorption	Chemisorption



# Ethylene Purification

## Adsorbents Portfolio for *Ethylene* Purification



### Attainable Contaminant Effluent Specifications

Contaminants	H <sub>2</sub> O, COS, H <sub>2</sub> S	CO <sub>2</sub>	NH <sub>3</sub> , Oxygenates, Mercaptans	CO, O <sub>2</sub> , H <sub>2</sub>
Effluent Limitation	0.1 ppmv	0.2 ppmv	1 ppmv	20 ppbv
Adsorption type	Physisorption and Chemisorption	Physisorption and Chemisorption	Physisorption	Chemisorption

# Mercury Removal

Almost all hydrocarbons contain mercury. In the case of natural gas and liquid natural gas it is likely to be present as elemental mercury whilst in crude oil it may also be present as organo-metallic and ionic mercury. Concentration levels vary from 10 to 5000 micrograms per normal cubic metre.

Our adsorbents can successfully remove mercury to 0.1 ppb that ensures your equipment is in a safe and continuous operation state.

- **Hg-NS:** *Non-regenerable adsorbent for removing mercury from natural gas streams.*
- **MR-582:** *Regenerable adsorbent for removing both water and mercury simultaneously in dehydrators.*
- **HgSIV 3:** *specifically developed to remove low levels of mercury from olefinic or reactive process streams, such as cracked gases and liquids, or natural gas and natural gas liquids*



# Sulfur Removal

Raw natural gas streams contaminated with sulfur compounds is becoming more common to the natural gas industry. Commercial and environmental pressures are setting increasingly tight limits on the levels of sulfur compounds allowed in gaseous and liquid hydrocarbons used for fuel and transportation.

PETROTAT adsorbents can effectively reduce the generation of COS and selectively remove hydrogensulfide ( $H_2S$ ), carbonylsulfide, mercaptans(RSH) in the gas. It can make the gas at a very low sulfur levels of <1 ppm for each sulfur compound.

- **SR-35:** *High-performance adsorbent to remove water, low levels of  $H_2S$  and COS from light hydrocarbons.*





# CO<sub>2</sub> Removal

When the CO<sub>2</sub> level is too high, it needs to be removed to meet product specification and avoid formation of solid CO<sub>2</sub> which can cause logging of pipes in cryogenic equipment.

We will help you choose the right adsorbent for both water and CO<sub>2</sub> removal in natural gas plants and ensure water and CO<sub>2</sub> outlet concentrations are less than 1ppm.

- **CR-50:** *High-capacity adsorbent for dehydration and CO<sub>2</sub> removal in LNG plants.*



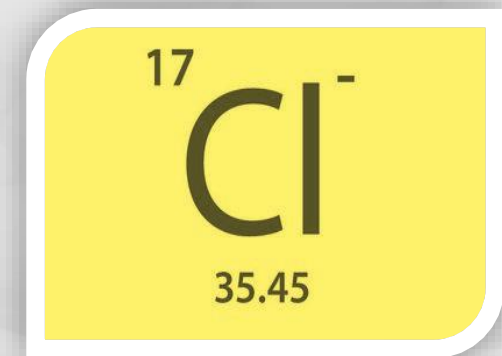
# Chloride Removal

The presence of chloride in refinery streams typically comes from the crude oil and the catalytic reforming unit. In common, the form is inorganic chloride but sometimes certain crude oil contains species of organic chlorides can not be removed in the desalter easily.

The most common source of chloride comes from the catalytic reforming unit which is injected with chloride onto the catalyst for optimal conversion and selectivity. The effects of chloride on downstream operations can cause corrosion of the steel equipments like pipes and pressure drop problems.

Chloride adsorbent are widely used in oil refinery, petrochemical, ammonia, natural gas, coal chemical plants to protect the downstream catalyst, pipe and equipment.

- **LCI -6255,6250:** *Chloride Adsorbent from Isomerate*
- **LCI -2255,2250:** *Chloride Absorbent from Hydrogen gas*



# Follow us on:





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