

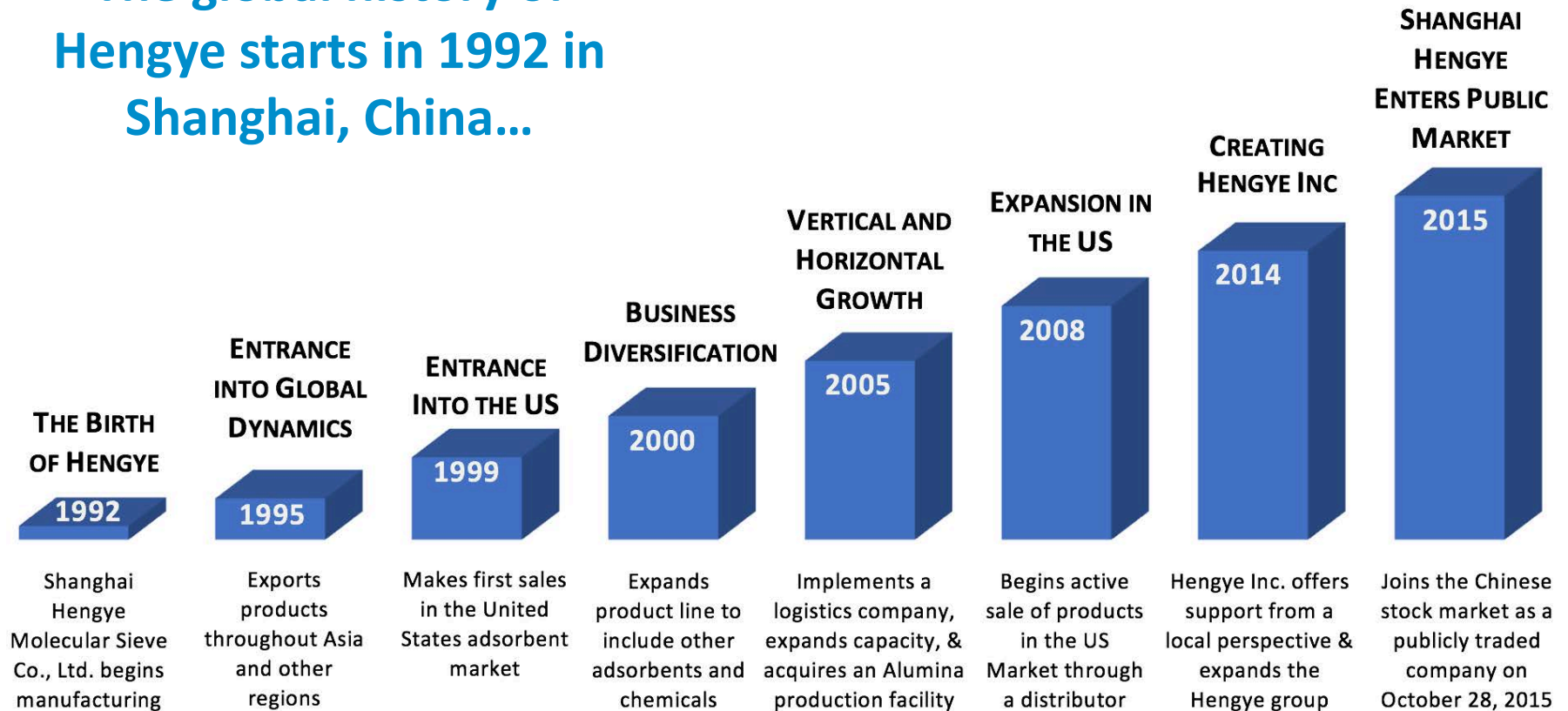
An introduction to Hengye Inc.

# Adsorbent and Catalyst Manufacturer

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# The global history of Hengye starts in 1992 in Shanghai, China...



...and continues  
with Hengye Inc.



# What we do

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## Our Products

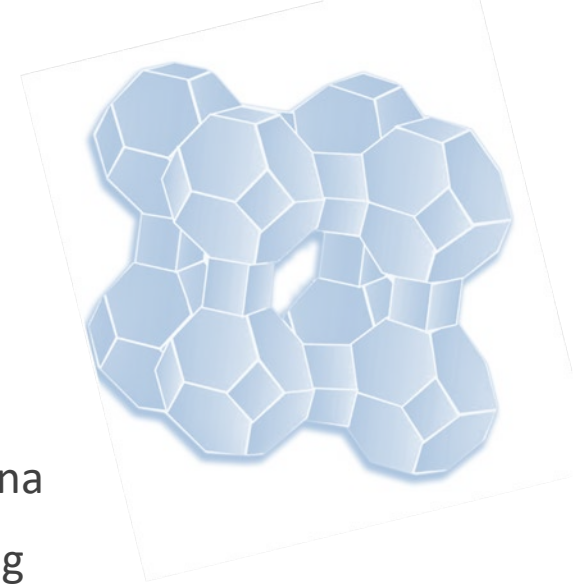
- One of the first privately-owned Zeolite Manufacturers in China
- In-house Research & Development and product quality testing
- We offer a wide range of adsorbents and catalysts and have the flexibility to manufacture products that meet unique requirements
- One of the highest volume manufacturers in the world
  - Production capacity 38,000 MT per year
- We can supply all the needed materials to fill dehydration units

## We Manufacture:

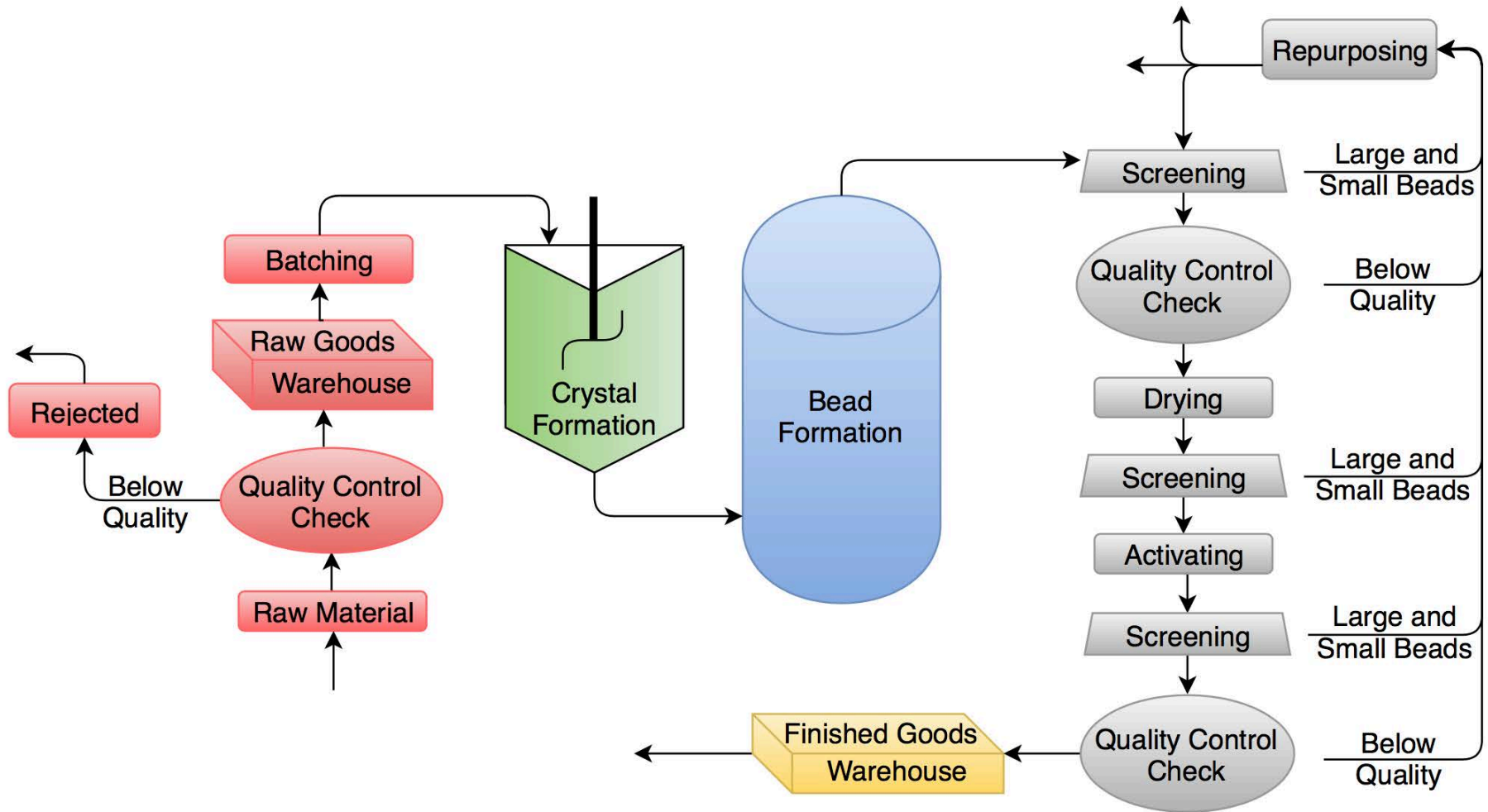
- Molecular Sieve (beads, powder, and pellets)
- Activated Alumina (beads and powder)
- Catalysts
- Support Material

## We Supply:

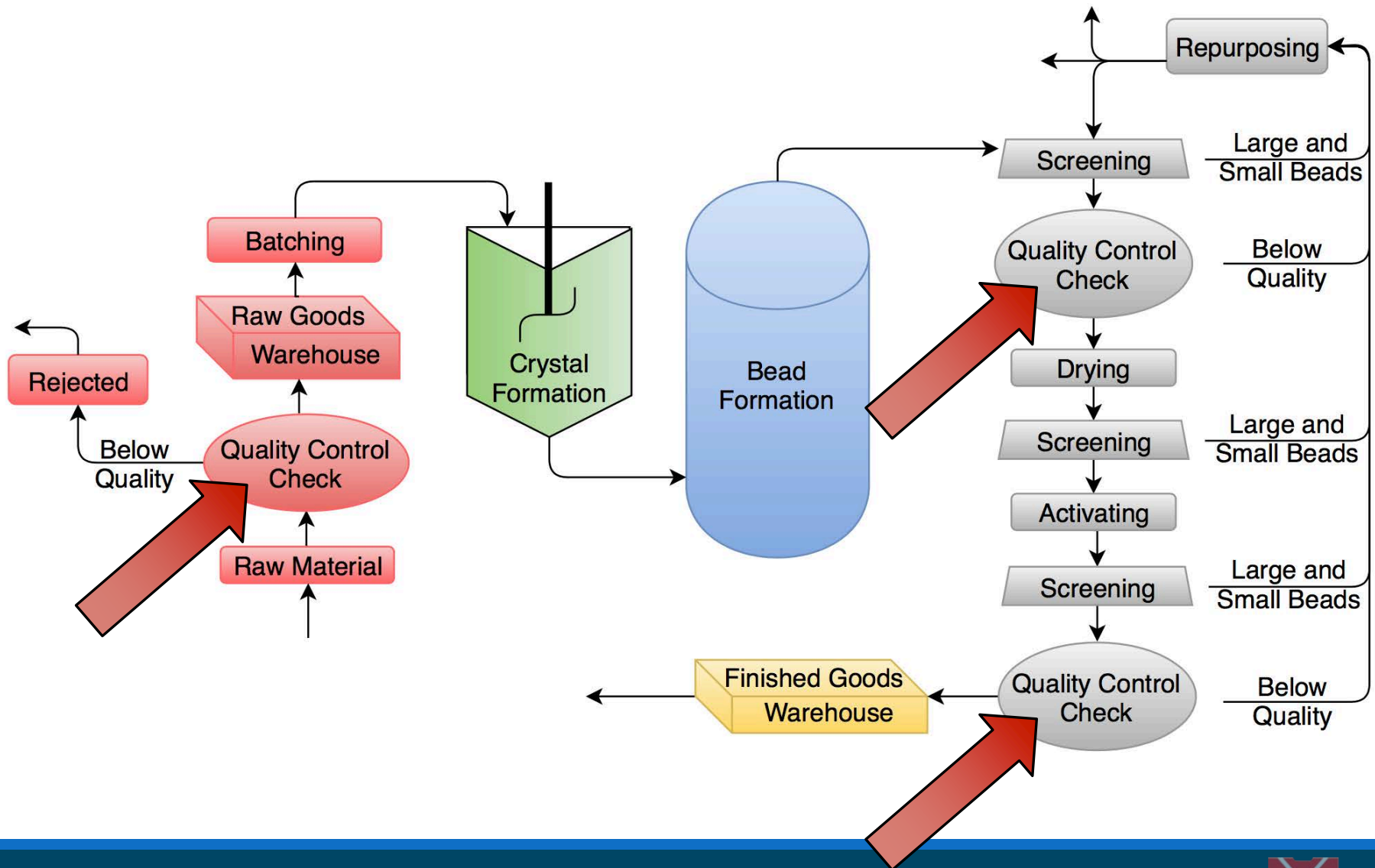
- Silica Gel (beads and granular)
- Silica Alumina
- and more...



# Process of Making Molecular Sieve



# Process of Making Molecular Sieve



# Making Sieve Right



## Samples of Quality

### **Pulled before drying and activating to evaluate quality**

- Crush strength
- Water adsorption
- Bulk density

### **Pulled after third and final screening**

- Physical properties are checked three times to ensure conformity to specifications
- Positive pressure wind used to release dust during activation
- Any material that does not meet specification is promptly rejected and does not enter the finished product warehouse

## Production

- Trial run data used for adjusting Production Control Plan to prevent potential errors, improve techniques, and ensure consistent quality over time
- Different products can have unique production lines to prevent cross-contamination
- Measures taken to ensure quality of raw material for uniformity and reliable quality
- Produce our own crystals and powder in a strictly controlled synthesis process to facilitate uniform crystal growth



# Sample Specification Sheet



Molecular Sieve					
Standard 4A		Beads		Pellets	
Property	Unit	4x8 Mesh	8x12 Mesh	1/8 Inch	1/16 Inch
Diameter	mm	2.5 - 5.0	1.6 - 2.5	3.0 - 3.3	1.5 - 1.8
Bulk Density	g/mL (lb/ft <sup>3</sup> )	0.70-0.76 (43.7-47.4)	0.75-0.81 (46.8-50.6)	0.65-0.71 (40.6-44.3)	0.66-0.72 (41.2-44.9)
Crush Strength	N (lbm*ft/s <sup>2</sup> )	≥90 (≥20)	≥45 (≥10)	≥80 (≥18)	≥40 (≥9)
Static Water Adsorption	wt%	≥21.5	≥21.5	≥21.5	≥21.5
Attrition	wt%	≤0.1	≤0.1	≤0.4	≤0.4
Moisture Content	wt%	≤1.5	≤1.5	≤1.5	≤1.5
Packaging Options	Beads	1,000 kg (2,204.6lb) / Super Sack; 150kg (330.7lb) / Drum			
	Pellets	1,000 kg (2,204.6lb) / Super Sack; 125kg (275.6lb) / Drum			

# All Products

## We Manufacture Molecular Sieve

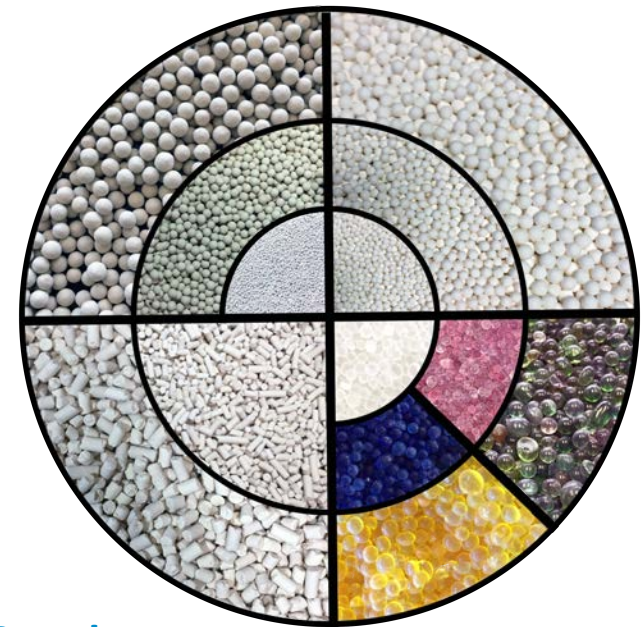
- Type 3A, 4A, and 5A
- Type 13X, CalciumX, SodiumX, LithiumX
- Carbon molecular sieve

## Activated Alumina

- Standard grade alumina
- Catalyst grade activated alumina
- Promoted aluminas
- High alumina support material
- Pseudoboehmite

## Catalysts

- HYZSM5
- Claus catalysts and tail gas units
- Steam methane reforming catalysts
- Nitrogen or Hydrogen generation
- Air purification catalysts



## We Supply

- Everything required to fill dehydration or purification units!
  - *Silica gel*
  - *Silica alumina*
  - *Activated Carbon*
  - *Ceramic support material*
  - *and more...*
- Engineering services for new constructions and existing units
- Turnkey contracting services



# Molecular Sieve

## Type 3A

- Polar solvent drying (ethanol, methanol, etc.)
- Olefin dehydration (ethylene, xylene, etc.)
- Hydrocarbon dehydration (natural gas, etc.)

## Type 4A

- Commonly used in dehydration applications
- Cryogenic separation of hydrocarbons
- Desiccant air dryers

## Type 5A

- Acid gas removal
- Gas drying (cracked, synthesis, more)
- Hydrogen purification
- Oxygen concentration

## Type 13X

- Cryogenic air separation
- Acid gas removal
- Oxygen concentration

## Other Molecular Sieves

- CalciumX
- SodiumX
- LithiumX
- CMS
- HYZSM5



# Activated Alumina

## Non-promoted

- Bulk dehydration
- Desiccant air dryers
- Water purification
- Natural gas dehydration

## Typical Form

- Beads (generally 1/16", 1/8", 3/16", 1/4", 7x14 mesh)
- Powder (including pseudoboehmite)
- 1-ton Super Sack (2,204 pounds)
- 25-kg Bags with liner (55 pounds)

## Promoted

- Air contaminant filtration
- Sour gas removal
- Mixed C4 stream purification
- Chloride removal

## Differences from Non-promoted

- Offers special chemical adsorption advantages that non-promoted aluminas cannot
- Can operate at higher temperatures
- Typically cannot be regenerated



# Additional Products

## Catalysts

- Fluid Catalytic Cracking (FCCUs)
- Steam Methane Reforming (hydrogen production)
- Deoxidant catalyst (inert gas purification)
- Sulfur Recovery (Claus and tail gas catalysts)

## Silica Gel

- White, non-indicating (beads and granular)
- Blue, indicating
- Yellow, indicating
- Specialized silica gels

## Silica Alumina

- HY-H and HY-W

## Activated Carbon

- Coconut shell
- Carbon based

## Support Material

- High alumina support balls
- Ceramic support material
- Filters and screens

## Everything to Fill Purification Units

- We can provide all materials needed to fill your dehydration units to keep things simple



# Supporting Our Products

## Technical Services

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### Engineering Assistance

- Custom design work for dehydration units and adsorption processes
- New build design capabilities, existing unit bed sizing
- Evaluation of capacity and efficiency
- Spent material analysis

### On-site Services

- Change-out / Turnkey reload services
- Reload instruction and assistance
- On-site service and support, remote service capabilities available
- Optimization guidance and assistance

## Support Services

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### Pricing and Availability

- Inventory in Shanghai, China; Houston, Texas; and Omaha, NE
- Special pricing for CIF door-to-door
- Direct from manufacturer pricing
- Flexible lead times, able to meet delivery deadlines
- Logistics support and shipping arrangements can be provided
- Credit terms for qualified orders

### Quality

- Warranties can be granted
- Multiple samples tested from each lot to ensure specifications are met and/or exceeded

# Gas Processing & LNG

## Dehydration

### Molecular Sieves – WateRyd

- Natural Gas Dehydration (<0.1ppm)
- Cryogenic Natural Gas Liquids extraction
- Liquefaction, Cryogenic separation
- Import and Export Terminals, Peak Shaving

## Sulfur Removal

### Various Adsorbents – SulfuRyd

- Molecular sieves and activated aluminas
- Acid Gas Removal, Sweetening
- Increase value of product stream
- Meet environmental regulations

## Mercury Removal

### Molecular Sieves – MercuRyd

- Improve safety, protect Cold Box
- Increase value of product stream
- Meet environmental regulations

## Nitrogen Rejection

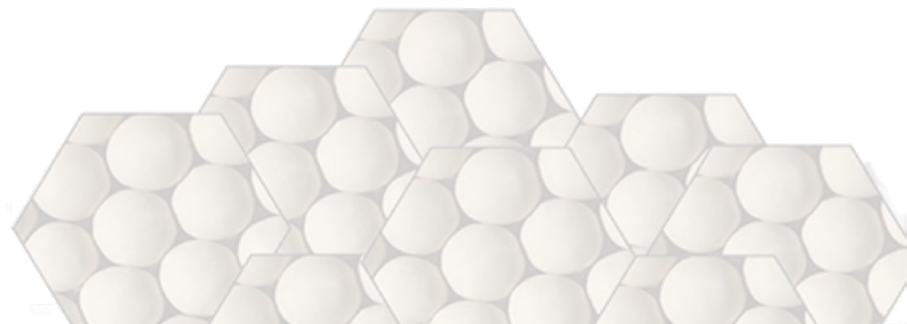
### Various Adsorbents – MercuRyd

- Molecular sieve and activated carbons
- Increase value of product stream
- Improve transportation efficiency

## Hydrocarbon Dew Point Control (DPCUs)

### silica alumina products – HY-H and HY-W

- Reduces hydrocarbon and water dew points



# Refining

## Steam Methane Reforming

### Hydrogen Production – HydroFlo

- Specialized catalyst for producing high purity hydrogen streams
- Offers a high single-pass conversion rate to increase the efficiency of your operation

## Catalytic Reforming

### Chloride Adsorbents – ChlориClear

- Adsorbents with high HCl adsorption capacity for use in chloride traps
- Minimizes polymer formation and adsorbs chlorides that damage equipment

## Isomerization

### Molecular Sieves

- Adsorbents for dehydrating and purifying feed streams prior to refining processes

## Refining Catalysts

### Catalysts and Adsorbents

- Methanol-to-Gasoline (MTG)
- Hydrocarbon isomerization and alkylation
- Syngas production (HyCO)

## Fluid Catalytic Cracking (FCCUs)

- HYZSM5
- Pseudoboehmite





# Air Purification Applications

## Cryogenic Air Pre-purification Processes

- Molecular sieves remove water, carbon dioxide, etc. to prevent freezing in cryogenic separation processes

## Oxygen Purification

- Molecular sieves for concentrating oxygen streams with purities above 90%
- Industrial air, pneumatic equipment, breathing oxygen, and more...

## Hydrogen Purification

- Molecular sieves and catalysts for generating high purity hydrogen streams

## Nitrogen Purification

- Adsorbents and catalysts for creating high purity nitrogen streams

## Desiccant Air Dryers

- Adsorbents for removing water and other impurities from compressed air in desiccant dryers

## Air Purification Products

- Molecular sieves
  - Type 5A
  - Type 13X
  - SodiumX
  - LithiumX
  - CMS
- Catalysts
- Activated carbon
- and more...

# Additional Applications

## Ethanol Production

### Molecular Sieve – EthaDry

- Specialized Type 3A that minimizes the undesirable adsorption of ethanol molecules

## Sulfur Recovery Units (SRUs)

### Claus Catalysts – SulCat Series

- Standard catalyst
  - high alumina content catalyst
- Hydrolyzing catalysts
  - promoted catalyst
  - titanium dioxide blended catalyst
  - high  $\text{TiO}_2$  content catalyst

## Tail Gas Units (TGUs)

### Tail Gas Catalysts – SulCat Series

- Tail gas hydrogenation catalyst

## Petrochemicals

### Olefin Dehydration – OleCleanse Series

- Molecular sieves for dehydrating various olefin cracked gas streams
- Specialized products depending on feed stream: ethylene, butylene, propylene, etc.

### Olefin Purification – SulfuRyd

- Acid Gas Removal

## Other Applications

- Siloxane removal from landfill gas
- Biofuel purification
- Air breather desiccant
- Insulating glass
- Paint, coatings, polymers, etc.

# Connect with Hengye...

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