BUSS ChemTech

REACTION TECHNOLOGY

HYDROCARBON RESINS

BUSS ChemTech is a leading technology supplier in the field of hydrocarbon resins – for both base hydrocarbon resins (HCR) and hydrogenated hydrocarbon resins (HHCR).

Our experience with specialty as well as standard products, combined with our comprehensive process development capabilities, enables us to provide optimized process designs resulting in cost effective and high performance solutions that have the shortest time to market.

Naturally, our HHCR technology is centered around the proven performance characteristics of the BUSS-Loop® Reactor, which achieves the highest mass transfer rates for the hydrogenation step in comparison to other technologies. Our HCR technology allows clients to reduce solvent usage, minimize catalyst consumption and deliver consistently high quality water white resins.
Our experience also includes partial and selective hydrogenations. The most distinctive feature of our hydrogenation technology is the continuous operation mode with a uniquely integrated catalyst filtration concept.

Continuous HHCR Plant, US

THE HCR/HHCR PROCESSES

Several types of petroleum-based streams are used as raw materials for base resins (or HCR's), that then can be hydrogenated to water white resins (or HHCR's). The major characteristic defining hydrocarbon resins types is the nature of the double bonds: aliphatic or aromatic.

The most important hydrocarbon resin types are:
- Aliphatic C5
- Cycloaliphatic (dicyclopentadiene or DCPD)
- Aromatic C9
- Mixed

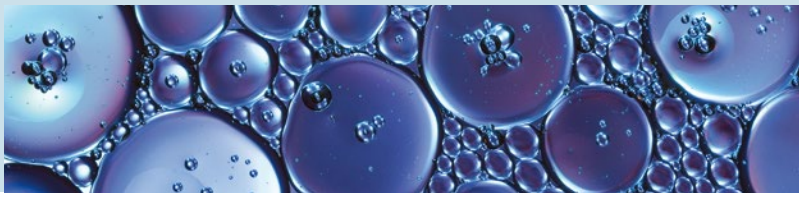
The figure below shows the chemistry of the most typical resins.

HCR's are produced by thermal or cationic polymerization. Hydrogenation of HCR's is primarily done to improve color and stability (UV and heat resistance) of the resin by removing vulnerable double bonds. Full, partial and selective hydrogenation are methods used to produce resins with broad compatibility and good stability. Depending on the desired target, Ni or Pd catalysts are used. Solvents are used in both steps of the process, and dedicated unit operations are part of our design.

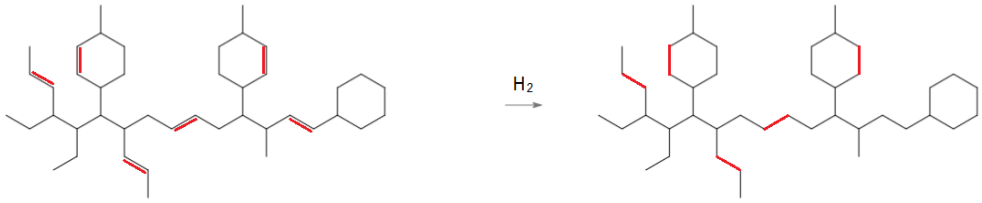
The resin hydrogenation process is predominantly a high temperature, high pressure reaction. The specific operating conditions will vary depending on the product and degree of hydrogenation desired and reactor type used.

The main reactor types are:
- Fixed (Trickle) Bed Column Reactor
- Stirred Tank Reactor (slurry)
- BUSS-Loop® Reactor (slurry)

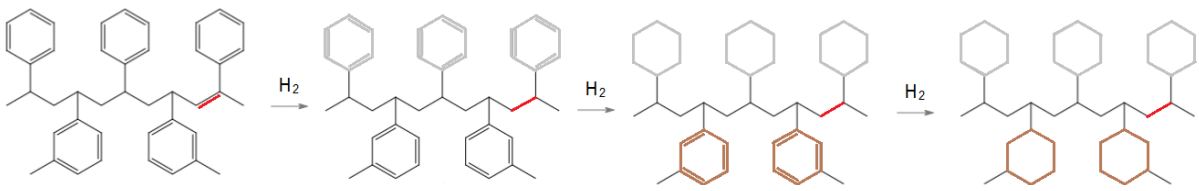
The BUSS-Loop® Reactor provides a number of advantages, especially for the hydrogenation step. The main characteristics of different technologies are shown in the table on the next page.



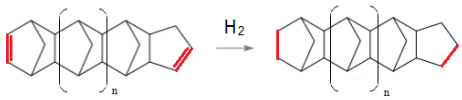
C5 aliphatic resins



C9 aromatic resins



DCPD (dicyclopentadiene) resins



OVERVIEW OF AVAILABLE HHCR TECHNOLOGIES

	BUSS-LOOP® REACTOR	FIXED BED REACTOR	STIRRED TANK REACTOR
Catalyst	+ reduced loads and consumption o moderate attrition	+ low attrition – limited available surface – channel creation/hot spots – catalyst replacement leads to interruption – regeneration cycles – high loads	o moderate attrition – higher loads and consumption
Hydrogen recycling	+ not necessary	– complex – very expensive (hydrogen compressor)	+ not necessary
Reaction Time	+ fast reaction time	– long reaction time	o moderate reaction time
Heat Removal	+ very high cooling capacity due to external heat exchanger	– poor cooling capacity due to limited heat transfer surface	– poor cooling capacity due to limited heat transfer surface
Operation Mode	Batch & Continuous	Continuous	Batch & Continuous
Product quality	+ high consistent product quality + full and partial hydro-genation	– very difficult to achive stable product quality + full and partial hydro-genation	+ high consistent product quality + full and partial hydro-genation
Flexibility	+ flexible; easy product change	– time consuming cleaning steps at product change	+ flexible; easy product change
Operating costs	+ moderate catalysts consumption + high resin concentration > 50 % + low distillation costs	+ low catalyst consumption + no product/catalysts separation – low resin concentration – high distillation costs – energy consumption of compressor	– high catalyst consumption – low resin concentration
Investment costs	o moderate to high	o low to moderate	+ moderate

Hydrogenation Plant with
BUSS-Loop® Reactor

Discover more about our technologies. Scan the QR code now!

SUMMARY

Hydrocarbon resins produced using technology from BUSS ChemTech are recognized as having the highest quality on the market. It is estimated that almost 50 % of worldwide water white hydrocarbon resins are produced with BUSS ChemTech technology.

In addition, there are numerous benefits from using a BUSS-Loop® Reactor, including:

- Smooth operation (high heat removal capacity)
- High mass transfer rate (optimized process and catalytic efficiency)
- Higher resin concentrations: less solvent, less energy cost (distillation)
- Homogeneous mixing (no hot spots)
- Closed system, no hydrogen recycling required
- Batch or continuous operation possible
- Consistently high product quality
- Less complex plant to run successfully
- Fastest time to market
- Process guarantees resulting from scale-up experience

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