

Purification of bio-based chemicals

Processing solutions for the fermentation and chemical industries

Optimized purification processes for bio-based chemicals

- Complete palette of alternative technologies to distillation
- Fully optimized process lines with guaranteed performance
- Robust and proven process development methodology
- Process integration & optimization: recycling, side streams purification, energy saving

Novasep's technology portfolio is unique in the industry

Applexion® Batch or Continuous Ion Exchange
Applexion® XA Resins
Salt conversion
Demineralization
Decolorization
Adsorption/Desorption

Adsorption & Ion Exchange

Membrane Processes

Kerasep® Ceramic Membranes
Applexion® Organic Membranes
Microfiltration Ultrafiltration
Nanofiltration Clarification
Concentration Desalting
Reverse osmosis

MEGA ED RALEX® technology
Salt conversion
Desalting
Demineralization

Electrodialysis

Evaporation/ Crystallization

Plate/tubular evaporators
Multiple effect or MVR
Falling films
Forced circulation
Draft tube baffle crystallizer

Normal/reverse phase HPLC
Selective elution
Complex mixture fractionation

High, Medium and Low Pressure Batch Chromatography

Continuous Chromatography

Applexion® SSMB (Sequential Simulated Moving Bed)
Proprietary chromatography simulation software
Separation of fractions
Purification

We have industrial experience with:

ORGANIC ACIDS

- Citric acid
- Glucaric acid
- Gluconic acid
- Itaconic acid
- Lactic acid
- Succinic acid

SUGARS

- Arabinose
- Fructose
- Galactose
- Glucose
- Mannose
- Xylose
- Oligosaccharides

GLYCOLS

- MEG & DEG
- PG
- 1,3-PDO
- 1,4-BDO
- Glycerol
- Sorbitol derivatives

OTHERS

- Lignin
- HMF
- Furfural
- Anti-oxidants



Continuous ion exchange



Ion exchange unit

Main Unit Operations for downstream processing

Demineralization and Salt Conversion by Continuous Ion Exchange

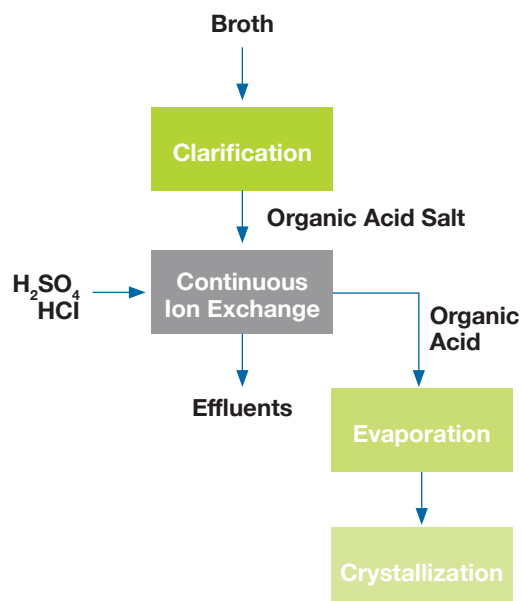
Versatile Applexion® Continuous Ion Exchange technology provides an optimal solution for **demineralization and salt conversion**, with benefits to processors that include:

- Low consumption of chemicals
- Low consumption of water

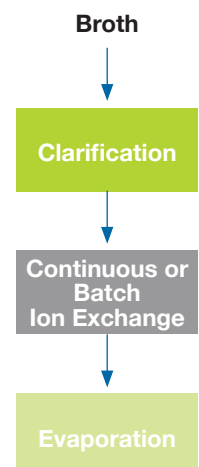
Applexion® Continuous Ion Exchange technology is well-suited to a number of compounds, such as:

- Organic acids
 - Gluconic acid
 - Lactic acid
 - Succinic acid
- L-Lysine
- Antibiotics
- Vitamins
- Mono Ethylene Glycol
- Glycols
 - 1,4 butanediol
 - 1,3 propanediol

SALT CONVERSION



DEMINERALIZATION



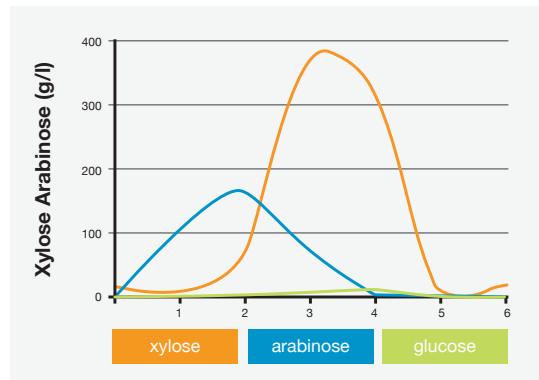
Separation by chromatography

Applexion® SSMB chromatography will bring you a cost-effective industrial solution to challenges like **fraction separation**. Benefits include:

- High purity fractions
- Low water usage
- No chemical consumption
- Operate with water or organic solvents as eluents

Applications for Applexion® SSMB chromatography include:

- Organic acids purification
- Sugars separation:
 - Xylose / Arabinose / Galactose
 - Glucose / Mannose
- Monomers / Oligomers separation
- Product recovery in mother liquors:
 - Citric acid
 - Threonine



Clarification by Ceramic Membrane Filtration

Kerasep® membranes will provide you with a long-standing and robust installation for clarification and concentration processes.

Benefits of these processes include:

- Wide range of cut-offs
- 24/7 operation
- Inline CIP/SIP
- Up to a 6-year guarantee



Applexion SSMB chromatography



Kerasep K99 module



Kerasep filtration unit

Some examples of these processes are:

- Organic acids
- Antibiotics
- Amino acids
- Enzymes



Kerasep membrane range

Novasep's unique process development capabilities can provide efficient solutions for any processing challenge

50 pilot units are available for:

- In-house or on-site piloting
- Full process line demonstration and performance guarantees
- More than 20 processes developed per year
- Proven track record for 45 years
- Development teams in France, China, the USA



China pilot hall

Screening Studies
Unit operations
sequencing

In-House Process
Simulation

Process Design
and Optimization

Process
Integration with
Upstream & Side
Streams

Pilot Study

Novasep Custom
Purification
Services

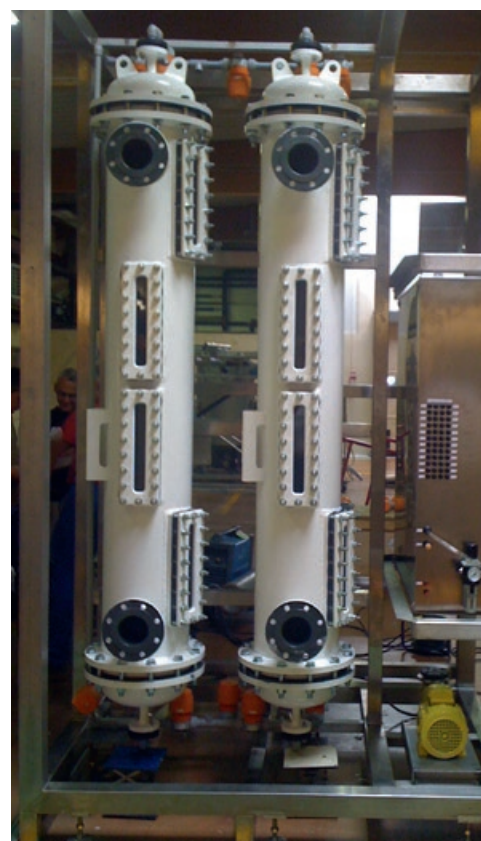
Supply of
Equipment
with Process
Guarantees



Electrodialysis pilot unit



Evaporation pilot unit



Ion exchange pilot unit



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for the life science industries

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