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PropOx+ Enhanced Propylated Starch Process

Reduces Costs and Emissions and rises profit!

DI Franz Gaisch, MBA

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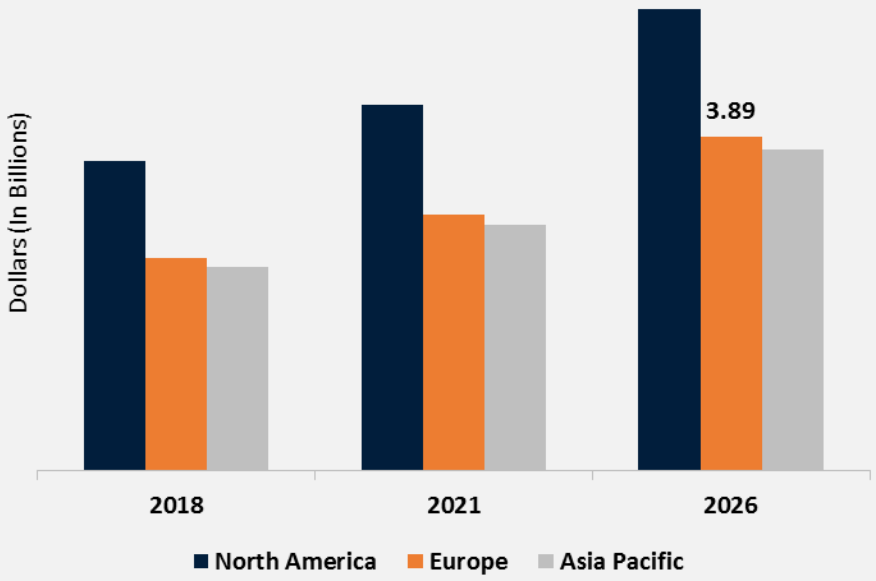

Asia-Pacific (APAC) market is expected to grow at the highest CAGR during the forecast period.

Europe is expected to reach USD 5.39 billion in 2026, at a CAGR of 5.1% during the forecast period.

North America held the largest market for Modified Starch in 2018 and is estimated to maintain its dominance during the forecast period.

REPORTS AND DATA

Propylated Starch Market

- Strong growing market
- Market growth for modifies starch from 10 B USD in 2018 to 15 B USD in 2026
- Few large producer:
  - Cargill (US)
  - Tate & Lyle (UK)
  - Archer Daniels Midland (US)
  - Ingredion Inc. (US)
  - Emsland Stärke GmbH (Ger)
  - Global Bio-Chem Technology Group Co. Ltd. (Hong Kong)
  - SPAC Starch Products (India)
  - Qingdao CBH Co. Ltd. Company (China)
  - Roquette Freres (France)
  - Agrana (A)
  - …….

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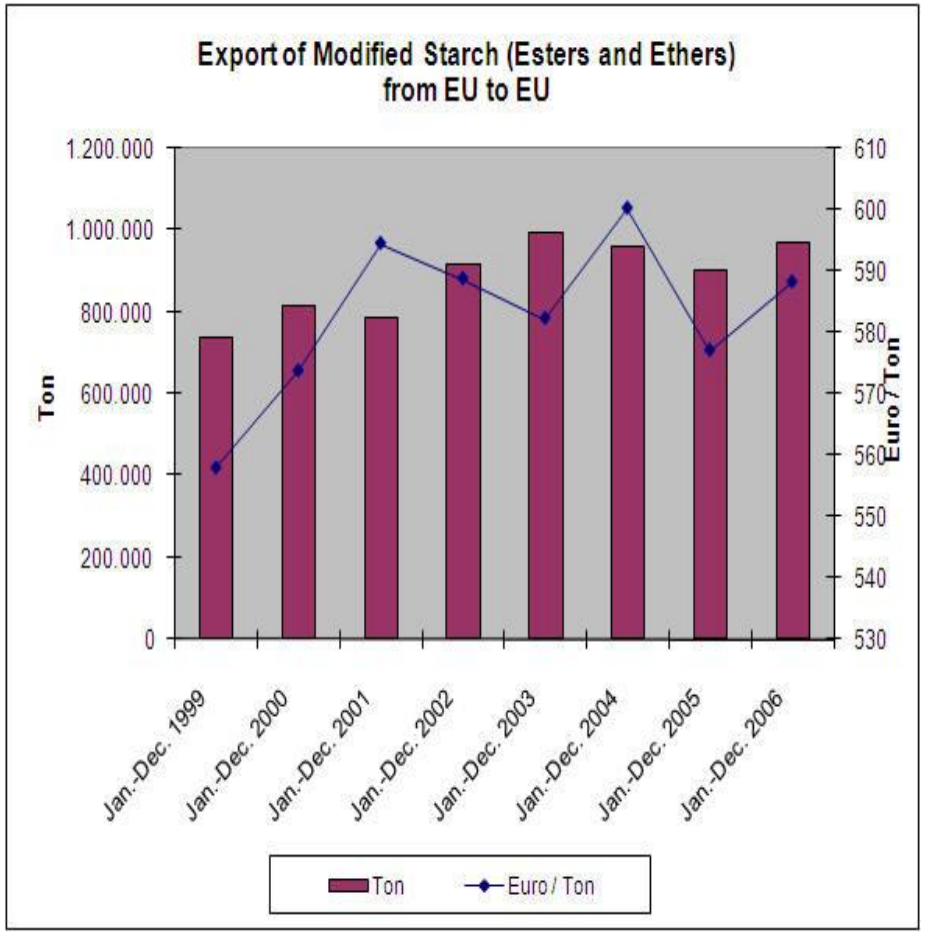
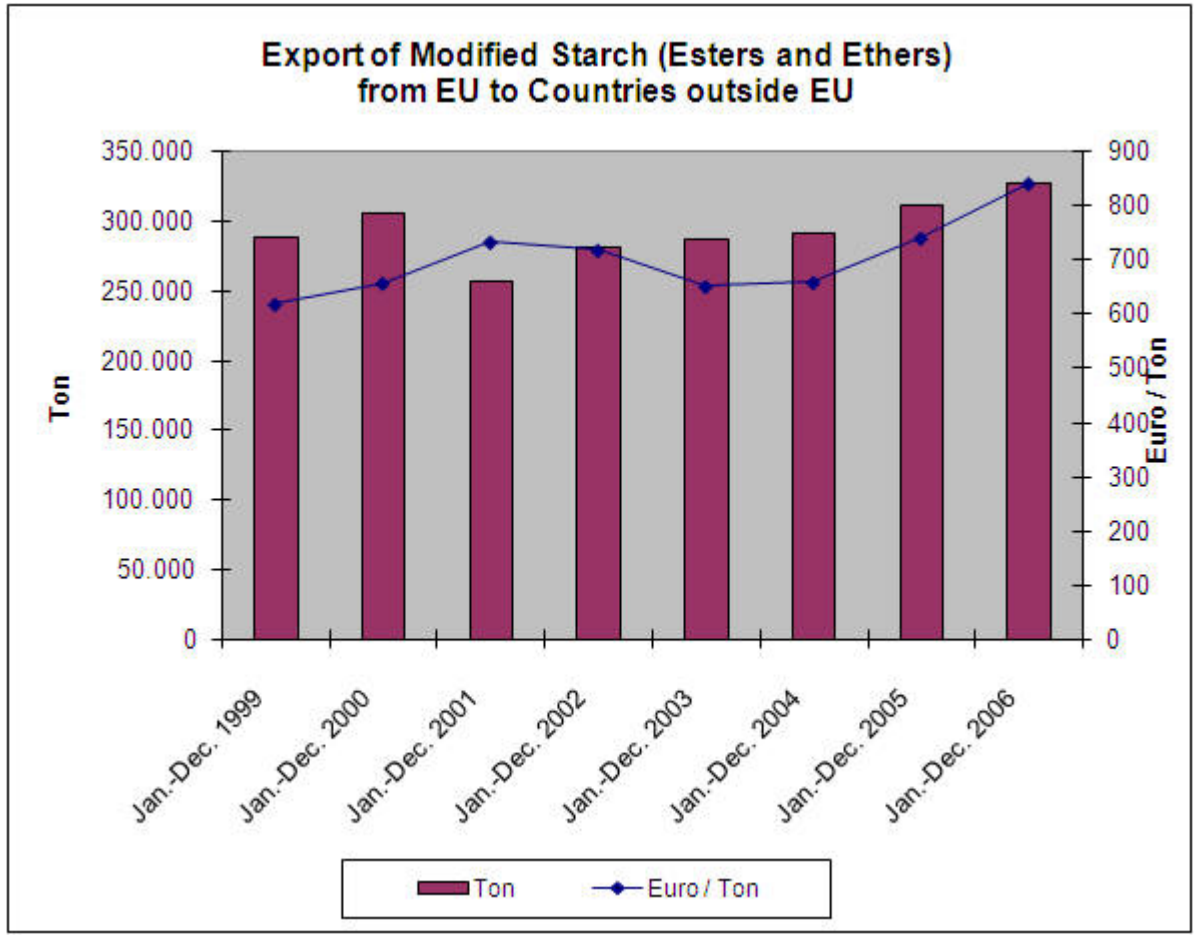
Modified starch market





http://www.starch.dk/isi/stat/eu.asp

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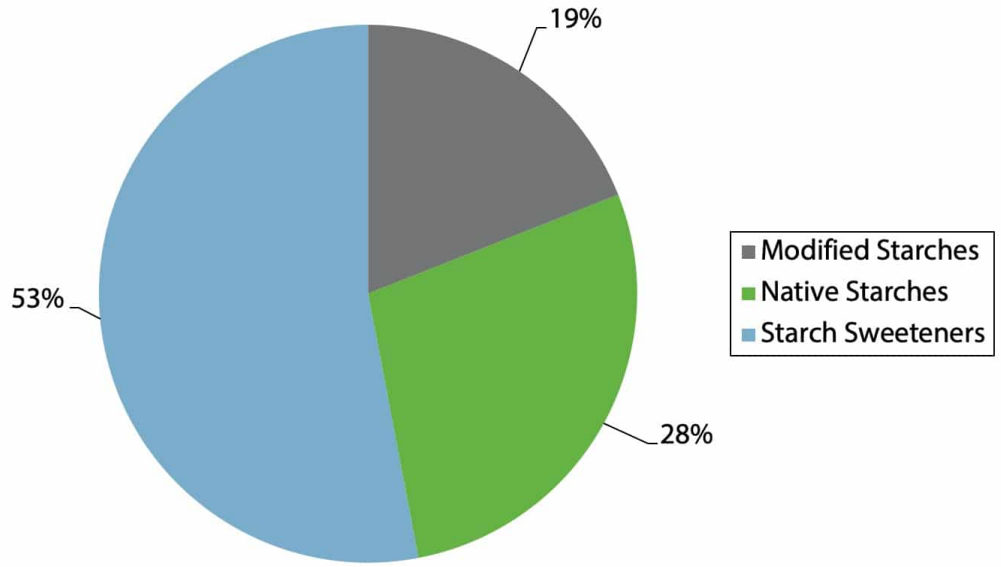
EU Modified starch market

- Global modified starches production stood at 21M tonnes in 2017, growing by 2.2% against the previous year.
- https://vvvvw.globaltrademag.com/global-dextrins-other-modified-starches-market-2019ingredion-inc-cargill-inc-bunge-ltd/

STARCH.EU

EU consumption of starch & starch derivatives - 2018



Total Market: 9,3 mio tonnes

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Challenges in Manufacturing

- Propylene oxide as a raw material
- Yield of propylene oxide is low
- High concentration of protecting salts for the reaction necessary
- Hence high concentration of salts in the effluent
- High volumes of effluent
- High water demand, no recirculation possible
- Corrosion in the wastewater treatment plant, caused by high salt, especially sulfur oxide, concentrations in the effluent

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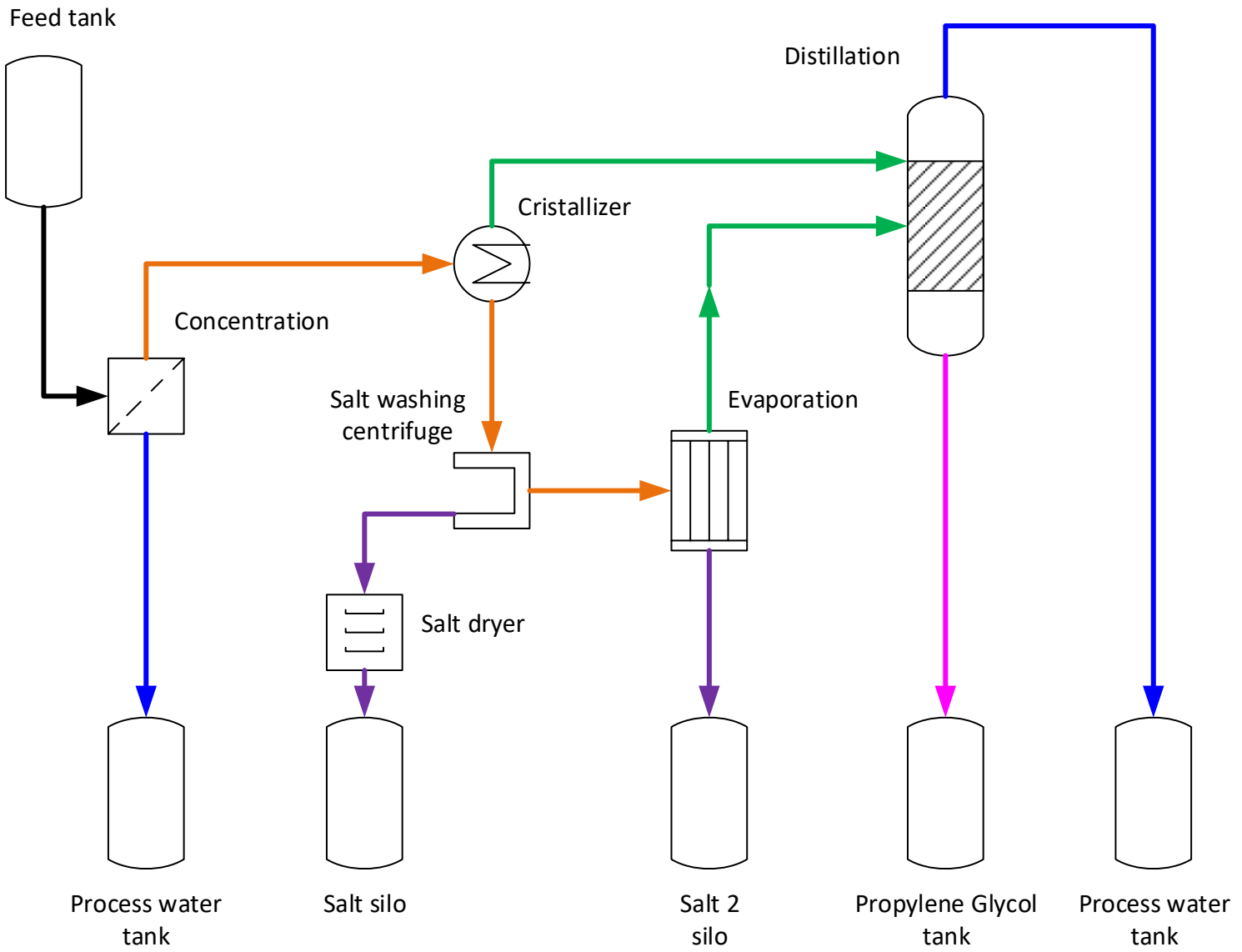
PropOx+ [1)]
Advantages

- Total processing of the effluent, no remaining effluent, no BOD and salt loads for the wastwater treatment plant
- Recovery of salts
- Production of propylene glycol as a sellable product
- Closing of the water cycle in the production process

1) Patent pending



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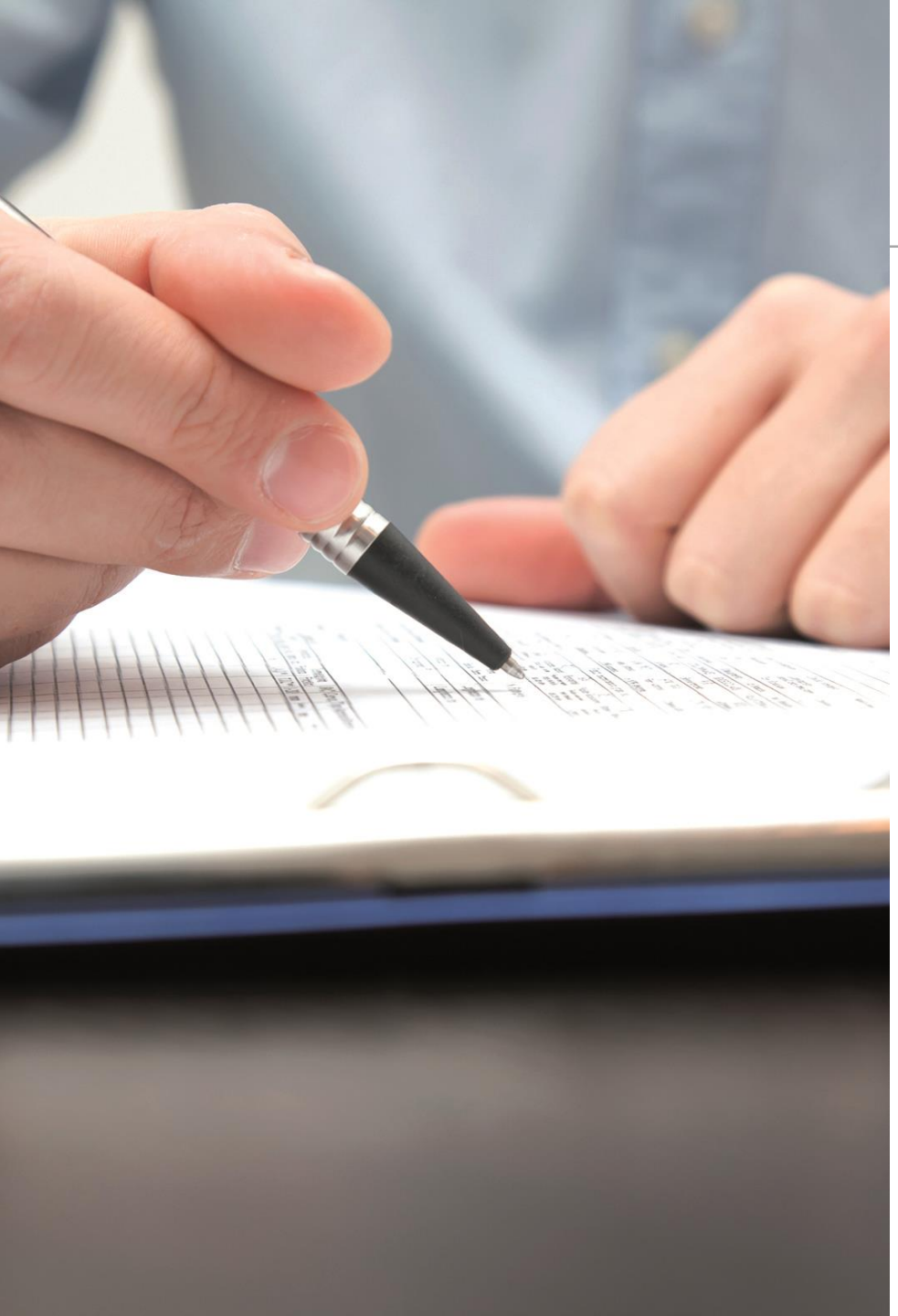

Economic Evaluation

Based on a production plant with and capacity of
55 tsd t per year propylated starch

- Investment costs 7,2 m€
- EBITDA 3,3 m€/yr
- EBIT 2,5 m€/yr
- Pay back period 2,2 yr

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Environmental benefit

Based on a production plant with and capacity of 55 tsd t per year propylated starch

- Reduction of energy demand in the sewage water treatment plant — 5700 MWh/yr
- Reduction of CO2 Emissions in the sewage water treatment plant — 3400 t/yr
- Reduction of BOD load of the sewage water treatment plant — 3900 t/yr
- Reduction of salt emission to the receiving water — 8500 t/yr
- Reduction of sewage sludge yield — 7800 t/yr

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