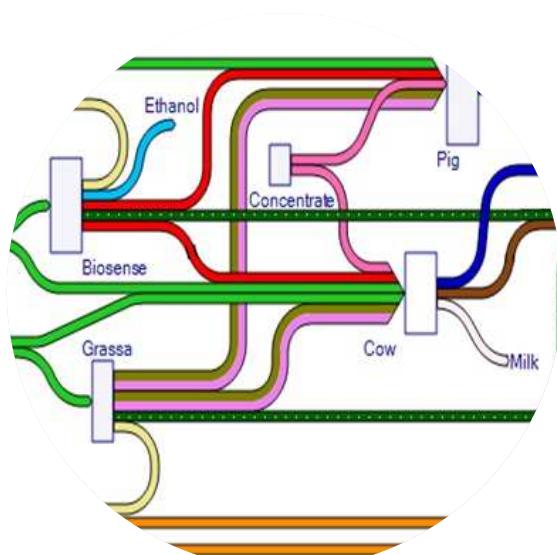


# Succesfactoren Kleine Schaal

Lokale bioraffinage in de keten

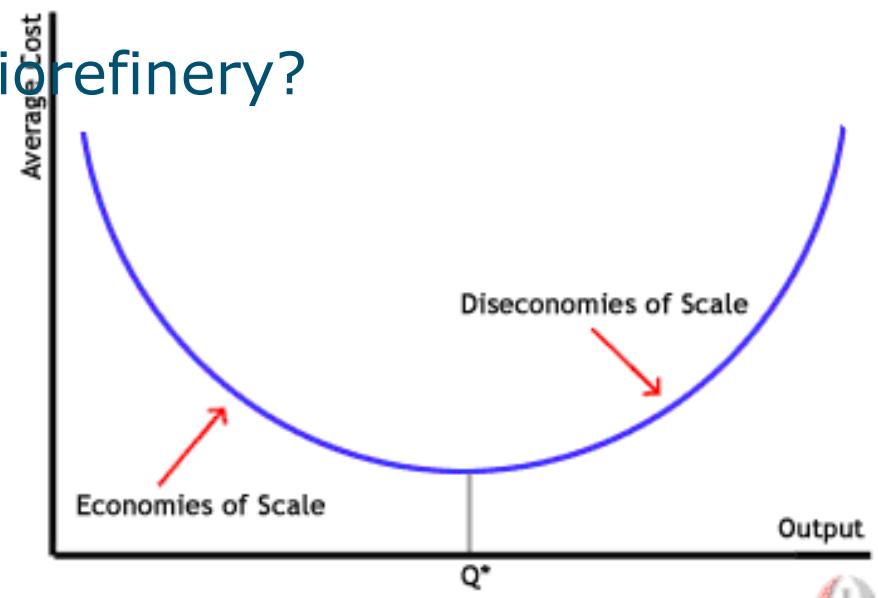
13 April, Lelystad, Marieke Bruins



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# Scaling

- In general: large scale factories will benefit from economy of scale
- Specific: the oil-based sector.
- However, in e.g. the food sector other effects occur. In this sector there are opposing forces between economy of scale for conversion facilities and diseconomy of scale for feedstock supply chains.
- Can this be the same for biorefinery?



# Small scale biorefinery

Solving the problem of low functional density of biomass

## ■ Advantages

- Lower transportation costs
- Increased storage times
- Water and minerals stay on site
- Less waste treatment on factory
- More income to farmers
- Faster innovations
- Safety
- Optimal process for the region
- Product quality improves due to fast delivery

## ■ Disadvantage

- Economy of scale



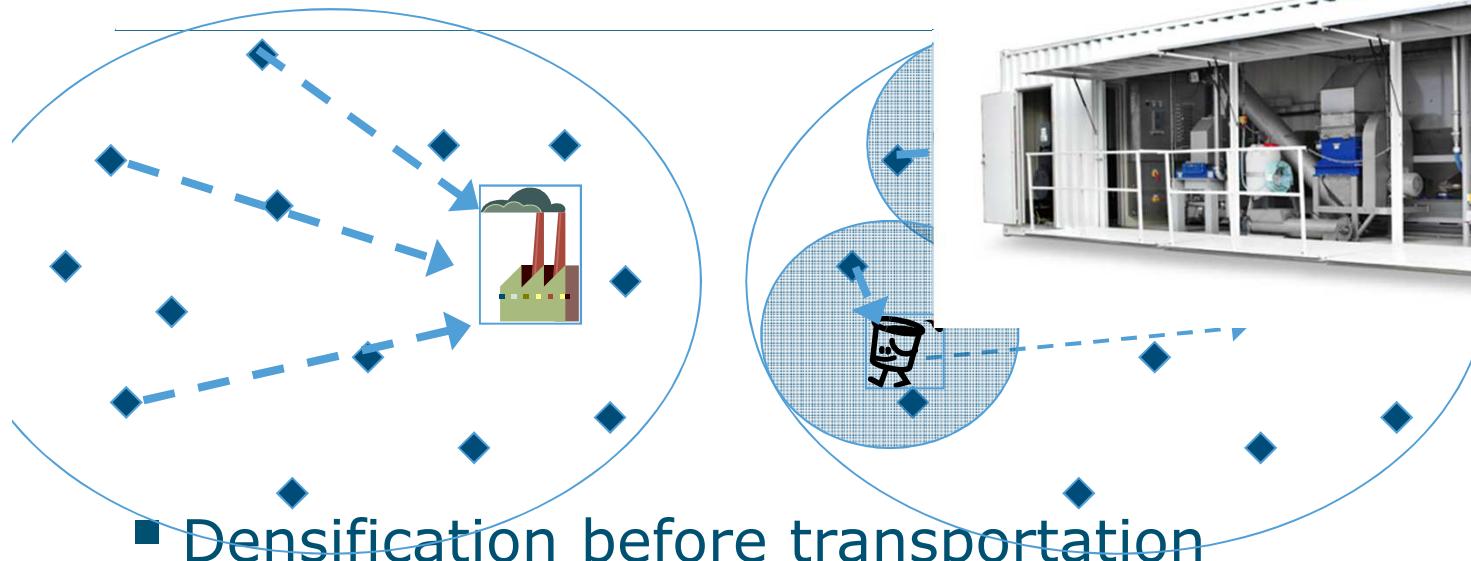
Chloofabriek Uhdenora/AKZO

# Design rules for scaling in biorefinery

Advantages of small scale without the disadvantages

- Splitting the process in two parts
- Low investment cost: Minimize heat exchange
- Energy use and the combination with biogas and CHP

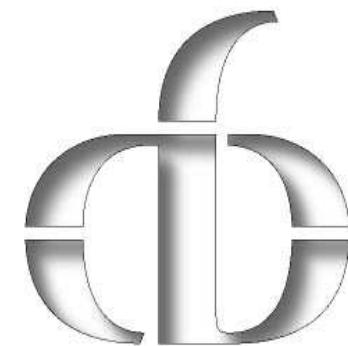
# Splitting the process in two parts



- Perishable crops
- Meal or starch from cassava



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• DADTCO •



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# Low investment cost: Minimize heat exchange

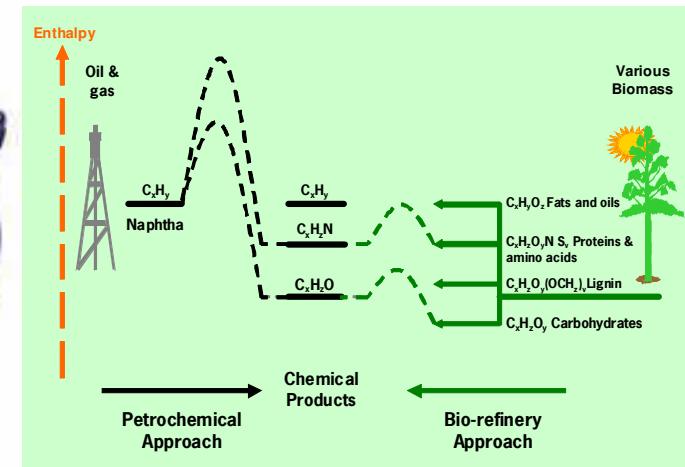
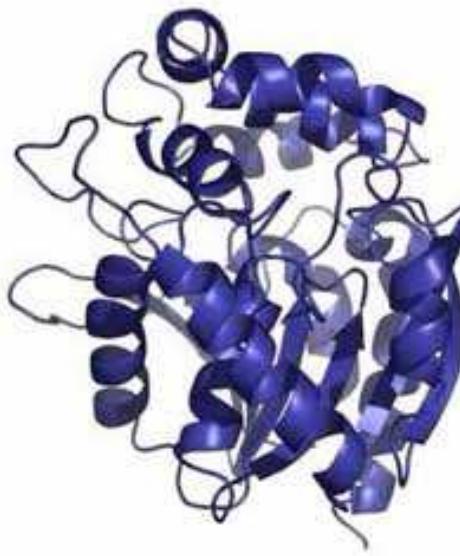
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High investment cost for heat exchange

Scaling makes sense for highly exothermic and endothermic processes

For heat neutral reactions small scale is a possibility  
Or: avoid heat exchange by clever solutions

# Low investment cost: Minimize heat exchange



For heat neutral reactions small scale is a possibility  
Or: avoid heat exchange by clever solutions

# Byosis (Lelystad, Netherlands)

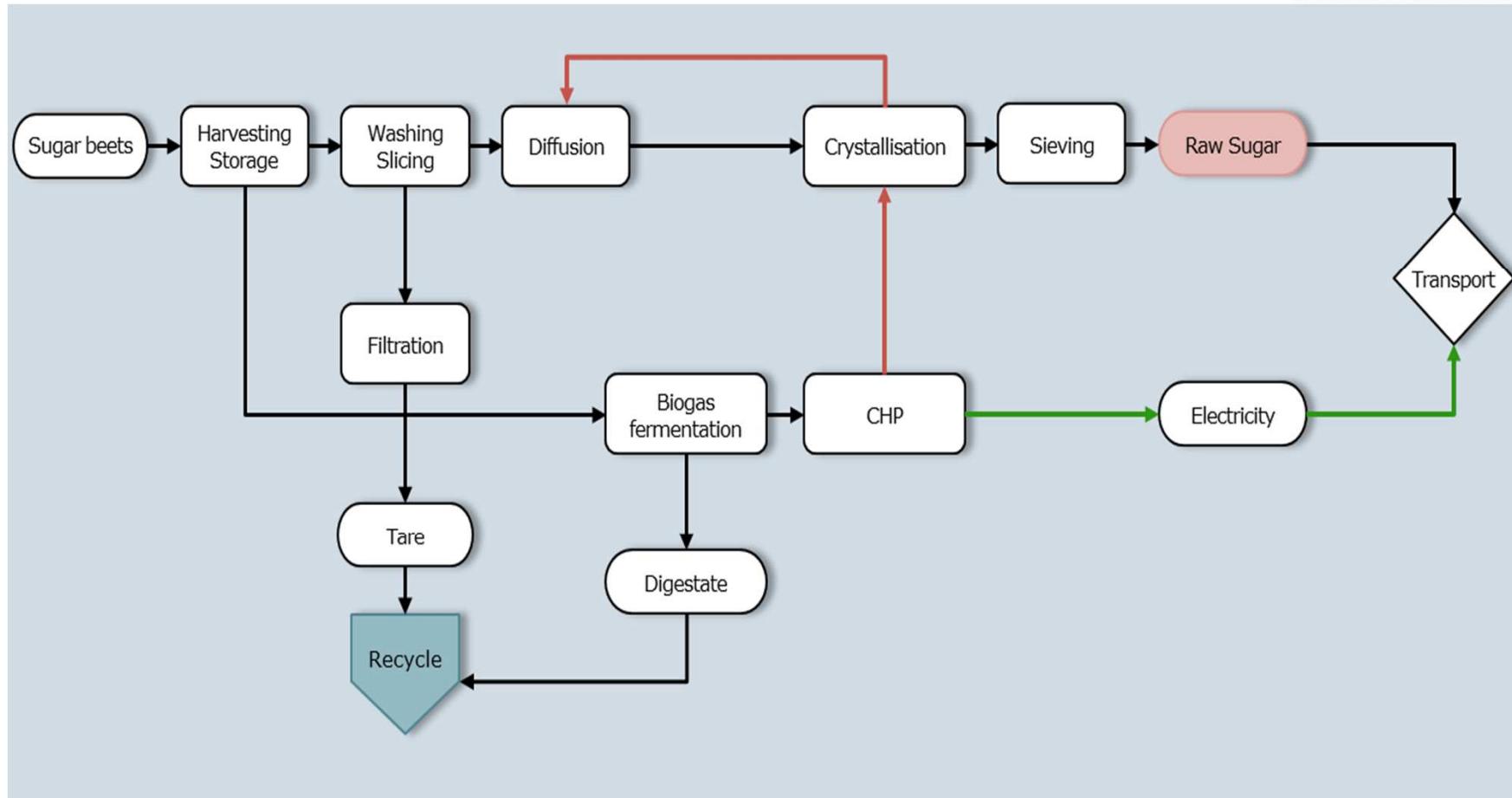


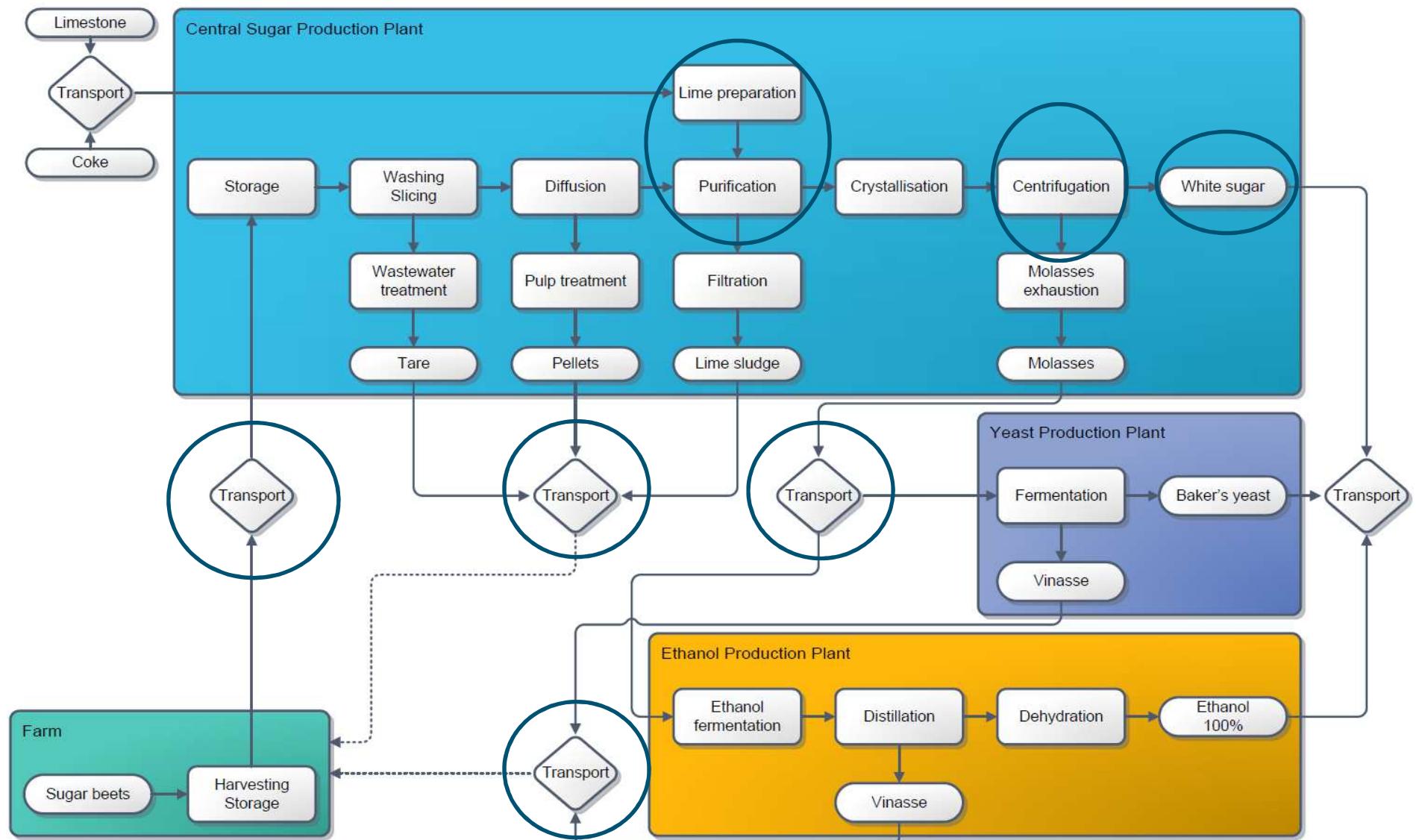
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Combine with Biogas/CHP

  
**byosis**  
group

# Combine with biogas and CHP

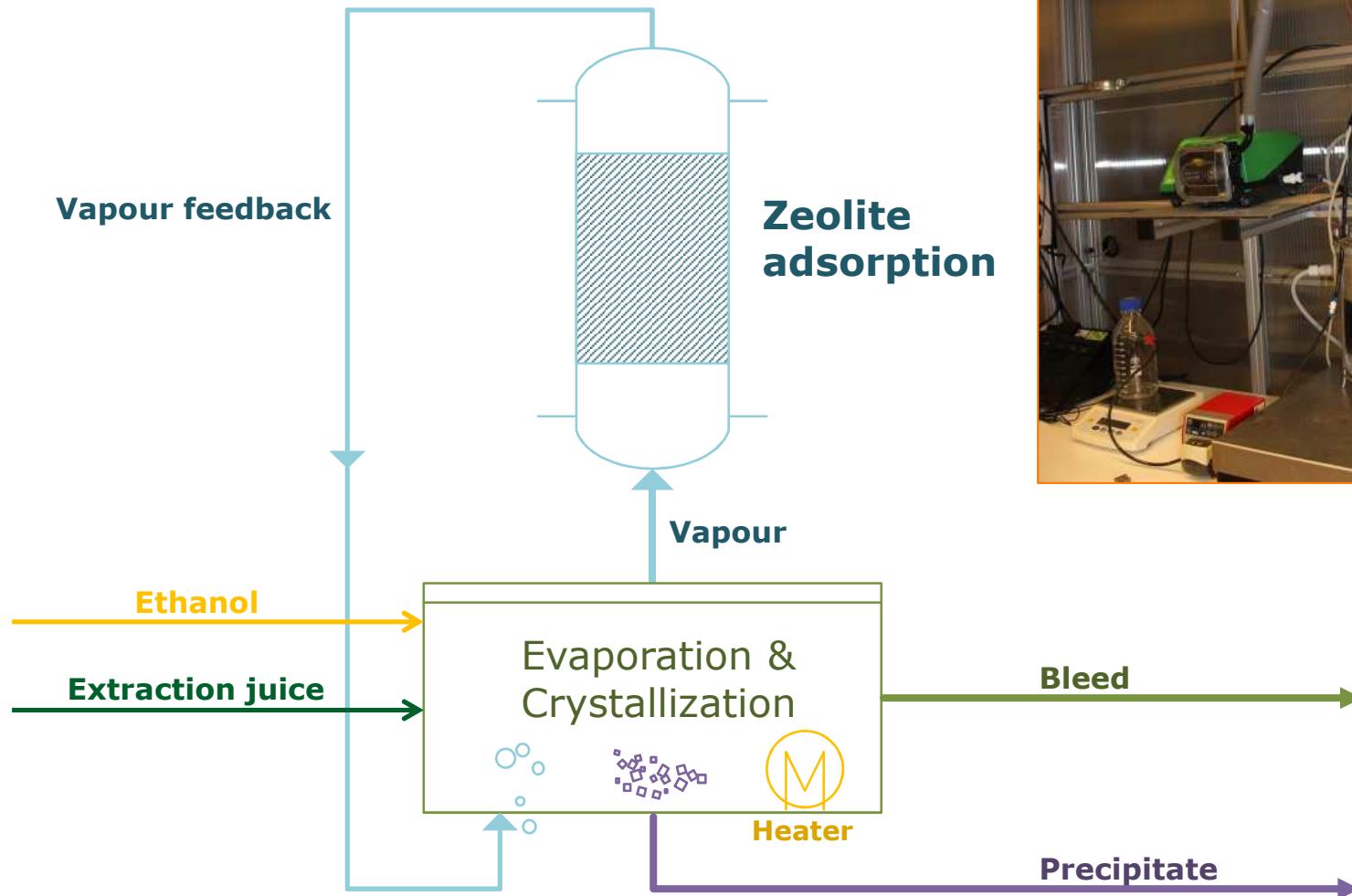




## Energy cost in conventional process



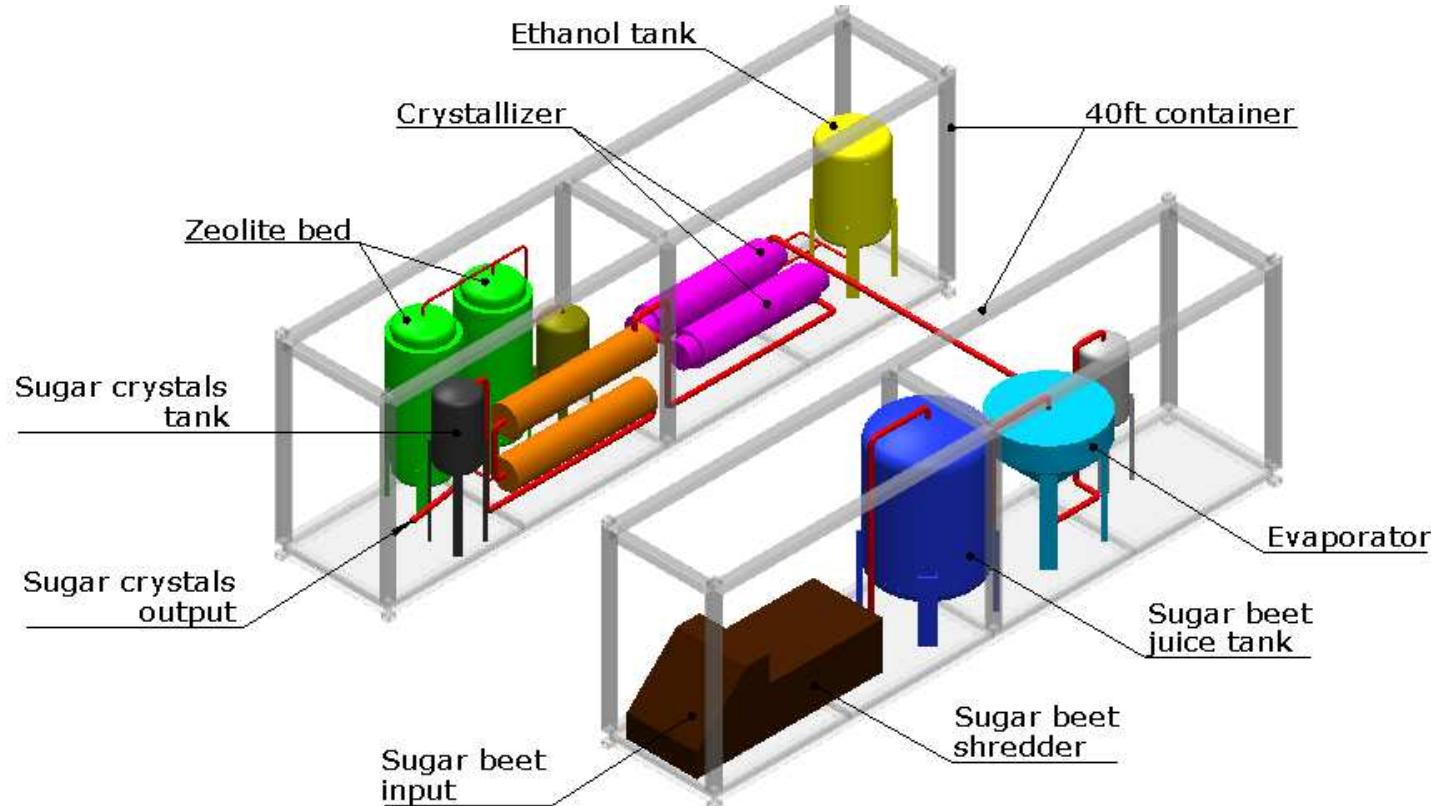
# Anti-solvent crystallization



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WO2012/128624A1

# First Demo Production Plant



**Impression demo plant  
sugar crystallization  
9,2 ton/hour**



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# Update ontwerpregels

- Maak de decentrale-centrale “knip” op de juiste plek.
- Houd investeringskosten voor apparatuur, en in het bijzonder warmtewisseling, zo laag mogelijk.
- Gebruik lokale reststromen voor de generatie van warmte en energie, die ter plekke gebruikt worden.
- Ontwateren is wel en drogen niet een optie op kleine schaal.
- Produceer voor een lokale of eigen markt.
- Gebruik het verschil tussen verkoopprijs en inkoopwaarde binnen je eigen proces.
- Werk met zo min mogelijk mensuren en zorg voor automatisering en centrale ondersteuning.
- Gebruik modulaire units als het proces op meerdere plaatsen toe te passen is.



# Future of small scale biorefinery

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- Small scale biorefinery can be:

- More sustainable
- Aiding farmers
- Be economical

Many biorefinery processes are still under development

Improvements on small scale may be implemented also on  
large

In the long run cost-effectiveness will determine  
success of small scale processes.

# Pre-processing of biomass

Is of all times

Food: Brandy

Dutch innovation

Transportation of pre-  
processed ethanol

## A Spirited Exchange

*The Wine and Brandy Trade between France and the Dutch Republic in its Atlantic Framework, 1600-1650*



Henriette de Bruyn Kops



THE NORTHERN WORLD @ @ @ BRILL

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