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Brussels

# SPIRE

Sustainable Process Industry through  
Resource and Energy Efficiency

## SME Workshop



# Turning the process industry up side down

Just by making  
process equipment  
smaller



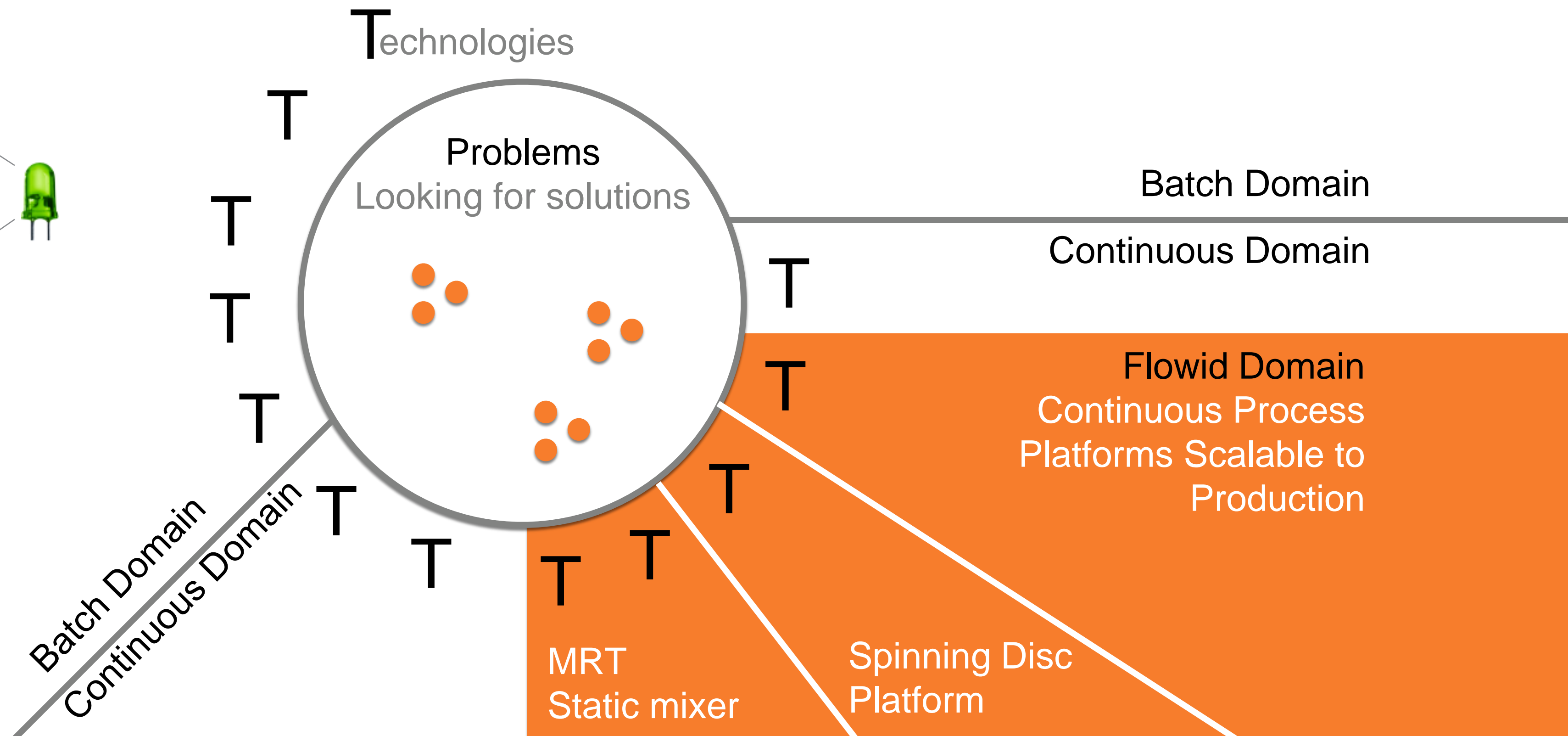
# From 'light bulb' to LED in process industry



**Efficient** Less energy- and raw material usage  
**Safe** Unique controllability, on/off in minutes  
**Flexible** Decentralisation, just in time production



90% of electricity was transferred into heat, less than 10% was used for lighting



# Micro level: Breakthrough Process Equipment



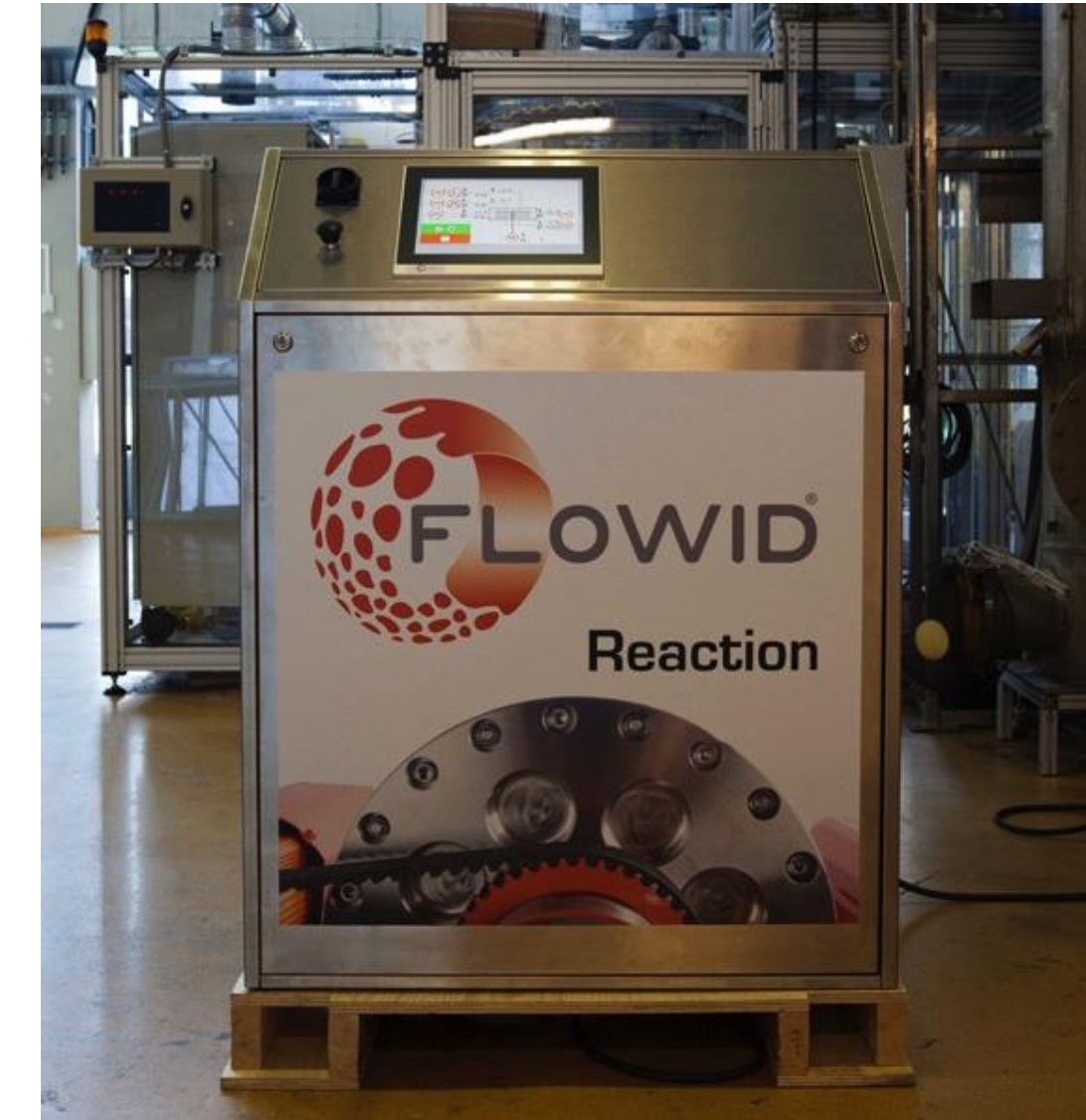
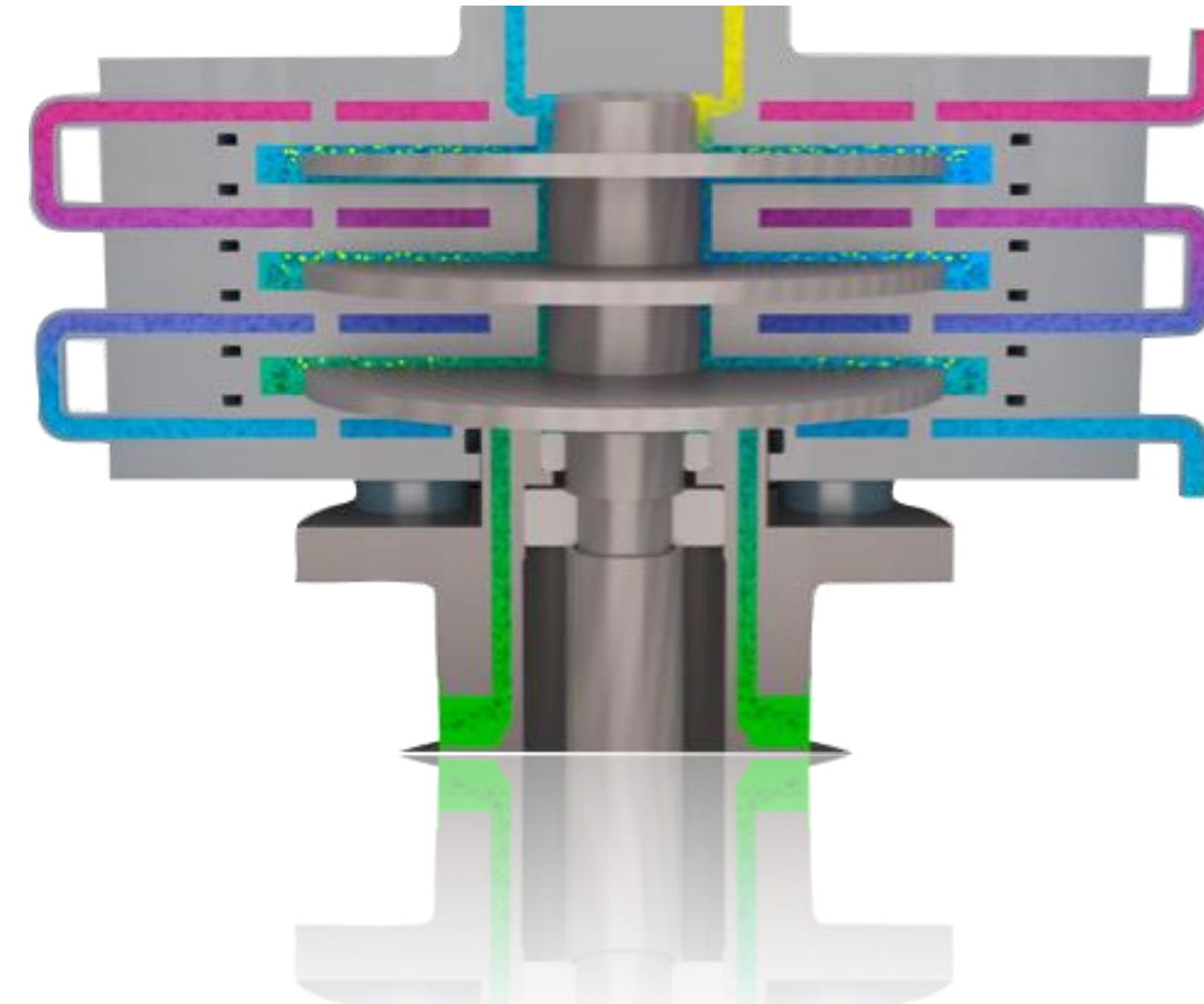
💡 Bulk production: one batch a day

Limitations: the amount of mixing and heat transfer capabilities.

Mixing: is easy on the scale of a cup of coffee.  
The bigger the tank the more difficult it becomes.

Heat transfer: in a cup of coffee, the coffee cools down in minutes.  
In a industrial batch reactor this requires complex cooling systems and takes hours.

💡 Same amounts continuously



Excellent mixing and heat transfer combined in one continuous spinning disc reactor.



Produce two truckloads of product a day in a spinning disc reactor (size of a cookie jar).

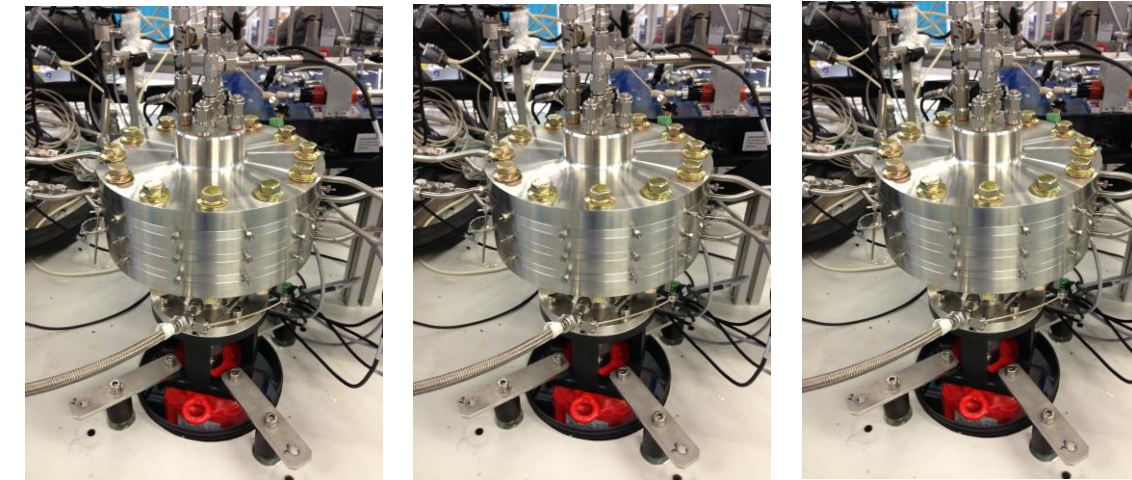


# SpinPro Reactor: What it is NOT



It's not a thin film spinning disc

# Factory Continuous Style - Business Case



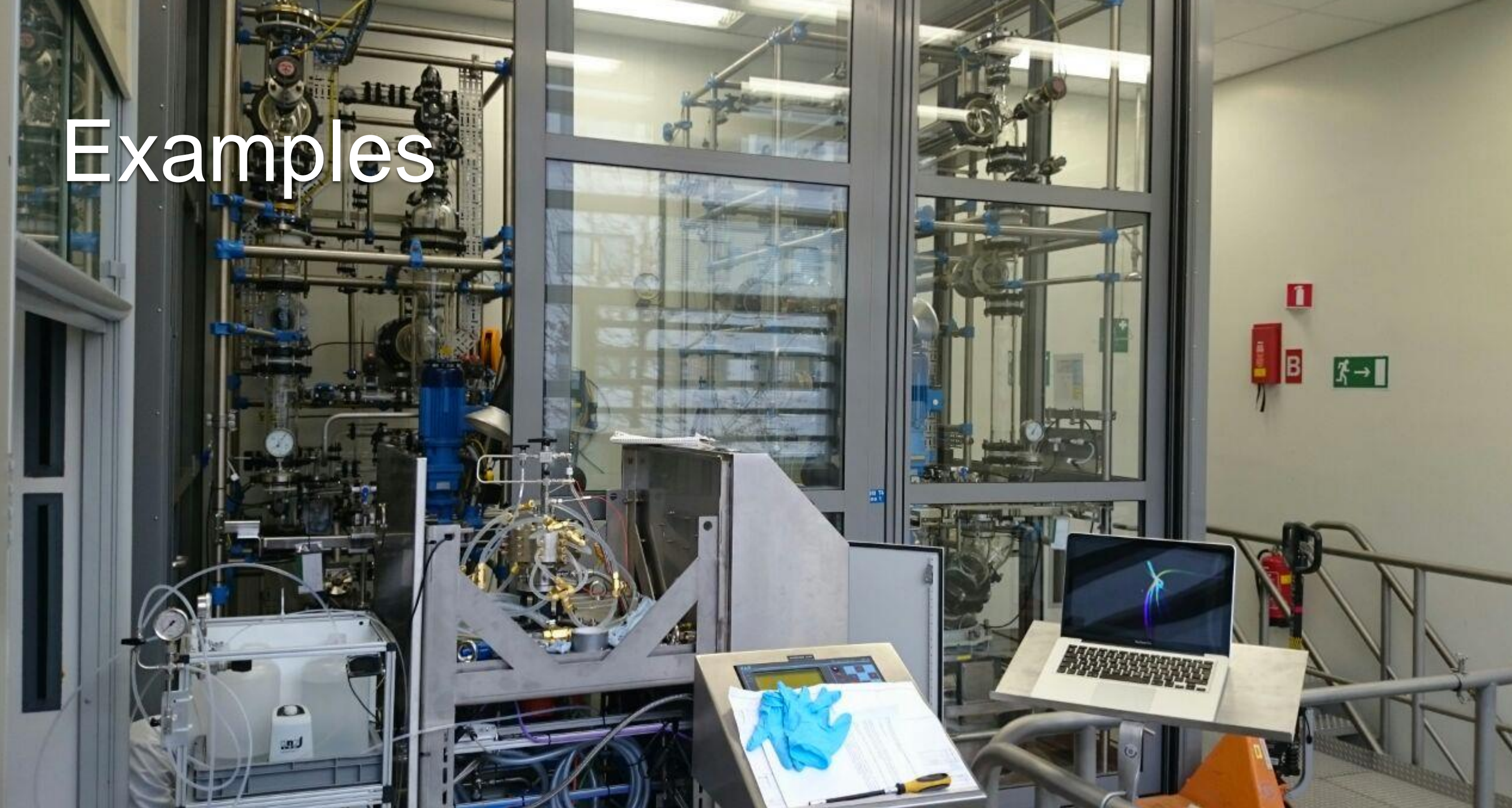
	Batch vessel	SpinPro
Production	25 ton/day	25 ton/day
# Reactors	1	3
Reaction volume	50.000 liter	0,9 liter
Residence time	8 hours	3 seconds
Temperature	85°C	195°C
Pressure	1 bar	12 bar
Energy usage estimate	4-7 MW	-0,3MW
Product Concentration	47 wt%	59wt% (max)

First SpinPro Plant is being realised this year  
1,7M€ Project  
1 liter per Second SpinPro Reactor  
180°C @ 100 Bar

SpinPro Reactor



# Examples



## Continuous

- 700KJ/mol MRT Hydrogen peroxide
- Full operational pharma pilot plant
- Shell probes (530°C 235Bar)
- EmulTech Infinity
- EAP Extractor (3 cases)
- Extraction silicon oil water
- FlowFlex development platform

## SpinPro

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- n-BuLi reaction for large US pharmaceutical company
- Brightlands Chemelot SpinPro plant
- Esterification reaction
- Gas/Liquid reaction for producing a line of food additives.
- H<sub>2</sub>S SpinPro reactor
- Liquid/Liquid reaction of which one component is a low temperature melting metal.

# Meso level: Containerised Flexible Plants

## Free of big capital investment and risk barriers



### Unit Operation Warehouse

Continuous processing alternative for all common unit operations available with similar throughput



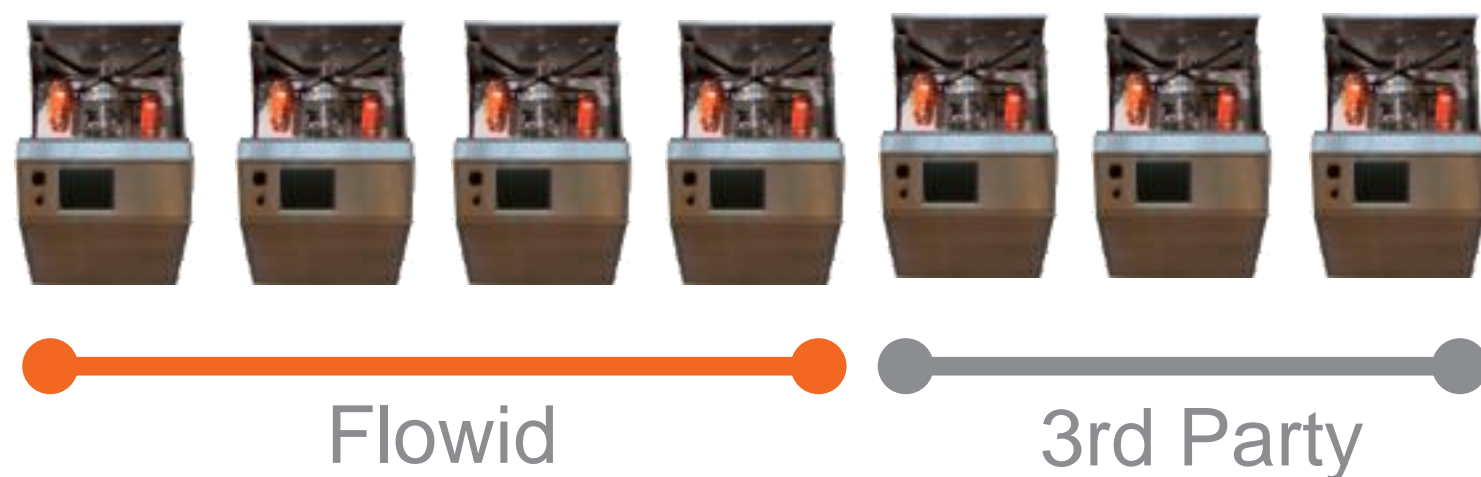
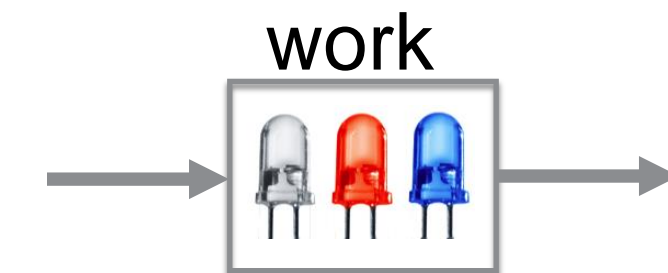
### Assemble & Test

Different unit operations are combined in a container to realise the required functionality



### Produce

At the multinational, SME or Flowid's test facility the containerised process is put to work



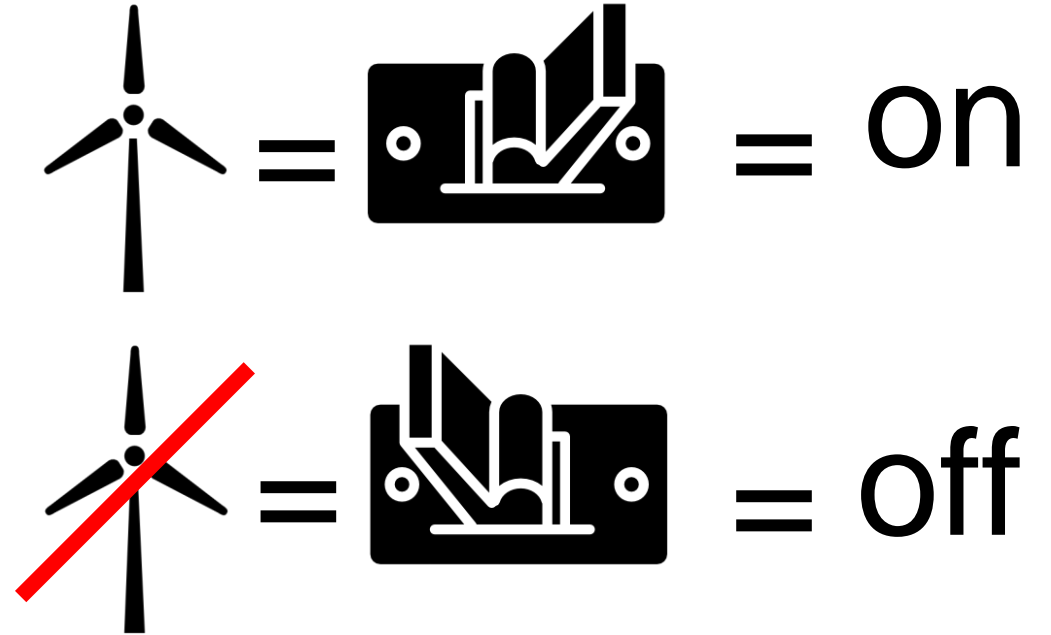
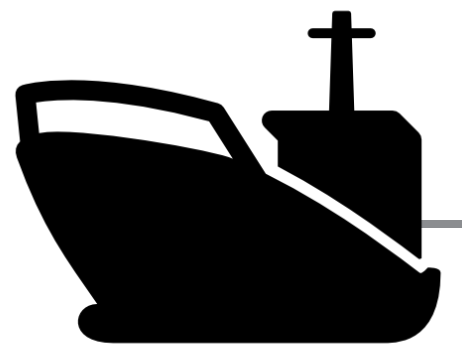
# Macro level: Energy Transition

## Process flexibility makes demand controllable

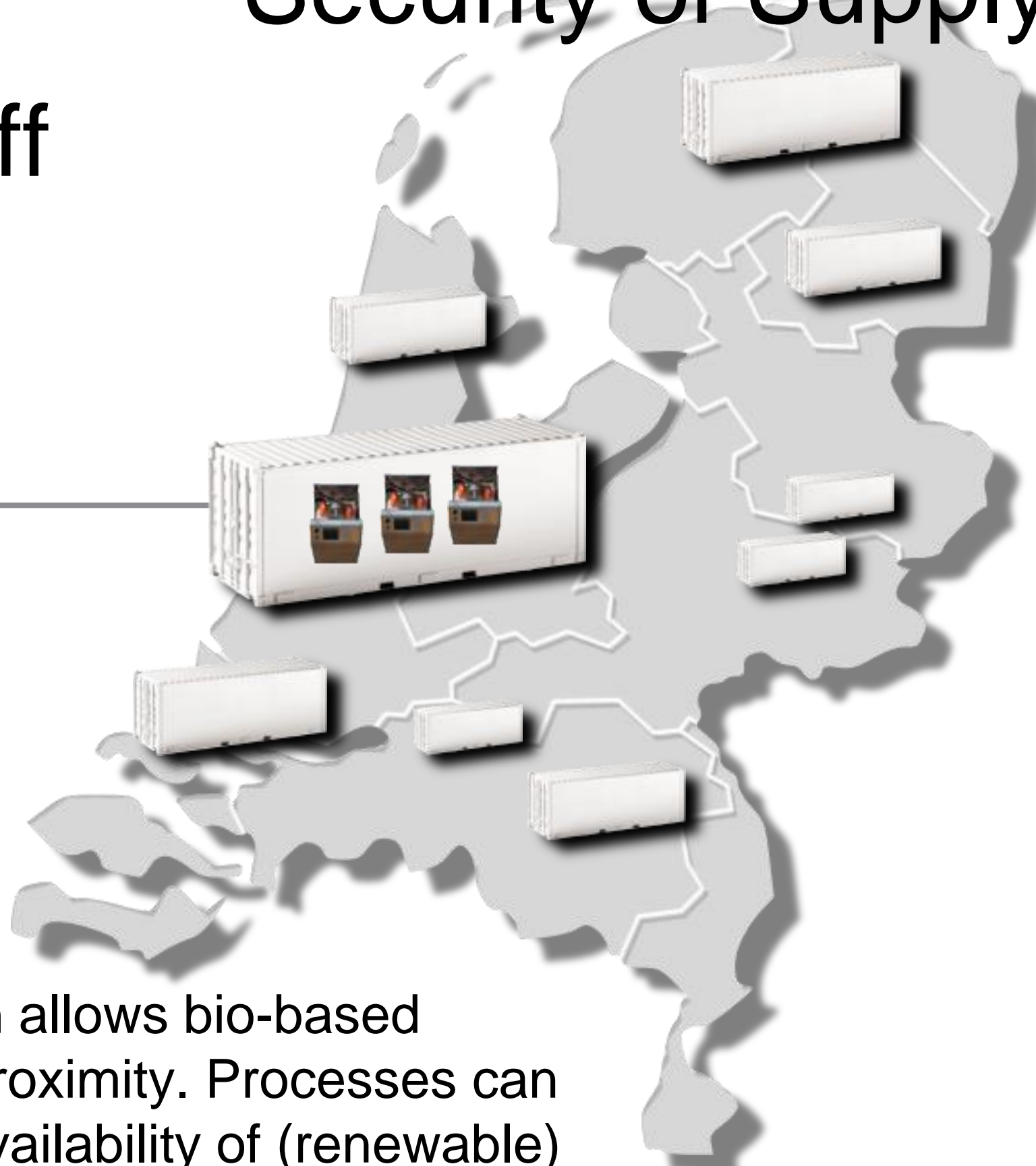


The traditional centralised process industry is inflexible and relies on a steady supply of crude. Factories require days to start and stop. They can't respond to fluctuations of a renewable energy supply.

### Economic & Environmental Unsustainable



### Sustainable & Security of Supply



Decentralised production allows bio-based feedstock due to close proximity. Processes can be controlled based upon availability of (renewable) energy.

# Facts - Not fiction

## What we're looking for



- AkzoNobel
  - SpinPro production of chlorine
  - Decentralised production plants
  - 1/2 football field to 1/2m<sup>3</sup>
- We look for Partners
  - EU Clients
  - Identification applications, cooperations
    - Continuous processing - Reaction & Extraction
    - Efficient, Safe, Flexible
    - Cooperation in projects



Thank You

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Beyond  
Standards