Bioeconomy and Chemical Industry
- Finnish and EU perspectives

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Kokkola Material Week 2014
Chemical Industry Federation, Finland - over 400 company members
Bioeconomy and Chemical Industry – Finnish level
Chemical industry is the largest export sector in Finland

Source: Board of Customs 2012
Chemical industry in Finland - key figures

- 25% Share of Finland’s exports
- 2/3 Of production exported
- EUR 21 billion Gross value of production
- 34 000 Employees in Finland

Data from 2013
Chemical industry in Finland
- key word: *sustainability*

- Material and energy efficiency
- Decrease of emissions
- Safety
- Increase of the share of biobased raw materials

- Circular economy
- Bio-economy
Resource efficiency, emissions, safety - figures 2013 from Finland

-86% Lost time injuries from 1988

-56% Water consumption* from 1995

-25% Energy consumption* from 1995

-54% Waste to be disposed of by landfilling from 1995

-29% Greenhouse gases from 1999

*proportional to volumes
Bio-based raw materials - study in 2013

Bioeconomy and chemical industry in Finland

From the 1940s bio-based chemicals have been industrially produced in Finland
• Production of various chemicals from crude tall oil and CMC, cellulose gum, from cellulose

From 1970s xylitol has been produced from hemicellulose

*Bioeconomy is not a completely new invention - the novelty is that the use of bio-based raw materials & waste and biotechnology is on the increase within the chemical industry*
Chemistry enables bioeconomy

Utilization of biobased raw materials in products:
- medicines, cosmetics, packings, paints, adhesives, chemicals, detergents, rubber products

Processing of biofractions:
- tall oil products, CMC, xylitol, bioethanol, renewable diesel, biogas

Fractionation of biomasses:
- separation resins, chemicals, enzymes, micro-organisms

Cultivation of biomasses:
- fertilizers, nutrients, plant protecting agents

Recycling of bioproducts:
- bioreactors, composting
Bioeconomy in Chemical industry - case examples from Finland

• Production of CMC, cellulose gum, for various applications, e.g. yoghurts, detergents, oil refining

• Pine chemicals from tall oil for various products and use
Bioeconomy in Chemical industry - case examples from Finland

- High quality outdoors paints containing plant oil based binders
- Wallpaper adhesives containing starch
When will bio-based raw materials appear in your company’s production?

- 35%: bio is already in use
- 39%: within 5 years
- 17%: after 10 years or never
- 9%: within 10 years

% of inquiry answers
In focus: management of side streams and new raw materials

"Bioeconomy is viewed especially in relation to"

- Sidestream and waste management: 37%
- New raw materials for products: 30%
- Renewable energy: 30%
- Development of technologies: %
- New regulation driven opportunities: %
- Production of new products: %
- New markets for biobased products: %
Various bio-based raw materials evoke interest

"Our company is interested in"

- Wood based biomasses: 30%
- Other plant based biomasses: 30%
- Sidestreams from other industries: 19%
- Food industry sidestreams
- Animal fats and/or plant oils
- Sidestreams produced by agriculture
- Sidestreams from fisheries
- Compounds produced by microbes
- Livestock sidestreams
- Algal biomasses

% of answers
Networks of co-operation and flexible access to feedstock are needed

*Bioeconomy in our company would be accelerated by*

- Increase of co-operation between different sectors
- Improved, well functioning raw material markets
- Better awareness & more straightforward application procedures of national and EU projects & funding

Directly between companies

In networking projects
Networks of co-operation
- production of bioethanol from food waste

Brewery

Enzyme factory

Bakery

Waste management

Feed, electricity etc.

BIO-ETHANOL
Networks of co-operation - under development: straw based renewable diesel & feed

Raisio: STRAW BIOMASS → Neste Oil pilot plant, where algae produce oil and proteins → Neste Oil NExBTL-process → Raisioagro feed production → REUWABLE DIESEL → FEED
Bioeconomy and Chemical Industry – EU level
Chemical industry – growing global market

Value of world chemical sales according to CEFIC

2002: 1400 billion €
2012: 3100 billion €
2030: 6300 billion € (estimate)

Estimate for 2050: 19 000 billion $

In 2012 EU accounted for 17.8% of the world chemical sales

Total: 3100 billion €

Source: CEFIC
Concept of Bioeconomy

Figure 1. Number of citations in Scopus with “bio-based economy”, “biobased economy”, “bioeconomy” or “bio-economy” in titles, abstract or keywords.

Market for bioeconomy

Demand for bio-based products is growing, e.g.

• Current annual growth of the market for bioplastics is 20 % (production estimated to grow from 3.5 million tonnes to 20 million tonnes, from 2011 to 2020) (European bioplastics, http://en.european-bioplastics.org/)

• In 2030 33 % of the global chemical industry production makes use of biotechnology (McKinsey)

• In 2030 30 % of the chemical industry production in Europe is bio-based (Bio-based Industries PPP)
CEFIC: Renewables hold a 9% share of the carbon-containing raw materials

Shares in total organic raw materials – material (feedstock) use only, EU chemical industry, 2011

- Mineral Oil: 68%
- Natural Gas: 21%
- Coal: 1%
- Renewables: 9%

Total volume of carbon-containing feedstock: 90 million tons in 2011
CEFIC: Renewables volumes in kilotonnes

- Vegetable Oil: 1,570
- Animal Fat: 500
- Chemical Pulp: 890
- Starch and Sugar: 1,560
- Bioethanol: 1,000
- ETBE: 590
- Natural Rubber: 1,240
- Glycerol: 470
- Others: 740

Vegetable waxes, natural resins, tanning agents, proteins, medicinal plants
Will Europe be competitive enough in bio-based production?

The development of bio- and circular economy in Europe needs

- Shared vision and mindset
- Access to feedstock
- Innovations and competence
- Investments
- Networks of co-operation connecting different sectors
- Good political framework – coherence of energy&climate, bioeconomy, waste, agricultural policies
The bioeconomy starts here.... Be part of it!
EU Commission’s video on bioeconomy online
https://www.youtube.com/watch?v=2xvXkOMRTs4
Thank you!

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