bioenergy2020+

BIOFIT – Bioenergieumrüstungen für Europas Industrie

Highlights der Energieforschung 2019 „Dekarbonisierung in der Industrie“

Dina Bacovsky, Doris Matschegg, BIOENERGY 2020+

Wien, 08.10.2019

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Bioenergy Retrofits for Europe's Industry

Unterstützung der Marktimplementierung

Umrüstung von bestehenden Industrieanlagen

- Um mehr Bioenergie zu verwenden oder
- Um (fortschrittliche) Biotreibsrtoffe zu produzieren

5 Industriesektoren

- *combined heat and power*
- *fossil firing power*
- *first-generation biofuels*
- *fossil refineries*
- *pulp and paper*

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BIOFIT Aktivitäten

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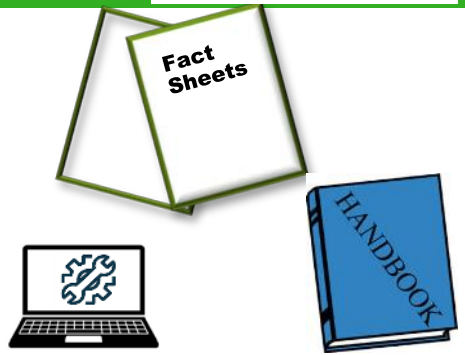
- Landkarte mit Umrüstungen
- Handbuch
- Best practice fact sheets
- Fallstudien
- Umfrage zur Motivation für Umrüstungen
- Industrieforen
- Empfehlungen für politische Entscheidungsträger

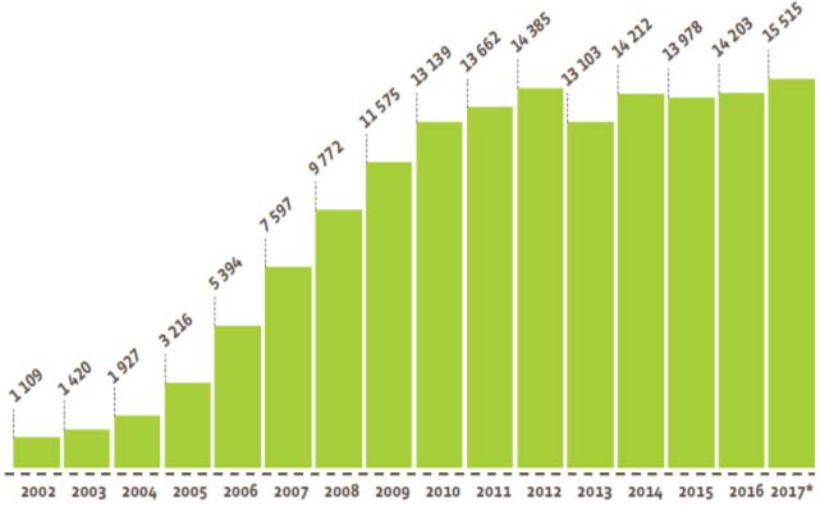


Überblick über die Industriesektoren

- 1G Biotreibstoffe
- Fossile Raffinerien
- Stromproduktion
- Kraft-Wärme-Kopplung
- Papier- und Zellstoffindustrie

1G Biotreibstoffe

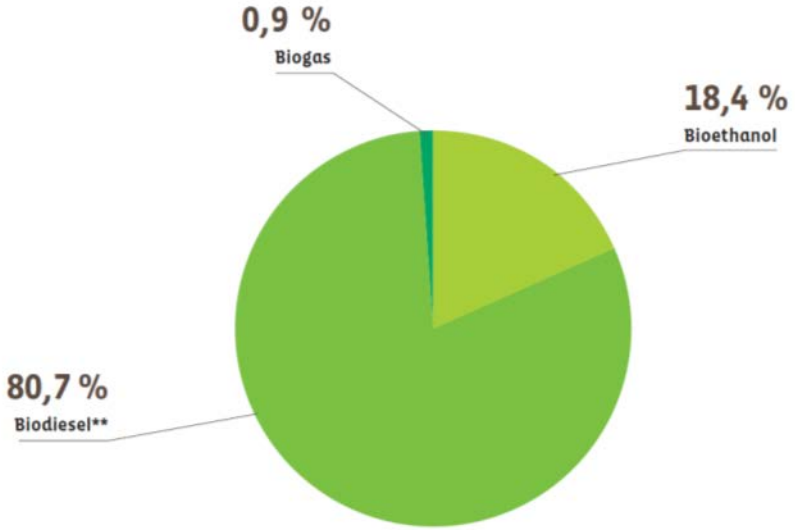
Trend in biofuel (liquid and biogas) consumption for transport in the European Union (EU 28) in ktoe



* Estimate.

Sources : Data from 2002 to 2015 (Eurostat 2018), data for 2016 to 2017 (EurObserv'ER 2018 - see methodological note).

Breakdown of total EU 2017 biofuel consumption in energetic content for transport by biofuel type.*



* Estimate ** Consumption of pure vegetable oil included in the biodiesel figure. **Source: EurObserv'ER 2018.**

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1G Biotreibstoffe – FAME Retrofit

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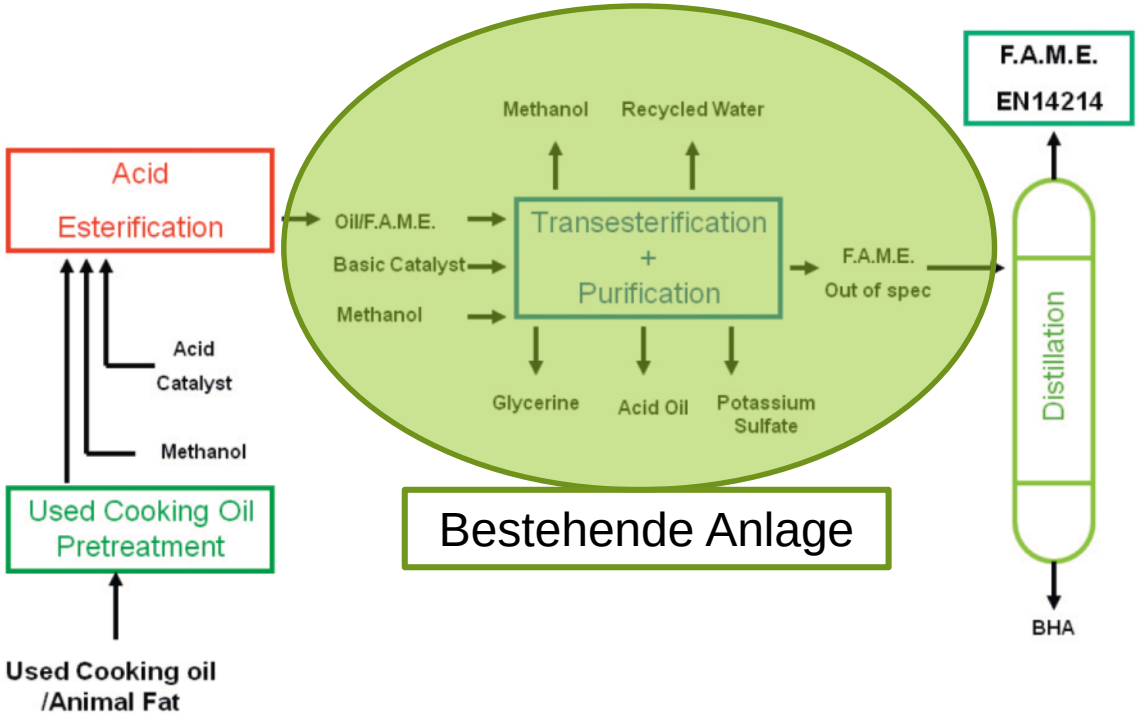

Bestehende Anlage

Annex IX B Rohstoff

Figure: courtesy of ELIN Verd

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1G Biotreibstoffe – Ethanol Retrofit

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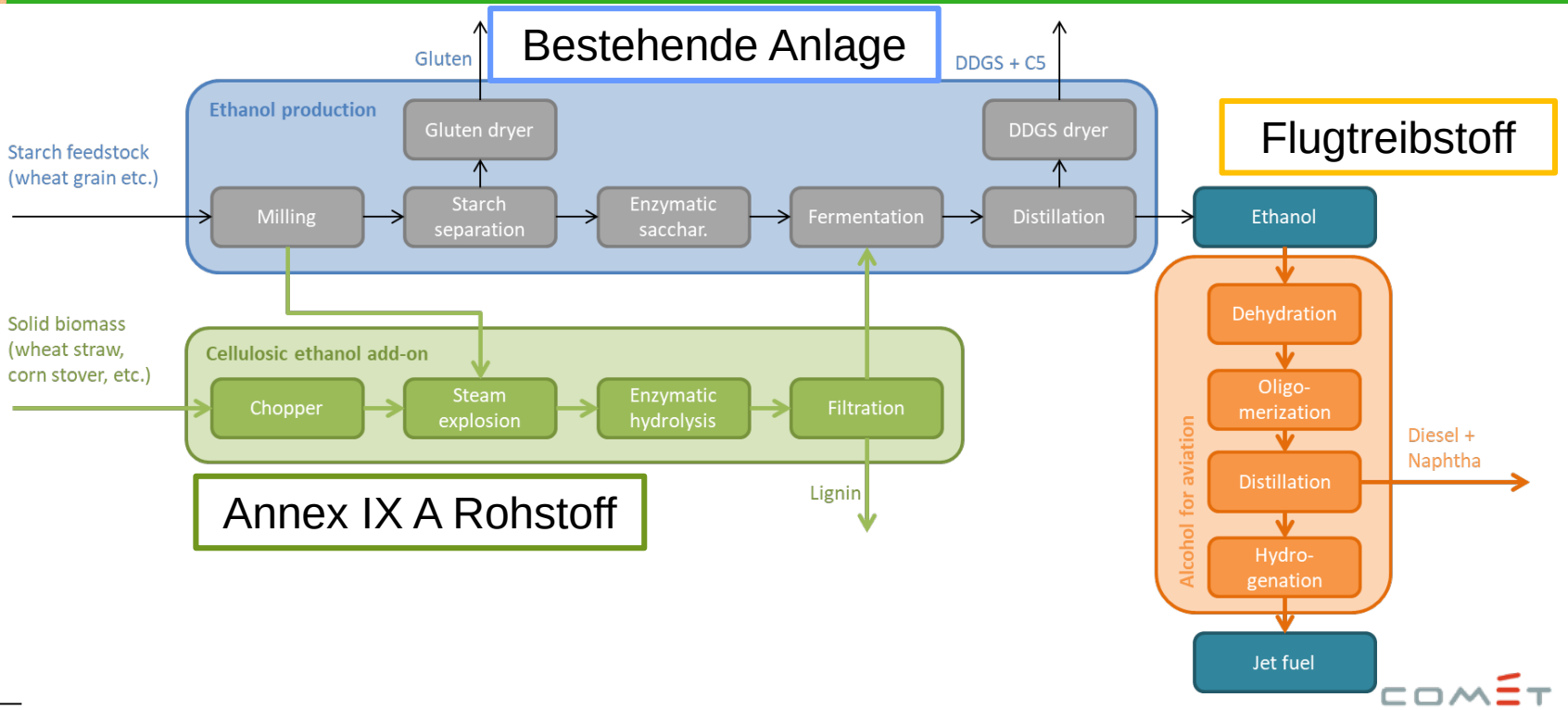

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Fossile Raffinerien

© Appe - Association of Petrochemicals Producers in Europe 2016

IEA Bioenergy Task 39 Publikation:
Potential synergies of drop-in biofuel production with further co-processing at oil refineries

Task 39 IEA Bioenergy

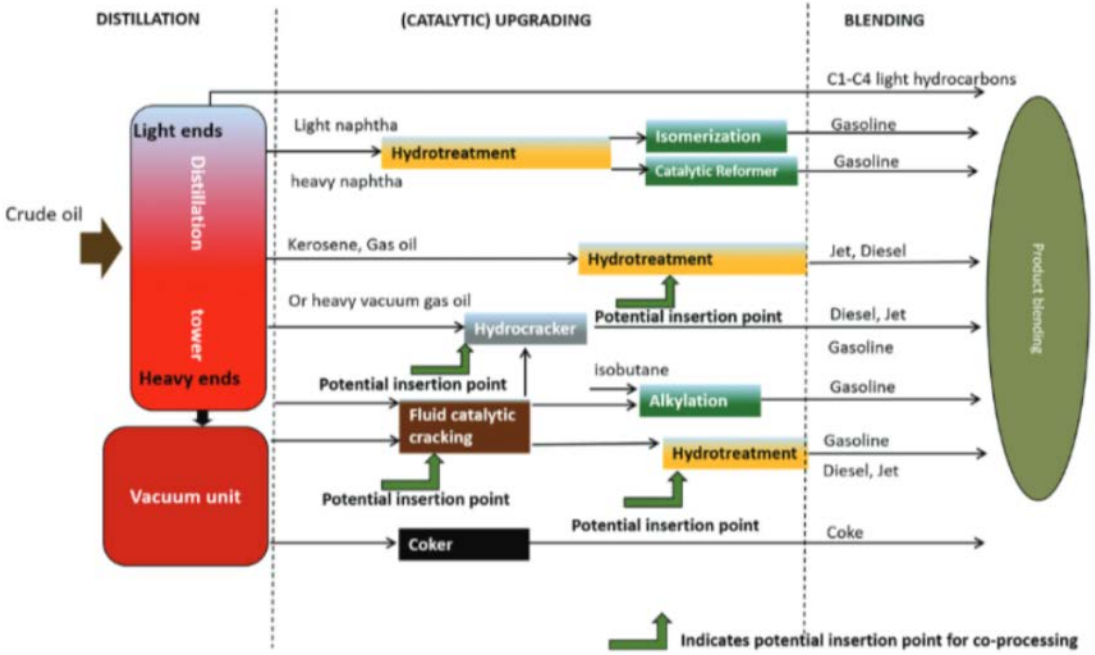

Figure 2. Simplified diagram of an oil refinery.[1,15]

Umbau von Anlagenteilen, um Biomasse mitzuverwenden

IEA Bioenergy Task 39 Publikation:
Potential synergies of drop-in biofuel production with further co-processing at oil refineries

Task 39 IEA Bioenergy

Table 1. Characteristics of different bio-intermediates and main refinery requirements.[1,28–32]

	Characteristics	Refinery needs
Vegetable oils	Triglycerides and free fatty acids Some heterogeneity with respect to chain length of fatty acids, but chemically quite homogenous Lipids in diesel range 11% oxygen, 1.8 H/effC ratio Waste oils have higher free fatty acids which affects the acidity. Waste oils also have other contaminants Metals/inorganic compounds	Removal of oxygen Some cracking may be required for specific products such as jet fuel as lipids in diesel range Isomerization / branching to improve cold-flow properties (biojet) Needs the least upgrading Fractionation may be required after cracking
Pyrolysis bio-oils	Up to 400 different components High oxygen levels over 40% Variable aromatic content from degradation of lignin Water content Catalytic pyrolysis oils or partially hydrotreated pyrolysis bio-oils have lower oxygen levels than bio-oil (for catalytic pyrolysis oil, the oxygen content is generally between 18 and 24 wt%)	Removal of oxygen Thermal or catalytic cracking of large molecules into smaller molecules Potential hydrocracking of aromatics Fractionation into different products after upgrading
HTL biocrudes	Lower oxygen content (range: 6–18%) Lower water content	Oxygen removal Cracking of larger molecules Hydrocracking of aromatics
Fischer-Tropsch (FT) liquids	High temperature FT creates smaller molecules suitable for gasoline Low temperature FT creates longer molecules in the diesel range	Fractionation required May require cracking Isomerization

Entfernung von Sauerstoff mithilfe von Wasserstoff

Fossile Raffinerien – HVO Retrofit

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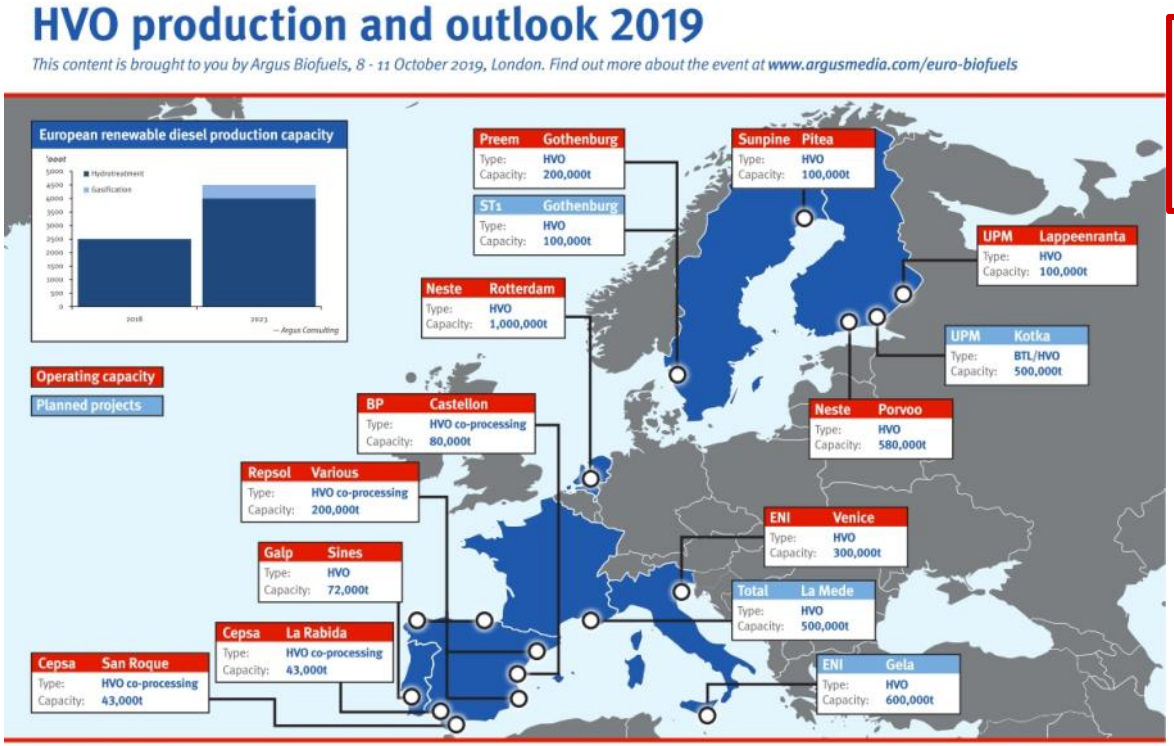

Kommerziell verfügbare Technologie

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Fossile Raffinerien – Pyrolyseöl Retrofit

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Demonstration

TechnipFMC and BTG-BTL to build bio-oil production in Sweden

Enschede, 16 September 2019 – Thanks to a Dutch invention, cars in Sweden will soon be powered by a fuel made from wood residues such as sawdust. TechnipFMC and the Dutch company BTG-BTL based in Twente will design and build a production facility in Sweden where wood residues will be converted into bio-oil. It will be the first plant in the world where 'green fuel' will be produced and further processed in a refinery for motor vehicles.

Fossile Raffinerien – bioCRACK

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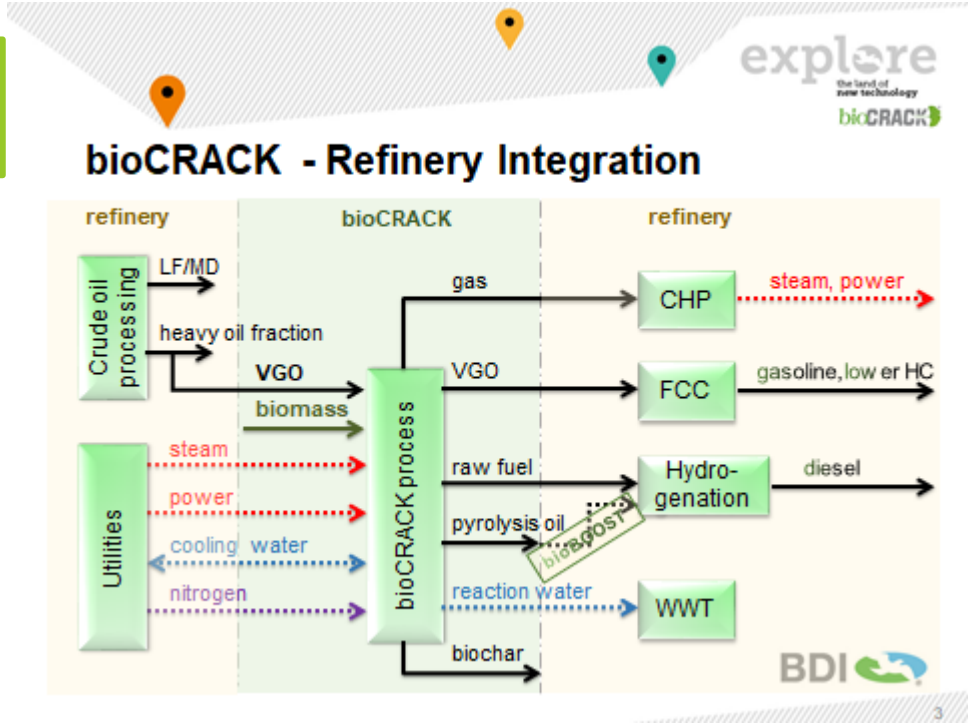
In Pilotanlage demonstriert



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Stromproduktion

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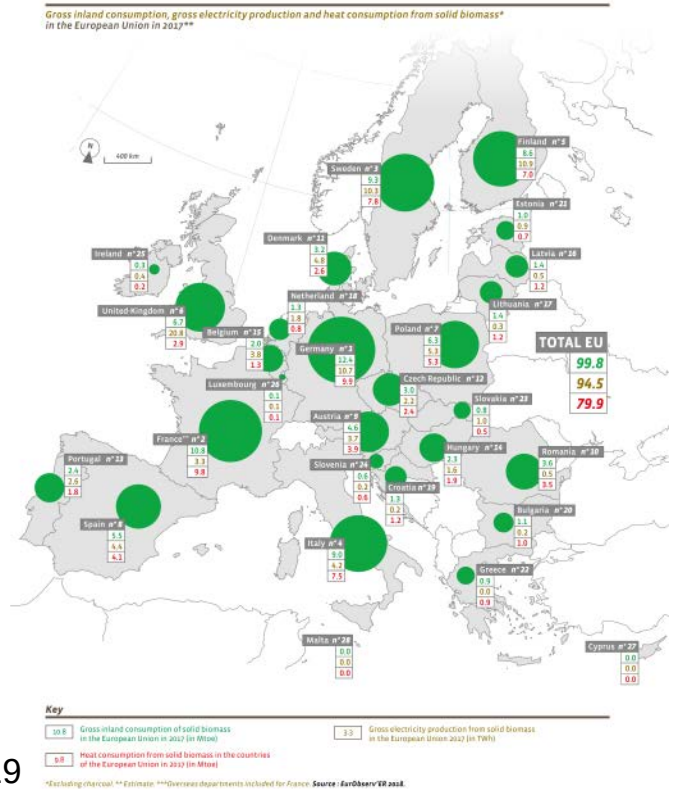

Photo credit: Orsted

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Stromproduktion – Retrofit Möglichkeiten

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- Rohstoff:
  - Fest: Hackschnitzel, Pellets, torrefizierte Pellets
  - Flüssig: Pflanzenöl, Biodiesel, Pyrolyseöl
  - Gasförmig: Syngas aus der Vergasung
- Betriebsform:
  - Komplette Umstellung
  - Co-firing

Stromproduktion – Pellets Retrofit

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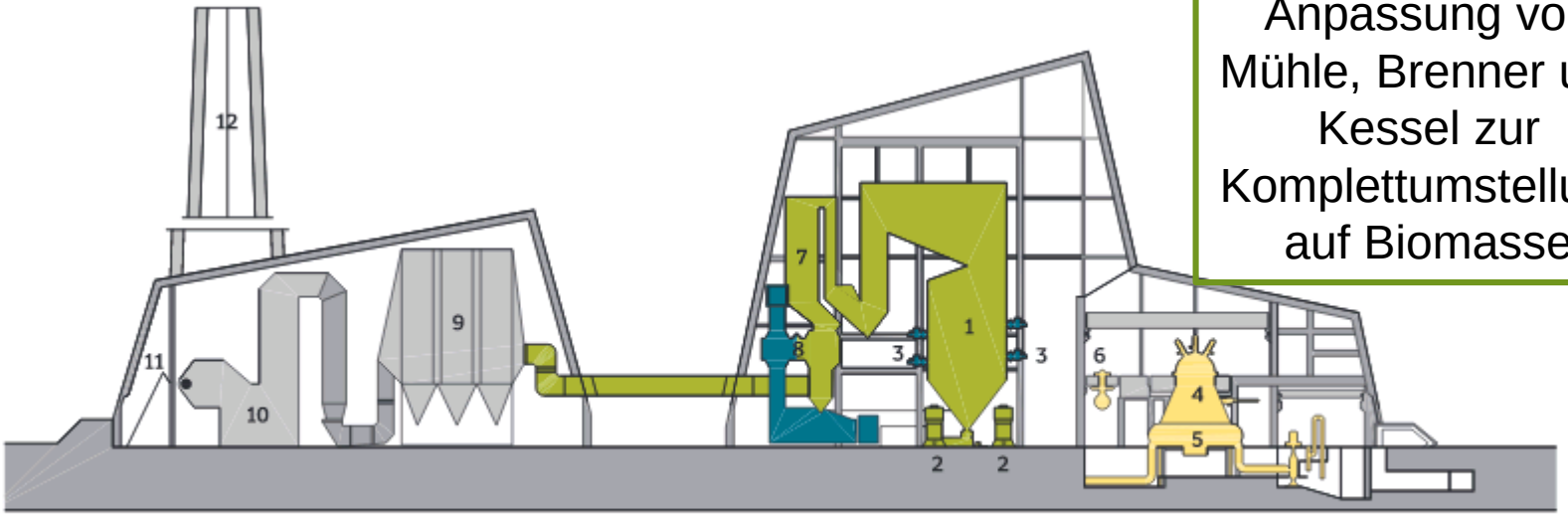
Anpassung von Mühle, Brenner und Kessel zur Komplettumstellung auf Biomasse



1. Boiler
2. Coal mills
3. Burners
4. Turbine and generator
5. Distnct heat exchangers
6. Feed pump
7. DeNO$_x$ plant
8. Air preheater
9. Ash separator
10. Desulphunsation plant
11. Gypsum storage
12. Stack

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Kraft-Wärme-Kopplung

Beispiele industrieller Wärmebedarf:

- Industrieöfen (z.B. Keramik, Metallindustrie)
- Dampferzeugung (z.B. Lebensmittelindustrie)
- Thermoöl – Kreisläufe (z.B. Kunststoff-Industrie)

Abbildung 8: Industrieofen in der Metallindustrie

Abbildung 9: Industrieofen in der Bauindustrie

EPS Extruder

Temperatur-Niveaus

- Branchen
- Prozesse mit Wärmebedarf
- Temperatur-niveaus

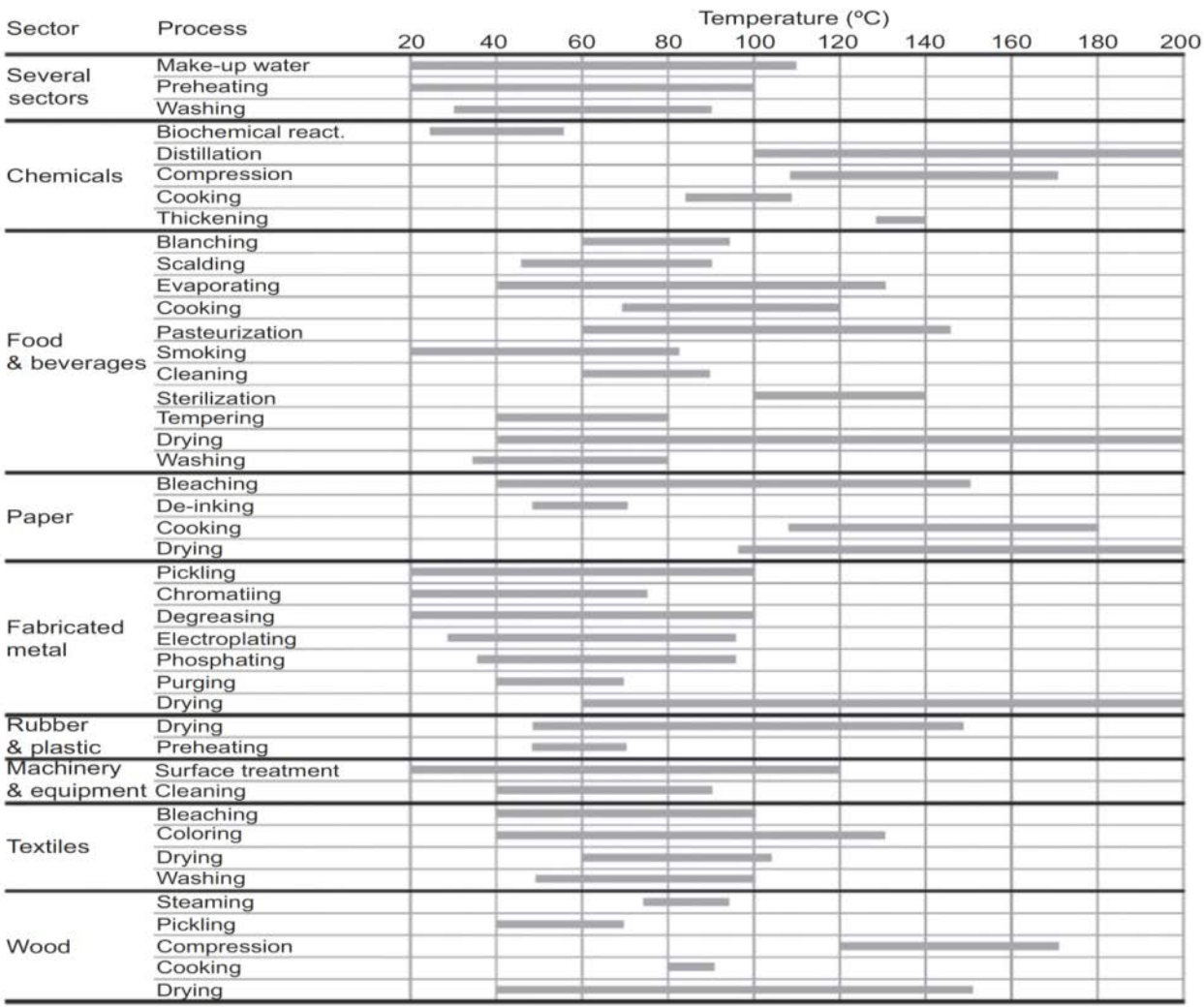


Figure 3.3 Promising industry sectors and processes for SPH (Lauterbach et al., 2012).

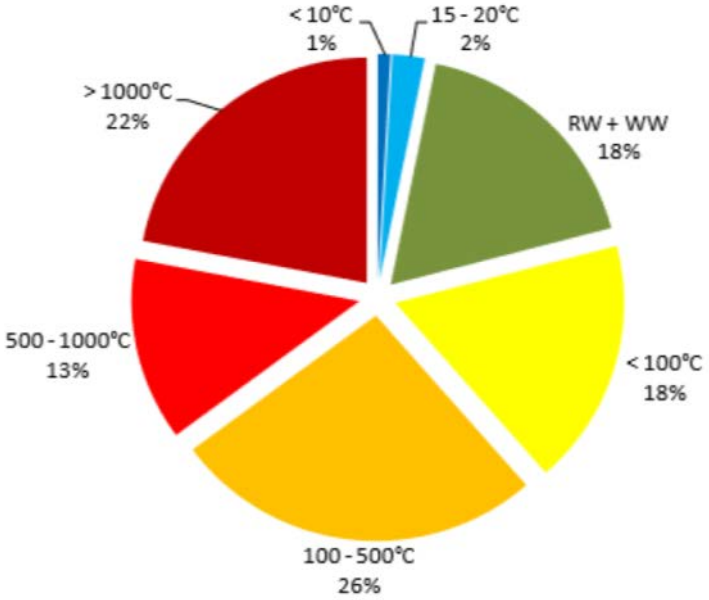
IEA Bioenergy
Task 32

Kraft-Wärme-Kopplung für produzierende Betriebe

- 65% des Wärmebedarfs < 500°C
- 100-500°C größte Bedarfsgruppe

→ Temperaturbereich prädestiniert für Biomasse (Solarthermie)

→ **Nationalen und internationale Roadmaps sehen in der Prozesswärme DEN Zukunftsmarkt für Bioenergie**



IEA Bioenergy Task 32 Nationaler Workshop:
Erneuerbare Wärme für die Industrie

- Industrievertreter mäßig interessiert
- Bei den aktuellen (fossilen) Energiepreisen ist Biomasse für die Industrie uninteressant
  - Frage an die Politik: Was gedenkt man hier zu unternehmen?
  - Chancen für die Bioenergie ergeben sich nur, wenn „saubere“ Energie dem Kunden verkauft werden kann (Lebensmittelbranche)
- Industrie hat zu wenig Informationen über vorhandene Biomasse Technologien

Papier- & Zellstoffindustrie

MILLS

Austrian mill map

Quelle: Austropapier

Papier- & Zellstoffindustrie

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Zellstoffproduktion
aus Holz

Papierproduktion
aus Zellstoff
oder Altpapier

Integrierte Papierproduktion

Papier- & Zellstoffindustrie – Tallöl Retrofit

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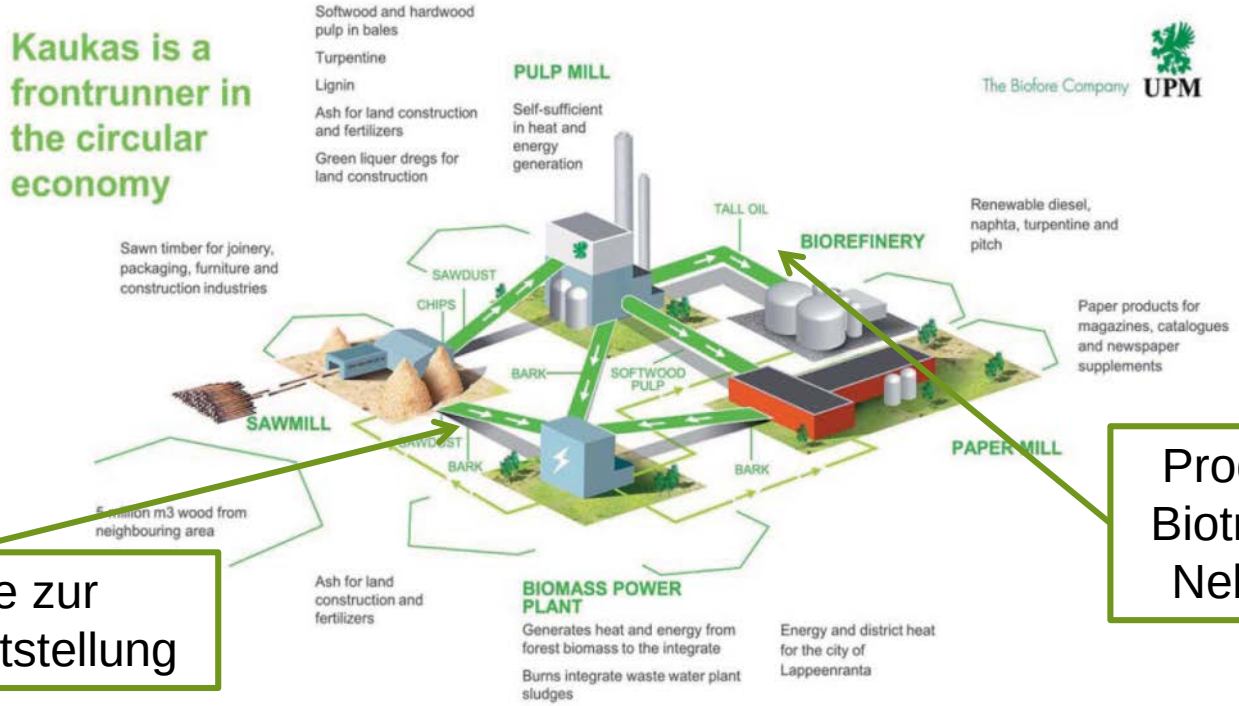

Biomasse zur Energiebereitstellung

Produktion von Biotreibstoff aus Nebenprodukt

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Papier- & Zellstoffindustrie – Bioenergie Retrofit

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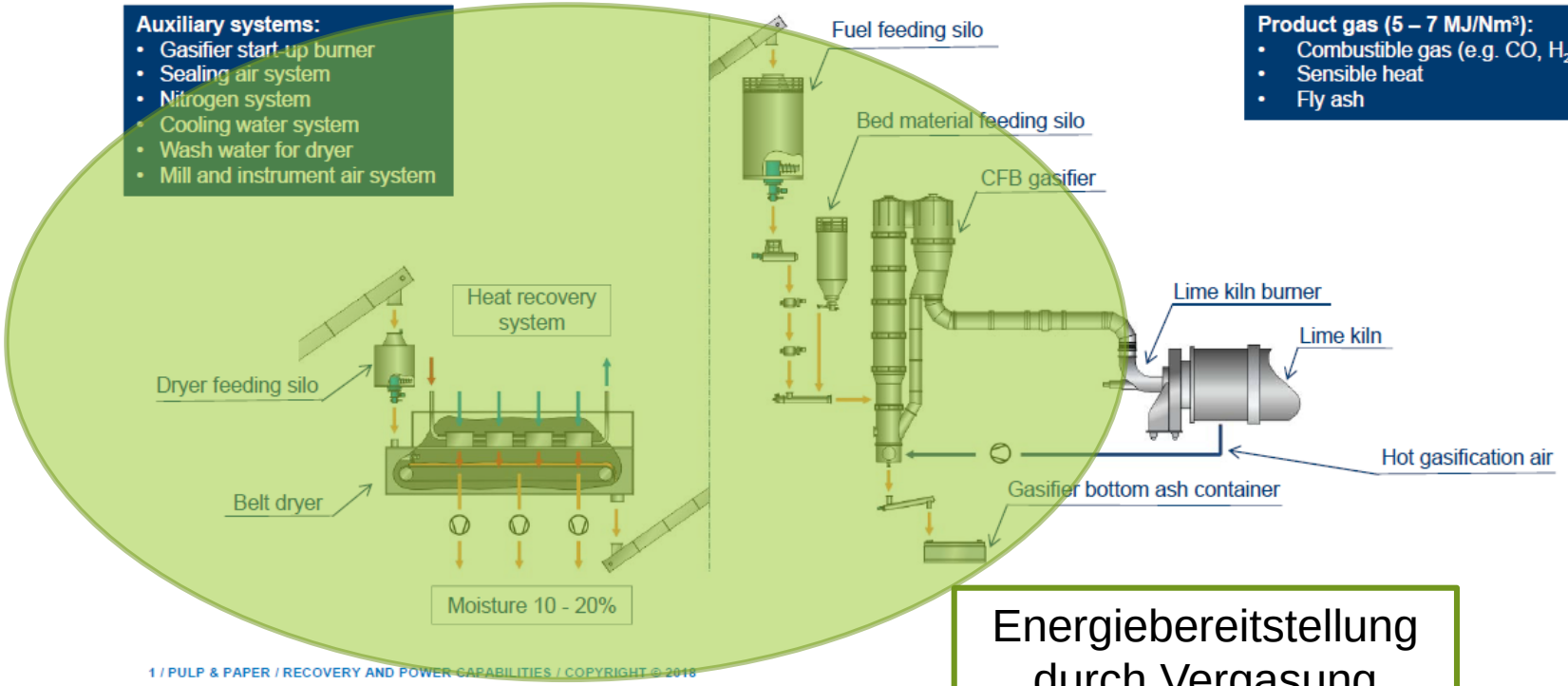

Energiebereitstellung durch Vergasung von Biomasse

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Zusammenfassung

BIOFIT
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- Vielzahl an technologischen Optionen vorhanden
- Treiber sind CO2-Minimierung, Produktdiversifizierung, Nutzung von Überkapazitäten,…
- Barrieren sind mangelndes Wissen, ungünstige ökonomische Rahmenbedingungen,…

Weitere Informationen unter www.biofit-h2020.eu

Danke für Ihre Aufmerksamkeit

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