Potential for EE and integration of RES in the European food and beverage industry

Based on the results of implemented projects

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Starting point
The European Food & Beverage Industry

25% of final energy consumption EU-28 by industry

Final energy consumption by sector (EU-28) in 2015

- Transport: 33%
- Residential: 25%
- Industry: 25%
- Services: 14%
- Agriculture/forestry: 2%
- Non specific (other): 1%

Source: Eurostat, 2017
The European Food & Beverage Industry

- 25% of final energy consumption EU-28 by industry
- 289,000 companies in the European food and beverage industry (F&B industry)
- 99.1% of these are SMEs accounting for
  - 49.5% of the industry’s turnover and
  - 62.8% of employment (Source: FoodDrinkEurope, 2016)
- More than 10% of final energy demand in the industry of the EU-28 are consumed in the food, beverage and tobacco industry (Source: Eurostat, 2017)
Challenges to overcome

- **Product quality**
- **Grown companies**
  - Old structured supply and distribution system (steam) and technologies used
- **Low energy efficiency, high energy costs and large dependency on fossil fuels**
- **Missing**
  - Awareness and knowledge
  - Know-how-transfer of identified solutions
  - Funding and financing systems (inefficient)
  - Best practice examples in different sub sectors
  - Contact and information points
- **Reservations** to be the “first” especially in SMEs
GREENFOODS – branch concept
Approach of a branch concept

- **IEE project GREENFOODS**
  - GREENFOODS Tools
    - Branch concept
    - GREENFOODS WikiWeb
  - Virtual Energy Competence Centres (VECC)
    - National one-stop-shops
  - Training Courses
    - Knowledge transfer and use of tools
  - Energy Audits
    - More than 200 basic, 45 detailed energy audits
    - 11 implementations
  - Funding and Financing Schemes
    - Recommendations for tailor-made funding and financing schemes
GREENFOODS branch concept

Economic Analysis

<table>
<thead>
<tr>
<th>Economic Analysis</th>
<th>Heat Recovery</th>
<th>Solarthermal</th>
<th>Photovoltaic</th>
<th>Biogas</th>
<th>Biomass</th>
<th>Heat pump</th>
<th>Absorption chiller</th>
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<tbody>
<tr>
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<td>%</td>
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<td>%</td>
<td>%</td>
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<tr>
<td>O&amp;M</td>
<td>% of invest</td>
<td>% of invest</td>
<td>% of invest</td>
<td>%</td>
<td>%</td>
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<tr>
<td>Electricity</td>
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<td>% of saving</td>
<td>% of saving</td>
<td>%</td>
<td>%</td>
<td>%</td>
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<tr>
<td>Operating time</td>
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<tr>
<td>Heating Start</td>
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<td>Working Days per Week</td>
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<td>Working Weeks per Year</td>
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<td></td>
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<td>Working Hours per Year</td>
<td>2,080</td>
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Processes

- Energy Balance
- Optimization Analysis
- Economics

Start - Branch Selection

Welcome to the GREENFOODS branch concept!
You have already selected the Hot Processing branch concept.
If you want to start the branch concept with another subsector, you need to start from the beginning.
Click on the Hot Processing button.

<table>
<thead>
<tr>
<th>Processes</th>
<th>Processes</th>
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<td>Photovoltaic</td>
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General Input Data

- General Conditions
- Ambient Air Temperature
- Ambient Air Relative Humidity
- Ambient Water Temperature

Water Input

- Total Yearly Water Input

Historical Input

- Livestock
- Olive Oil

Define energy input, conversion, distribution etc.

Energy Flow Sheet

- Energy Costs [€/MWh]
- CO2 Emissions [t/ha]
- Primary Energy [PE MWh]

CommandButton
GREENFOODS WikiWeb (1)

Project consortium

- Austrian Energy Agency
- Austrian Federal Economic Chamber
- Graz University of Technology
- Bongfish GmbH
- The Polish National Energy Conservation Research Association for the agriculture
- ESCAN S.L.
- AIGUASOL. Sistemes avançats de gestió d'aigua
- FIAB Spanish Food and Drink Industry
- Campden BRI
- University of Newcastle upon Tyne
- University of Kassel
- Stuttgart University of Applied Sciences

<table>
<thead>
<tr>
<th>Regional matrix</th>
<th>Austria</th>
<th>Poland</th>
<th>United Kingdom</th>
<th>Spain</th>
<th>Germany</th>
<th>France</th>
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<td>GreenfoodsTrainings</td>
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</table>
## GREENFOODS WikiWeb (2)

### Solar application for general process heating

- **Back to EFFICIENCY FINDER**

### Unit Operations

<table>
<thead>
<tr>
<th>Action</th>
<th>Typical processes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleaning of bottles and cases</td>
<td>x</td>
</tr>
<tr>
<td>Washing products</td>
<td>x</td>
</tr>
<tr>
<td>Cleaning of production vessels, equipment</td>
<td>x</td>
</tr>
<tr>
<td>Drying</td>
<td>x</td>
</tr>
<tr>
<td>Evaporation and Distillation</td>
<td>x, x</td>
</tr>
<tr>
<td>Blanching</td>
<td>x</td>
</tr>
<tr>
<td>Pasteurization</td>
<td>x</td>
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<tr>
<td>Sterilization</td>
<td>v</td>
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</table>

### Integration Table

<table>
<thead>
<tr>
<th>Integration Type</th>
<th>Emerging Technologies</th>
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<th>Heat Integration</th>
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<td>x</td>
<td>x</td>
<td>x</td>
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<td>Dairy</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Fruit</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Vegetable</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Beer</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Distillery</td>
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<td>x</td>
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<tr>
<td>Food processing</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Agro processing</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Pigmontary</td>
<td>x</td>
<td>x</td>
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</tr>
<tr>
<td>Agro production</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
</tbody>
</table>

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**Illustration 1:** Plate and Plate-Fin heat exchangers [2]

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**TrustEE**

**GREENFOODS**

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19/04/2017 – ICSEF
Potential for EE and RES in F&B industry

➢ Audits on different levels
  ≫ Basic audits (204) + detailed audits (45)
  ≫ Detailed audits
    • Total energy consumption 534 GWh/a
    • Energy saving potential 120 GWh/a → ~ 30,000 t CO₂e

➢ Implementations of EE + RES in 11 enterprises
  ≫ EE measures on process and system level
  ≫ Heat recovery from processes and cooling machines
  ≫ Switchover from steam to hot water distribution
  ≫ Integration of CHP systems
  ≫ Innovative cooling systems
  ≫ Integration of PV and solar thermal systems
Frontrunners
Best-practice-Example „Brewery Goess“

➢ Projects
  ➢ National projects
  ➢ FP7 project SolarBrew (2012-2015)
    • Realization of a large scale solar thermal plant for the brewing process
      ➢ Target: 100% renewable energy supply

➢ System concept
  ➢ Heat recovery
  ➢ Partial switchover from steam to hot water distribution
  ➢ Integration into district heating network
  ➢ Installation solar thermal plant
  ➢ Installation biogas plant
Best-practice-Example „Brewery Goess“

- Prozessoptimierung – Anpassung an den Heizwärmetauscher
- Solarthermalkraftwerk mit 1 MWhth
- 1500 m² Bodenmontage-Flat-Plate-Kollektorfeld
- 200 m³ druckgefülltes Wassertank zur Speicherung der Wärmeenergie

Source: AEE INTEC
Best-practice-Example „Brewery Goess“

➢ Biogas plant
  ➢ Erection of a Biogas plant based on spent grains
    • Input of the substrate: spent grain, yeast, filter cake
  ➢ Installation of a “Combined Heat and Power - CHP” facility
    • Use of electricity for the production as well the heat
    • Remaining biogas for the gas boiler to produce steam

Source: Brauerei Gösser – Brau Union Österreich
How to engage followers?
Evaluation of funding and financing options

➢ Evaluation of 78 funding and financing programs
  ➢ Grants are the most useful way so far
    • Improve economic parameter of investment
    • Create incentives
  ➢ Existing programs are considered not easily available
    • Limited budgets for some of the programs and/or
    • Limits on the eligible costs of the individual measures
    • Complex and time consuming application procedures

➢ Banks show low willingness to invest
  ➢ Lack of ability/capacity among lenders to assess project risks
  ➢ Insufficient performance or credit guarantees
Demand for...

- **Special approaches for**
  - Small implementations as “fast track” projects (e.g. list of recommended measures, materials and equipment)
  - Bigger projects with wider focus, incl. state-of-the-art and innovative technologies, and a streamlined application process

- **Innovative funding and financing programs**
  - Standardized project evaluating for banks and investors
  - Possibility for banks to assess project risks
TrustEE – Horizon 2020 project

➢ Building on results of GREENFOODS project

➢ Vision
  ➢ Enable and stimulate application of EE and RES in industry
  ➢ Eliminate creditworthiness barriers imposed by traditional banks
  ➢ Development of innovative solutions for funding and financing of EE measures and RES
  ➢ Standardized technical and economical evaluation of EE and RES projects

➢ Status
  ➢ Development of web-based assessment platform
  ➢ Establishment of legal framework for project financing
TrustEE platform

- **Web-base platform**
  - Projects are submitted + partly automatically evaluated

- **Removes obstacles of the financing acquisition**

- **Structured application procedure**

- **Facilitating + accelerating implementation and financing from investors point of view**

- **Significant reduction of transaction costs**
  - Very high for these assessments, regardless of the actual project volume
Conclusion and outlook

- **GREENFOODS** has shown high potential for EE and RES in European F&B industry

- **Challenges**
  - Missing lighthouse projects like „Green Brewery Goess“
  - Inappropriate funding and financing schemes
  - Banks with missing knowhow for assessing project risks or technical characteristics

- **TrustEE**
  - Development of innovative funding and financing options
  - Standardized evaluation of projects (EE + RES)
  - Project acquisition of promising projects
Disclaimer

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