Utilization of agricultural biomass and residuals for heat and steam production
AGENDA

1. Linka Group - who are we
2. Straw as an energy resource
3. Technology / product range
4. References
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LINKA GROUP

- Together we have one of the widest product lines in the industry
- We are making boilers for all professional purposes
- Our technologies are state of art
- We have our own service organization
- We guarantee efficient incineration of various types of biomass
VALUES

Responsibility
• We take responsibility for our solutions and for the collaboration with our customers and the dialogue that leads us towards common goals
• Responsible behavior is for us operational and solution-oriented advice, credibility, quick responsiveness and smooth delivery
• As a responsible energy partner, we must be able to provide responsibility at all levels from development to installation and after service

Credibility
• The foundation for innovation and development of the right solution is always based on honest advice, based on deep professional competence
• We build up to 100 - 150 projects every year
• Long reference list with satisfied customers
• We comply with the warranty data we promise

Collaboration
• At Linka Group, we take pride in speaking the customer’s language
• Our professionalism is evident through our ability to listen and to answer technical questions at all levels
• For us, the collaboration is the only path towards innovation and the common goal: a future-proof and optimized energy plant
QUALITY

• The quality standard ISO 9001
• The environmental standard ISO 14001

• Quality plan is prepared for all contracts
• Effective self-control of produced components as well as input control of deliveries
UN SUSTAINABLE DEVELOPMENT GOALS

7 Affordable and Clean Energy
We are increasing the share of renewable energy through our energy plants

9 Industry, Innovation and Infrastructure
We convert waste into energy and thus support the green transition
We innovate and continuously contribute to more efficient energy solutions, so that climate change in the world is reduced

11 Sustainable Cities and Communities
By utilizing local resources, we create global change and reduce the environmental impact per citizen
Our facilities convert resources into energy in local urban communities

12 Responsible Consumption and Production
We support and inspire green conversion by focusing on waste and biomass as a valuable energy resource
STRAW AS AN ENERGY RESOURCE
ENERGY INSTEAD OF WASTE

• In the past, straw was considered as a waste product
• Straw was burned and plowed into the ground
• The oil crisis meant that new methods had to be found to extract energy
• Linka’s founder, Erling Jensen, found out that straw could be converted into energy
• The utilization of straw went from the farm to district heating plants
BENEFITS OF USING STRAW

- Straw is CO₂-neutral and does not emit greenhouse gases
- It is easily accessible and often a waste product
- The efficiencies and utilization value are extremely high
- In Denmark, the straw is primarily traded on the free market via tenders, and this has made the straw more competitive
# FUEL RANGE

<table>
<thead>
<tr>
<th>Fuel Source</th>
<th>Image</th>
</tr>
</thead>
<tbody>
<tr>
<td>Straw</td>
<td><img src="image1" alt="Straw" /></td>
</tr>
<tr>
<td>Grain waste</td>
<td><img src="image2" alt="Grain waste" /></td>
</tr>
<tr>
<td>Saw dust</td>
<td><img src="image3" alt="Saw dust" /></td>
</tr>
<tr>
<td>Waste wood</td>
<td><img src="image4" alt="Waste wood" /></td>
</tr>
<tr>
<td>Dry wood chips</td>
<td><img src="image5" alt="Dry wood chips" /></td>
</tr>
<tr>
<td>Wet wood chips</td>
<td><img src="image6" alt="Wet wood chips" /></td>
</tr>
<tr>
<td>Bark</td>
<td><img src="image7" alt="Bark" /></td>
</tr>
<tr>
<td>Wood pellets</td>
<td><img src="image8" alt="Wood pellets" /></td>
</tr>
<tr>
<td>Coffee shells</td>
<td><img src="image9" alt="Coffee shells" /></td>
</tr>
<tr>
<td>Coffee grounds</td>
<td><img src="image10" alt="Coffee grounds" /></td>
</tr>
<tr>
<td>Olive stones</td>
<td><img src="image11" alt="Olive stones" /></td>
</tr>
<tr>
<td>Cherry stones</td>
<td><img src="image12" alt="Cherry stones" /></td>
</tr>
<tr>
<td>Grass seed</td>
<td><img src="image13" alt="Grass seed" /></td>
</tr>
<tr>
<td>Miscanthus</td>
<td><img src="image14" alt="Miscanthus" /></td>
</tr>
</tbody>
</table>

And many more...
TECHNOLOGY - PRODUCT RANGE
The boilers can be designed for:

- Hot water
- High Pressure Hot water
- Steam
- CHP (Combined Heat and Power)

Our innovative combustion technologies ensure high efficiency, low emissions and optimal utilisation of the fuel

Linka’s combustion technology is world patented
BOILERS
Highly automated systems

The boilers are developed from our own design, based on 40 years of experience

• In close collaboration with our Danish boiler supplier

• Efficient and secure fire extinguishing equipment eliminates the risk of backfire

• Boilers can be prepared for later installation of SNCR equipment
COMBUSTION

Through Linka’s highly efficient, patented combustion technology

✓ Heated air is added during combustion, to ensure complete burnout of all gases
✓ This invention means that our grates can obtain better results on efficiency as well as emissions
COMBUSTION

Primary and secondary air

- Primary air is added into three combustion zones under the grate. Each zone is supplied from a separate, primary fan to achieve exact control of the air stream.

- Secondary air is added after a downstream principle, by nozzles in the front end of the combustion area.
MOBILE SOLUTIONS

Pre-manufactured boiler plant

☑ The boiler system is delivered as “plug and play” including feeding- and deashing systems

Turnkey solution - delivered directly on site

☑ Operational soon hereafter

Mobile plants are built from 250 kW - 5,000 MW
REFERENCES
Hobro, Denmark

MOSEGAARDEN

Sustainable heating for producing 1.8 mio. chickens every year

- 6 sheds, which for optimum breeding purposes have an inhouse temperature of between 24°C and 34°C

"Sustainable heating is a major issue. We really like using the incinerator we have nearby. It makes a difference in the long run."

Leif Barsballe, Operations Director, Mosegaard

96 % Efficiency
110 °C Flow temperature

Fuel: Straw
Plant size: 1 MW
Year of building: 2020
Skamby, Denmark

**DANISH AGRO**

Process steam using own waste residues

- Previously, they paid to get rid of the residual products, so there is a financial benefit to Danish Agro by driving them to incineration at the biofuel plant instead.
- The steam from the plant is primarily used for heat treatment of the feed that the company produces. Also, the moisture from the steam is used to keep the shape of the products.

<table>
<thead>
<tr>
<th>Fuel: Wood chips and grain waste</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant size: 2 MW</td>
</tr>
<tr>
<td>Type of plant: Process steam</td>
</tr>
<tr>
<td>Year of building: 2018</td>
</tr>
</tbody>
</table>

**Efficiency**: 91.4 %

**CO2 reduction**: 1,030 ton per year
CO₂-neutral straw-fired plant replaces natural gas-fired plants

- 72 hours of fully automatic operation
- Ensures optimal utilization of local straw

“We have been supplying heating derived from straw continuously since May. This is a clear sign that the new district heating plant has been put to good use,”

- Jens Nansen Poulsen, project manager at Sønderborg Forsyning.

**SØNDERBORG FORSYNING**

Nordals, Denmark

Fuel: Straw
Plant size: 10 MW
Type of plant: Hot water
Energy type: District heating
Year of building: 2019/2020

<table>
<thead>
<tr>
<th>Efficiency</th>
<th>kWh pr. produceret MWh</th>
<th>Tons of CO₂ saved</th>
</tr>
</thead>
<tbody>
<tr>
<td>94.4%</td>
<td>4.61</td>
<td>350,000</td>
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</table>
We’re helping to create sustainable energy based on maximising exploitation of local resources or waste products