

# **Straw for Energy Production**

**Danish Technological Institute is a competent partner!**



Denmark is leading in utilizing straw as an energy resource. About 1,5 mill tons of straw is used annually for energy production. There has been a strong tradition for the use of small scale straw boilers in agriculture and medium scale boilers for district heating. And during the last couple of decades straw consumption for electricity production in CHP and Power Plants has reached almost 1 mill tons per year through the implementation of the Danish Biomass Action Plan



A truck load of straw arrives at the Power Plant

Danish Technological Institute has several key competences within most disciplines regarding the use of straw as energy resource:

- Estimating straw resources
- Straw logistics
- Organizing straw supplies
- Utilization of ash and other residues

As an independent company, DTI cooperates with Power Companies, Farmers Organizations, Straw Equipment Manufacturers alike, and we are thus the ideal partner for all new stakeholders in straw-for-energy business.

### **Estimating straw resources**

Before the establishing of plants for combustion of straw it must be verified, that sufficient amounts of straw is available within a reasonable distance of the planned facility.

Even if sufficient straw potentially is available in the region, it is important to ensure that the potential suppliers are actually interested in producing and selling straw to the plant. So information about opportunities, advantages and disadvantages must be disseminated to the farmers, if possible in cooperation with their organizations.



## Straw logistics

To ensure supply of straw in sufficient amounts, appropriate quality and acceptable price, optimizing straw logistics is essential. Large scale production of straw involves several handling operations like raking, baling, field and road transport, storage etc.

DTI has for two decades worked with research stations, agricultural organizations straw, producers and Energy Companies to optimize straw logistics. In Denmark straw for Large Scale Applications is almost always handled in “big bales” (500-600kg). Under most conditions, it’s not feasible to produce straw pellets, even though it may have some logistic advantages. We can always assign the optimum logistic system according to local conditions.



Raking, baling, field and road transport are among the handling operations in straw logistics

## Organizing straw supplies

No large scale straw fired plant has the storage facilities for long term storage of straw. Typically, the power plants have storage capacity for only a few days, i.e to cover the consumption during weekends and short holidays like Christmas.

This means, that the straw is stored by the straw producers/suppliers and transported continuously to the plant. For large scale plants there may be several hundred straw suppliers, and there is thus a comprehensive and important task in coordinating the transports from different suppliers.

This task may be undertaken by logistics staff at the plant, or it may be outsourced to straw suppliers associations. Anyway it is important to consider this issue well in advance.



Straw is stored in barns or large stacks in the field

### Utilization of ash and other residues

Ash, slag and other residues from energy conversion of straw (and other biomass) is an important nutrient source. It is therefore important, that handling and utilization of the by-products from the energy conversion is taken into consideration early in the project.



Ash and other residues from conversion are valuable products



There's a lot of interest in straw utilization and straw suppliers and power plants have many visitors

### Study tours in Denmark

DTI can arrange tailored study tours in Denmark with visits at straw-fired Power Plants, CHP plants and District Heating Plants as well as straw producers. DTI can also arrange training programmes / courses for straw producers, operational staff etc.

## Straw experts at DTI

Jørgen Hinge, M. Sc. Biology

Mr Hinge has been working with straw as energy resource for more than 15 years. From 1995-2005 he was general secretary for the Danish Straw Suppliers Associations and has profound experience in the implementation of the Danish Biomass Action Plan. He is an expert especially in organizing straw supplies, straw logistics, agricultural aspects of straw removal and utilization of byproducts from energy conversion of straw.

Lars Nikolaisen, B. Sc. Mech. Eng.

Mr. Nikolaisen has been head of Centre for Biomass Technology, working on many projects on straw as an energy resource. He is an expert in straw logistics and straw combustion technology and utilization of biomass residues.

## Examples of reports/projects

1. Elaboration of a platform for increasing straw combustion in Sweden, based on Danish experiences. Hinge, J. for Värmeforsk, 2009.  
<http://www.varmeforsk.se/rapporter?action=show&id=2189>
2. "Straw for Energy Production", 2. edition. The Danish Energy Agency, 1998  
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