

Biogas woodchip drying innovation for reduced bioenergy production costs

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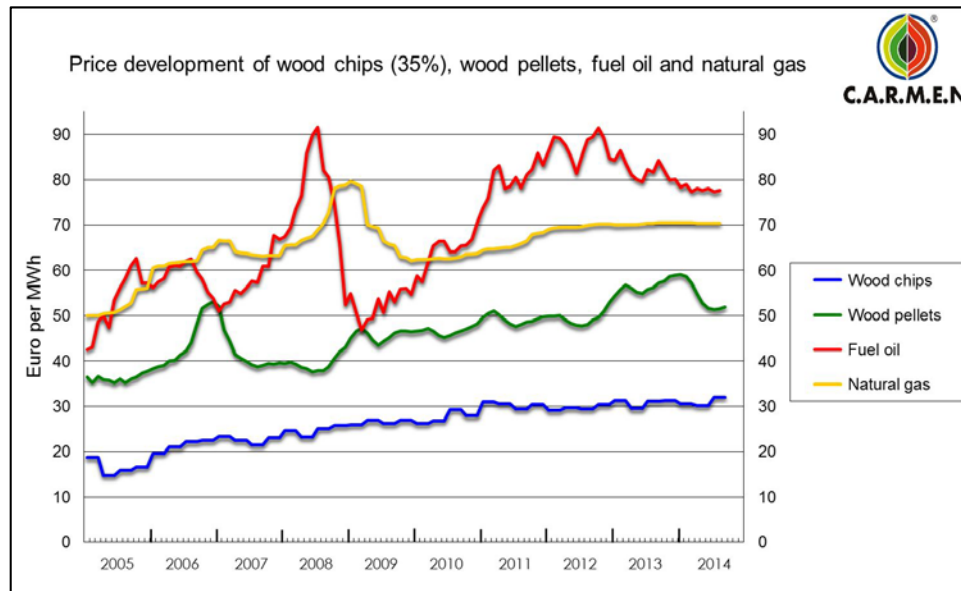
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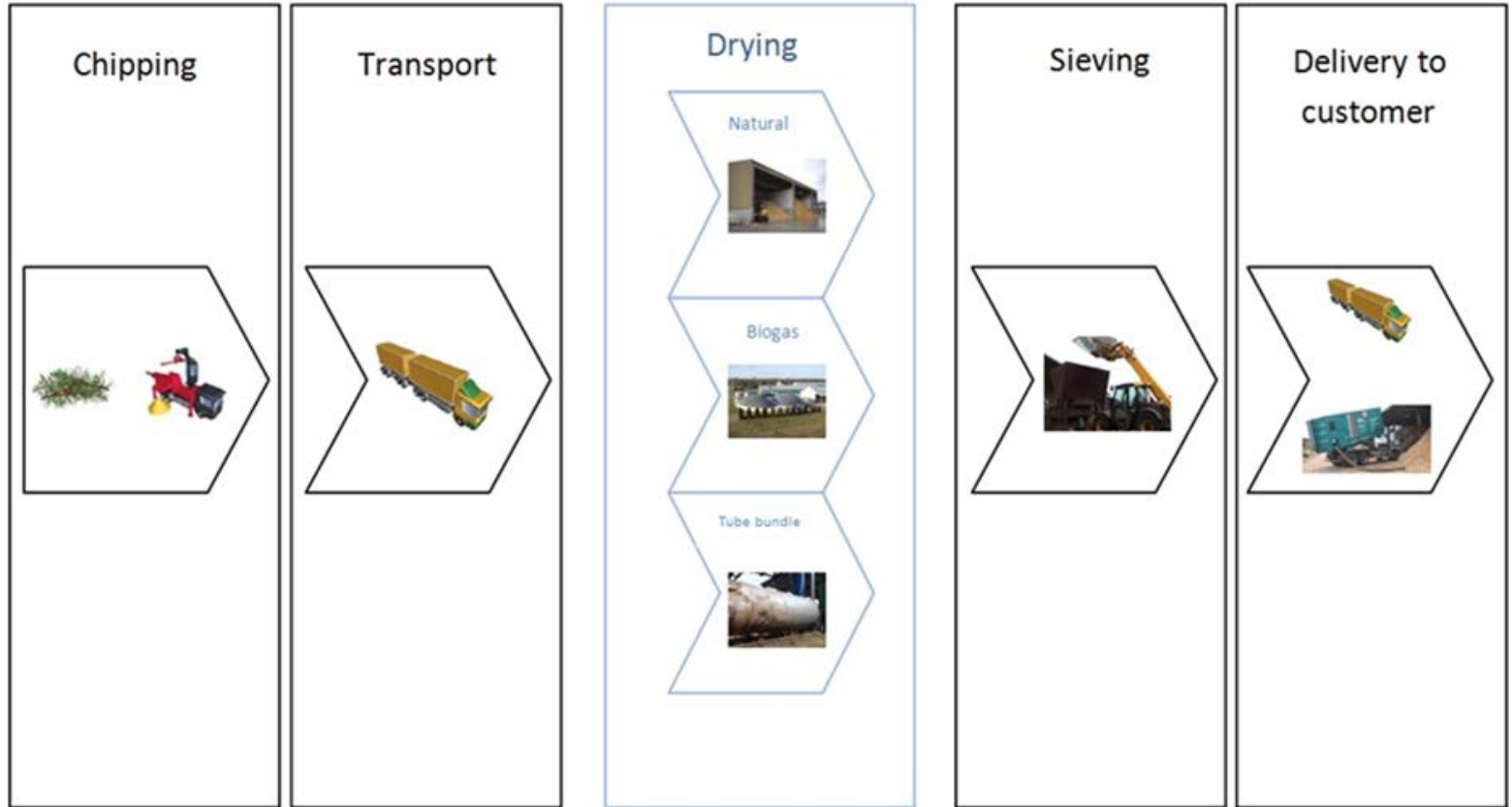


Introduction

- Diverse market for bioenergy for thermal and electric energy: Pellets, wood chips, biogas
- Consumers decision parameters: Energy content, quality, price, storage, energy demand
 - i.e. pellets vs. wood chips
- Wood chips production contains few and simple processing steps, thus low production costs and low price for customer



Supply Chain for Wood Chips



Conventional Drying Methods

- **Natural air-drying**
 - Chips are piled on clean ground
 - Protection against rain, wind, pollution by fleece cover or roofing
 - Moisture content reduction to 35% within 3 months (in summer)
 - Costs: Approx. 0,50 €/bulk meter
 - Drawbacks: High seasonality, space requirements
- **Tube-bundle**
 - Output: 1,5 bulk meter/hour
 - Moisture content reduction to 20% within 1 hour
 - Costs: Approx. 3 to 3,5 €/bulk meter
 - Drawbacks: Low output per hour, high energy demand

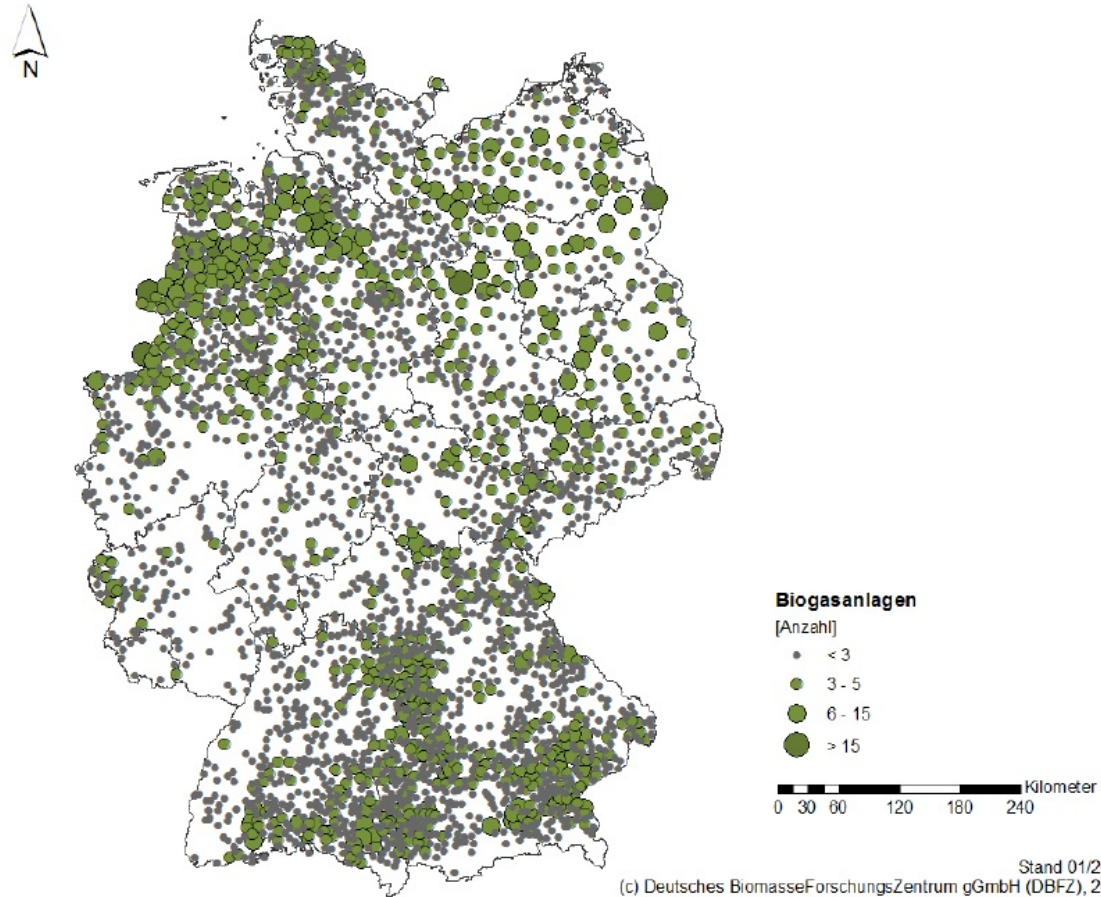
Innovation

- **Renewable energy act (EEG) launched in 2000**
 - Operators of biogas-facilities must use the excess heat that results from biogas-production to receive the EEG-feed-in tariff(EEG 2012)
 - 60% capacity utilization of excess heat per year
 - Maximum 25% may be used for fermentation purposes
 - 35 to 60% has to be used for ulterior functions (i.e. heating of buildings or drying of loose material)
- **More than 7500 biogas facilities in Germany with an installed capacity of 3352 MW (2012)**



Partnership between forest bioenergy firm and local agricultural producer running a biogas facility

Biogas Facilities in Germany



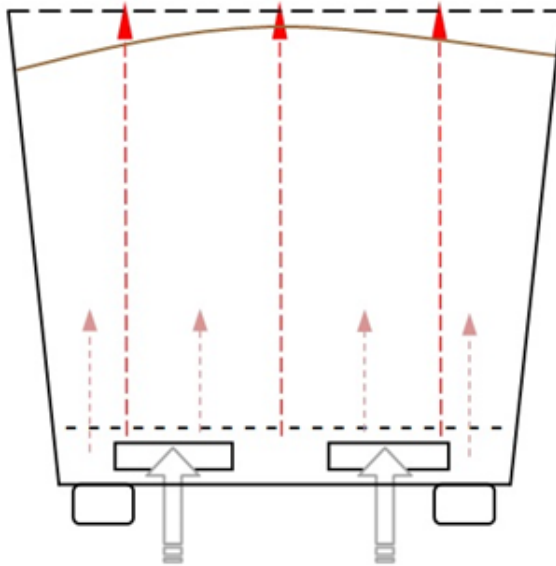
Innovative Drying Method

- **Utilization of process heat that results from**
 - Emissions from biogas combustion and
 - Engine cooling system
- **Instead of blowing the excess heat into the atmosphere, it is redirected through tubes into wood chip containers to dry the material**
- **Low investment costs for modified container design**
- **Additional electricity costs for heat exchanger and air circulation system are marginal**

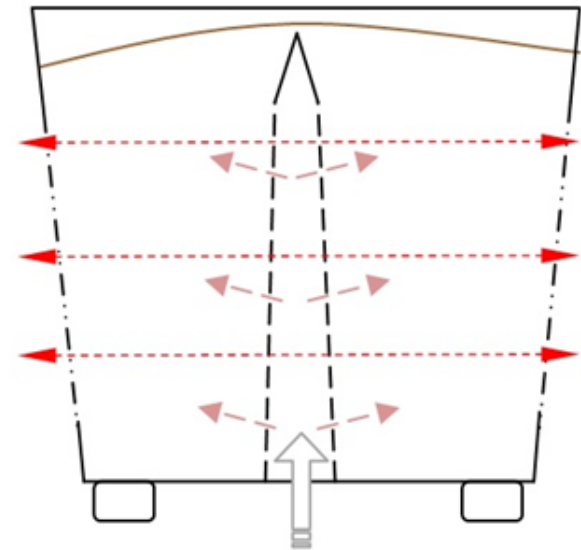


Air ducts supplying containers with heat

Container Options



Container with false floor and vertical drying



Container with centered air supply duct and horizontal drying

Productivity

6-container system	Container with centered air duct
Moisture content reduction to 10%	Within 1,5 days
Monthly drying volume (summer)	2800 bulk meter
Machine running costs/bulk meter	approx. 0,40€ to 0,60€
Transportation costs/bulk meter (30km)	approx. 1,30€
Total costs/bulk meter	1,70€ to 1,90€



Total reduction in wood chip production cost of 14 - 17%

Summary

- Utilization of excess heat from biogas facilities ensures future competitiveness of wood chips production
- Drying cost reduction of around 80% due to lower machine running costs in comparison to conventional dryer
- Reduction of cost-effectiveness due to transport costs (i.e. > 70km)
- South Germany offers highest potentials for partnerships due to high coverage of biogas-facilities and hence short transport distances
- Potentials for similar synergies in other European countries should be explored



Thank you for your attention.

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