Normative Issues and Standards –

Key issues for new markets

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HEATING WITH BIOMASS IN THE TERTIARY SECTOR

ATHENS 07.April 2011

Content Overview

- Company Description
- Challenges for Market Acceptance
- Fuel Characteristics
- Examples (olive kernel, wood chips)
- Normative Status and Future Requirements
- Conclusions and Outlook

KWB product line

Wood pellet, wood-chip and wood log heaters from 10 - 300 kW

DOMO HEAT

We take responsibility for the future both in terms of our products and how they are manufactured.

Stiftung Warentest
test

Testurteil
GUT (2,5)

Holzpelletkessel
KWB Easyfire

Im Test:
10 Holzpelletkessel
(4 Gut, 4 Befriedigend, 2 Ausreichend)

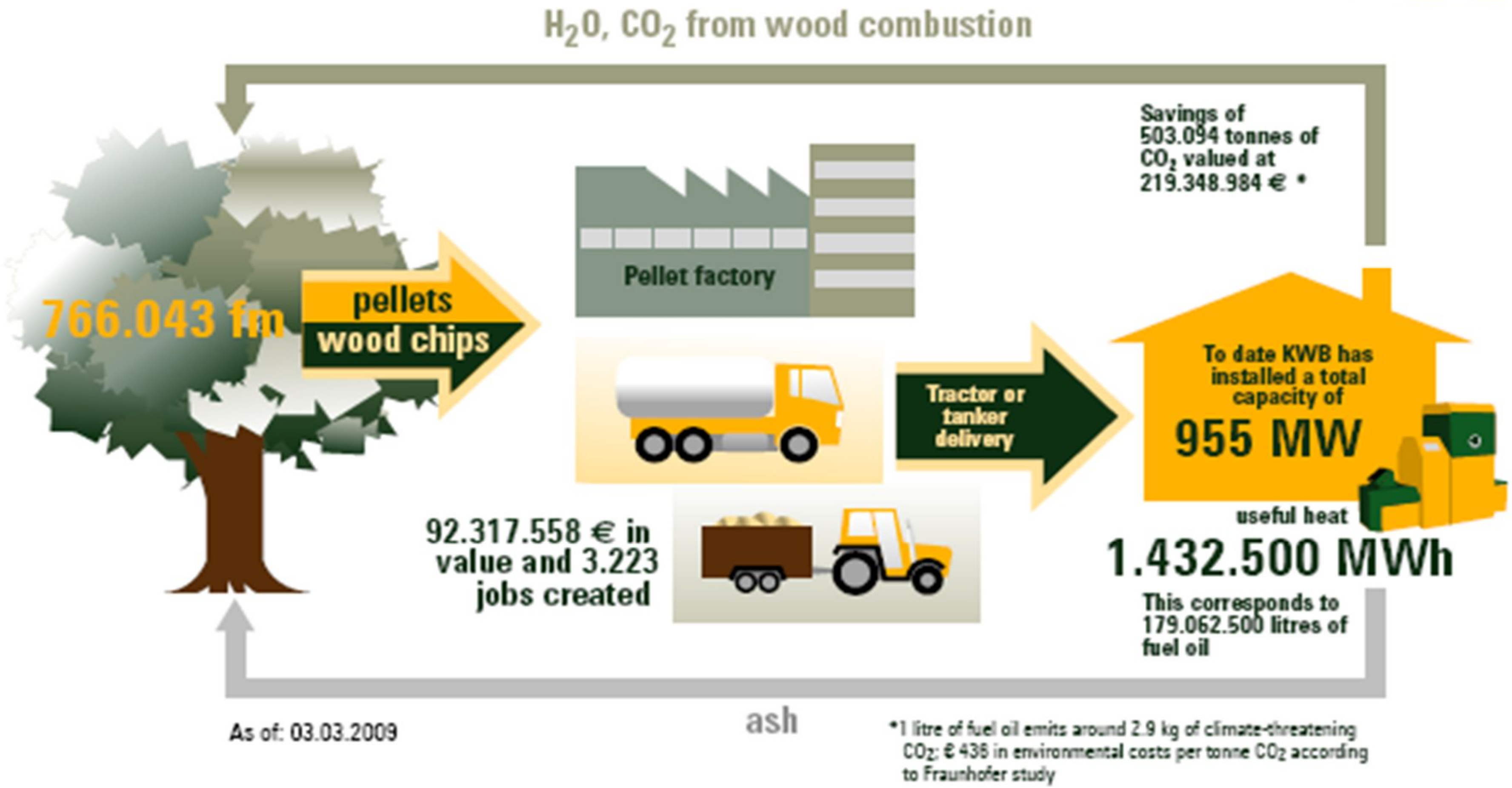
test Spezial Energie 05/2009

KWB - the company

- **Headquarter** St. Margarethen/Raab Austria
- Specialists in the combustion of biomass
- 11 different countries
  - 6 languages
  - distribution network
  - service network
  - trainings
- www.kwb.at

KWB
Calderas de biomasa

KWB Bio-Energy Plan



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Success Criteria for Local Concepts

The key issue for a market development for heating applications of non wood biomass is

market acceptance.

- To get acceptance three major criteria must be fulfiled:

  - Comfort
  - Economy of Life Cycle
  - Reliability and Safety

Customer satisfaction

Challenges for Non Wood Solid Biofuels

- Combustion Technology
- Emissions and Emission Limits
- Corrosion Aspects

Standardization & ***Fuel quality assurance***

Market Acceptance

Challenges for Solid Biofuels

Influence Matrix of Key Parameters of fuels

Key parameters	*size*	*moisture*	*heating value*	*ash content*	*ash melting behaviour*	*fuel composition*
Sucess criteria						
Comfort		*x*	*x*	*x*	*x*	
economy	*x*	*x*		*x*	*x*	*x*
security and reliability	*x*	*x*		*x*	*x*	*x*

Key parameters for fuel compositions are:

- Cl, K, S, Si influence ash melting behaviour, deposition corrosion and particle emissions
- N influences NO_x Emissions
- Water content influences efficiency, gaseous emissions and storability

Challenge Standardisation and Quality Assurance

Non wood biomass fuels will only be sucessful if they are standardised combined with a quality control system.

Several standards have already been developed in Austria:

ÖNORM M 7139 Energy Crops, ÖNORM C 4000 Miscanthus compacted, ÖNORM C 4001 Miscanthus

The challenge is to keep key parameters as low as necessary, but reachable for producers and distributers and controlable with affordable means.

Important standardisation projects are at final vote or in progress in Europe that are important for a successful market:

- EN 14961 part 1 - 6 Solid biofuels specification (final vote)
- EN 15234 Solid biofuels quality assurance (final vote)
- Revision of the EN 303-5 – 2010 actually in stage of inquiry

Supply chain concept

EN 14961 series (part 1 to 6)

EN 15234 series (part 1 to 6)

Raw material

Identification and collection of raw material

Production / preparation of solid biofuels

Trade and delivery of solid biofuels

Reception of solid biofuel by end-user

End-user Combustion unit or other conversión unit

Supply chain activities covered by this European Standard

ÖNORM M 7139 Energy Crops,

ÖNORM C 4000 Miscanthus compacted,

ÖNORM C 4001 Miscanthus

EN 303 -5; other boiler and oven standards

Challenge Standardisation and Quality Assurance

Example – Necessary structure for specification of non wood pellets

Table 1– Specification of pellets produced from herbaceous biomass and blends and mixtures

Property class Analysis method	**units**	**A**		**B**
		1	**2**	
Origin and source EN 14961-1 Table 1		2 Herbaceous biomass 4 Blends and mixtures	2 Herbaceous biomass 4 Blends and mixtures	2 Herbaceous biomass 4 Blends and mixtures
Diameter, *D* and length *L* [a] ENXXXX According Figure 1	mm	D06 ± 1,0 ; 3,15 ≤ L ≤ 30 mm D08 ± 1,0 ; 3,15 ≤ L ≤ 35 mm	D06 ± 1,0 ; L1 3,15 ≤ L ≤ 30 mm D08 ± 1,0 ; 3,15 ≤ L ≤ 35 mm D10 ± 1,0 ; 3,15 ≤ L ≤ 40 mm	D06 ± 1,0 ; 3,15 < L < 40 mm D08 ± 1,0 ; 3,15 < L < 35 mm D10 ± 1,0 ; 3,15 < L < 40 mm D12 ± 1,0 ; 3,15 < L < 50 mm D25 ± 1,0 ; 10 < L < 50 mm
Moisture, M EN 14774-1, EN 14774-2	as received, w-%	M10 ≤ 10	M15 ≤ 15	M15 ≤ 15
Ash, A EN 14775	w-% dry	A5 ≤ 5	A7 ≤ 7	value to be stated
Mechanical durability, DU EN 15210-1	as received, w-%	DU97.5 ≥ 97,5	DU96.5 ≥ 96,5	DU95.0 ≥ 95,0
Fines at factory gate in bulk transport (at the time of loading) and in small bags, up to 20 kg and large sacks (at time of packing or delivery to end-user), F prEN 15149-1	w-%	F1.0 ≤ 1,0	F1.0 ≤ 1,0	F2.0 ≤ 2,0
Additives [b]	w-%, dry	Type and amount to be stated	Type and amount to be stated	Type and amount to be stated
Net calorific value as received, Q EN 14918	MJ/kg or kWh/kg	Q15.0 ≥ 15,0 or Q4.1 ≥ 4,1	Q13.2 ≥ 13,2 or Q3.8 ≥ 3,8	Q12.4 ≥ 12,4 or Q3.4 ≥ 3,4
Bulk density, BD EN 15103	as received, kg/m^3	BD600 ≥ 600	BD600 ≥ 600	BD600 ≥ 600
Nitrogen, N , prEN 15104	w-% dry	N0.5 ≤ 0,5	N1.0 ≤ 1,0	N2.0 ≤ 2,0
Sulphur , S prEN 15289	w-% dry	S0.1 ≤ 0,1	S0.2 ≤ 0,2	value to be stated
Chlorine, Cl prEN 15289	w-% dry	Cl0.1 ≤ 0,1	Cl0.3 ≤ 0,3	Cl0.5 ≤ 0,5
Arsenic, As prEN 15297	mg/kg dry	≤ 1	≤ 1	≤ 1
Cadmium, Cd prEN 15297	mg/kg dry	≤ 0,5	≤ 0,5	≤ 0,5
Chromium, Cr prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10
Copper, Cu prEN 15297	mg/kg dry	≤ 40	≤ 40	≤ 40
Lead, Pb prEN 15297	mg/kg dry	≤ 10	≤ 10	≤ 10
Mercury, Hg prEN 15297	mg/kg dry	≤ 0,10	≤ 0,10	≤ 0,10
Nickel, Ni prEN 15297	mg/kg dry	≤ 15	≤ 15	≤ 15
Zinc, Zn prEN 15297	mg/kg dry	≤ 60	≤ 60	≤ 60
Ash melting behaviour, DT [c] prEN15370	°C	DT ≥ 1 000	DT ≥ 800	DT ≥ 800

Amount of pellets longer than value stated in the table can be 5 w-%.
Type (e.g. pressing aids, slagging inhibitors or any other additives like starch, corn flour, potato flour, vegetable oil,…).
If appropriate, all characteristic temperatures (shrinkage starting temperature (SST), deformation temperature (DT),
emisphere temperature (HT) and flow temperature (FT) in oxidizing conditions can be stated.

Example Quality Aspects Wood Chips

Excellent wood chips

Shredded wood chips

→ only large scale application (storage and transportation risk)

Example Quality Aspects Wood Pellets

Pellets do not enable the customer to check the quality without special equipment.

- Standardisation for wood pellets was the key to success
- Quality Assurance by certification, documentaion and external control
- Reliability and safety Safety

and by this

Market Acceptance

New:

ENplus

certification may form a new standard all over Europe

Example Quality Aspects Olive Kernel

- Byproduct in production of olive oil
- The pits of the olives can be separated from the olive cake
- The fuel properties depend mainly on the quality of that separation process
- The heating value and density are similar to pellets – the size is smaller

Example Quality Aspects Olive Kernel

Olive Kernel show a broad variation of key parameters

The fuel tested in DOMOHEAT showed a moderate level for Cl, K, S, N

- Good combustion results and emissions within the limits can be achieved – but so far not guaranteed
- a strong variation in fuel quality also in the composition of corrosive elements is a risk
- a high potential
- For legal and market acceptance fuel must be standardised and quality assurance must be installed

Conclusions and Outlook

- Standardisation and quality assurance are the key issues for a successful market development
- All stakeholders (fuel producers, fuel distributors and boiler manufakturer) must closely cooperate in lokal networks to build up a market for new fuels and to build up a quality assurance systems that enables the fuel quality the boilers need.
- Corrosion is an important task for further research. Material testing takes too long. Evaluation of corrosion risks is still only possible via trial and error.
- General approach should be: Make a fuel as little corrosive as possible

Conclusions and Outlook – Open Tasks

- Advanced combustion technologies are already capable of combusting non wood fuels with comparatively low emissions.
- Advanced Standards for fuels that have a potential of a high trading volume need to be created (e.g. olive kernel) to ensure reliability and lower emissions.
- Maintenance costs and boiler lifetime will be influenced by the fuel quality.
- At presence a prediction of lifetime of boilers is difficult because long term monitoring is needed.
- For the most promising fuels long term monitoring has started.
- Technology development will further increase as soon as market acceptance is given

Conclusions and Outlook

- Emission levels will affect the investment costs and operating costs.
- Emission levels shall not be more restrictive than the state of the art measurement technology.

Fuel	***potential fuel production***	***impact emissions***	***impact boiler investment cost***	***impact reduced lifetime of boiler***
wood chips	high	depending on wood type and amount of bark	low	low
wood pellets	high	low	low	low
pine cones	low (local)	low	low	low
olive kernel	medium	particles NO_x	increased	increased
straw	high	particles, NO_x	strong increase	strong increase

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KWB Bio-Energy Plan

For foreign markets, the KWB Bio Energy plan is transferred to

local ENERGY concepts and local cycles using

local infrastructure and local fuels

THINK GLOBAL ACT LOCAL

is part of our philosophy

This was the intention to participate in the DOMOHEAT Project

Challenge Corrosion for Non Wood Biomass

Higher amounts of ash induce higher amounts of possibly corrosive compounds (especially Cl, S, K). This can only be influenced during grow and harvest of the fuels, for some residues probably during processing.

Corrosion mechanisms and effects

- High temperature chlorine corrosion.

  Affects not-watercooled parts of the boilers, results in failure of parts that are needed for good combustion results and higher life cycle costs.

- Corrosion of water cooled areas of the vessel because of depositions of basic or acidic compuonds.

  The components form depositions and acidic compounds in the flue gas that can condensate at the cold watercooled walls of the vessel. Risk of leckages.

- Additional research for the prediction of corrossivity and corrosion rates is necessary in this field