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AshMelT project

Background – Why this work was necessary

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Results of the AshMelT project – Workshop
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Content

- Market requirements
- Fuel Characterisation
- Status quo: characterisation methods
- Project Mission
- Progress regarding characterisation methods
- Progress regarding quality control & classification

Market requirements

Higher demand leads to

→ increasing competition with other sectors of industry

→ wooden materials of lower quality & agricultural raw materials / by-products

Broad variety of biomass fuels & fuel properties

Fuel characterisation

Specification of properties of solid biomass fuels in respective standards

- Normative
  e.g. dimensions, moisture, ash content or content of particular elements (S, Cl, N).
- Informative (only)
  no classification available for ash melting behaviour
  "…DT should be stated…"

Need for quality standards

- Fuel producers
  ► Ensure adequate quality
- Boiler manufacturers
  ► State applicable/suitable fuels for their products
- Achieve customer satisfaction

Normative

Dimensions (mm)	
Diameter (*D*) or equivalent (diagonal or cross cut), mm	
D 40	$25 \le D \le 40$
D 50	≤ 50
D 60	≤ 60
D 80	≤ 80
D 100	≤ 100
D 125	≤ 125
D 125+	> 125 (maximum value to be stated)
Length (*L*), mm	
L 50	≤ 50
L 100	≤ 100
L 200	≤ 200
L 300	≤ 300
L 400	≤ 400
L 400+	> 400 (maximum value to be stated)
Moisture, M (w-% as received) EN 14774-1, EN 14774-2	
M10	≤ 10 %
M15	≤ 15 %
Ash, A (w-% of dry basis) EN 14775	
A0.5	≤ 0,5 %
A0.7	≤ 0,7 %
A1.0	≤ 1,0 %
A1.5	≤ 1,5 %
A2.0	≤ 2,0 %
A3.0	≤ 3,0 %
A5.0	≤ 5,0 %
A7.0	≤ 7,0 %
A10.0	≤ 10,0 %
A10.0+	> 10,0 % (maximum value to be stated)
Particle density, DE (g/cm³) CEN/TS 15150	
DE0.8	≥ 0,8
DE0.9	≥ 0,9

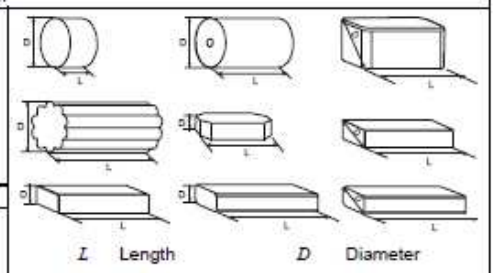

Figure 2 — Examples of briquettes

Informative: Ash melting behaviour (°C) CEN/TS 15370-1	Deformation temperature, DT should be stated

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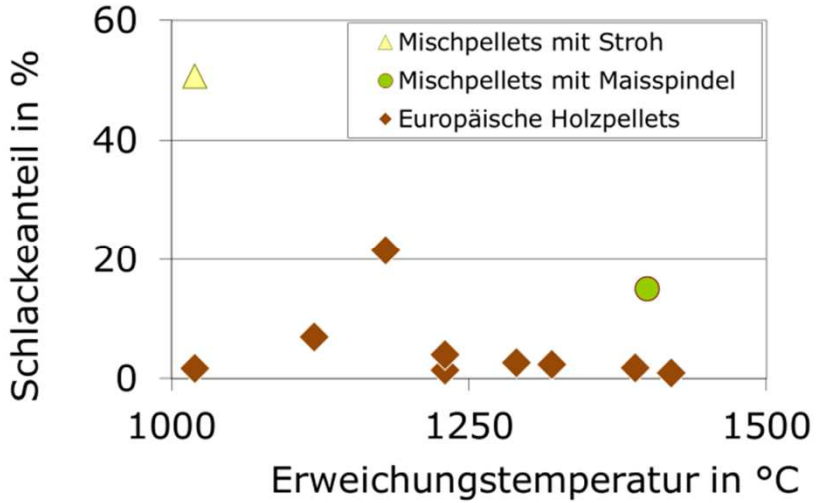
Status quo characterisation methods

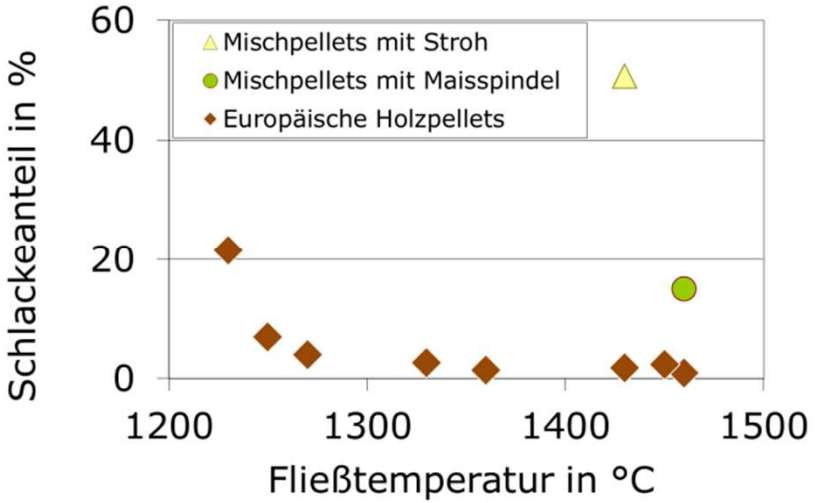
- Available method
  - More than 12 laboratory methods developed to determine ash melting behaviour (and additionally a number of available analysis methods tested for this purpose), but only one method standardised and commonly used
  - DIN51730 or CEN/TS15370
  - Many methods initially developed for coal
    -> Significance/reliability for wood / other biomass?
  - Aspects on test conditions of available methods vs. real combustion conditions
    - Nature of investigated sample - Almost all methods use laboratory ashes
    - Atmosphere (may have considerable influence)
    - Heating rate and residence time (usually slow heating rates and long residence time is used – providing equilibrium-like conditions)
    - In many methods mechanical stresses are not considered
  - No significance regarding practical relevance!
    -> threshold value?

Problematic fuel qualities

Slag amount from real combustion systems
(Results from Project ProPellets II)

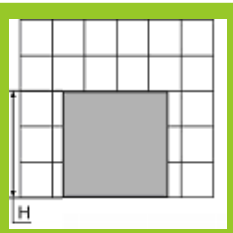
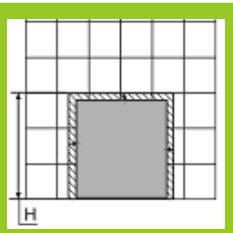
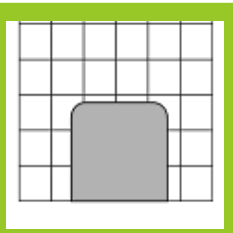
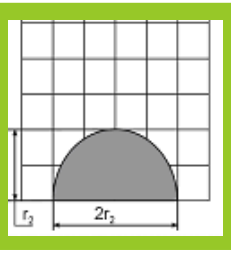
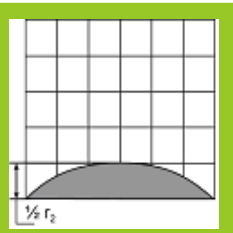


Deformation temperature



Flow temperature

Characteristic temperature method or ash fusion test (AFT)

Shape					
Term		Shrinkage starting temperature (SST)	Deformation Temperature (DT)	Hemisphere Temperature (HT)	Flow Temperature (FT)

For biomass samples atypical characteristics may be observed for the change of shape with increasing temperature

- strong expansion prior to shrinking
- formation of bubbles
- other changes in shape that are not characteristic in terms of the standard

Need

Urgent need for the development of a test method which is applicable for biomass fuels and significant with regard to the combustion behaviour in small scale combustion appliances.

Project mission

Mission

Improve reliability of pellet combustion technology and consumer satisfaction

Vision

Develop a widely accepted standard for an ash melting test

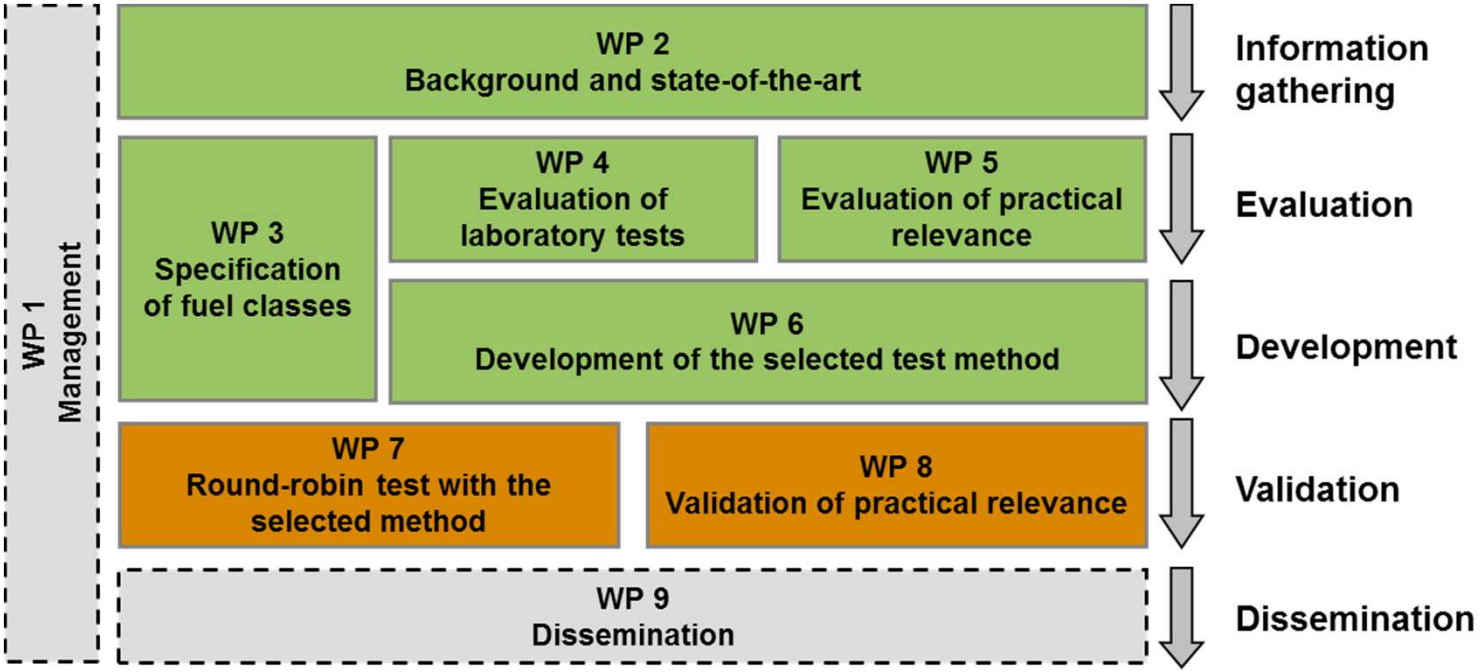
Strategy

- Proof suitability of selected ash melting test method
- Develop classification system for solid biofuels

Objectives

- Select suitable methods
- Optimise method
- Validate method

Projects approach



Purpose & use of AshMelT outcome

…provide information about **melting properties & slag formation propensity** of biomass fuel ashes

- Quality control
- Compare & assess severity of residues from combustion
- Estimate suitable technologies for application

Progress regarding characterisation methods

- Methods to assess the ash melting properties of solid biomass fuels
  - Standard Ash Melting test
    - Significance with regard to real combustion conditions
    - Applicability of the method for solid biofuels
    - Specification of threshold values
  - Research on alternative methods
    - Survey on approaches
    - Limitations and R&D requirement

Progress regarding quality control & classification

- Quality control and classification with regard to ash melting properties
  - Consideration in standards and certificates for solid biofuels
    - Classification principle
    - Product standards – threshold value
  - Specification of melting classes
    - e.g. via indices

Impact

- Development of new European norms, standards, and quality labels
- Meeting policy objectives in the area of energy and climate change
  - Setting the basis for broadening the fuel resources
- Contribution to solving technological problems
  - Clear standards and requirements framework conditions enhance and enforce technology development
    - significant improvement of fuel quality
    - increased competition between boiler manufacturers regarding allowed fuel qualities

Impact

- Economic benefits to SMEs
  - Customer complaints due to slag problems account for 1-2 € per installed boiler and year in developed markets (Austria, Germany, Switzerland) Up to 100 € per installed boiler and year in new markets (without consideration of effects due to bad perception)
  - It is estimated by the interviewed persons that successful implementation of the AshMelT test as normative reference method could cut costs due to customer complaints by 50% and speed quality development in new markets and market diffusion significantly.
  - Developing markets – creating values – creating jobs

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Thank you for your attention

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AshMelT Workshop. February 26th 2015.

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