Biomass Design Standards

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David Palmer BSc MSc CEnv MIEMA
The Campbell Palmer Partnership Ltd
The Campbell Palmer Partnership Ltd (CPp Ltd)

- Biomass & Renewable Energy Consultants
- Renewable Energy System Designers
- Led the development of the Biomass Boiler System Sizing Tool at the University of Strathclyde
- Lead author on the CIBSE Biomass Heating Application Manual (BHAM)
- Delivered the first comprehensive technical training on biomass design, operation and maintenance for CIBSE in October 2012
Successful Biomass Installations

Some of the key success factors:

• Be prepared to acknowledge how difficult biomass can be to get right
• Seek specialist advice from the outset
• Assess loads carefully, size the boiler accurately & incorporate a thermal store
• Good control of fossil fuel boilers, good hydraulic design
• Get the flue right
• Pay careful attention to fuel storage & delivery arrangements & ensure fuel is within specification
Recent UK Initiatives

- Carbon Trust Biomass Heat Accelerator programme
- Development of the Biomass Boiler System Sizing Tool (BBSST)
- Development of the CIBSE BHAM
- Establishment of biomass training
Biomass Heat Accelerator (BHA)

- CT worked with fuel suppliers, installers and designers to improve biomass design & implementation standards
- CT funded development of the BBSST
- CT initiated development of the CIBSE BHAM
- A BHA consultant and sat on the CT Biomass Technical Advisory Panel
Biomass Boiler System Sizing Tool

• Started life as a MSC student group project at the University of Strathclyde supervised by David Palmer
• Subsequently identified by the CT as the only significant freeware available
• Final version completed in Jan 12
• Available to download from the Carbon Trust website: http://www.carbontrust.com/resources/tools/biomass-decision-support-tool
Biomass Boiler System Sizing Tool

Allows the user to:

• Produce heat load profiles
• Size boiler & buffer vessel, or boiler & thermal store
• Select type of fuel & fuel store, & to size fuel store
• Produce an overall financial analysis
CIBSE Biomass Heating Application Manual (BHAM)

- No comprehensive technical or design manual on biomass currently exists in the UK
- Biomass expertise and knowledge resides in some installation companies and a small number of consultants/designers
- 50 years experience available in continental Europe
- Covers systems from 50kW to 3MW
CT sought to bring experience and knowledge together in a single publication and approached the Chartered Institute of Building Services Engineers (CIBSE) to publish the document

First draft completed and initial CIBSE review Dec 11

David Palmer appointed as lead author Dec 11
CIBSE BHAM Contents

• Strategic decisions
• Key indicators for successful installations
• Biomass fuels, combustion & emissions
• Fuel delivery, storage & characteristics
• Biomass boiler types & characteristics
• Buffer vessels & thermal stores
• Sizing a biomass boiler & suitability of biomass
• Biomass boiler front-ends
CIBSE BHAM Contents

• Configurations of auxiliary & back-up boilers & load circuits
• Integrating front-ends with back-ends
• Flues & flueing
• Heat metering
• Proving competent operation
• Operation & maintenance
• Procurement
CIBSE BHAM - Objectives

To provide:

• Best practice guidance on biomass design, operation & maintenance
• Detailed technical information on biomass boilers and their operation
• Design guidance on all aspects of biomass system design
• Information not currently available and not published elsewhere
BHAM – What is New

Biomass boiler types and characteristics:

• Classifications by type of stoker, ignition system & fire-tube orientation

• Standard and optional features available

• Boiler control

Understanding boiler types is essential to the correct selection of a biomass boiler.
BHAM – What is New

Buffer vessels & thermal stores:
• When to use them
• System operation
• Designing with them

Understanding buffer vessels and thermal stores and how to design with them is critical to successful and efficient biomass systems.
Understanding why and how to size biomass boilers accurately is crucial.
BHAM – What is New

Front end & back-end configurations:

• 5 standards front-ends
• 19 standard back-ends
• Any front end can be used with any back-end
• Control descriptions integral to each module

Intention is to provide detailed configurations which are known to work and perform well
Sample Front-End
Sample
Back-End

Fossil fuel boiler with modulating burner

Burner

Fossil fuel boiler pumpset

DC

CS

MM 2

Tr

Tf

NRV mandatory for the RHI

System primary pumpset

Low Loss Header
BHAM – What is New

System integration:
• Selection of the correct control strategy
• System pressurisation
• System isolation
• Low loss headers

Biomass systems present particular challenges in these areas
BHAM – What is New

Flues & flueing:

• Why biomass flues are different
• Particular biomass issues related to flueing
• Guide to biomass flue design

There is currently NO PUBLISHED GUIDANCE on the design of biomass flues in the UK.
BHAM – What is New

Heat metering:
• Heat metering for the Renewable Heat incentive
• Detailed guidance on heat meter selection & installation
• Heat metering for fossil fuel boiler control
BHAM – What is New

- Proving competent operation
- Safe boiler operation
- Maintenance regimes
- The extended timescale & detail of biomass system procurement
Health & Safety rules throughout the BHAM including:

- Hazardous emissions
- Explosion risk and Carbon Monoxide hazard in pellet stores
- Fungal growth in woodchip stores
- Use of fuel which is too wet for a boiler
- Flashover risk of opening a fire-door when a boiler is slumbering
- A flue able to evacuate the boiler in the event of an electrical power failure
QUESTIONS?

David Palmer BSc MSc CEnv MIEMA
The Campbell Palmer Partnership Ltd

t: 01360 312000
e: consultants@campbellpalmer.com