EU FP5 Project BIFIC

Biomass/Waste FBC with Inorganics Control

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BIO-ENERGY
ENLARGED PERSPECTIVES

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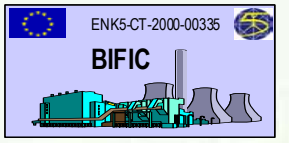
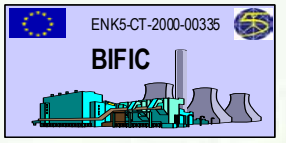


BIFIC – Project Partners

- **TPS Termiska Processer AB (Co-ordinator)**
  Sweden
- **Wykes Engineering Company Ltd**
  United Kingdom
- **Combustion Integrated Numerical Applications & Radiation Ltd**
  United Kingdom
- **Netherlands Energy Research Foundation**
  Netherlands
- **Fraunhofer Gesellschaft zur Foerderung der angewandten Forschung e.V.**
  Germany
- **Essent Energy Systems Zuid BV**
  Netherlands



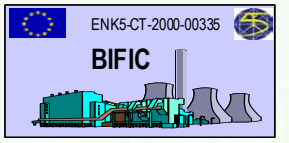
BIFIC – The Background

The potential to generate heat and power from the combustion of waste and biomass materials, in an environmental acceptable manner, is an attractive concept.

Establishing a diverse and sustainable fuel supply can realise a number of potential advantages:

- **Economic benefits**
  - **optimise fuel logistics and costs - improving cost-effectiveness and competitiveness**
  - **provide security of long-term viability, of commercial FBC plant.**
  - **enhance the economic driving force for the replacement of fossil fuels.**

- **Environmental benefits**
  - **reducing the amount of waste landfilled**
  - **reducing levels of GHG and fossil fuel derived emissions.**



BIFIC – Biomass/Waste FBC Issues

- **Ensure efficient operation of commercial scale FBC installations using new waste/biomass mixtures – identify/capability to predict potential problems**

- **Waste and biomass characteristics vary widely and may fall outside the operational design limits of a plant.**

- **Inorganic components**
  - **Technical**
    - **Fouling/agglomeration**
  - **Environmental**
    - **Emissions - adequate control systems**
    - **Ash residues - utilisation**

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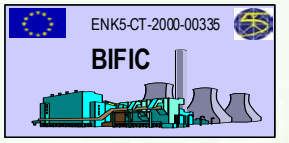
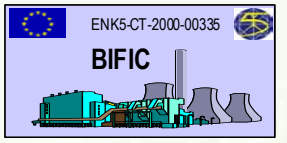
BIFIC – Fouling Deposits



BIFIC – Objectives

To promote the large scale use of biomass/waste fuels in FBC installations for energy generation

- **Evaluate and optimise the process, operability and environmental performance of biomass/waste fired FBC plants (*WP1, WP2, WP3*)**
- **Model and simulate the formation of fouling type deposits and heat transfer (*WP4*)**
- **Develop guidelines and recommendations for reliable operation of commercial systems based on the selected fuels (*WP5, WP6*)**
- **Identify ash utilisation options (*WP1*)**
- **Develop specific methods of planning and optimising logistic processes for FBC systems (*WP7*)**



BIFIC – Fuel Type Matrix

WP	Rig	Sewage sludge	Demolitn wood	RMF	Grass type	MBM	Tyres	Oil cuttings	Cocoa beans	Palm pit shredders
1	30 kW	✓ + forest wood	✓		✓		✓ + waste fuel			
1	350 kW	✓ + MBM		✓ pure and + MBM		✓	✓ + MBM	✓ + MBM		
1	750 kW	✓ + wood	✓		✓		✓ + waste fuel			
2	3 MW	✓ + MBM				✓				
3	25/40 MW	✓ + MBM		✓ + MBM		✓				
3	80 MW		✓						✓	✓

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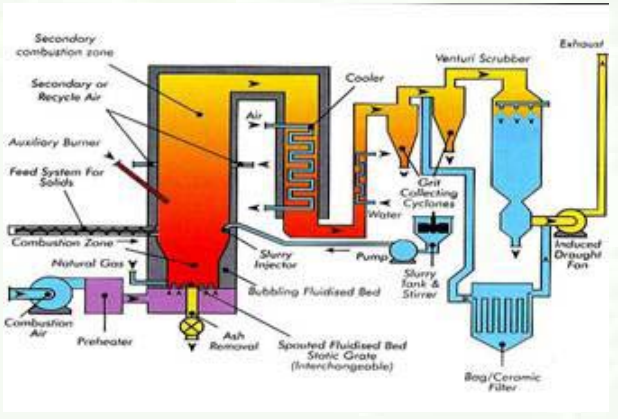
BIFIC – Small Scale Testing

TPS - 20 kW



Wykes/CRE - 350kW

TPS - 750 kW

BIFIC – Medium Scale Testing

Wykes – 3 MW Plant

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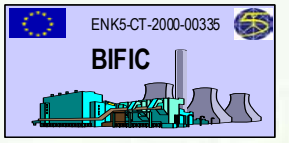
BIFIC – Commercial Scale Testing

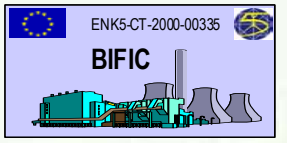
WYKES – 25/40MW

ESSENT - 80MW



BIFIC – Progress to Date - Testing

- **Experimental screening of fuels and parameters at small scale …… using 30 kW, 350 kW and 750 kW reactors**
- **Single and combined fuels in varying proportions.**
- **Suitable waste/biomass fuels for testing at medium and commercial scale identified …… 3 MW, 25/40MW and 80 MW plants …. included MBM, RMF, sewage sludge, demolition wood, cocoa beans, palm pit shredders**
- **FBC not considered to be efficient for certain wastes/biomass, such as oil cuttings, tyres**
- **Potential utilisation options for the ash residues have been identified**

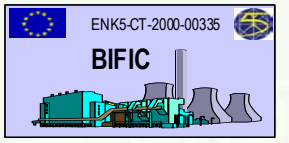


BIFIC – Progress to Date - Prediction

- **Extensive analyses of the fuels, bed materials etc.**
  - **Indicated potentially problematic fuel combinations**
  - **Simple fouling/agglomeration indices have been formulated....predicted fuel related behaviour will be compared with experimental behaviour**

- **Comprehensive mathematical model being developed**
  - **Simulation of particle laden gas flow through tubes banks**
  - **Calculation of heat transfer/losses due to deposit build-up**

- **Detailed market analysis within the project countries has been conducted for the selected fuels and a mathematical model has been developed to describe the system and to identify cheapest fuel combinations**



BIFIC – Expected Impact/Results

- **Comprehensive understanding of the waste combustion process – operability, emissions and bed ash utilisation**
- **Capability to predict behaviour of and potential issues for new biomass/waste fuels and mixtures**
- **Guidelines/recommendations for planning, design and operation of existing and future biomass/waste FBC plants**
- **Software tool for planning supply and covering demand of most economic fuel/fuel mixtures**