



Optimisation and Design of biomass  
combustion SYSTEMS  
**(OPTICOMB)**

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**BIO-ENERGY**  
**ENLARGED PERSPECTIVES**

*Budapest ,16-17 October 2003*

# Outline

- Background
- Objectives
- Project structure
- Description of Work
- Expected results

# Background

- Combustion of biomass play important role in sustainable energy
- At present in grate systems a limited range of fuels can be used. More vast range of fuels result in a lower availability, due to limited flexibility of grate systems and control concepts.
- Improving grate, furnace and control concept design will improve performance of biomass combustion grate systems

# Objectives

- Development and demonstration of advanced control concepts for biomass combustion grate systems.
- The development of guidelines, including demonstration, to minimise the important emissions of NO<sub>x</sub> and CO.
- Improvement of the efficiency (technical and economical) of biomass combustion plants.
- Design rules for biomass combustion systems and process control systems.
- The design and testing of a new grate

# Project structure

- Started 1-1-2003, End date 1-7-2006
- Partners
  - TNO-MEP (NL), co-ordinator
  - VT-TUG (A)
  - TU/e (NL)
  - Vyncke (B)
  - IST (P)
  - SP (Sweden)
  - BES (NL)

# Description of Work

## Main research points

- NO<sub>x</sub> formation mechanisms
- Fuel layer modelling
- Dynamic modelling
- CFD modelling
- Controller design

# Description of Work (II)

Experimental data to validate the models:

- Grid reactor experiments with different fuels for NO<sub>x</sub> mechanisms
- Pot furnace experiments for characterisation of N-release
- Experiments with FT-IR at 440 kW pilot plant
- Experiments with artificial grate

# Description of Work (III)

Experiments in 7.5 MWth Biomass combustion plant at Schijndel (NL)

- on-line calorific value sensor
- system identification experiments to reveal plant dynamics
- testing of control concept

All experiments with different fuels



# Expected results

- Innovative control concepts for biomass combustion.
- Furnace concept for a new multi fuel biomass combustion plant
- Reduction of CO and NO<sub>x</sub> by 20-50%
- Increased energy efficiency and availability
- A new multi fuel grate system
- A 3D-CFD combustion model for biomass fuels