Multi Fuel Operated Clean Energy Process:
TDT – 3R MULTI FUEL

Clean Coal End Products Combustion and Emissions Characterisation

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- Centre for Research and Technology Hellas / Institute for Solid Fuels Technology and Application (Greece) [CERTH]
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- Bunge Vegetable Oil Production PLC. (USA - Hungary) [BUNGE]
- Latvian State Institute of Wood Chemistry (Latvia) [LSIWC]
- United European Environment Controls Ltd. (UK) [UNECO]
- Aristotle University of Thessaloniki (Greece) [AUTH]

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1. ROTARY KILN THERMAL DESORPTION TREATMENT PROCESS

2. RAW FEEDSTOCKS and PYROLYSIS PRODUCTS ANALYSIS

3. COMBUSTION and EMISSIONS TESTS

4. SELECTED TEST RESULTS

5. CONCLUSIONS
Clean Coal Pilot Plant Thermal Desorption Process

- **Renewables:** Biomass, Organic Wastes, Derived Fuels
- **Brown Coal Feed**
- **PYROLYSIS 550-650°C (Vacuum)**
- **HOT FLUE GAS**
- **POST COMBUSTION >1150 °C**
- **PYROGAS**
- **Cool Flue Gas**
- **Clean Coal / Clean Multi Fuel**
Installed 3R Pyrolysis Pilot Plant in Hungary 2005

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Low Grade Brown Coal and Biomass Feedstocks

Markushegy Mine

Rakoczi Mine

Lencsehegy Mine

Rotary Kiln Pilot Plant in Polgardi

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Biomass: Straw Willow Demolition Wood
Raw Feedstocks and Pyrolysis Product Properties

Carbon content (maf)

Biomass pyrolysed in Pyromat (ECN); Coal pyrolysed in the Rotary Kiln Pilot Plant (TERRA)
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Biomass Pyrolysed in Pyromat (ECN); Coal Pyrolysed in the Rotary Kiln Pilot Plant (TERRA)

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Ash content

Biomass Pyrolysed in Pyromat (ECN); Coal Pyrolysed in the Rotary Kiln Pilot Plant (TERRA)

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Sulphur content (mf)

Biomass Pyrolysed in Pyromat (ECN); Coal Pyrolysed in the Rotary Kiln Pilot Plant (TERRA)
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Experimental Pulverised Fuel Combustion Test Plant
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Insertion of ash sample probe
Example of Fouling on a Ceramic Round Probe
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Si Content in Biomass Char: WC 694 ppm; DWC 4 544 ppm; SC 66 242 ppm

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The 6 tested PAHs as per the German drinking water regulation (TrinkwV 2001) were not detectable in the fly ash samples.

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SO₂ Emissions (Normalised for 6 % O₂ in flue gas)

SO₂ Concentration [ppm]

Markushegy raw coal
Rokoczi raw coal
Rokoczi 550
Demolition wood char+Markushegy 550
Straw char+Rokoczi 550
Willow char+Rokoczi 550
Lencheshegy 350
Lencheshegy 550
Lencheshegy raw coal

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Not Burnt Material

**Not burnt material in ash pan**

- Rokoczi dry raw coal
- Rokoczi 550
- Straw char + Rokoczi 550
- Willow char + Rokoczi 550
- Demolition wood char + Markushegy 550
- Lencheshegy 350
- Lencheshegy 550
- Lencheshegy raw coal

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Conclusions

- The TDT 3R Clean Coal treatment technology could be successfully demonstrated in the 100kg/h pyrolysis pilot plant in Hungary.
- The sulphur content in the treated coal could be reduced by about 50% and sulphur flue gas emissions could be reduced by up to 99%.
- Feedstocks suitable for the TDT-3R thermal desorption treatment are High volatile, high Sulphur brown coals with relatively low ash content.
- Addition of biomass char reduces CO2 emissions and can help bind sulphur in the ash.
- High silicon biomass is better suited as it does not reduce the ash fusion temperature.
- No carcinogenic PAK, emissions could be detected.
- High temperatures or long residence times will be required for complete combustion.
- Slagging may be a problem for high ash coals.