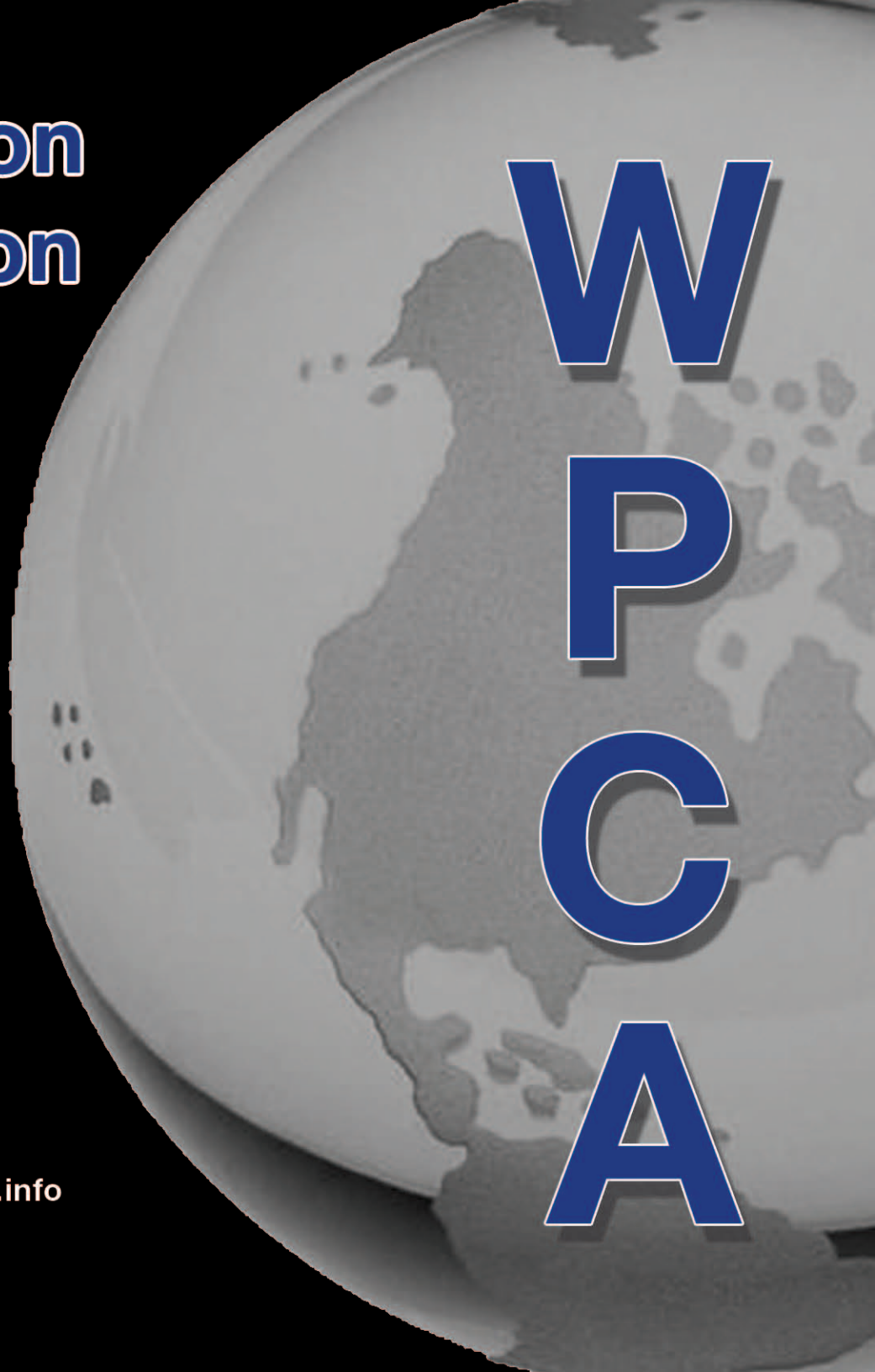
Worldwide Pollution Control Association

WPCA/FirstEnergy Biomass Seminar

Akron, Ohio
December 3, 2009

Visit our website at www.wpca.info



WPCA First Energy Biomass Meeting

Mark Ehrnschwender
December 3, 2009

EVONIK INDUSTRIES

Evonik in North America

Evonik Degussa Corp
CYRO – methylmetha-crylates, ACRYLITE® acrylic sheet, polymer products

Evonik Goldschmidt Corp
Care & Surface Specialties. Manufacturing plant, fatty acids nitrogen derivatives.

Evonik Goldschmidt Corp
Care & Surface Specialties. Products include betaines, used for hair care, hard surface cleaners; fatty acid & fatty alcohol emollient esters.

Evonik Stockhausen Inc
Superabsorber, Care & Surface Specialties, superabsorbants / skin care.

Evonik Degussa Corp
Hydrogen peroxide, Aerosil® fumed silica, CHEM-TRETE® silanes
Bio-diesel facility under dev.

Evonik Energy Services LLC, Kings Mountain, NC
Consulting and Engineering
& **SCR Catalyst Regeneration Services**

Evonik has ~ 3,500 employees in our North American operations at over 58 locations

Evonik Coal Fleet
Co-firing of Biomass

Weiher

724 MW

1976

Fenne

502 MW

1982

Walsum

600 MW

1959

Lünen

507 MW

1996

Herne

950 MW

1962

Voerde

2,234 MW

1970

Bergkamen

747 MW

1981

Bexbach

773 MW

1983

Infracor

600 MW

1999

Leuna

58 MW

1996

Köln-Godorf

211 MW

1966

Termopaipa

165 MW

1999

Iskenderun

1,320 MW

2003

Mindanao

232 MW

2006

Walsum

750 MW

COD 2010

COD = projected commercial operation date

Evonik's Fleet – Dedicated Biomass Units

Buchen
27 MW_{th}
2004

Dold
8 MW_{th}
2002

Dresden
25 MW_{th}
2003

Flohr
32 MW_{th}
2005

Großaitingen
22 MW_{th}
2002

Ilmenau
24 MW_{th}
2005

Lünen
80 MW_{th}
2006

Neufahrn
21 MW_{th}
2004

Traunreut
20 MW_{th}
2005

Werl
14 MW_{th}
2003

Latest Addition to Evonik's Biomass Mix:

Warndt

COD 2009 **12.5 MW_{th}**

Dedicated Biomass Units
Lünen biomass power plant

Project description
Construction and operation of a biomass power plant for the supply of electricity on the basis of the Renewable Energy Act – EEG

Commissioning
June 9th, 2006

Investment
~ $67 Million (€ 54 M) : ~$3375 per kw

Project partners
Evonik New Energies GmbH (50.9%) and
Remondis AG & Co. KG (49.1%)

Lünen biomass power plant

The biomass power plant – key figures

Boiler plant:

High pressure/steam:	864 °F / 957 psi (462 °C / 66 bar)
Production output*:*	176,000 lb/hr
Combustible (wood scrap):	148,500 T/yr

Turbine unit:

Steam turbine:	20 MWel

Production:

Electricity:	150,000 MWh/yr
CO_2 saving (versus coal):	110,000 T/yr
Work Force:	15 employees

Issues to consider with Biomass

- Startup Issues with waste wood biomass
  - Grate Design – needed larger air hole design
  - Fuel handling into unit
  - Consistency of fuel source
- Environmental
  - Baghouse for Particulate
  - SNCR
- Biomass fuel source
  - Economy influences the amount of waste wood
  - Evonik is sourcing material from other countries including UK - (Evonik Power Minerals)
  - Unit Size – Evonik size range 12 $MW_{thermal}$ to 80 $Mw_{thermal}$. Reason – Fuel Source

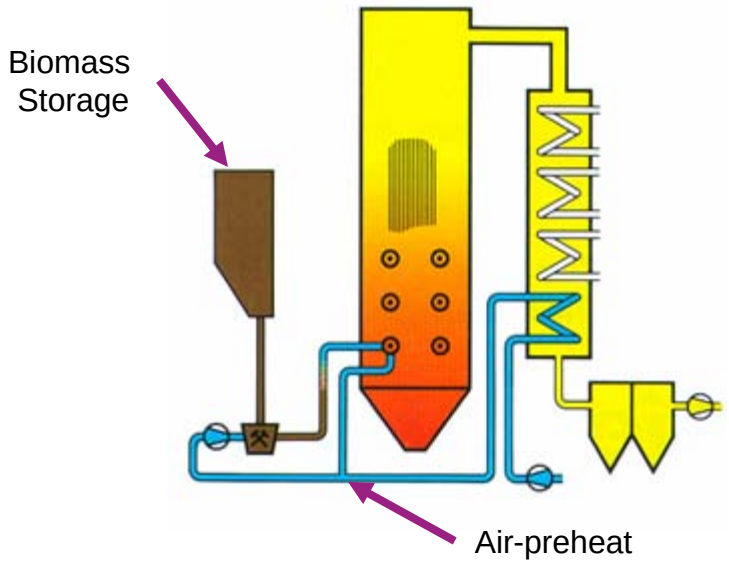
Infractor – Biomass Addition

Biomass utilized within Evonik Fleet

- Virgin & Waste Wood
- Sewage Sludge
- Bone Meal
- Some Agricultural Products

Biomass Issues

- Feed system into unit
- Combustion and furnace – Evonik limits biomass materials to 10% of total heat input. May go a little higher on
- SCR degradation
- Airheater pluggage



Typical Arrangement

Economic Considerations
Evonik thoughts

Dedicated Unit versus Co-firing

- Capital Cost Considerations
  - Dedicated unit - $ 2,700 - $ 4,000 per kw
  - Co-Firing w/ Coal - $75 - $ 275 per kw

Example 50 MW's Costs (x 1000 $'s)	Dedicated	Co-firing
Debt Service	$7,500	$650
O&M		$2,000
Fixed	$3,800	$600
Variable	$3,600	$1,900
Catalyst Cleaning		$1,200
Operations Total	$14,900	$6,350
$/T biomass	$27.70	$11.70 $9.50 tailing end SCR

Dedicated versus Co-firing
Evonik Conclusions

- Evonik focus for biomass on dedicated units on smaller units with steam hosts. Greater dollar value with steam versus electric sales.
- Evonik dedicated units utilize waste wood from construction. Economy dependent!
- Smaller dedicated units in Europe will have better economics then US in the US – Normally higher tipping fees and electricity fees.
- Evonik prefers to utilize the biomass in our wet bottom units which have tailing end SCR's. Lower cost for benefit.
- Biomass will be driven towards larger units / co-fired or with dedicated units that have a commerical steam supply.

Biomass will become a fuel commodity based on carbon neutral equivalent pricing compared to coal / natural gas.

Questions

EVONIK INDUSTRIES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