WASTE CO-PROCESSING IN CEMENT PLANTS

NEW DEVELOPMENTS IN EUROPE

Dr Jean-Marie CHANDELLE – CEMBUREAU Chief Executive

WASTE FRAMEWORK DIRECTIVE

- Common Position 20 December 2007
  2nd reading to start in February 2008
- Co-processing of waste in cement plants = recovery
- No application of self sufficiency and proximity principles to co-processing in cement plants
- But waste can be declassified…

ACCESS TO BIOMASS IMPERILED

- Biomass Action Plan → December 2006
- Renewables target → September 2007

  The EU's energy mix is sourced 20% from renewable energy sources by 2020 including 10% biofuels of total transport fuels in EU

Important because biomass is CO_2 neutral in ETS

REVISION OF THE INCINERATION OF WASTE DIRECTIVE (2000/76/EC)

Announced as part of IPPC Review…

REVISION OF EMISSIONS TRADING DIRECTIVE (2003/87/EC)

Commission proposals expected 23 January 2008…
in principle only direct emissions!

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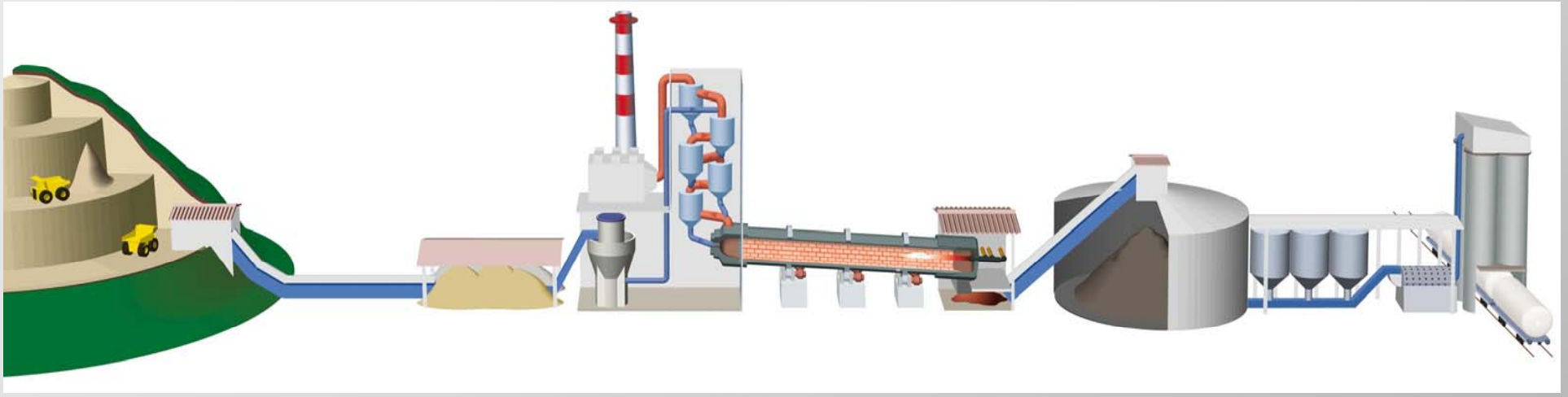
WASTE CO-PROCESSING IN CEMENT PLANTS

THE EUROPEAN EXPERIENCE

Dr Jean-Marie CHANDELLE – CEMBUREAU Chief Executive

CEMENT MANUFACTURING – MAIN PHASES



1) Preparation of raw materials into raw meal (Extraction – Crushing – Pre-homogenisation - Dosing – Grinding – Homogenisation)

2) Clinker production – pyro-processing of raw materials (calcination of the raw meal into the rotary kiln – energy supplied by burning fuels)

3) Cement production - grinding of clinker and mineral components to obtain cement

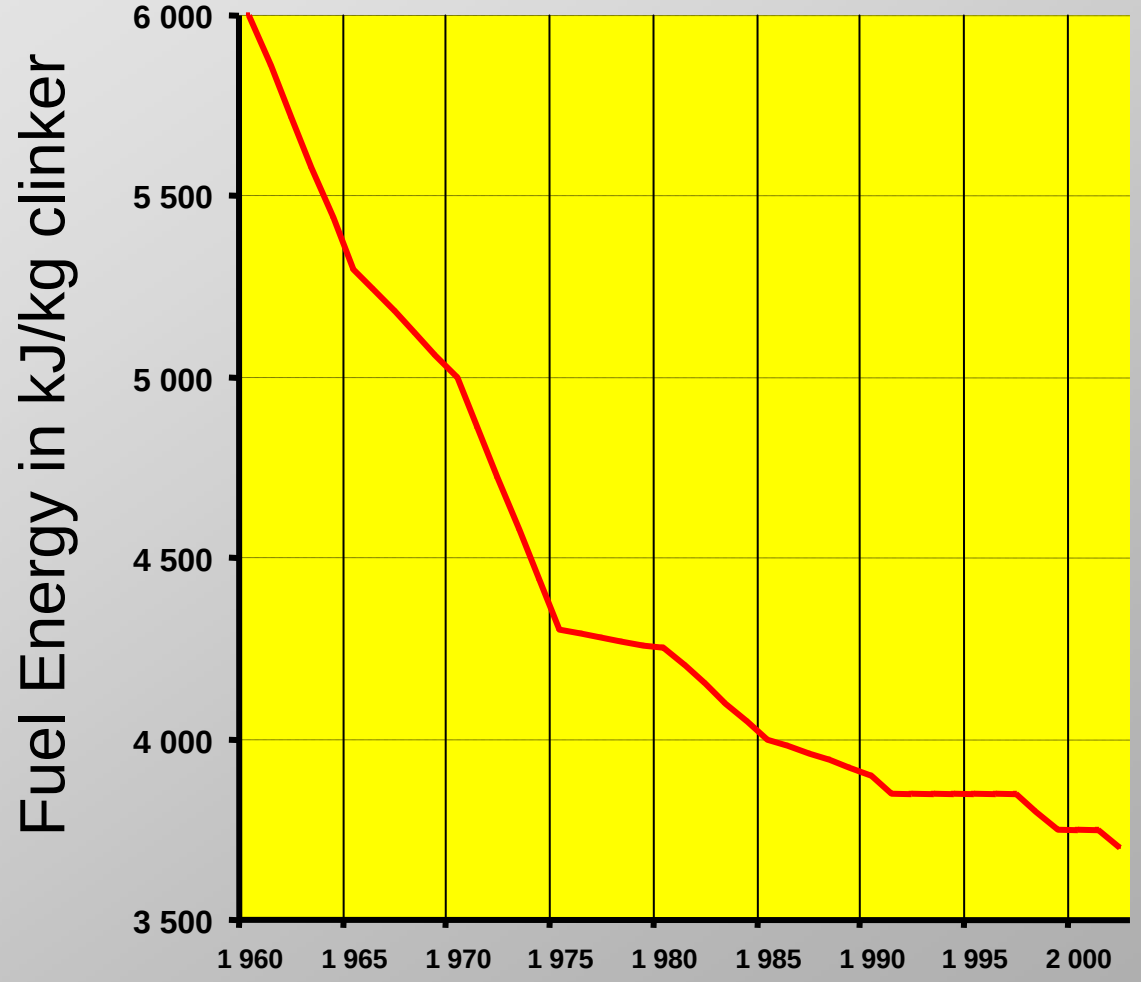
AN ENERGY INTENSIVE INDUSTRY

One metric tonne of cement

- 60 - 130 Kg of fuel oil (or equivalent fuelling amount)
- The world has only limited amount of fossil based fuels
- Sustainable development: “To meet the needs of the present without compromising the ability of the future generation to meet their own needs”
- Take measures in order to save “some” resources for the future generation

REDUCTION OF SPECIFIC ENERGY

Development of the specific fuel energy consumption in CEMBUREAU countries since 1960



Source: CEMBUREAU EL October 2004

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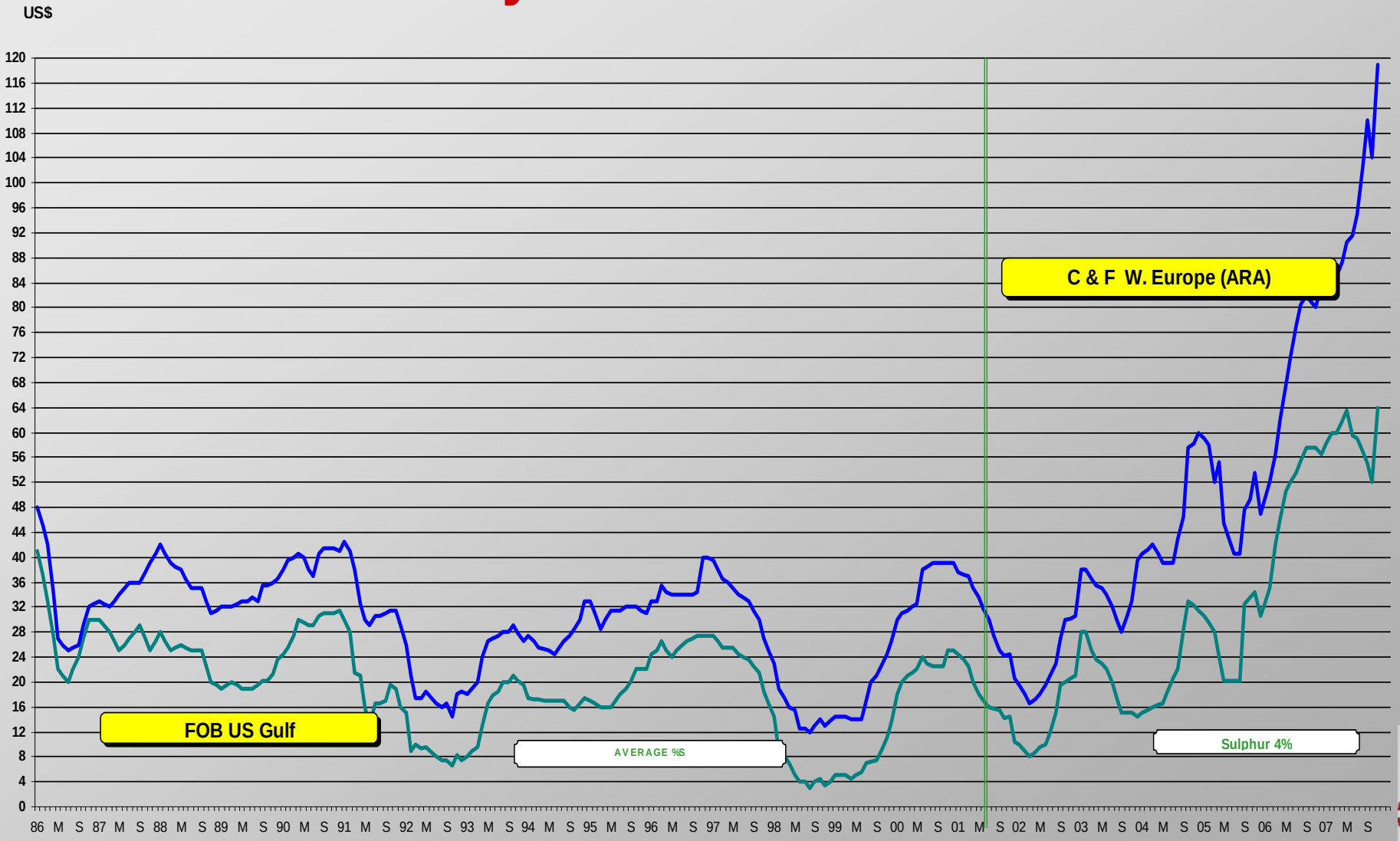
Remaining potential for reducing specific energy consumption through classical means (technological innovation and improvement)

= LESS THAN 2%

PETCOKE PRICE

January 1986 - Mid November 2007



M = May S = September

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COULD WASTE BE THE SOLUTION?

Homogeneous waste can be effectively recovered energetically and/or materially by co-processing in the cement - making process

- as alternative fuels (co-processing of waste)
- as alternative raw materials
- as mineral components

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EXAMPLES OF WASTE CO-PROCESSSED IN CEMENT PLANTS

Alternative Fuels

- waste oil, waste wood
- sewage sludge
- waste tyres
- plastics
- animal meal
- solvents
- impregnated saw dust

Clinker Substitute (Mineral Components)

- fly ash (power generation)
- artificial gypsum (flue gas cleaning)
- ground slag (steel industry)

Alternative Raw materials

- foundry sands
- contaminated soil
- waste from road cleaning
- iron-, aluminum-, silica-containig wastes
- contaminated soil

Auxiliary Materials

- water containig ammonium (for de-NO_x)
- water containing solvents
- water from photo chemical process

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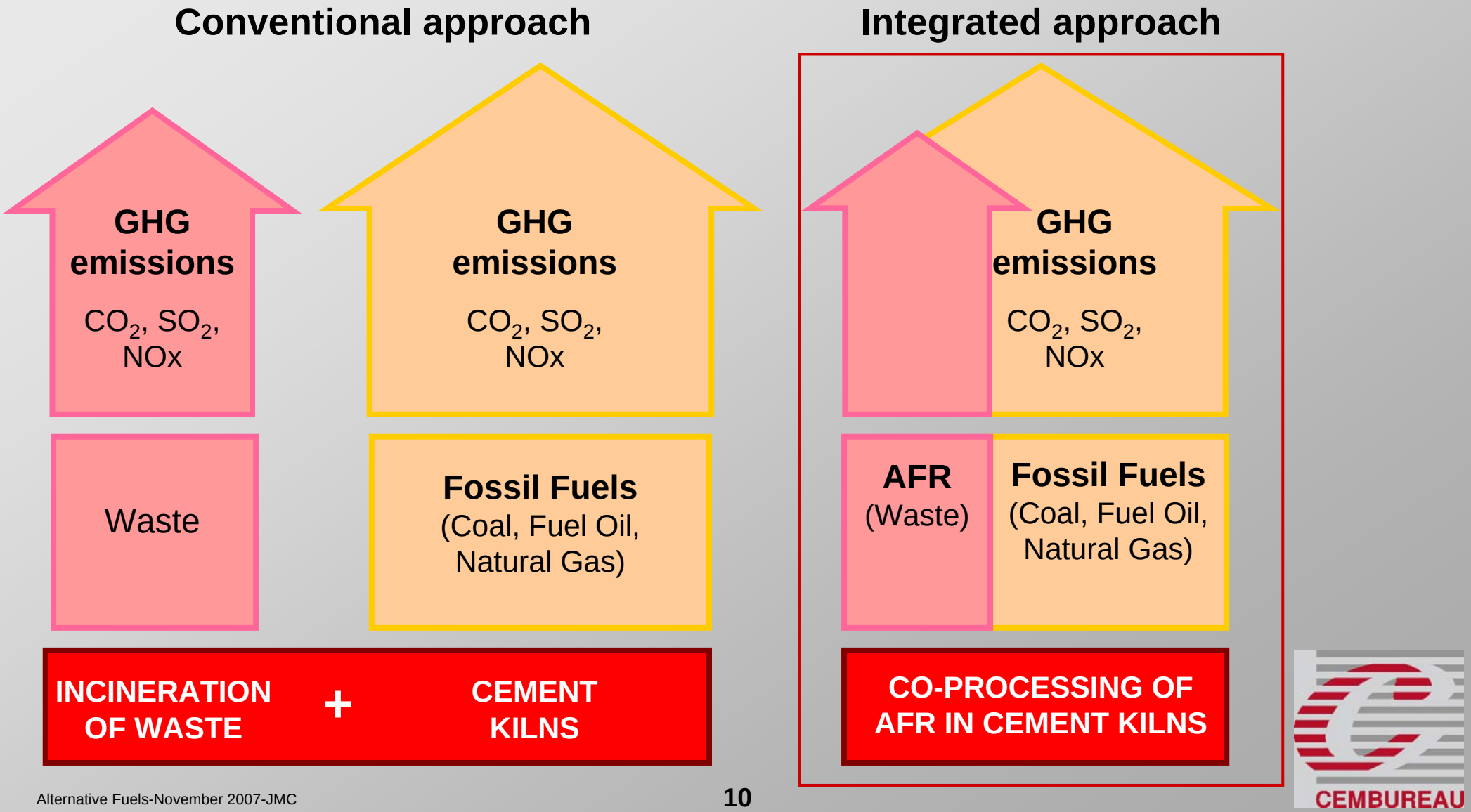
BENEFIT TO THE ENVIRONMENT

- 4 million tonnes of coal saved every year
- Lower global CO_2 emissions

CO-PROCESSING AND REDUCTION OF GHG EMISSIONS



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ALTERNATIVE FUELS: CO_2 EMISSIONS AVOIDED

YEAR	SUBSTITUTION RATE	CO_2 EMISSIONS AVOIDED
1990	3%	1.7 Mt
1998	13%	7.4 Mt
2000	About 12%	6.8 Mt
2004	17%	9.7 Mt

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CLUSTERED STATISTICS RANKED WITH DECREASING QUANTITY FOR THE YEAR 2001

	Volume in kT	Average calorifc value MJ/kg	Energy in TJ	Substitution rate (% on energy)
Solid fuels (80%)	**3532**			**9.19**
Others non-hazardous	788	19.1	15035	2.00
Animal meal, bone meal & animal fat	890	19.3	17203	2.29
Tyres	554	27.0	14980	2.00
Other hazardous waste	357	18.3	6545	0.87
Plastics	210	23.9	5026	0.67
Paper/cardboard/wood	180	15.6	2802	0.37
Impregnated saw dust	167	11.6	1931	0.26
Coal slurries/distillation residues	112	14.8	1654	0.22
Sludges (paper fibre, sewage)	107	9.6	1032	0.14
Fine/anodes/chemical cokes	89	18.0	1603	0.21
Refused Derived Fuels	41	13.0	531	0.07
Shales/oil shales	14	9.3	130	0.02
Packaging waste	12	22.0	264	0.04
Agricultural & organic waste	11	15.5	170	0.02
Liquid fuels (20%)	**841**			**3.04**
Waste oil + oiled water	402	35.6	14331	1.91
Solvents and others	266	15.3	4081	0.54
Other hazardous liquid fuels	173	25.4	4398	0.59
TOTAL	**4373**			**12.23**

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LATEST PUBLICLY AVAILABLE DATA ON THE SUBSTITUTION LEVEL PER COUNTRY FOR THE YEAR 2001

	Substitution level in %	Number of plants using alternative fuels/ Total number of plants
Austria	**46**	9/9
Belgium	30	5/5
Czech Republic	24	6/6
Denmark	4	6/7
Finland	3	2/2
France	34.1	38/44
Germany	30	32/35
Greece	<1%	1/8
Hungary	3	2/6
Ireland	0	0/4
Italy	2.1	23/60
Luxembourg	25	1/1
Netherlands	**83**	1/1
Norway	35	2/2
Poland	1	6/6
Portugal	0	0
Spain	1.3	16/36
Sweden	29	3/3
Switzerland	**47.8**	8/8
United Kingdom	6	8/16

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BENEFITS TO LOCAL COMMUNITIES

- No capital cost
- Lower operating costs
- A safe -strictly regulated- solution

BENEFIT TO THE CEMENT INDUSTRY

- Long term viability – in an era with fewer and fewer fossil natural resources

- From “Polluter image” to “Supplier of safe waste solution”

STRICT REGULATION AT EU LEVEL

- IPPC Directive
- Incineration of Waste Directive (2000/76/EC)

  of 4 December 2000 ... to be transposed into national laws by 28 December 2002

DIRECTIVE “INCINERATION OF WASTE”

The Directive covers:

- Cement plants burning waste
- Hazardous waste and non-hazardous waste
- Waste oil, but the specific requirements for hazardous waste do not apply to waste oil

DIRECTIVE “INCINERATION OF WASTE”

The Directive prescribes obligations on:

- Application and permits
  - *Types and amounts of waste*
- Delivery and reception of waste
  - *Control*
- Operating conditions
  - *Gas temperature > 850 °C/1100 °C, 2 sec*
- Access to information
  - *Applications for permits, annual reports*

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EMISSION LIMIT VALUES

The following emission limit values are provided for cement plants burning non-hazardous waste or less than 40% hazardous waste:

Total dust	**30**
Hydrogen Chloride (HCl)	**10**
Hydrogen Fluoride (HF)	**1**
NOx for existing plants	**800**
NOx for new plants	**500**
Cadmium (Cd) & Thallium (Tl)	**0.05**
Mercury (Hg)	**0.05**
Antimony (Sb), arsenic (As), lead (Pb),	**0.5**
Chromium (Cr), cobalt (Co), copper (Cu),	
manganese (Mn), nickel (Ni), vanadium (V)	
Dioxins and furans	**0.1**
Sulphur dioxide (SO_2)	**50**
Total Organic Carbon (TOC)	**10**

Exceptions may be authorised by the competent authority in case where TOC and SO_2 do not result from the incineration of waste

Limit values expressed as a daily average, 10% O_2, dry, mg/m^3 (dioxins ng/m^3)

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WASTE FOR RECOVERY V. DISPOSAL

CEMBUREAU position:
co-processing is a recovery operation because:

- The combustible parts of the waste replace fossils fuels;
- The non-combustible parts of the waste replace raw materials;
- The energy efficiency in cement kilns is high;
- The environmental impact is low:
  - emission to air (strictly regulated)
    - kiln - preheater system - “neutraliser” of the acid gases
    - high temperatures assures complete combustion
  - there are no releases to soil (no ash and slag) or to water.

WASTE CASE LAW

Case C-228/00

Judgment of the Court (Fifth Chamber) of 13 February 2003

European Commission v. Germany

Ruling:
A ruling delivered by the European Court of Justice holds that using waste as a fuel in cement kilns should be classified as recovery, while burning municipal waste in dedicated incinerators, even with energy recovery, should be classified as disposal.

The calorific value of the waste is not a relevant criterion for the purpose of establishing whether an operation involving the combustion of waste is a recovery operation

REMAINING BARRIERS

At national level:

- No incentives for collection and sorting of waste
- No implementation of Waste Action Plans
- No action versus illegal landfilling
- No reduction of landfilling

EU Member States should take waste management seriously

NEW BARRIERS AT EU LEVEL

- EU Biomass Action Plan (Dec. 2006):
  Biomass ⇒ electricity and transport

- EU target 20% of renewables by 2020 (8-9 March 2007)
  ⇒ use of biomass fundamentally redirected

THE OBVIOUS CONCLUSION:

WASTE CO-PROCESSING IN CEMENT KILNS IS A SOUND WASTE MANAGEMENT POLICY

ALTERNATIVE FUELS: OUR AMBITION

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Our Ambition:		
2010 (No barriers)	27%	15.4 Mt

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OUR AMBITION …

BUT New (revised) Framework Directive ???

New Definition of Recovery ???

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