

*AL*ternative  
*Fuels in the*  
*CEMent*  
*INDustry*

# Project's findings and results in Poland

Institute for Fuels and Renewable Energy

- **Status of the cement industry in Poland**
  - Historical Overview
  - Environmental protection
  - Emmisions
  
- **Pre-feasibility study – Polish case**
  - Cement Plant Ożarów
  - Fuel economy
  - Investment schedule
  - Key decision factors
  - Conclusions

## Status of the cement industry (1/2)

- Cement industry in Poland consists of 11 cement plants working in complete production cycle, 1 grinding plant and 1 aluminous cement plant.
- Technical modernization of cement industry was finished in 2003. It especially concerns the most energy consuming process, which is cement clinker burning.
- Presently, 17 dry method and 5 wet method kilns are exploited in Polish cement industry. As a result of privatization, the huge means for modernization and new investments were obtained.
- The modern methods in management, process control, production concentration as well as economic efficiency and environment protection influenced on high level of the cement industry in Poland, which is counted among the leading in Europe.

## Status of the cement industry (2/2)

Group	Cement plant	Characteristic
Lafarge	Cementownia Małogoszcz	Plants with complete production cycle
	Cementownia Kujawy	
HeidelbergCement	Cementownia Góraźdże	Plants with complete production cycle
	Ekocem Sp. z o.o.	Grinding plant
CRH	Grupa Ożarów	Plants with complete production cycle
	Cementownia Rejowiec	
Dyckerhoff	Dyckerhoff Polska Sp. z o.o.	Plants with complete production cycle
Cemex	Cementownia Chełm	Plants with complete production cycle
	Cementownia Rudniki	
Polen Cement	Cementownia Warta	Plants with complete production cycle
Miebach	Cementownia Odra	Plants with complete production cycle
Polska Energetyka Holding SA	Cementownia Nowa Huta	Plants with complete production cycle
Mapei	Górka Cement	Plants with complete production cycle Aluminous cement producer

## Historical overview:

- The first cement plant in Poland was built in 1857 in Grodziec, near Będzin. At the same time it was the fifth cement plant in the world.
- 1913 – Total production of the cement industry is near 665 000 tones/a
- The annual productivity 21 million tones of cement achieved in 1977 made Poland one of the leading cement producers: tenth in the world and sixth in Europe
- After transformation from centrally planed to free-market economy in 1990, cement production averaged 12 million tons. The consumption of cement felt rapidly to 10 million tons in 1993. And finally changed to better in the years 1994 – 1995

## Environmental protection

Negative environmental impact has been limited as a result of thoroughgoing technical modernization during the last decade:

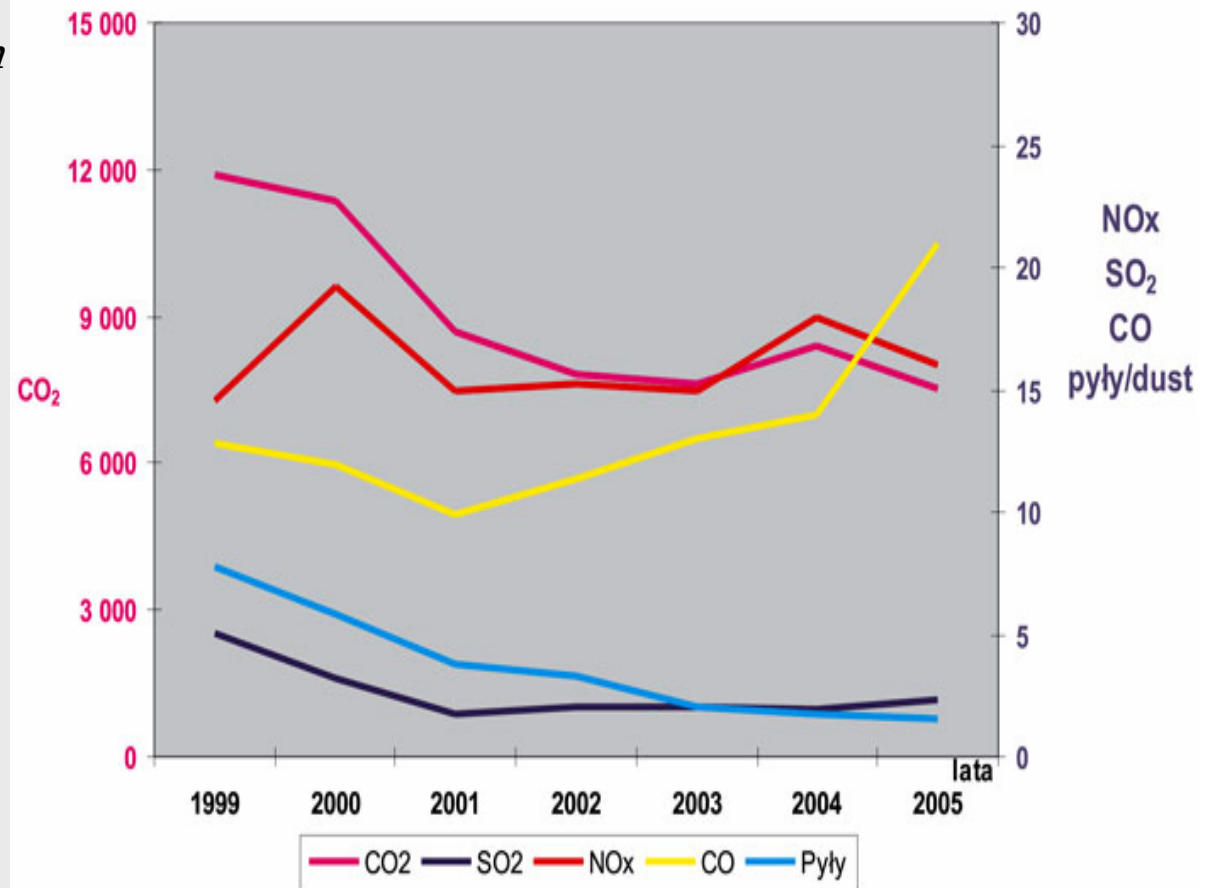
- Dust emission to air has been reduced
- Elimination of the wet method clinker production brought reduction of energy consumption and gas emission
- Emission of carbon dioxide has been limited about 40% per unit of clinker burnt (in comparison with levels reached in the early 1990's).

The environment also benefits from the industry's operation:

- about 4 million tons of wastes are used in the cement production process per year, which allows to decrease the consumption of natural fuels, and therefore to protect natural re-sources, according to the principle of sustainable development

- Present amount of dust emissions - 0,131 kg per 1 ton of produced cement (*while this same factor in the early 1990's amounted to about 5 kg*).
- Elimination of the wet technology resulted in reduction of sulphur compounds emissions.
- The quantity of carbon dioxide discharged into the atmosphere during the clinker burning process, increased about 40% from the early 1990's.

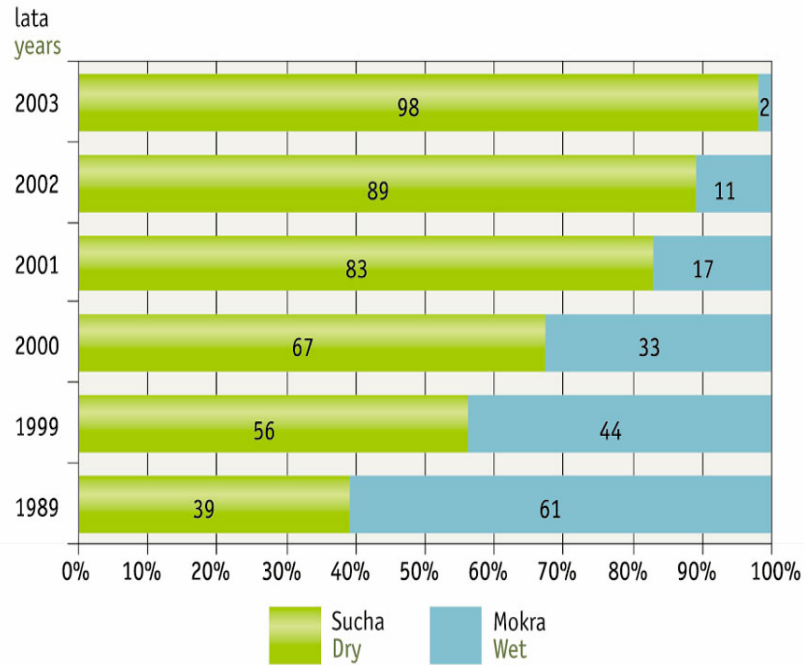
Emisje z przemysłu cementowego w latach 1999-2005



17 dry and 5 wet kilns were exploited in polish cement industry in 2005.  
From the environmental and economical point of view the dry process kilns are preferred to use.

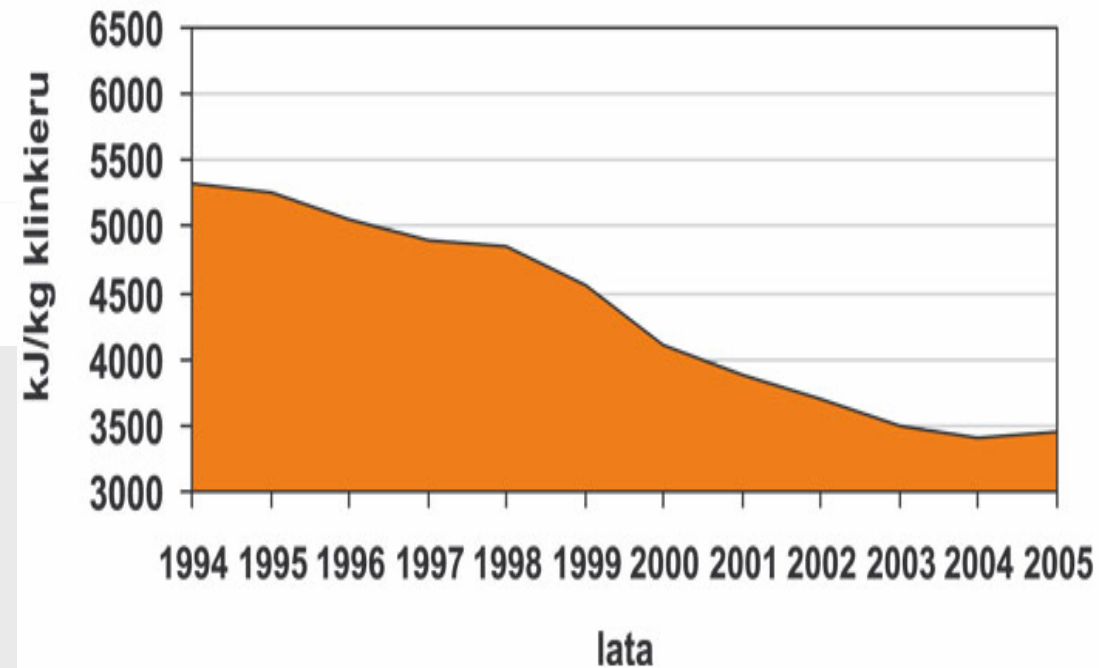
The wet method is presently used in white and aluminous cement production.  
Cement kilns capacity increased considerably in consequence of modernization and expansion of cement industry.

Presently total production capacity averages 42 thousand tons of clinker per 24 hours. It has to be mentioned that potential production capacity is utilized in 100%



Vet and dry method in total clinker production

Heat consumption on clinker burning



Cement plant Ożarów has the IPCC type installation for clinker production, which contains the ILC production line with dry method and yield 8500 Mg clinker per 24h

The aim is to build the professional installation for the alternative fuels dosing into the main burner.

Investment main points:

- Swirlax burner exchange to the multi channel burner Duoflex,
- Construction of the warehouse for the alternative fuels,
- Dosing line for the main burner

## Types of alternative fuels used in OZAROW

Type of fuel	2004		2005		2006	
	[Mg]	[GJ]	[Mg]	[GJ]	[Mg]	[GJ]
191210	6488	128,70	3237	58,99	31922	643,63
Used tires	15	0,47	11968	371,67	3237	110,05
Other flammable wastes	1477	20,50	0	0	11894	165,22
Biomass	0	0	80	0,69	2906	43,34
<b>TOTAL</b>	<b>7980</b>	<b>149,67</b>	<b>15285</b>	<b>431,35</b>	<b>49959</b>	<b>962,24</b>

<b>Fuel economy</b>			
<b>Fuel</b>	<b>Purchase price [€ / Mg]</b>	<b>Heating value [MJ / kg]</b>	<b>Energy unit cost [€ / MJ]</b>
<i>Coal</i>	62.7	23,5	2,67
<i>Alternative fuel</i>	11	18,0	0,62
<b><i>difference</i></b>			<b>2,05</b>

Calculation of yearly savings:

Purchase of 28 170 Mg of coal 1 768 450 €

Purchase of 36 000 Mg alternative fuel 400 000 €

**Savings per year 1 368 450 €**

Stage of the investment	Month of the investment														
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Choice of the Duoflex burner supplier	█														
Installation of Duoflex burner						█									
Concept Elaboration	█														
Report of environment interaction		█	█												
Execution of construction project				█	█										
Tender for the warehouse executive						█	█								
Built permission								█	█						
Built of warehouse									█	█	█				
Tender for the dosing installation executive								█							
dosing installation assembly											█	█			
Investment finish														█	
Account settlement of the investment															█

## Key decision factors

Project is financed from the own financial recourses, therefore there is no risk of failure

Updating the installation for the alternative fuels utilization do not cause the final product deterioration

Project will not have any negative influence on the environment and people health

Realisation of the project meets EU and national policy:

- IPPC directive
- Incineration of Waste Directive (2000/76/EC)
- Greenhouse Gas Emission Trading Scheme
- EU goals within the share of renewables in total energy production

## Alternative fuels utilizations - Conclusions

### Negaive efect

- ✓ Expenses assigned to update stock of the plant – technology fit
- ✓ Changes of current living costs (corrosion, fire-resistance)
- ✓ Laboratory –environmental and quality research
- ✓ Reporting

### Positive efect

- ✓ Decreased cost of conventional fuel
- ✓ Decreased cost of fuel preparation ( e.g. crumbling of charcoal)
- ✓ Increments from elimination of waste
- ✓ Restraint of emmissions

Thank you for your attention

Instytut Paliw i Energii Odnawialnej  
ul. Jagiellońska 55  
03-301 Warszawa  
[www.ipieo.pl](http://www.ipieo.pl)  
[kwnek@ipieo.pl](mailto:kwnek@ipieo.pl)