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# ALTERNATIVE FUELS AND RAW MATERIALS IN CEMENT MANUFACTURE

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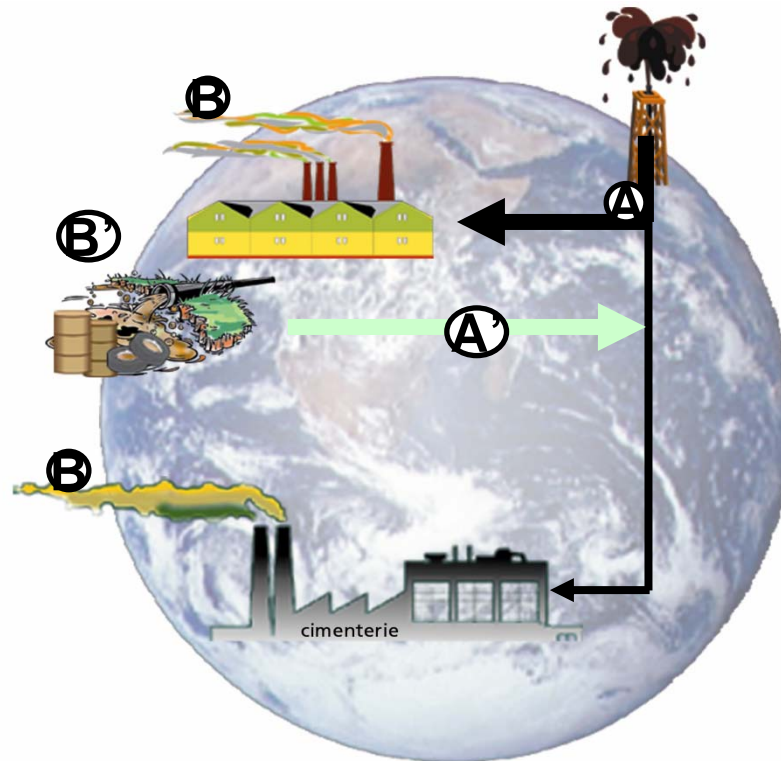
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- Fuel and electricity represent about 35% of total cement production cost.
- Energy savings have reached a critical point (30% reduction since 1970).
- Prices of traditional fuels (coal, pet-coke, heavy fuel oil) continuously increase.
- Alternative fuels are an interesting solution both financially and environmentally.

# INDUSTRIAL ECOLOGY

***Recycling in cement kilns = Resource saving (A')***  
**+**  
**Waste and releases minimization (B')**



## **ECONOMY**

- The use of alternative fuels counterbalances the high increase of fossil fuel price, reduces production cost and improves company competitiveness.

## **ENVIRONMENT**

- Use of AF and ARM in cement production saves non renewable natural resources and recovers both energy and materials because:
  - Their organic part replaces fossil fuel
  - Their inorganic part replaces natural raw materials
- Pollution due to their uncontrolled disposal in the environment is avoided.
- CO<sub>2</sub> emissions are reduced.

## **COMMUNITY**

- An alternative solution is offered to community for safe disposal of waste

## LAFARGE RESOURCE RECOVERY POLICY

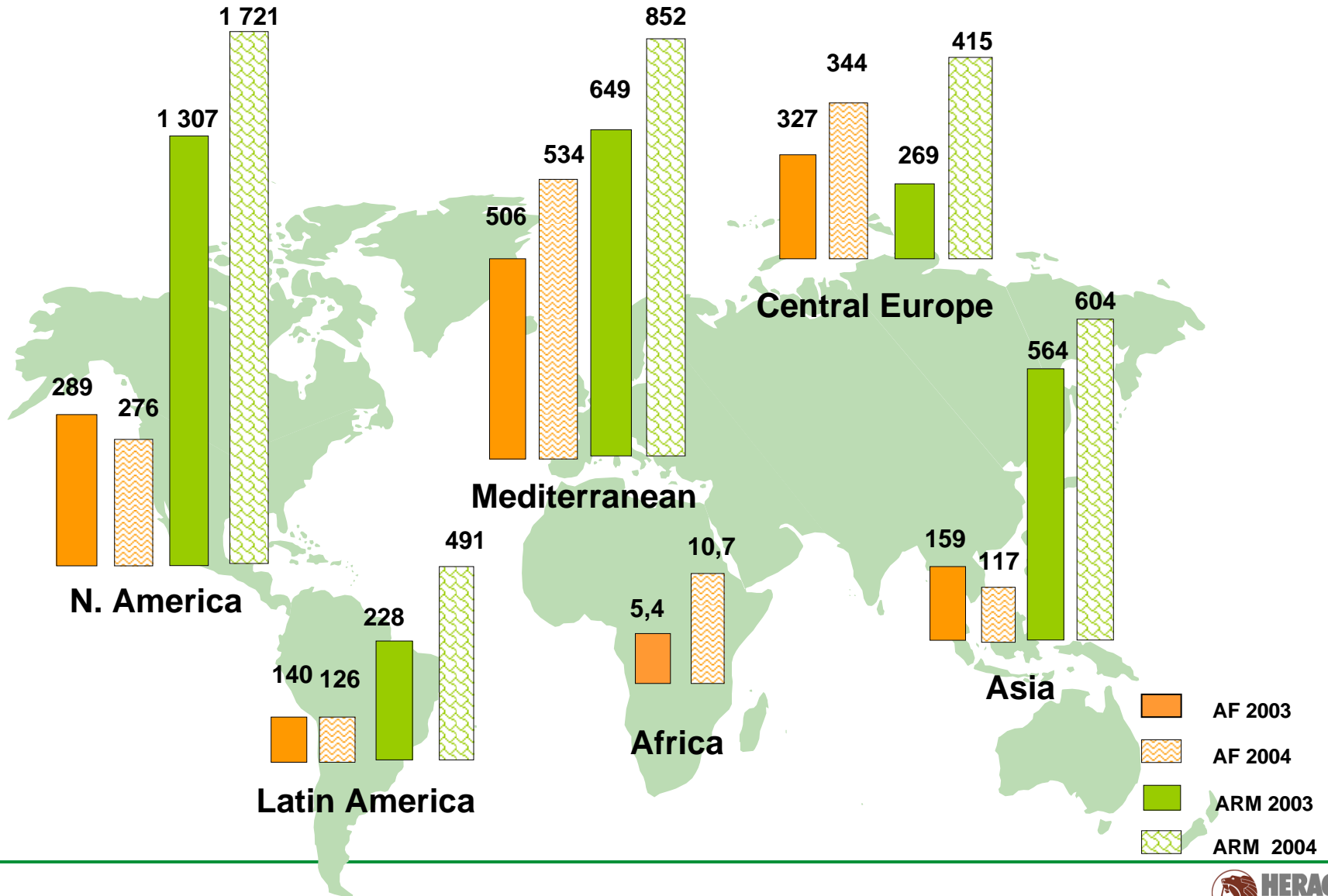
It specifies strict observance of the following operating conditions :

- Respect to relevant & applicable regulations and Lafarge standards
- Assure that there are no negative effects on the quality of the end product
- Ensure a perfect knowledge and mastering of waste material arriving at the plant
- Ensure total transparency vis-a-vis the community
- Given the sensitive nature of this issue, it is absolutely essential that the use of waste as a alternative fuel and/or raw material is handled with strict professionalism.

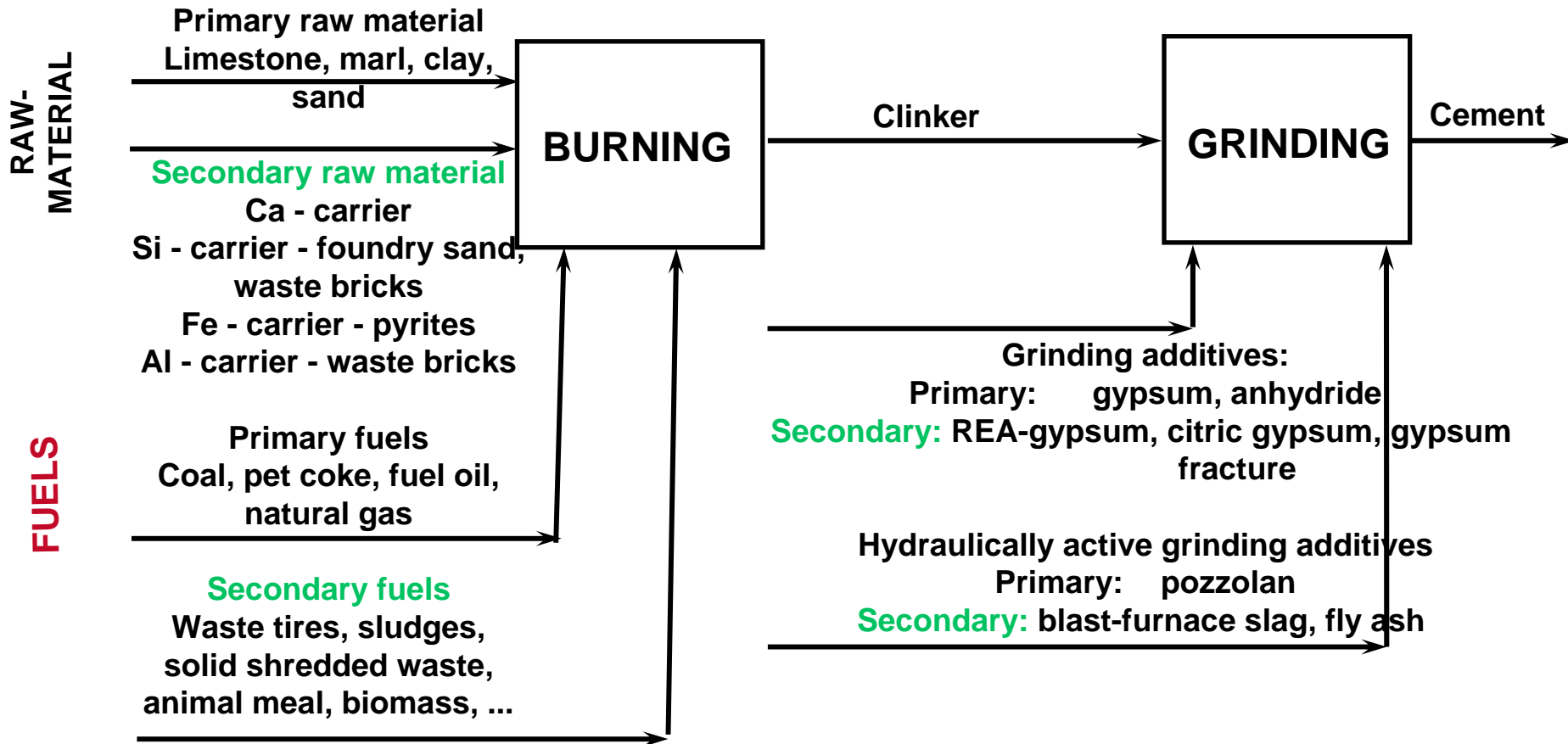
## SAFE PROCEDURES AND EXPERIENCE

- Use of alternative materials in Heracles is made with respect to environment, health and safety standards and in an absolutely controlled manner.
- Lafarge has been using AF and ARM since 1980 and has great experience in their use.
  - up to 85% recovery rates in terms of liquid waste fuels (Paulding, Fredonia USA)
  - up to 50% recovery rates for solid waste fuel (Retznei Austria)
- In any case it is ensured that there will be no impacts on employee health, environment and the quality of cement.

# Lafarge uses 5,5 m tn of AF/ARM all over the world



# WHAT CAN BE USED IN OUR PROCESS?



## ALTERNATIVE RAW MATERIALS USE IN HERACLES

- Started in 1980 and is continuously adapted to current standards and availability of materials
- ARM used include:
  - Fly ash
  - Blast furnace and other types of slag
  - Iron mill scale
  - Red mud
  - Waste bauxite
  - Pyrite ashes
  - Chemical gypsum

YEAR	QUANTITY (t)
2001	1.141.000
2002	1.208.000
2003	1.298.000
2004	1.507.000
2005	1.216.000
2006	1.156.000

## ALTERNATIVE FUELS USE

- Following an extensive review of waste market conditions in Greece several waste streams that could be used were identified, such as:
  - Tyres
  - Sewage sludge
  - Solid shredded waste
  - Biomass
- Main obstacles in Greece seem to be:
  - Non efficient waste collection systems → small quantities of waste available
  - Illegal dumping
  - Low awareness of local communities about benefits of co-incineration → slow permitting procedures, local concerns

## ALTERNATIVE FUELS USE

- Two major projects are currently in progress:
  - Use of different types of biomass, i.e. agricultural waste, food industry waste, biodiesel waste, etc.
  - Use of Solid Shredded Waste from the Waste Recycling & Composting Plant of Attica region
- Trials made in 2006 to evaluate impact on process and production
- Design of necessary installations is completed and their construction is in progress
- We plan to replace (on thermal basis) about 12% of conventional fuels at Milaki plant and about 5% at Volos plant