

# **GREEN OVER GRAY**

**MAKING CEMENT & CONCRETE  
MORE SUSTAINABLE**

A Presentation by Raymond Sih, UAP, LEED AP

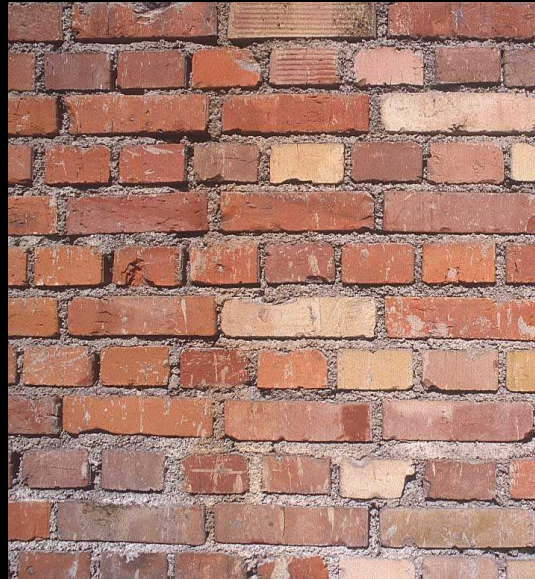
**CONCRETE IS THE SECOND MOST USED  
RESOURCE ON EARTH AFTER WATER**



# SUBSTITUTES FOR CEMENT & CONCRETE ARE NOT AS VERSATILE



STONE



BRICK



BITUMEN



# 1. CEMENT CAN BIND VARIOUS MATERIALS LIKE SAND, AGGREGATES & RECYCLED MATERIALS

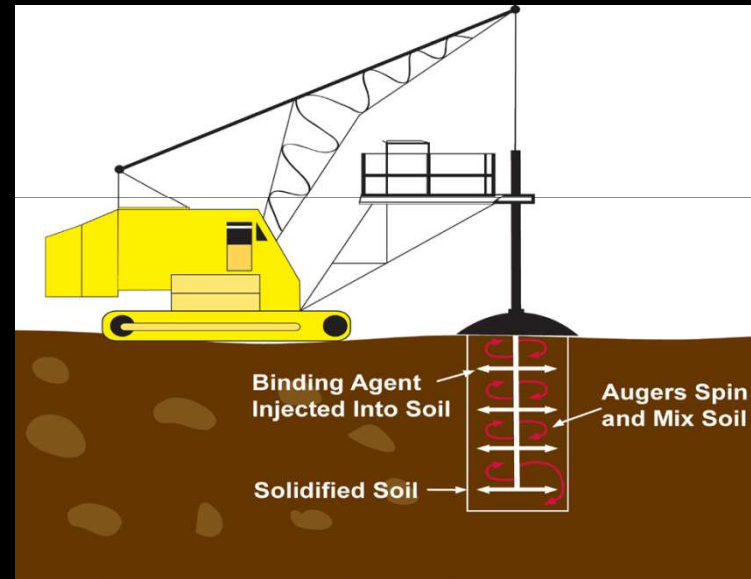


CONVENTIONAL CONCRETE



CONCRETE WITH RECYCLED GLASS

## 2. CEMENT CAN EVEN SOLIDIFY & STABILIZE CONTAMINATED SOILS



### 3. CEMENT IS LOCALLY PRODUCED





**LAFARGE and BAAC plants are strategically located in the Philippines (Regional Materials); and has Recycled Content (Fly Ash) and S3 (Manufactured Sand).**



**HOWEVER, CEMENT MAKING IS  
ENERGY INTENSIVE AND RELEASES CO<sub>2</sub>**





### 3. TO REDUCE CO<sub>2</sub>, CEMENT PLANTS CAN USE MORE EFFICIENT CEMENT KILNS



**LAFARGE reduces its carbon footprint by using AF and recycling Waste Heat, decreasing dependence on coal.**

## **Alternative Fuels, AF**

**30+%** substitution rate of coal as alternative fuel in our manufacturing process.

- Cement Industry is heavily dependent on fossil fuels
- Lafarge uses sustainable alternative fuels, such as rice husks and saw dust as substitute for fossil fuels
- These materials would have otherwise been left to rot or be burned along the roadside of rice mills and plantations
- 50% substitution by 2015



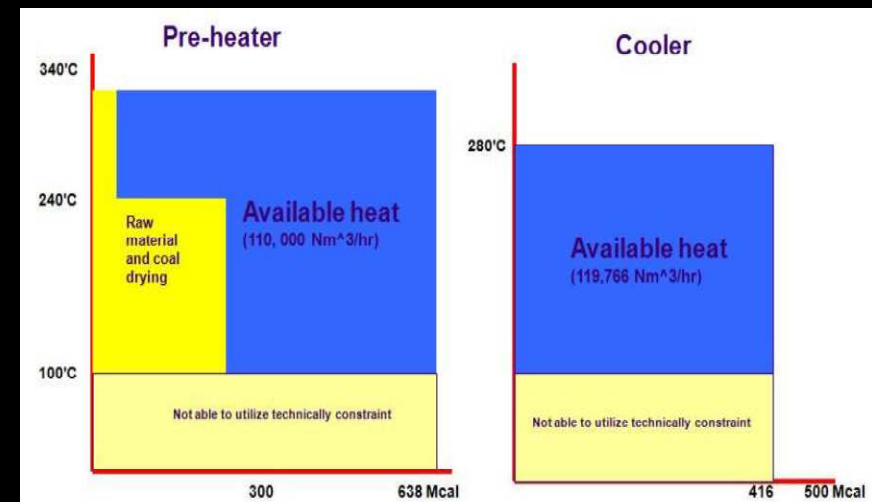
# Heat Recovery System

## 1<sup>st</sup> Cement company in the Philippines to invest in Heat Recovery System

- An innovative system in Teresa Plant that takes heat from the pre-heater and cooler stages of cement production and converts it directly to electricity
- Capacity to meet approximately 30 percent of Teresa Plant's electricity requirement
- The amount of decrease in greenhouse gas emissions by approximately 12,000 tons of CO<sub>2</sub> per year
- Approved in 2011 as a Clean Development Mechanism (CDM) by the UNFCCC. It is the only CDM in Philippine cement industry
- A portion of the earnings from the Certified Emission Reduction credits will be used to supplement Teresa plant's scholarship program

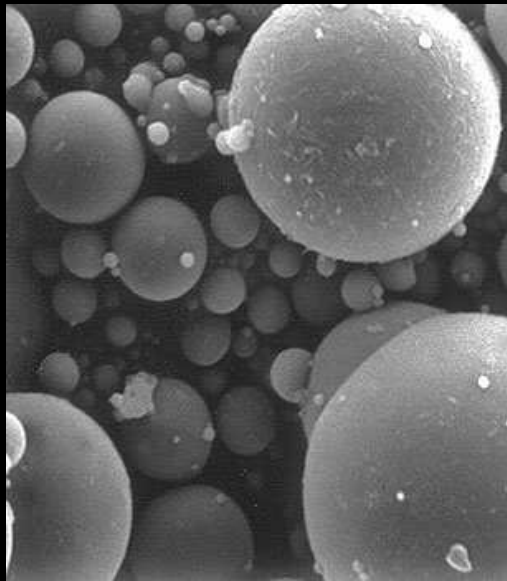


## Wasted Heat

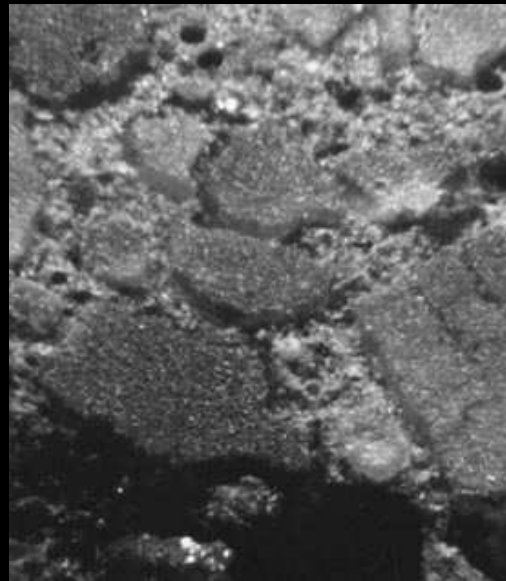




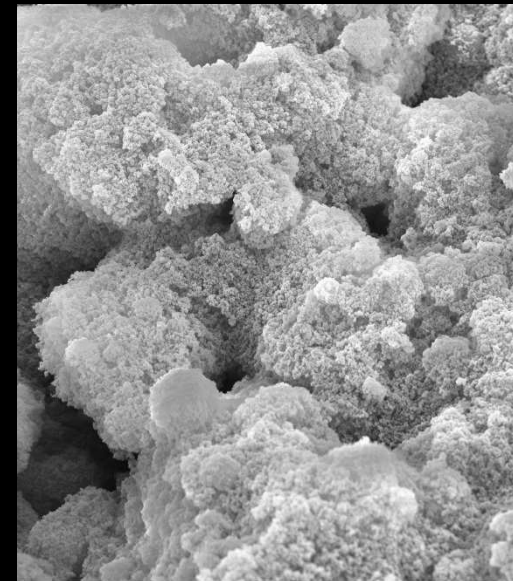
**5. TO REDUCE CO<sub>2</sub>, CEMENT CAN BE MIXED WITH  
SUPPLEMENTARY CEMENTITIOUS MATERIALS  
THAT ARE 100% RECYCLED BYPRODUCTS**



FLY ASH

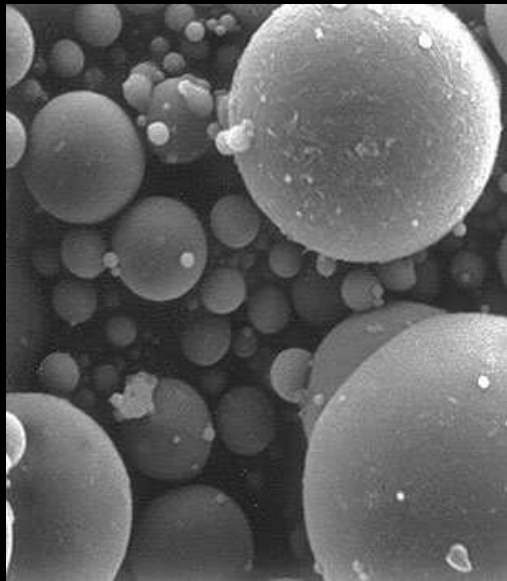


SLAG CEMENT



SILICA FUME

# FLY ASH IMPROVES WORKABILITY, SLOWS CURING & REDUCES WATER DEMAND

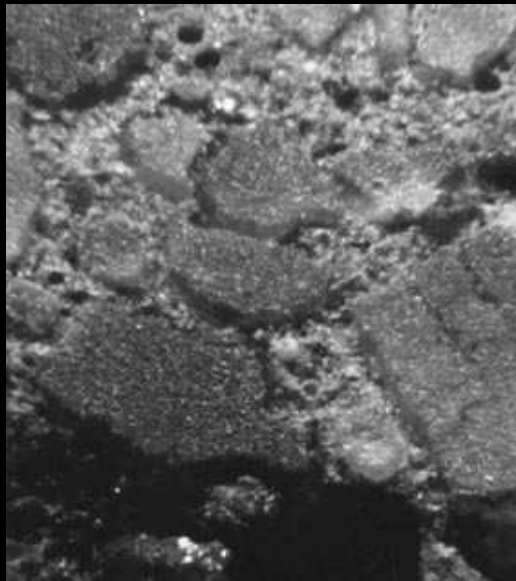


FLY ASH



BYPRODUCT OF COAL POWER

# SLAG CEMENT IMPROVES WORKABILITY, SLOWS CURING & REDUCES WATER DEMAND



SLAG CEMENT



BYPRODUCT OF STEEL PRODUCTION



# SILICA FUME IMPROVES STRENGTH & DURABILITY



SILICA FUME

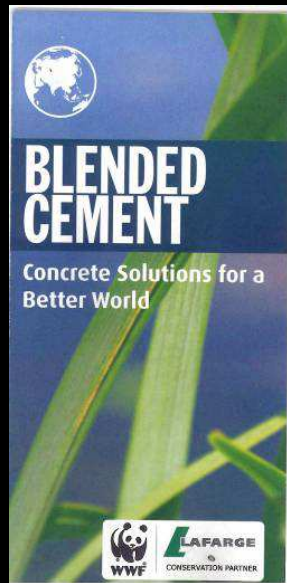


BYPRODUCT OF SILICON ALLOY PRODUCTION

# LAFARGE Blended Cement

**25%** lesser total environmental burden points for producing Type 1P than Type 1.

- Reducing the environmental footprint of our products by replacing clinker in cement with carbon-neutral minerals or industrial byproducts (blended cement)
- REPUBLIC PORTLAND PLUS is the only blended cement manufactured in the country using fly-ash



## FOR THE ENVIRONMENT

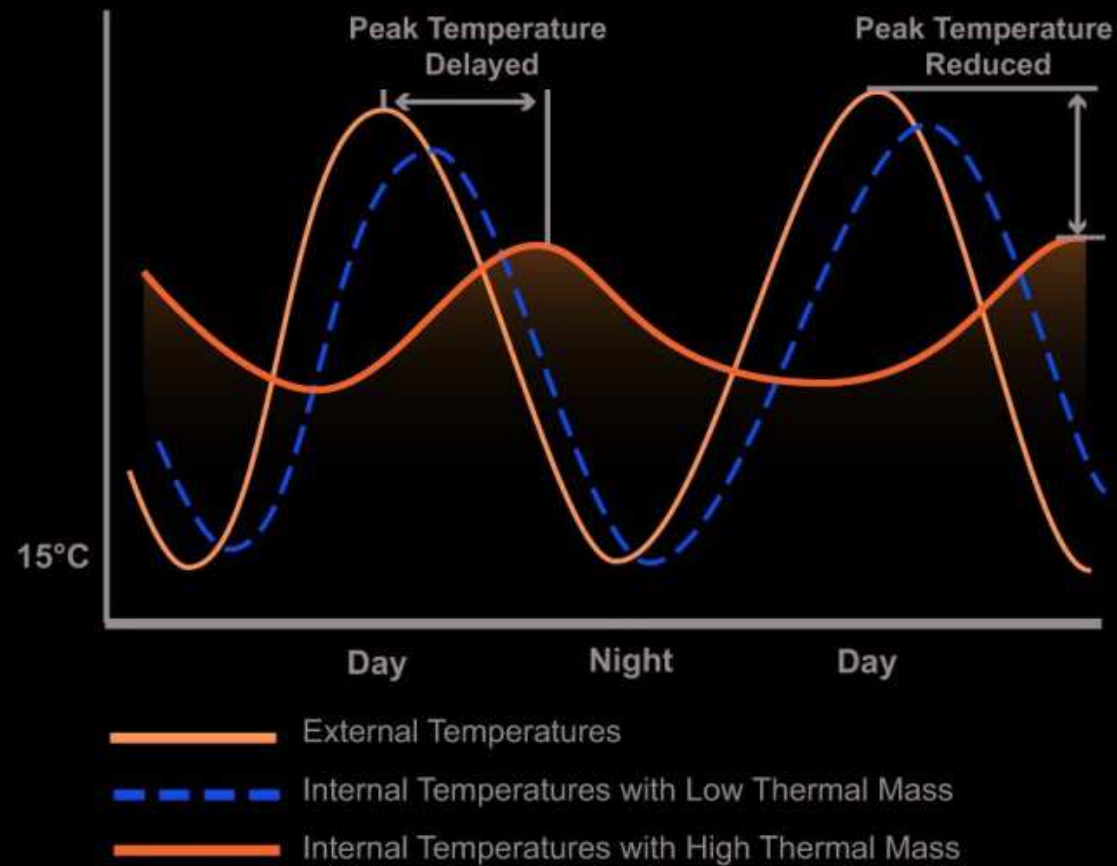
- Lafarge recently participated in a study of construction materials ('life-cycle analysis') alongside WWF Philippines and UP College of Engineering. In comparing the footprint versus ordinary portland cement, REPUBLIC PORTLAND PLUS was found to have a lower environmental impact of around 25 percent



The use of fly-ash can increase the strength and durability of concrete over time, bringing its own enhancement to the product.

**LAFARGE and GN Power Partnership (Fly Ash)**

## 6. CONCRETE HAS A LOT OF THERMAL MASS THAT REDUCES TEMPERATURE SWINGS





## **7. INSULATED LIGHTWEIGHT CONCRETE CAN IMPROVE THERMAL PERFORMANCE**



## 8. PERVIOUS CONCRETE PAVING CAN REDUCE STORMWATER RUNOFF



POROUS CONCRETE



POROUS CONCRETE PAVING

## 9. DUST-FREE CEMENT CAN IMPROVE INDOOR AIR QUALITY



# LAFARGE Value Added Products (VAP's) and Efficient Building Systems (EBS) - Global



ARTEVIA® – Decorative Concrete

**LAFARGE CENTER FOR RESEARCH (LCR) LYON, FRANCE – R&D**  
**>50% dedicated for SUSTAINABLE DEVELOPMENT**



**Structural thermal concrete walls: THERMEDIA® 0.6**

THERMEDIA® 0.6 by Lafarge is the first structural concrete contributing to energy efficiency in buildings. Lafarge's THERMEDIA® 0.6 combines strength and lightness, mechanical performance and thermal properties, as well as with the advantage of maintaining traditional construction methods.

The thermal properties of this Lafarge product are more than 3 times as efficient compared to those of a conventional concrete. When combined with exterior insulation, it can reduce heat losses from thermal bridges by up to 30% and most often avoids using thermal breakers in any one part of the building (see image below).

**Advantages**

- Structural performance of conventional concrete **> 3.5**
- Thermal bridges significantly reduced **> 3.5**
- No need to thermal breakers **> 3.5**
- Improved global thermal performance of a building **> 3.7**

THERMEDIA® & CHRONOLIA® - EBS

**AESTHETIC EXTERIOR CONCRETE SURFACES - ARTEVIA**  
 Efficient Building™ System

8.2.1 ROADS, PATHS & PAVINGS June 2012

CORPORATE

EFFICIENT BUILDING

LAFARGE

**INSULATED SEMI-PRE-CAST DOUBLE WALLS**  
 Efficient Building™ System

2.1.2 FRAME June 2012

CORPORATE

EFFICIENT BUILDING

LAFARGE



AGILIA® – Self Compacting Concrete (SCC)



EXTENSIA®



HYDROMEDIA® – Pervious Concrete



# 10. CONCRETE IS DURABLE AND RECYCLABLE



RECYCLED CONCRETE AGGREGATE



RECYCLED CONCRETE IN GABIONS

# **GREEN OVER GRAY**

**MAKING CEMENT & CONCRETE  
MORE SUSTAINABLE**

Presented by Raymond Sih, UAP, LEED AP