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Lafarge Bath Plant

concrete connection

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Special Edition Part 2

LAFARGE

bringing materials to *life*

Exploring the New Frontier of Renewable Energy Sources

For centuries, the world has been fuelled by traditional energy sources such as wood, coal, and oil. But in recent decades, governments, scientists, environmental organizations and industry have started to explore new energy sources for the future. As the world's largest cement manufacturing company, and a fuel consumer, Lafarge is committed to being a part of this exploration.

The black sedimentary rock known as coal has a long history as a fuel for homes and industry. Marco Polo witnessed the use of the burning black rocks by Chinese peasants during his epic travels to the country in the 13th century. But it was declining sources of wood in Britain that ushered in the widespread use of coal and assured its place as the principal energy source during the Industrial Revolution of the 18th century.

Centuries later, the burning of this fossil fuel is recognized as a leading contributor to carbon dioxide emissions into the earth's atmosphere. Still, coal is so widely available and affordable that it remains a significant energy source today. The largest reserves are in the United States and currently over 100,000 metric tonnes of coal and petcoke from the US are shipped each year to our Bath Plant to manufacture our cement products. Although emission control technologies are in place to make coal a safe, affordable fuel, the **Cement 2020** goal is to replace this imported fuel with cleaner, local, and renewable fuels.

In this issue, we provide more information about our **Cement2020** project, with Queen's University and WWF-Canada, to find low carbon fuel sources suitable for our operations here and our over 100 plants worldwide. The project embraces a range of integrated research initiatives undertaken by a multi-disciplinary team to explore practical, sustainable recommendations for use by the worldwide cement industry. One of the early, tangible goals is to replace 30% of the fossil fuels we use with local, low carbon fuels at our Bath plant by 2020.

"In this issue, we provide more information about our **Cement2020** project, with Queen's University and WWF-Canada, to find low carbon fuel sources suitable for our operations here and our over 100 plants worldwide."

The Greener Fuel Protocol: Identifying fuels of the future

Environmental:
Carbon footprint, life cycle assessments, knowledge building, emissions, beneficial re-use

Social:
Transportation, transparency and community participation, education opportunities

Economic:
maximizing local benefits, affordable fuels, local jobs and economic development

Lafarge would like to thank the Asia Pacific Partnership and Natural Resources Canada for their financial support of the **Cement2020** project.

Our project partners often point out that no fuel is 100% green or clean, but some fuel choices are "greener" than others. But what makes one fuel "greener" than another?

As one part of the team's fuel research, we're working with universities, environmental NGOs, governments, industry and other public partners to develop a method of objectively and transparently evaluating different energy sources – not just in terms of traditional economic values such as cost and availability of supply – but also measuring their environmental and social impact.

This measurement system, called The Green(er) Fuel Protocol, reviews fuel choices in a broader, holistic manner.

Measuring the total costs and benefits of new fuels in terms of a "triple bottom line" of social, environmental and economic benefits means undertaking extensive study of the life cycle of fuels.

Critical factors considered as part of the evaluation process include the availability of fuels from local suppliers to reduce the environmental impact of transportation, inputs required to produce biomass fuels, challenges such as water content and production costs, recovery of appropriate materials diverted from disposal, and energy value and emissions.

Although still in its development stage, the goal is to develop objective, number-based standards to evaluate potential new fuels – a protocol eventually to be shared with other businesses, organizations and communities considering reducing their environmental footprint by switching to other energy sources. The objective is to develop careful decision-making tools, which embrace all factors such as the sustainability and safety of the fuel producer, and fuel user, greenhouse gases and other air emissions produced by the fuel, and the social benefits of using these new fuel sources.

"The quest for green energy alternatives is the move towards sustainable clean energy that might have looked like an idealist's pursuit in the past, "says Dr. Darko Matovic of the Mechanical Engineering Department at Queen's University in Kingston, "but it is unfolding today as a viable, alternative to traditional emissions-dominated practices. A vibrant, multi-disciplinary team of sustainability experts in energy, agriculture, environment and life cycle analysis, convened by Lafarge through the **Cement2020** initiative, and dedicated to create visionary partnership with the local community, demonstrates that sustainable growth and use of locally available biomass can be beneficial to all. We are seeking to establish a sustainability model that can be adopted and adapted elsewhere, multiplying the benefits of sustainable energy."

cement 2020

Initial Results

Phase One of the project involved a trial study of biomass, called The Energy Farm Project. This project began in 2008 with local farmers growing a variety of both annual and perennial crops such as sorghum, millet, hybrid corn, industrial hemp, switchgrass and other crops to assess their value as energy sources for cement production.

Local farmers grew 500 tonnes of biomass crops for the successful experimental demonstration at Lafarge's Bath Plant.

While not yet economically viable, the field production of the crops and test burn in October 2009 did reveal that a projected 20-30% replacement of coal and petcoke with crops produced near the Lafarge Bath Plant is technically viable.

There are other low carbon fuels, which the team indicates may be suitable energy sources. These sources include agricultural and forest byproducts, construction and demolition debris, surplus materials from recycling processes, and other carefully selected residue materials, destined for disposal but containing large fractions of biomass. All of the materials are readily available within two hundred to five hundred kilometres of Lafarge's Bath plant.

As part of Phase Two of the project, the project team is now examining the potential of low carbon fuels made from these everyday waste products. The team is particularly interested in those surplus fuels that are both affordable and cleaner.

These byproducts – everything from wood and wood chips, coffee bean shells and coffee cups, shingles and railway ties, non-recyclable cardboard castoffs, construction wood, all have high-energy value and should lower emissions.

Biomass fuel injection during the 2010 Biomass Demonstration program.

A touchstone of all of the research into new fuel sources is its open, transparent approach and thorough, independent methodology developed in partnership with its project partners drawn from government, industry, academic institutions, non-governmental organizations and the community.

Notably, one of the key observations from the Energy Farm demonstration shows that ash components (e.g. minerals and metals) within these materials are incorporated, with naturally occurring raw materials, into the cement made in the high temperature process of cement manufacturing.

This mixing of ash into cement products means there is no need for disposal of ash, an effect unique to cement manufacture.

For more information, visit the project website **www.cement2020.com.**

The **Cement2020** Constellation of Projects

Lafarge's Cement2020 research project embraces four initiatives exploring the use of new fuel sources:

- The Energy Farm project funded in part by Natural Resources
- The Local Initiative project with WWF, the global conservation organization, focusing on the wide-ranging policy implications of the move to biomass fuels
- A 2010 Asia Pacific Partnership project funded in part by Environment Canada to evaluate the international applications of the project
- A Queen's University project that examines the sustainability of biomass fuels, funded by the Ontario Centres of Excellence.

In November 2011, the company released initial results from its field trials at a community meeting in Bath.

Community Feedback: November 2011 Public Meeting

On November 29, 2011 members of the **Cement2020** project team hosted a public meeting at the Loyalist Golf and Country Club in Bath to update residents of the local community on the ongoing research of new, low carbon energy sources.

For those who weren't able to attend, the poster boards are available on line at **www.Cement2020.com**. In the future, as results become available from the next stage of testing, additional public meetings will be held to share the results.

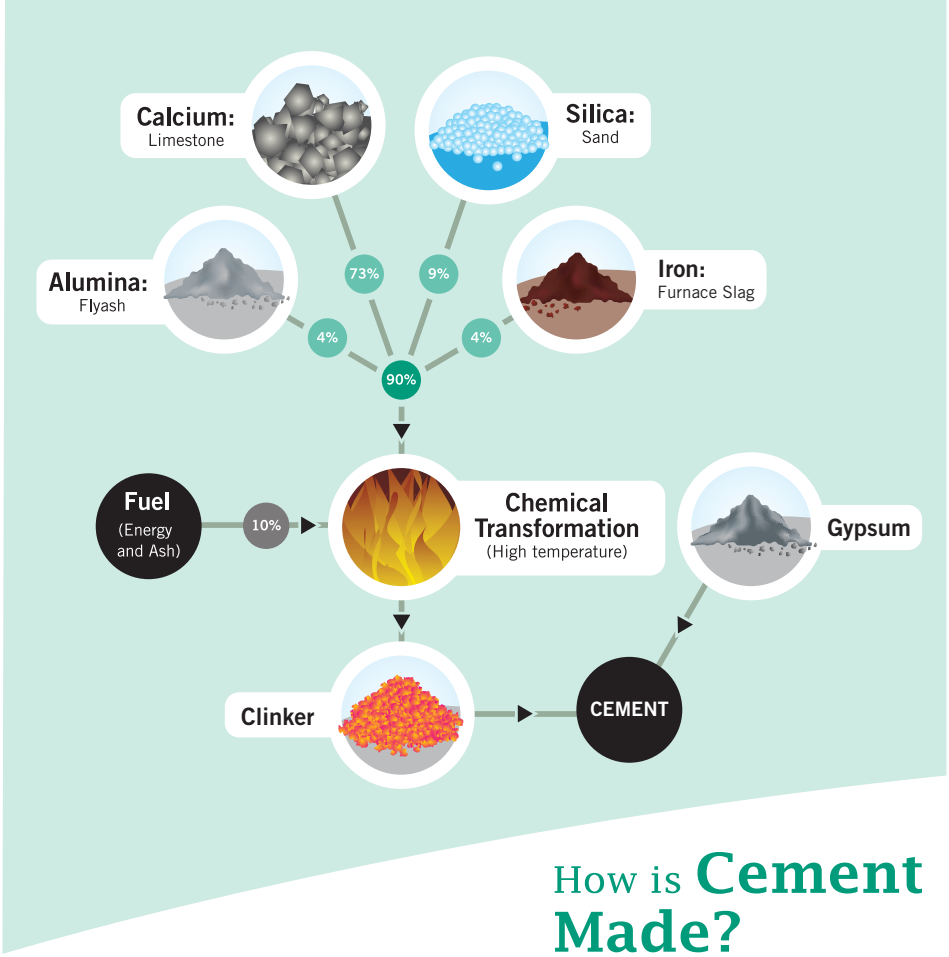
The objective of the November meeting was to share results of the work so far, to outline the next stage of testing and the associated regulatory process, the objectives of the research, and to encourage community participation in the project.

The open house event is part of the team's continuing efforts to ensure community awareness and participation in this research project exploring new fuels to eventually replace the fossil fuels that currently fuel the company's Bath plant.

A survey of those in attendance conducted by Golder Associates of Mississauga, Ontario indicated that guests welcomed the open house public events, the information they received from the experts on hand, and appreciated company efforts to keep the community informed through its newsletters, regular meetings of its Citizen's Committee, and reports posted on the project website **www.Cement2020.com**.

Questions from the public focused on the independence of the proposed testing and the expected emission performance. Based on the Green(er) Fuel Protocol and the results of the 2010 biomass testing program, the fuels selected for the next phase of testing by the research team are all expected to lower emissions. Further, the involvement of a multi-expert panel, under the scrutiny of Ministry officials, ensures that the results will be transparent and independent. (See the Public Consultation Report available at **www.Cement2020.com** for more information on the public meeting, questions asked, and the results of the survey)

In order to proceed to the next stage, Lafarge is applying for two Environmental Compliance Approvals from the Ontario Ministry of the Environment. The first is a permanent Approval to use virgin biomass, such as the materials tested in the successful 2010 program, when they become economical. The second is a 3-year, rate limited (75 tonnes per day or about 10-12% co-fire) demonstration Pilot Approval to validate the benefits of the local, low carbon fuels selected for further review. You can find the entire application package for both applications at **www.Cement2020.com**.



How is **Cement Made?**

Project Partners

2011 marked the tenth anniversary of Lafarge's partnership with WWF, the global conservation organization. In Canada, WWF-Canada is working with businesses like Lafarge to assist in new research, promising technologies, and best practices to help businesses significantly reduce their environmental footprint.

Lafarge is also working with others to access their expertise and capacities as part of the project to explore the new frontier of low carbon energy sources; a key partner is Queen's University in Kingston, Ontario where multiple Departments are actively engaged in the research of new fuels.

Rising fossil energy prices, concerns over the security of energy supplies and mounting evidence linking fossil energy use to global climate change have all increased interest in developing new technologies, management strategies, and the transformation to a new economic model – a sustainable bioeconomy. A bioeconomy is an economic system in which biological resources like forests, agricultural and aquatic ecosystems provide not just food, but also energy and environmental benefits.

With its vast agricultural and forest resources, Canada has a potential competitive advantage over other nations in developing a green economy. But transitioning to this new economy means developing practical approaches for industries such as Lafarge Canada.

The Sustainable Bioeconomy Centre at Queen's University in Kingston is reviewing and validating the project results.

"The worldwide cement industry is estimated to represent 5% of the world's carbon dioxide emissions, which is very significant especially when compared to Canada's national carbon dioxide contribution which is 2%,"states Andrew Pollard, Director of the Sustainable Bioeconomy Centre. "Lafarge's leadership in developing local solutions to the worldwide climate change challenge is visionary and exciting."*

Queen's Institute for Energy and Environmental Policy is also contributing to the Lafarge research project. The mission of the institute is to generate pragmatic advice on energy and environmental policy relevant to governments, industry and the public.

The institute serves as a crossroads for researchers, policy-makers and industry leaders exploring energy and environmental issues.

"Addressing sustainability, particularly considering the challenges of climate change, is important to all sectors of our economy," says Dr. Warren Mabee of the Institute for Energy and Environmental Policy at Queen's. "Our work with Lafarge which focuses on the cement industry will produce science and policy ideas, which can be applied to other sectors such as electricity, transportation, and other home heating."

Others involved in the Lafarge renewable fuels project include:

- Natural Resources Canada
- Cement Association of Canada
- Chandler and Associates
- Golder & Associates
- Hyndman and Associates
- Rail Link Inc.
- Rowan Williams Davies Inc (RWDI)
- Scott Environmental Group
- Sustainable Ventures Inc.
- The New Energy Project

The Environmental Compliance Approval applications and their supporting documents will be available at **www.Cement2020.com** on the Publications page. If you have questions, please don't hesitate to contact the **Cement2020** team by calling **(613) 352-7711x214** or emailing **lafargebathinfo@lafarge-na.com**.

You can also provide comments directly to the Ontario Ministry of the Environment. Please go to **www.ebr.gov.on.ca** and enter *Lafarge Bath* in the search field and you will find the posted application summaries along with information on how to provide comments.

Lafarge Canada, Bath Plant is committed to being an environmentally responsible organization.

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