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Lafarge Bath Plant

concrete connection

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LAFARGE

bringing materials to *life*

Welcome!

We are excited to be able to keep in touch with you through this special edition newsletter.

In 2008 we began our Energy Farm project and biomass combustion trial, and as promised, we are delighted to tell you about the highlights of the work and the progress we made. At this juncture in our quest for a greener but practical fuel source, we're finalizing one successful phase and beginning another. In the future, we'll move forward with the initiative under the Cement 2020 project name.

This newsletter is part one of a two-part series. We hope you enjoy reading about the biomass combustion trial, the culmination of our Energy Farm project where we learned a lot about the production and use of locally-grown energy crops. We'll also tell you about how we're expanding our fuel focus and are developing a Greener Fuel Protocol.

This protocol, which we're designing with the guidance of community experts, is meant to help assess more sustainable fuel sources by focusing on the "triple bottom line" benefits: social, environmental and economic.

In our next edition due in early December, we'll focus on the Greener Fuel Protocol and its use in assessing the fuel options that have been submitted to us by companies and community groups in the region. By then we should have community feedback to share with you and information on plans to move to the next step.

The work we're doing on this project has the potential to change the way cement is made around the world, starting right here in Bath.

If we can replace fossil fuels used by the global cement industry, by switching to low-carbon fuels, it would be like eliminating Canada's entire carbon footprint. As the world's largest Cement maker, we're serious about doing our part.

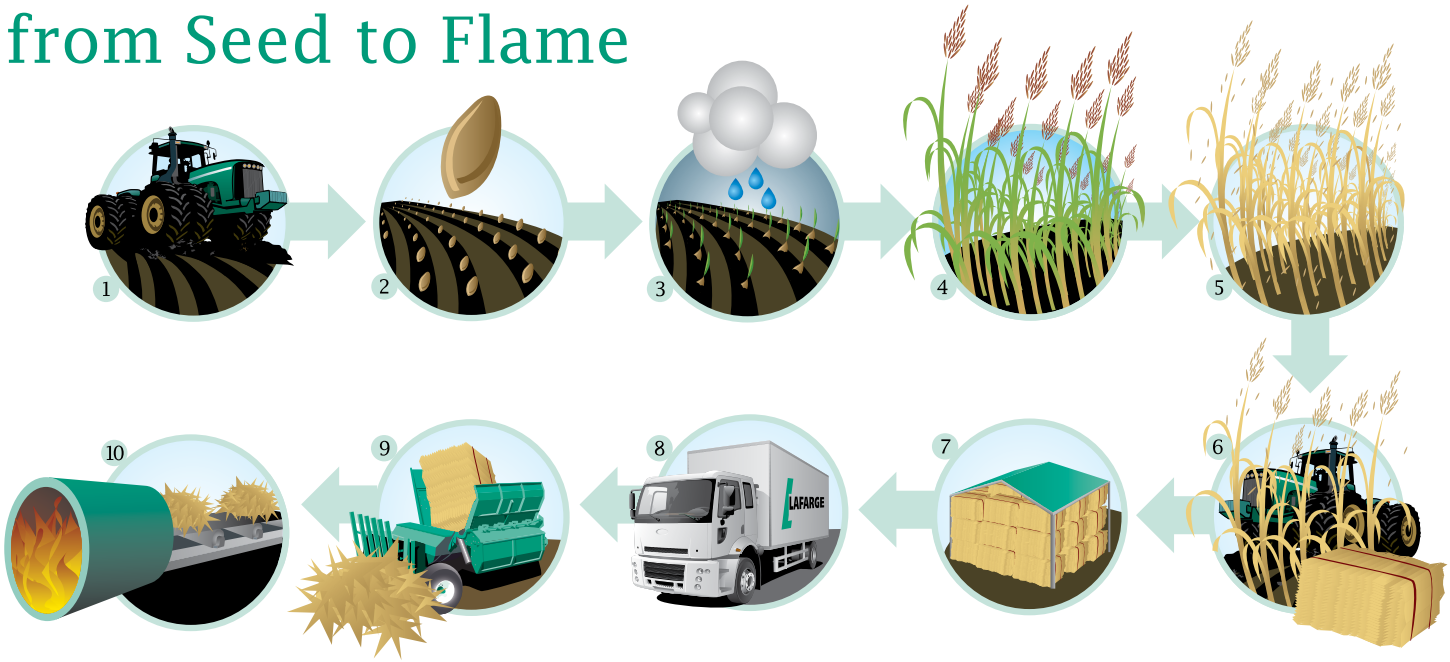
This is an ambitious and exciting project. We have researchers and experts from around the world collaborating with us, and we're learning every day. In the end, we want to build a better future, for our community, for our industry and for our planet. It's the best way we can think of to be a good neighbour.

Sincerely,

Michael Kralik
Plant Manager, Lafarge Bath Plant

Pictured here: *Heather Richardson (left) and Krysten Rutherford (right), students from Queen's University, Geography Department, conduct soil tests as part of a Life Cycle Assessment study funded by Lafarge and the Asia Pacific Partnership.*

Energy Farm: from Seed to Flame



The Results Are In

In 2010, we tested several forms of locally-produced biomass fuel to see if we could use it as a substitute for coal. We tested maize, millet, hemp and sorghum, among a few others. Most of these plants were annuals, or plants that are produced within a single growing season. However we also tested some switchgrass, a promising perennial crop, from Willowlee Sod Farms in Prince Edward County. Perennial plants grow back every spring and do not need to be replanted.

The focus of the project was on gaining local experience with fuel production and use. Some of what we have learned was in line with what we expected and some of it was surprising. Here are some of our findings:

- Variety is better: Some crops, like maize and millet, yielded about what we expected, while others, like hemp and sorghum, delivered less than half of what we thought they would. The best approach, based on what we've learned, is to plant a variety of annual crops so that we don't rely too heavily on one crop.
- Perennials may be the way to go. Experts agree that perennials like switchgrass and big bluestem are the best biomass crops, since you can reap up to 20 years' worth of crops from a single planting. We couldn't test a large amount of these in our 2010 trial. However we're working with our partners at Queen's University on a longer-term crop study and we're happy to report that these grasses and a number of hybrid poplar varieties are in their third growing season on research plots on Lafarge land.
- The process is not as cost-efficient as we need it to be. While we're 100% committed to reducing our dependency on coal, unfortunately coal is still more economical than the biomass fuel we tested. However, we did find ways to reduce the cost to almost half of previously published cost figures, but we're not there yet. We'll continue to promote the development of more efficient practices and processing methods so that we can bring these costs down further, making them a real sustainable option.

"We feel the test was hugely successful; we've learned substantially from it," says Steven Price, Senior Director of Conservation Science Practice at WWF Canada.

"We are more aware of the benefits and challenges in making this process both environmentally and economically sustainable. We also know, there is a lot more we need to learn."

If you'd like to learn more about our results, visit ***www.cement2020.com.***

Above: Energy Farm from seed to flame: *(1) Land preparation; (2) Seed is planted; (3) Water and fertilizer (as needed); (4) Plant grows; (5) Frost. Plant dries & returns nutrients to soil; (6) Plant is harvested and baled; (7) Bales are stored; (8) Bales are shipped; (9) Bales are shredded. (10) Shredded biomass is conveyed to the combustion process. The biomass is combusted; Next year, go back to 1. for annuals and 3. for perennials.*

Energy Farm: A Brief History

We started the energy farm project in early 2008 to see if biomass crops could be grown locally. We planted two annual crops, maize and sorghum, and two perennial crops, Miscanthus and switchgrass, on 10 hectares of Lafarge land leased to a local farmer. We researched different planting densities and varieties to help us determine the best conditions for our region. The two annual crops grew well.

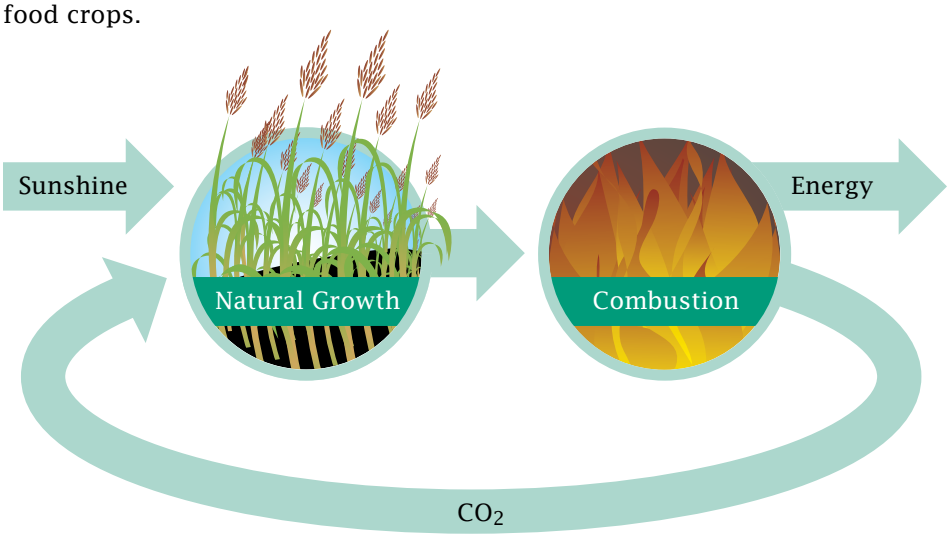
Our next step was to open the project to more local farmers. In 2009, several farmers in the Bath area agreed to grow a hundred Hectares of maize and sorghum, as well as millet and industrial hemp. At the same time, researchers at Queen's and other universities were studying the environmental impact we would have if we switched from coal to the biomass crops that we'd been growing.

Herb Hart of Hart Acre Farms in nearby Lennox & Addington County dedicated 77 hectares of his land to the project. "We grew it on our marginal grounds," he says, explaining that most area farms have large stretches of marginal ground, or land that can't economically produce traditional food crops.

"I was excited to be able to plant something on it, because otherwise it goes to waste."

Hart and the other farmers delivered their crops to us in 2009. "We had mixed results," he says. "The corn did well, like it always does, but the hemp was miserable to work with. It was hard to cut and hard to bale and hard to grind." The sorghum also did not yield as well as expected.

The biggest problem, according to Hart, was the weather. "It wasn't a good year, weather-wise," he says. "We couldn't start planting until later in the spring, and the yields weren't as high as they need to be." The low yields drove the prices up, adding to the cost of production.



Above: Why Biomass is Carbon Neutral. *Plants are literally green because they contain a pigment called chlorophyll that is used to convert carbon dioxide from the atmosphere to the molecules needed for plant growth and development. When the plant reaches the natural end of its life, that carbon is re-released back into the atmosphere through the natural processes of decay, completing the "carbon cycle". Whether a plant releases its carbon back to the atmosphere through natural processes of decay, or because it is used as a fuel, the same amount of carbon is returned to the atmosphere to be reused the next growing season.*

Biomass Combustion Trial: The Proof is in the Flame

In October of 2010, we took the fuels we collected, ground them and introduced them into our kiln. A third party monitored the emissions (monitoring methods were per Ministry of Environment regulations), both before and during the trial, and we're happy to report that the emissions were well below the regulatory limits. Professors from the Queen's Engineering school oversaw the testing and the report preparation.

Among the lessons we've learned is that biomass is, indeed, a cleaner-burning fuel that can help us with our goal of reducing our greenhouse gas emissions by 20%. We've also learned that it can be grown close to home. Both of these findings help us get closer to our goal of further reducing our carbon footprint by eliminating the need to import our fuel from far away mines.

Currently, our biggest hurdle is that biomass from dedicated fuel crops isn't an economically viable option. Yet. We have a lot of work ahead of us. We're looking at ways of finding biomass fuels that are more affordable while we continue to work with our farming partners and support research to reduce production costs even further.

Local Fuels, Greener Future

Biomass is an attractive idea. You start with a crop specifically grown for fuel or a by-product that we have no use for — like corn husks — and you turn it into clean-burning energy that can benefit society in so many ways.

While researchers work to make this kind of biomass fuel more affordable, we're considering other options, including other sources of clean-burning biomass fuel.

When we use the word biomass, we're talking about any plant-based fuel. Besides crops, there are many other materials that also qualify as biomass because originally they were made from plants. We're looking at many of them, including forest waste, railway ties, surplus wood from construction and demolition projects, pulp and paper by-products, even wood-based factory discards. Every fuel option we're studying has been proposed to us by local businesses as cleaner fuel options than coal.

Our research partners are studying each of these fuels (see Greener Fuel Protocol) to ensure that they are cleaner than coal. Some of them have other advantages, including the fact that using them for fuel would keep them from rotting in landfills. And all of them are available locally. We'll study every option — some over the short term and others over the longer term — before we make any final decisions.

While we continue to use coal for the time being, switching to some of these alternative fuel sources, which are very competitively priced compared to coal, could allow us to economically invest in a permanent system for using these fuels, as well as biomass crops from local farmers, as soon as they become economically viable.

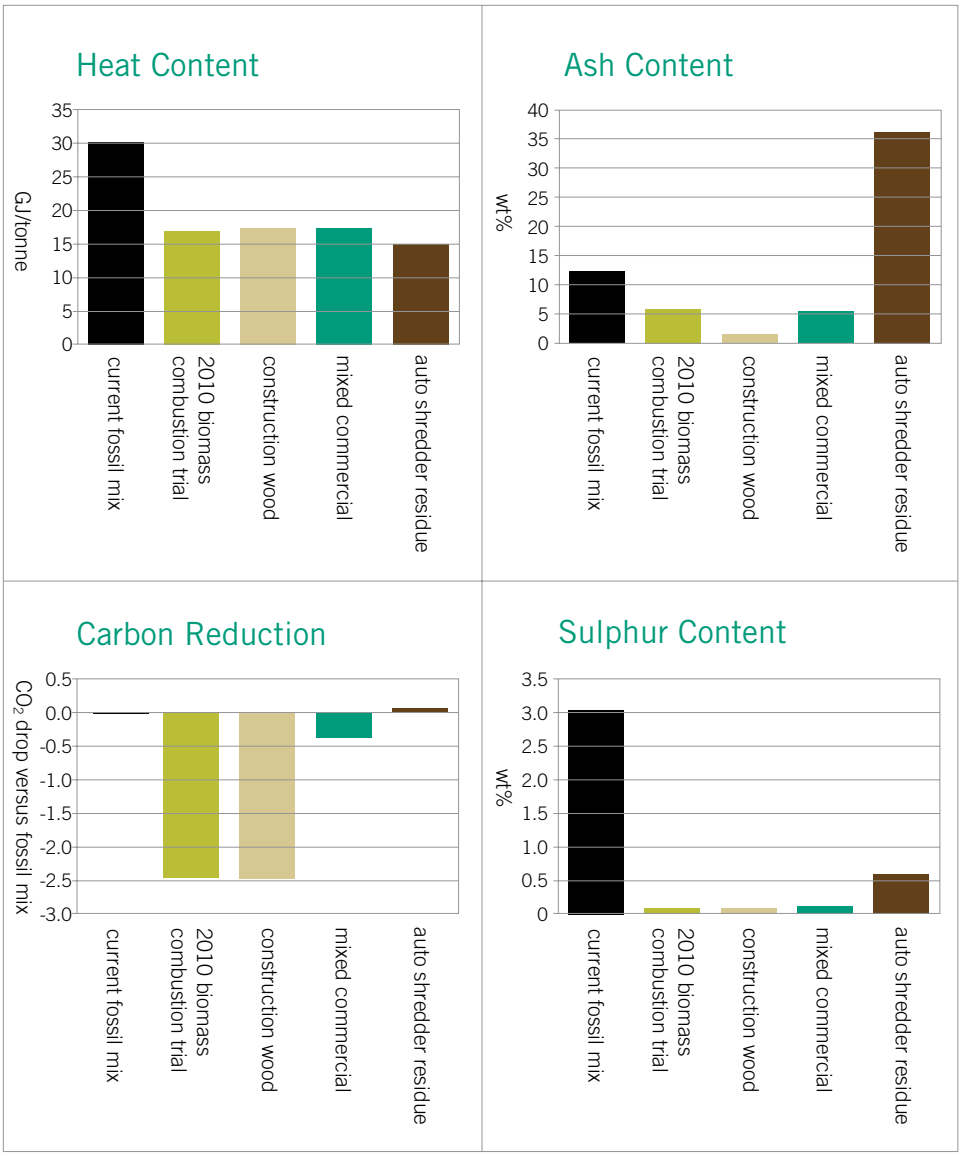
"As citizens of the earth, we need to get off of fossil fuels," says Steven Price of WWF. Exploring other alternatives while we perfect our ideal solution is one way we can do that.

Looking Forward: The Green(er) Fuel Protocol

One of the important points driven by our science partners is that there is no such thing as a green fuel, although some fuels are certainly greener than others. How do we rank one fuel against another? That's the purpose of the Protocol. What does a greener fuel look like if you dig deeper in assessing it?

The more tests we conduct and the more we study our results, the more we're learning about the processes that need to be in place. The Protocol will help us agree on a definition for a greener fuel and develop an objective, number-based system to help us rank the fuels we're considering.

The New Energy Project is one of our partners in the Greener Fuel Protocol. Executive Director Ruth Noordegraaf says the protocol is an important project. "It's an exciting collaboration," she says. "We've got business people, technical people, environmental NGOs, academic researchers and the community involved. There's a nice cross-pollination of ideas going on as we try to figure out how to grade a greener fuel."



Noordegraaf explains that the protocol is about more than just environmental concerns. "This is also about trying to transform lifestyle and community," she says. "So we're looking at it from all parts of the sustainability equation. We're going to measure it from the environmental perspective, but also from the social and economic perspectives."

Although it's still in the development phase, the Greener Fuel Protocol is not just for Lafarge. Our aim is for it to be available for any corporation, organization or community that's considering reducing their footprint by switching to alternative fuels. It will certainly be available to the entire cement industry to help with its goal of further reducing the environmental footprint of cement production.

What's Next

The last three years have been a great learning experience for us. In particular, we learned from the feedback from the community from our earlier alternative fuels project — engaging further with the community, taking a holistic view of our fuel choices and proceeding slowly with staged tests. If you'd like more information or greater detail, visit the Cement 2020 website.

In part two of this newsletter series we will share how the Green(er) Fuel Protocol is helping us evaluate submissions from local fuel suppliers and our plans for a pilot plant system to support more biomass testing. We promise to continue sharing what we learn as we work towards making sustainable cement production a reality, and we happily welcome your feedback or questions.

Above: Project management and Research Advisory Team: *(Back row L to R standing) Dr. Ted Grandmaison (Chemical Engineering Professor, Queen's University); Dr. David Hyndman (Hyndman & Associates, project management); Dr. K. Goni Boulama (Mechanical Engineering Professor, Royal Military College); Scott Beckett (Lafarge Bath Plant); Dr. Andrew Pollard (Mechanical Engineering Professor, Queen's University); Dr. Andrew Duncan (Post-doctoral fellow, Queen's University); Alison Obenauf (Sustainable Ventures, Inc., project management); John Chandler (A.J. Chandler and Associates Ltd., environmental consultant); Ron Quick (Sustainable Ventures, Inc., project management); (Front row L to R sitting) Dr. Darko Matovic (Mechanical Engineering, Queen's University); Sam Fujimoto (Corporate Technical Services, Lafarge Canada Inc.); Robert Cumming (Environmental and Public Relations Manager, Lafarge Bath Plant)*

Save the date!

As always, we invite you to stay in touch with us. We've scheduled a public meeting to discuss Cement 2020, and we hope to see you there.

Date: November 29, 2011
Time: 6–9 pm
Place: Loyalist Golf & Country Club

If you can't make it to the meeting, we hope you'll feel free to contact us with all of your questions, comments, concerns or suggestions.

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Or get a detailed update by visiting us online at ***www.cement2020.com.***

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

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