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World's first at St. Marys Cement

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It may be one of the earth's oldest organisms, but it could be the solution to a very modern problem — greenhouse gas emissions — at St. Marys Cement.

Algae — the green goop that coats river rocks and unused swimming pools — is the core of a new pilot project at St. Marys Cement (SMC) to see how much carbon dioxide can be diverted from the plant's current exhaust stack.

The Journal Argus was exclusively invited to the plant last week to learn about the new pilot project.

"It's a new frontier," notes Terry Graham, chairman of Pond Biofuels, the Scarborough-based firm which will be installing the pilot project, and developed the process.

"But algae is the oldest single-cell animal on the planet; it represents 60 per cent of the biomass of the world."

He notes that, during the earth's creation, volcanoes were emitting a variety of noxious gases into the earth's atmosphere.

"Algae remediated all that," he says. "It's the best carbon dioxide scrubber, because that's what it needs (to eat to live)," Graham says.

"A cement plant is a like a man-made volcano; you're melting rock."

Martin Vroegh, SMC's environmental manager, says that the project concept has been in the works for over a year. While the official figures are private (as St. Marys Cement is privately owned), he estimates the cost to be between $30 and $40 million.

"It's hard to get money out of people during a recession, when a company's loosing money," Vroegh says. "But our shareholders, when they heard our presentation on it, definitely wanted to pursue it."

He notes that SMC is still in discussion with the Ministry of the Environment to get approval to perform a test burn of waste plastic film; the Ministry has not made a decision either way on the test as of press time. SMC has received approval from the town's building department to erect the necessary temporary buildings for the algae test.

While many cement plants around the world use waste plastic as fuel, using algae to clean stack emissions, even on a test level, will be "the first of its kind in the world at a cement facility," Graham says.

Research into algae as a power source has been taking place for over a decade, primarily at the university level. Graham says that Pond Biofuels has worked on the process for two-and-a-half years.

Equipment is now being installed at the plant, including a six-inch diameter pipe about 70 feet up the stack (past the last exhaust blower fans), which will divert approximately one per cent of the emissions into a half-acre "algae farm" of tubes, Graham explains.

The algae then absorbs the carbon dioxide via photosynthesis and releases oxygen. As for other trace compounds found in the exhaust, including sulphur and nitrous oxide, Graham says that they are involved in the process as a "fertilizer" for the algae. Sunlight and water, and waste heat from the plant complete the process.

"You hit it with what it likes to eat — carbon dioxide — it breaks down that carbon chain, retains

the carbon and releases the oxygen molecule," he explains.

The algae will be harvested daily because it does retain carbon — which the plant could potentially run on instead of the coal and pet coke it currently uses to heat its kilns (the algae will be a local strain to ensure biosafety). Graham explains that oil is actually algae combined with three million years of pressure — and the algae used in the test can be burned completely, or the oil squeezed from it and then sold as a biodiesel, or used to power SMC's own trucks.

One of the goals of the project is to determine to what extent the harvested algae can be used as fuel. Algae has the same caloric value as coal, and in some cases, even higher.

"It'll be like growing our own fuel," Vroegh says. It's not only coal and pet coke that contribute to the plant's carbon emissions; the limestone used to make cement contributes about 60 per cent of the carbon coming out of the stack.

"We can turn our second-biggest product manufactured here at the plant — carbon — into something we're not throwing away," says Vroegh. "We'll be able to say we make cement and oxygen here."

The other goal of the test is to ensure the process works on a large scale. Graham says that the process has worked from the beaker stage to a large model on the roof of Pond Biofuels' research centre.

The test will be computer-monitored, and be at least 15 days long; since algae has a short lifespan, Pond Biofuels will be able to determine issues quickly. It is expected to be completed this summer.

Graham says that St. Marys is an ideal site for the test, and, possibly, a permanent farm. Even though the area may not be the warmest, it receives plenty of sun, and doesn't have drastic fluctuations between day- and night-time temperatures.

If the test goes well, SMC could install a full-scale algae farm, as it owns the roughly 300 acres that extend from Highway 7 north to the edge of the town landfill site. The permanent plant could be built as early as next year.

As a potential "world model," Graham adds, "it means all the (other) good stuff — the plant keeps operating, the plant expands, the job stays."

The other environmental benefit of the process is that, unlike wind or solar power, algae power is a remediative energy source; algae is one of the best oxygen producers, which can help dilute the existing carbon dioxide in the earth's atmosphere.

"It harkens back to the issue of being sustainable," Graham says. "The vast majority of money spent on algae in the past was on how to kill it — and that hasn't worked out well because it's the toughest little guy in town."