Issue 1 - 2003/2004

The Canadian Boiler Society Newsletter

CARBON UNDERGROUND

Much of the world points a finger at CO_2. Now it needs a place to hide.
by Jeffrey Winters, Associate Editor, ASME ME Magazine

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Building with gas:

These bricks, fabricated at the Office of Fossil Energy's Albany Research Center, are about one-fifth carbon dioxide by weight

Editors: Sada Joshi, David Frost, Richard Barnes and Louise McColeman

Robert Kane could well have been holding the salvation of the Earth's atmosphere in his hands. It usually sits on a shelf behind his desk, but to illustrate a point, Kane an environmental scientist at the Department of Energy's Office of Fossil Energy, picked it up. "I have in my hand a brick that is comprised of, well, a bunch of things– but by weight, it's 20 percent carbon dioxide," Kane said. "It's permanent storage for CO_2, and it has a lot of potential."

Right now, a CO_2 brick is far too expensive to be economically practical, but it is one example of the lengths researchers are going to find a way to remove carbon dioxide from the atmosphere and lock it away for good.

Carbon sequestration, as it's called, is quickly becoming a cornerstone of the Bush administration's approach to dealing with the issues surrounding global climate change and the influx of greenhouse gases in the atmosphere. Last November, for example, Energy Secretary Spencer Abraham announced the establishment of a network of public-private partnerships to develop a means of permanently storing carbon dioxide from coal-burning power plants.

It's an approach that drives most environmentalists nuts. Many see carbon sequestration research as a diversion from the unfinished task of developing inexpensive, renewable zero-emission energy sources. But even the most optimistic long-term forecasts of energy use suggest that we're not going to abandon burning carbon fuels– not any time soon, maybe not ever. If governments want to avoid increasing atmospheric CO_2 levels– and many, especially in the European Union, have publicly declared their intent to reduce carbon emissions as a step toward averting catastrophic climate change– then finding cheap, permanent carbon skins becomes imperative. Fortunately, there are lots of good places to hide the extra carbon.

Of course, the fact that a preponderance of researchers and governments are convinced that certain that certain gases– CO_2 chiefly, but also methane and nitrogen oxides– are triggering changes in the global climate doesn't make it so. Others have argued that the climate is changing due to naturally occurring factors, or that it is not changing at all.

A Gathering Storm

Nonetheless, geologists have established that atmospheric carbon dioxide levels have risen over the past century. Measurements of air bubbles trapped in glacial ice show that the CO_2 concentration in the atmosphere was 280 parts per million before the Industrial Revolution; current readings are now more than 360 ppm.

And it seems incontrovertible that CO_2 levels are set to rise even more during the first half of the 21st century. The Intergovernmental Panel on Climate Changes has projected energy use to 2050 and beyond. The group's baseline model– a "business as usual" scenario that accounts for an ever-increasing worldwide power demand and predicts no radical move away from fossil fuels– suggests that concentrations of CO_2 could top 500 ppm by mid-century and reach 700 ppm by 2100.

The problem is rising power demands. It's been calculated that in order to create just one dollar of additional gross domestic product, more than 4 kilowatt-hours of power must be consumed. Want to raise average incomes in India or china by $1000? You'll have to develop another 500 GW. Even taking into account long-term gains in energy efficiency, trends in population and economic development suggest that worldwide primary energy

demand will increase from 400 quadrillion BTU, or "quads", at present to some 1,000 quads by 2050. The U.S. alone will require some 260 quads - a 260 percent increase over current consumption.

For sure, renewable energy sources, such as geothermal and biomass, are expected to make up an increasingly large share of total energy production over the next few decades. Solar and wind power have received a great deal of interest, since they are both nonpolluting and potentially inexpensive. Already, wind power is competitive with fossil fuel in some markets and the price per watt for solar cells is dropping rapidly.

But in an argument that inverts the environmental arguments of the last 30 years, some researchers now question whether renewables are plentiful enough to supplant fossil fuels. One of the leaders in this reassessment is Columbia University professor Klaus Lackner, who says the best way to look at the problem is to examine the energy passing through a typical square meter. Lackner estimates that the average flux of solar energy in desert climates, allowing for day and night and weather, is 200 W; the energy of a stiff wind passing through the same square meter is 600W.

If, instead of extracting the energy of the wind, you removed all the CO_2 from a cubic meter of air, Lackner said you could generate some 10,000 W of power through burning fossil fuels before fully replacing the carbon in that volume of air. "The energy represented by carbon dioxide in the air is far more concentrated than the kinetic energy harnessed by a windmill," Lackner said.

That's when the idea of carbon sequestration starts to gain some traction. To people like Lackner, capturing that carbon and locking it away erases the negative impact the fossil fuels have on the atmosphere. A coal-fired power plant that emits no sulfur, NO_x, or CO_2 can be thought of as environmentally benign as a bank of photovoltaic cells or an array of wind turbines. And it can provide far more energy.

Two problems stand in the way of that decarbonized future. The cost of extracting CO_2 from an exhaust stream or the atmosphere is, at present, prohibitive. Kane pegs it at around $100 per ton of carbon about 7.5 cents per kilowatt-hour of power from a conventional coal plant or $1 per gallon of gasoline. "But we're getting a lot of preliminary experimental information that shows the cost of capture is coming down significantly, to as little as $20 a ton of carbon," Kane adds. The DOE has a target of $10 per ton, less than the cost of extracting CO_2 from natural reservoirs.

But once you've captured the CO_2 , you then have to put it somewhere.

But once you've captured the CO_2 , you then have to put it somewhere…

No Free Lunch

One approach that's been popular among policy makers is that of natural carbon sinks: relying on the carbon-fixing activity of plants to remove CO_2 from the atmosphere. One of the reasons for the United States' refusal to accept the Kyoto Protocol on climate change was the Bush administration's insistence on counting tree and plant growth against industrial CO_2 emissions.

Letting trees sop up excess carbon from the atmosphere is an attractive idea: It requires no carbon capturing-in fact, little action beyond planting some seeds - and no infrastructure aside from fields and forests. But the ability of plants to become meaningful carbon sinks is fiercely debated. In December a team of Stanford researchers published a study that suggested expected consequences of climate change, such as higher temperatures and increased nitrogen deposition in the soil, will reduce the rate at which plants can capture carbon. If this and other studies are correct, there will be no free lunch for CO_2.

Another much-discussed sequestration scheme involves capturing CO_2 and pumping it to the bottom of the ocean, where the crushing pressure will keep it in liquid form, pinned to the sea floor for decades. The ocean already absorbs more than two gigatons of carbon a year. And researchers estimate that the deep ocean can hold between 1,000 and 27,000 gigatons more. But adding that much CO_2 might eventually change the ocean's pH balance, making the water too acidic for many types of sea life. And, in terms of CO_2 the atmosphere and the ocean are in balance, meaning that as the level drops in the atmosphere (as it surely must, someday, if these steps are taken) the ocean will become a net source of carbon. That prospect makes sinking carbon in the ocean a temporary fix at best, and not a terribly good one.

Burying Carbon

From a platform in the North Sea, a carbon sequestration project has been up and running since 1996, pumping CO_2 into what looks like a more-or-less permanent storage site. The project, run by the Norwegian petroleum giant Statoil, pulls CO_2 from a stream of natural gas pumped from offshore fields. The CO_2 is then injected down into an aquifer some 3,000 feet below the surface.

Statoil's project in the Sleipner West gas field stores some 2,800 tons of CO_2 a day - about the rate produced by a 140-MW coal power plant. The aquifer is more than 800 feet thick and extends for hundreds of miles. The project manager, Tore A. Torp, contends, "The entire carbon dioxide emissions from all the power stations in Europe for 600 years could be deposited in this structure."

The case for replicating Sleipner's success on a larger scale is compelling. Seams of

Continued Page 5

Canadian Boiler Society News

NEWS FLASH !!!

TSSA-CBS MEETING OCTOBER 10, 2003

Some members of CBS have expressed concern about a lack of consistency in the application of regulations by some TSSA Field inspectors. The Canadian Boiler Society Board of Directors, in response to these comments have arranged a meeting with the TSSA Operations Management at which all members of the CBS are invited. This will provide you with an opportunity to ask questions and voice your particular concern if you have one. It will be held at the CBS Office on October 10, 2003. It will begin at 9:30 am.

Please note that this is a service for members only. The invitation is extended to members and their approved representatives.

All participants must register. To register please send an email with the subject reading TSSA-CBS Meeting and indicate the number of participants attending.

CBS EDITORIAL

ONTARIO'S ENERGY CRISIS

For over three generations, Ontarians have come to rely on a dependable, plentiful, affordable and clean supply of electricity. Thanks to the vision and legacy left behind by Sir Adam Beck (1857-1925), the first Chairman and founder of Hydro Electric Power Commission of Ontario, the province invested in hydroelectric projects to assure plentiful energy to industry and the public. In recent years, for a variety of reasons, the public utility in Ontario ran up a $38 billion debt. Observing that a number of countries, notably Britain, Australia, Norway and Sweden had successfully privatized the power generation industry, the government in Ontario decided to follow suit. A body called the Independent Market Operator (IMO) was set up to buy and sell electricity at the market rate. The "Reliable Energy and Consumer Protection Act" of June 27, 2002 was passed to:

- provide an efficient source of energy and to ensure competitiveness,
- provide the necessary capital for transmission related infrastructure development, and
- eliminate the $38 billion debt.

However, a combination of soaring summer temperatures, a shortage of power within the province, and a shortage of power in the US system led to skyrocketing energy prices. Under public pressure, the government stepped in and "froze" the price of electricity for small users at 4.3 cents per kWh.

The "frozen" electricity price in reality is a deferral of payment. Since the electricity is being purchased at a much higher price than the 4.3 c/kWh selling price, the debt load is increasing. Already, the subsidy has cost Ontario taxpayers over $600 million. Since residents of Ontario are getting their electricity at a subsidized rate, the average citizen is no longer feeling the urgency for energy conservation. With conflicting signals sent to the private sector by the government and the potential threat of low cost nuclear power, the additional generating capacity created in the private sector has been minimal. In order to meet the peak demand in the summer of 2003, the government explored its options including portable diesel generators and gas turbines to avoid brown-outs.

It is ironic that the province of electricity shortage is also home to some of the most respected boiler manufacturing companies in the world. These companies can supply a range of products and services to solve this problem, while meeting both the power and the environmental needs of Ontario. Ontario designers and manufacturers have built the most reliable and cost effective steam generating equipment for nuclear and fossil power generation. Innovative solutions exist for controlling pollutants and for improving plant efficiency. Restoration of the existing nuclear and fossil fuel fired plants in a fiscally well-managed manner is the best short-term solution. Soon, we will see the return to service of Pickering A Unit 4 and Bruce A units 3 and 4. Together, they will bring in over 2,000 MW of emission-free power.

The future energy plan should include refurbishment of remaining Pickering and Bruce units, and adding the latest technology to minimize emissions from existing coal plants. Baseline loaded nuclear and coal fired capacity will bring stability of supply at the lowest price. Additional gas turbine/HRSG units should be installed to provide peaking power and spinning reserves. Let's hope that our leaders will see the value of investing in Ontario instead of continuing to pay large sums of money for importing power.

RATIFICATION VOTE ON THE KYOTO ACCORD

The following is a letter that was developed by the CBS Board of Directors and sent to the Prime Minister's office regarding the Kyoto Accord.

Canadian Boiler Society News Continued

Honourable Prime Minister Jean Chrétien, Honourable Minister of Environment, David Anderson and the Honourable Minister Paul Martin, and local Members of Parliament:

Dear Mr. Prime Minister and Honourable Sirs,

The Canadian Boiler Society (CBS) strongly believe that the passage of legislation by the Government of Canada adopting the Kyoto Protocol without a technically and economically feasible plan, acceptable to the Provinces, will have a negative impact on the economy of Canada that will affect the life style of every Canadian for many years to come. After making these sacrifices, there is no certainty that meeting the Protocol targets will result in a significant reduction in world wide carbon dioxide emissions or a measurable effect on global warming.

The members of CBS are engaged in applying state of the art technology to convert fossil fuels into useable energy for both industrial process and the electric power generation. All of the processes employed use sound engineering principles to maximize the efficiency of the conversion and mitigate combustion emissions, which are proven to have a harmful effect on the environment. As new technology is developed, the best processes are generally adopted by our customers, resulting in the responsible removal of many tons of harmful emissions.

The members of CBS are not in a position to assess the credibility of the conflicting scientific viewpoints on global warming. However, the Canadian Boiler Society membership, after many years of involvement on technical councils at various levels of government helping to develop responsible goals for public safety and for efficient use of Canada's resources, believe the selection of targets and implementation of those targets for reduction of green house gas emissions has been poorly conceived without adequate scientific evidence or sufficient consultation with technical experts in Canadian industry.

For the Government of Canada to sign this accord without a clear understanding of the technological feasibility of the plan, would leave the Canadian people with a legacy that would put the entire economy at a disadvantage with Canada's trading partners, subsidize foreign economies for inaction through the trading of emission credits and commit to developing questionable new technology without evidence or assurance that it would have a significant impact on the world environment.

The CBS urges the political leaders to carefully weigh the impact of implementing the Accord and the shift in allocation of Canada's economic resources before casting a vote in favour of emission targets for greenhouse gas without a technically and economically responsible plan.

On Behalf of the Canadian Boiler Society - President – Mr. Richard Barnes, Chairman – Mr. David Frost and Vice Chair – Mr. David Duthie

Response:

I wish to thank you for your e-mail regarding the Kyoto Protocol.

As you are no doubt aware, on December 10, the House of Commons voted overwhelmingly in favour of ratifying this international agreement to combat climate change. Global climate change is a pressing international problem, for which the Kyoto Protocol is a first step toward a solution. Canada must do its part in the global community and taking action is in our interest. Adverse effects of climate change could include droughts of increasing frequency and severity; reduced water levels in the Great Lakes and St. Lawrence River; changes and reductions in the marine fishery; melting permafrost levels; and an increased number of heat waves. All of these could have serious implications for our economy and the health and well being of Canadians.

On November 21, we released the Climate Change Plan, which we will use, in collaboration with our partners, as the basis for the reduction of greenhouse gas emissions within the global framework of the Kyoto Protocol. In the weeks ahead, the Government will continue intensive consultations with provinces and territories, industry and stakeholder groups as we work together on implementation issues in order to meet our target under the Protocol in a cost-effective, fair and environmentally sustainable way. Meeting the challenge of climate change is a national project, one that will call upon the efforts and contributions of all Canadians, in all regions and sectors of the economy.

As the Prime Minister said after signing the instrument of ratification on December 15, By working together, setting targets and time frames, and focusing on results, I know we will succeed. We will make Canada and the world a healthier place for ourselves and for generations to come.

Thank you for taking the time to share your views on this important issue. You may be assured that they are appreciated.

L.A. Lavell
Executive Correspondence Officer / Agent de correspondance de la haute direction

New Member Company Profiles

The Canadian Boiler Society is proud to introduce...

QUALITY TUBE SUPPLY LTD
(CBS contact - Gordon Sharp)

Quality Tube Supply is the Canadian leader in the supply and distribution of tubing for the condenser, heat exchanger and air cooler industry. Their warehouses in Calgary, Alberta and Ancaster, Ontario, service requirements from coast to coast for both "just in time" and mill direct supply of these specialty tubes.

Quality Tube stocks a complete selection of seamless and welded, carbon, alloy, stainless and non-ferrous tubing in two 30,000 + sq. ft. facilities each equipped with 10 ton overhead cranes and two cutting lines to insure the customer gets the exact finished product they require, in a timely fashion.

As a result of the expansion to the new Ancaster facility, Quality Tube Supply has now added a full line of welded carbon boiler tube to their growing list of products. It is Quality Tube's intention to bring the same high level of service, competitive pricing, global sourcing and quality that has earned it a respected position in the marketplace over the last 14 years, to the boiler industry. Quality Tube plans to continue to expand within the boiler industry and ultimately stock a wide assortment of seamless boiler tube.

LIPTEN ENERGY CANADA INC.
(CBS contact - Paul J. Henry)

Lipten Energy Canada Inc. is the Canadian subsidiary of Lipten Company, Inc., Wixom, MI. Since 1969, Lipten has specialized in Energy Centres, Control Systems and Related Projects. Operating as an EPC provider, Lipten offers complete engineer, procure, and construct services. With 30-plus years of serving institutions, industries and municipalities, across the United States and Canada, Lipten is a Hands-On EPC contractor that has been able to carve out and retain a niche market to service municipal utilities and industrial power plants. Visit the Lipten website at: www.lipten.com for more details.

On behalf of all Company Members of the Canadian Boiler Society, we would like to welcome you and look forward to building new relationships and networking contacts.

Carbon Underground continued

gas-such as CO_2 and methane are found in all sorts of geological formations, captured or produced through natural processes. (There would be no natural gas industry, after all, without natural gases.) Under layers of impermeable clay or shale, these gases can lie trapped for millions of years. In more porous strata, however, gas can burble back to the surface.

Scientists are actively tracking gas leakage from various types of geologic formations. For now, the gas injected by Statoil seems to be staying put. "The question is how long is long enough," said Sally Benson, director of the Earth Sciences Division at Lawrence Berkeley National Laboratory. Benson is leading a government effort to study geological carbon sequestration options. "If you have leaking at a rate of 0.1 percent or 0.01 percent a year, then I think sequestration will be very effective."

The project at Sleipner aside, CO_2 is already being bought on the open market and being pumped into underground reservoirs, although on a modest scale. Producers have known for some time that injecting CO_2 into an oil reservoir will help push oil toward the production well, extending the potential recovery from a mature well by 10 to 15 percent. In one operation, PanCanadian Resources in injecting some 5,000 tons a day of CO_2 piped from a coal gasification plant in North Dakota into the Weyburn oil field in Saskatchewan; this will extend the productive life of the field by 25 years.

CO_2 can also be used to extract methane from coal seams. Long the bane of miners, methane is often pumped out of coal beds, but the gas molecules prefer to stick to the surface of the rocks. Those rocks turn out to be more attracted to CO_2 than to methane, so if CO_2 is pumped into the coal seam, the rocks release the methane, creating a larger pool of recoverable gas.

Oil wells and deep coal seams provide huge potential reservoirs for sequestering carbon dioxide. Geologists estimate that as much as 500 billion tons of carbon-about two thirds of all the carbon in the atmosphere today-can be locked away in such sites.

Unfortunately, that still isn't enough. To keep atmospheric CO_2 at current levels-that is, about 30 percent higher than the pre-industrial rate-a much larger reservoir will be needed. Saline aquifers trapped in formations more than a mile below the surface offer perhaps the best sites for permanent carbon storage. The capacity is huge-500 billion tons in the United States alone. Taken together, Benson said, geologic formations have the potential to store every gram of projected CO_2 emissions for the next 100 years.

Conclusion Page 8

Annual General Meeting 2003, London, Ontario

The Canadian Boiler Society's (CBS) Annual General Meeting 2003, was held May 25-27, at the Delta Armouries Hotel, London, Ontario. It was a great success. We had a terrific turnout and everyone had a fantastic time.

THE GOLF TOURNAMENT





The golf tournament was a great success!

The winning foursome was actually the winning threesome. The group that won was Ted Kusz, Ryan Tangney, and our Chairman David Frost.

Congratulations gentlemen!

The winning foursome for the most honest were Ken Parry, Glenn Harrison, Richard Barnes & Frank Morrison. Honest men like these are hard to come by!

The winner for the longest drive was a newcomer and his name is Gordon Sharp from Quality Tube Supply Co.

Congratulations Gord! You beat them all first time out! Glenn Adgey was honored to hand Gord his prize.

And finally the winner for the best score was Ryan Tangney.

Congratulations to all the players. It was a great day and everyone had a lot of fun.

THE TOUR

This year the CBS toured Labatt's Brewery. Everyone who attended this tour had a great time.

A special thank you to Jana-Lyn the tour guide at Labatt's for her bubbly and friendly personality that kept everyone smiling.

THE CHAIRMAN'S DINNER

Everyone had a great time at the Chairman's Dinner. There were so many prizes that some participants received more than one. The food was great and the company was better.

Anne Kraemer
Kerry and Lena Johnson

Marianne Odell, Ted Kusz, Pat Smith, Bryan Heppell, Gord Sharp and Mark Ingham

THE BUSINESS SESSION

The CBS business meeting was held on May 25-27, 2003. The theme was Boiler Feedwater.

It was an exciting meeting. Quality Tube Supply is a new member to the Canadian Boiler Society. Quality Tube Supply was represented by Gordon Sharp.

There were a few changes to the Board of Directors. Ryan Tangney replaced Jim McArthur of Innovative Steam Technologies. Frank Morrison of Bigelow-Liptak has been the Program Committee Chair for many years. Frank has resigned from this position. He remains on the Board of Directors and has been assigned other responsibilities. The Canadian Boiler Society would like to thank Frank for all the success he brought to the many planned events of the Canadian Boiler Society. Glenn Harrison of ABB Inc. was elected for this position and introduced himself as the Chair of the Program Committee during the business meeting.

The theme of this AGM was Boiler Feedwater. There were speakers from Ashland Drew Canada and Klenzoid. Thank you to our speakers for the interesting and informative discussion.

Lorne Smith was generous to share his time with the Canadian Boiler Society to deliver a technical presentation. For a copy of this please contact the Canadian Boiler Society office.

The May 2004 AGM is gong to be great!

The Canadian Boiler Society is headed for Québec! the beautiful city of Montréal. Start planning today to attend. This is a great opportunity to network, socialize and have a lot of fun! Hope to you see you there May 2004!

BOARD OF DIRECTORS

President	Mr. Richard Barnes
Chairman	Mr. David Frost
Vice-Chair	Mr. David Duthie - Membership Committee Chair
Treasurer	Mr. Kerry Johnson
Member	Mr. Glenn Harrison - Program Committee Chair
Member	Mr. Glenn Adgey - Technical Committee Chair
Member	Mr. Sada Joshi - Communications Committee Chair
Member	Mr. Frank Morrison
Member	Mr. Ryan Tangney
Member	Mr. Bryan Heppell

2003 - Fall General Meeting Mississauga, ON, October 24, 2003

The Fall General Meeting will be held on October 24, 2003 at the Holiday Inn Select Hotel in Mississauga, Ontario, located at 2565 Argentina Road. The **Theme of the FGM is BURNER TECHNOLOGY.**

Keith Farrell of RIELLO Burners, a member company, will be delivering the presentation, followed by an active discussion. **RIELLO Burners** has generously offered their facility for the tour.

The CBS would like to thank Keith Farrell and RIELLO Burners in advance for offering their time and facility to our members and colleagues.

If you are interested in attending please complete the attached registration form and fax it to the CBS office by October 10, 2003, at 416-252-5335. If you have any questions please contact Louise McColeman at the CBS office.

2004 - Annual General Meeting Montréal, Québec, May 2004

The Spring AGM is scheduled for **May 30 - June 1, 2004. It will be held in Montréal** Québec. The hotel and golf course will be announced in the next newsletter. A block of rooms will be held.

Le Groupe Simoneau Inc., a member company has generously offered their site facility to tour. The CBS would like to thank Le Groupe Simoneau Inc. in advance their generosity.

PLAN AHEAD AND JOIN THE FUN! MARK THIS DATE ON YOU CALENDER TODAY!
DON'T MISS THE 2004 AGM!
MONTRÉAL IS A BEAUTIFUL CITY !

Carbon eraser:
The saline aquifer beneath this Statoil platform in the North Sea has the potential to store the carbon dioxide emissions from every European coal-fired power plant for the next 600 years.

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Please submit any company news you would like published in the next CBS newsletter by fax to 416-252-5335 or by email to info@canadianboilersociety.ca.

WE'RE ON THE WEB!!!
www.canadianboilersociety.ca

The Canadian Boiler Society Member Companies

ABB Inc.
ANRIC Enterprises Inc.
Aqua Chem Cleaver Brooks of Canada
Armour Valve Ltd.
Ashland Drew Canada
Babcock & Wilcox Canada
Bigelow-Liptak of Canada Limited
Boiler Inspection & Insurance Co.
Clayton Sales & Service
COEN Burners Canada Inc.
Enbridge Consumers Gas
Fireye Canada
Innovative Steam Technologies
Johnson Paterson Inc.
Klenzoid Co. Ltd
KMW Systems Inc.
Le Groupe Simoneau Inc.
Lipten Energy Canada Inc.
MBB Power Services Inc.
McRae Engineering Equipment Ltd.
Miura Boiler Company Ltd.
Pendell Boiler Limited
Quality Tube Supply Ltd.
Riello Burners
Superior Boiler Works Welding
Thermogenics Inc.
Unilux Boilers Ltd.
Vapor Power International
Waterloo Manufacturing Co. Ltd.
Weishaupt Corporation

Making Rocks

Geologists know of another, natural mechanism for getting rid of excess carbon from the atmosphere. CO_2 and water carbonic acid, which then reacts with certain minerals, such as magnesium-rich serpentine, to create quartz and the kinds of rocks called carbonates. Of course, these carbonates formed through the weathering of precursor minerals over the course of millions of years.

But researchers have explored ways to speed things up a bit. "We're accelerating the rate at which the rocks weather," said Richard Walters, associate director of the Office of Fossil Energy's Albany Research Center in Oregon. "What normally takes geologic time to convert, we're trying to convert in engineering time." If CO_2 can be locked up into carbonates in a matter of minutes, the process might provide a lasting means of sopping up excess carbon.

The process made at Albany and other labs is impressive. They're found, for instance, that by heating the serpentine, modifying the carbonic acid with bicarbonate and salt , and increasing the CO_2 pressure, 80 percent of the magnesium silicate can convert to a carbonate in about 30 minutes. But much more work needs to be done, especially in finding alternative reactions that don't require adding heat to the system.

The question remains: What do you do with the tons of carbonate churned out every day? You could bury some of it back in the pit where the serpentine was mined, but the volume of the carbonate exceeds that of the stock minerals. Researches at Albany have been working on that problem, too. The brick that Kane has in his office? They made it. "It's a nice demonstration piece," Walters said. But it's far from a practical answer: The brick was made from magnesite particles bound up by common wood glue.

"Still, given the amount of material we could be generating," Walters said, "you want to do something with it."

Surely, someone will come up with a way to make something useful out of all that carbonate. If not bricks or building blocks, then fertilizer or fireproofing. After all, our treating an industrial byproduct-CO_2-as worthless waste is why carbon sequestration has become a research topic in the first place.

Please continue your support of ASME. ASME is an organization that continues to provide our industry with essential information that is current. ASME has many committees that require volunteers. Helping them helps you. For more information about becoming a member please visit
http://www.asme.org/member/