



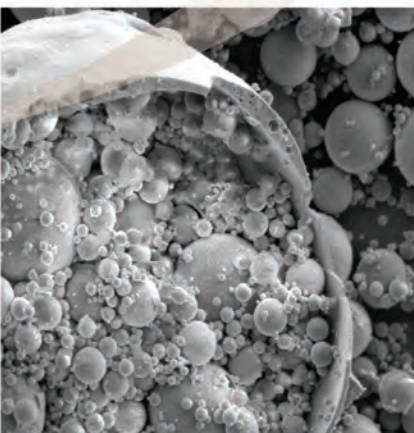
SUSTAINABLE COAL ASH



University of British Columbia's Liu Centre for Global Issues is constructed with recycled materials including high volume Fly Ash concrete.



The fine, durable finish of York University's Student Services Parking Garage is attributable to the use of high volume Fly Ash concrete. *Photo courtesy of Monica Contreras.*



Electron micrograph of Fly Ash particle (4000x). *Photo courtesy of Natural Resources Canada.*

In Canada, industry response to demands for more sustainable practice is demonstrated across market sectors through initiatives ranging from revised practices^[1] and specifications^[2] to new programs^[3,4] that support a greener future.

The goal of more sustainable practice has inspired diverse contributors to look beyond traditional practices and to undertake working relationships in the interest of mutual benefit.

Coal Fly Ash, Bottom Ash and FGD Gypsum are by-products of ongoing^[5] industrial processes; "recycling these materials as raw materials for another process creates... relationships between industries that move society closer to a zero-waste economy."^[1] In this way, coal-fuelled power generation can support the efficiency and productivity of other industries by:

- reducing consumption of virgin, natural resources;
- reducing energy use and the GHG emissions associated with many manufacturing processes;
- improving the environmental and technical performance of other manufactured products.

Industry-government alliances support the increased use of Fly Ash as a means to improve the sustainability of concrete construction.

Recycling these products retrieves value intrinsic to recycled materials and reduced waste streams:

- recovering minerals from natural resources and energy expended to produce electricity;
- reducing landfill (for disposal of by-products from industrial processes);
- reducing operating costs (of landfill maintenance and management) with

revenues from recycling materials into other applications.

Coal Fly Ash, Bottom Ash and FGD Gypsum can greatly improve the environmental footprint of needed materials, manufactured products and construction projects, including applications for:

- aggregates
- de-icing material
- grouts and mortars
- paints and plastics
- concrete and cement
- roadbeds
- roofing shingles
- wallboard
- waste stabilization
- soil solidification
- agriculture
- mining

As the public becomes increasingly motivated by sustainability issues, industry is capitalizing on opportunities to showcase environmentally-responsive improvements that reap economic and social rewards.

So successfully has this transpired in the power generation and concrete industries^[6] that industry-government alliances have forged collaborative efforts to support the increased use of Supplementary Cementing Materials (SCMs), including Fly Ash, as a viable means to improve the sustainability of concrete construction:

"Industry has recognized the value of SCMs for Portland Cement as a means to enhance concrete from both a performance and environmental perspective...The Use of SCMs in concrete as a partial substitution for Portland Cement provides a means to reduce GHG emissions..."^[7] while increasing the design life of concrete.

As a consequence, barriers to SCM use have been reduced, and over recent years much needed technical information^[8] has been produced to encourage the successful use of SCM concrete.

Continued...



SUSTAINABLE COAL ASH (CONTINUED)



The 12.9 kilometre Confederation Bridge, completed in 1997, links Prince Edward Island to New Brunswick. Its 100-year design life was achieved with high performance, precast, Fly Ash concrete mix designs.



50% Fly Ash was used to reduce the heat of hydration of Calgary Courts Centre's concrete footing. Photo courtesy of Lehigh Inland Cement Ltd.

The restoration and life cycle performance of our primarily concrete infrastructure is central to a robust Canadian economy. Since the "use of SCMs helps to produce more durable concrete" ^[9] in a more sustainable way, we are seeing the political will to follow through to realize the material and energy efficiencies sought by proponents of green building practice.

"We can use tax dollars more wisely and at the same time protect our environment and our health. The Government of Manitoba green buildings policy will require all new capital projects to be certified Leadership in Energy and Environmental Design (LEED) Silver by the Canada Green Building Council. Both government and the private sector recognize that green buildings make good economic sense." ^[10]

The beneficial use of recyclable materials is good business. In competitive markets, where profitability is enhanced by cost-effective practices that maximize outputs, improve product quality, and provide value to customers, recycling can offer an edge on the competition. Cementitious blends with Fly Ash answer both the consumers' traditional needs (for concrete strength, workability and economy), and their sustainability objectives, yielding improved recycled material content, reduced GHG emissions per cubic metre of concrete and improved concrete quality.

Recycling coal combustion products allows industries to improve their bottom line while improving their operations' environmental sustainability.

References:

1. *Guidelines for the Selection and Use of Raw Materials in the Cement Manufacturing Process, Cement Sustainability Initiative*, December, 2005: http://www.wbcscement.org/pdf/tf2/tf2_guidelines.pdf
2. CSA A 3001 "Cementitious Materials for Use in Concrete", 2005 & CSA A 23.1 - 04 "Concrete Materials and Methods of Concrete Construction"
3. North America's leading green building program, LEED is actively promoted by the Canada Green Building Council: <http://www.cagbc.org>
4. Action Plan 2000 on Climate Change: Supplementary Cementing Materials Program: <http://www.scm.gc.ca/ap2k.html>
5. 21.6% of Canada's electricity generation is from thermal power; [such] "conventional technologies are essential to meet demand... and can contribute to emission reduction targets". *Energy Security: a North American Concern*, Canadian Electricity Association, March 2007: http://www.canelect.ca/en/Pdfs/3395_CEA_NA_paper_EN_Final.pdf
6. CIRCA is a Canadian, non-profit Association of Coal Combustion Product producers and marketers, dedicated to increasing the technically sound, environmentally responsible, and commercially competitive use of CCPs as mineral resources
7. *A synthesis of Data on the Use of SCMs in Concrete Pavement Applications Exposed to Freeze/Thaw and Deicing Chemicals*, N. MacLeod, P.Eng., for Cement Association of Canada, March 2005: <http://scm-ac.gc.ca/docs/pavements.pdf>
8. *Use of Fly Ash and Slag in Concrete: A Best Practice Guide*, N. Bouzoubaa & S. Foo, Materials Technology Laboratory, January, 2005: http://scm-ac.gc.ca/docs/best_practices.pdf
9. SCM Basics, EcoSmart Foundation, 2007: http://www.ecosmartconcrete.com/facts_scm_basics.cfm
10. "Green Buildings Policy One of North America's Most Progressive: Chomiak... All New Provinciallyfunded Buildings to Meet International Environmental Standards" Manitoba News Release, June 2006: <http://www.gov.mb.ca/chc/press/top/2006/06/2006-06-15-01.html>

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