

ECOSMART™ CONCRETE Project

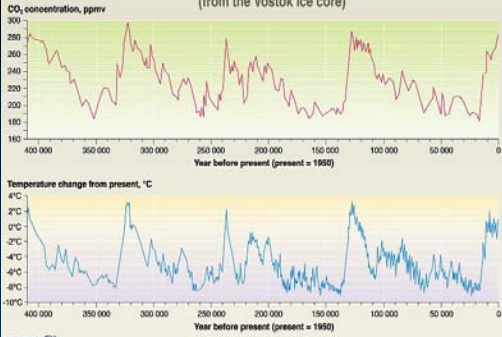
a concrete contribution to the environment

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CIRCA Seminar

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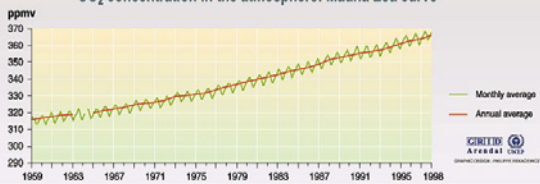
Temperature and CO₂ concentration in the atmosphere over the past 400 000 years
(from the Vostok ice core)



Source: J.P. Petit, et al., *Climate and atmospheric history of the past 400 000 years from the Vostok ice core in Antarctica*, Nature 399 (6783), pp 429-435, 1999.

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CO₂ concentration in the atmosphere: Mauna Loa curve



Source: Scripps Institution of Oceanography (SIO), University of California, 1998.

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EcoSmart Objectives

To minimize GHG "signature" of concrete by optimizing replacement of Portland cement with SCM while improving or maintaining

- Cost
- Performance
- Constructability

EcoSmart is a non-profit organization based on a partnership between

- Federal government
- Building industry
- Building professionals

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SCM : Traditional

SCM	Production 2001	Useable as SCM	Used
Fly Ash	4,800,000	2,200,000	450,000
BFS	1,500,000	380,000	216,000
SF	20,000	20,000	20,000

Source: Canmet

Case Studies

How much SCM replacement can be achieved, what effect on:
Cost – Performance - Constructability

As experienced by

Supply

Cement manufacturers , ready-mixed concrete producers, SCM producers / suppliers

Design

Developers & owners, architects, structural engineers, Material engineers & test labs, code officials

Build

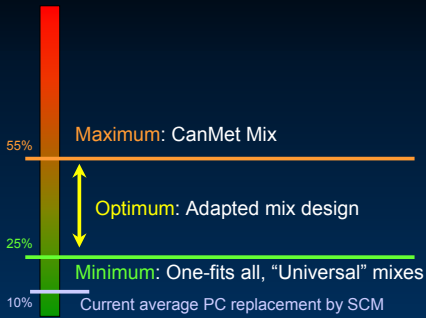
Contractors, Sub-trades (concrete placers, finishers, form installers)

Learning by doing

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Case Studies



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50% FA



- Greater strength @ 56d
- Superior appearance
- Less water
- Excellent workability
- 'Repeated customers'



- More cementitious
- Increased setting time at low temp
- Contractor training
- Finishing slab @ low T & low w/c
- Curing

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Parameters

Material

Type of SCM: FA, GGBFS, SF, other
Cost, Availability, distance

Technical

Type of element: slab, walls, footings, ..
Strength: Stripping, 28d, 56d
Durability, resistance to scaling, exposure
Curing, carbonation
Standards, liability

Construction

Placing, finishing, forms, curing
Setting time: Stripping and finishing
Architectural aspect: Color, texture, finish

Environment

GHG Signature
Waste reduction
Expected lifespan

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Industry decision-makers

Supply

- Cement Manufacturers
- Ready-Mixed Concrete Producers
- SCM producers / suppliers

Design

- Developers
- Architects
- Structural Engineers
- Material engineers & test labs
- Code officials

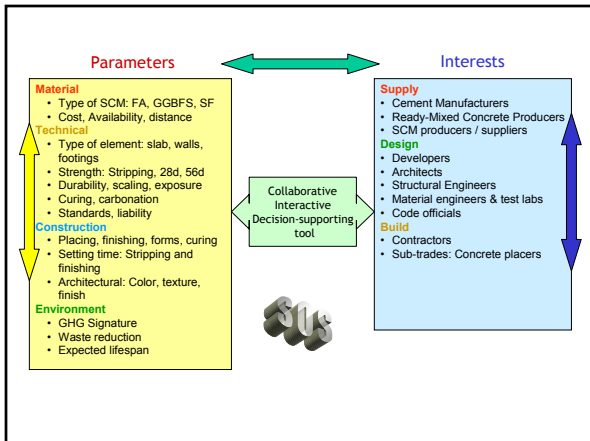
Build

- Contractors
- Sub-trades: Concrete placers



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Conclusion

SCM Optimization System

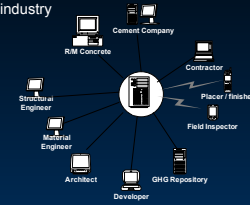
- Decision-supporting computer to optimize concrete performance according to multiple criteria.
- Collaborative, adapted to the needs of all industry stakeholders

Three years project

- Identify resources and define scope
- Develop algorithm and database
- Develop computer system and interface
- Validate on cases studies.

Resources

- Government of Canada (SDTC)
- Consortium



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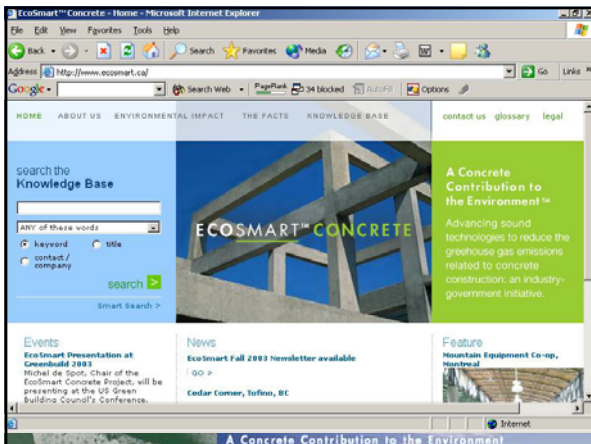
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Conclusions (the last decade)

1. Climate Change a reality - **Kyoto, credits, regulations.**
2. Greater SCM awareness – **Case studies**
3. Increased use when possible - **greater average, blended**
4. From 50% to optimization – **as result of case studies, SOS**
5. Revised CSA standard – **HVSCM-1 & -2**
6. Value and Precautions – **Performance, carbonation**
7. Performance Specification – **Proprietary Mix Design**
8. Green Building movement – **LEED**

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Thank You

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knowledge base

www.ecosmart.ca

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