Asian Concrete Federation E-Newsletter

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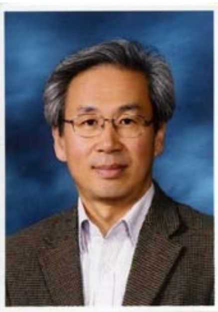
The theme of this edition of ACF E-Newsletter is Environmental Friendly Concrete (EFC) and Sustainable Construction Technology (SCT).

In order to get a glimpse of the opinion on this topic from a specialist of this field, ACF E-newsletter invited Prof. Donguk Choi who is a chair of Korea Concrete Institute's Sub-committee on Environmental Friendly Concrete.

He is also a professor in the Dept of Architectural Engineering at Hankyong National Univ. who has been involved with many researches on the topic of Environmental Friendly Concrete and Sustainable Architectural Constructions.

INTERVIEW

Donguk Choi
Professor of Hankyong National University



What are your thoughts on the broad picture of Green Concrete?

Dr. Kim, thank you for specifically adding the term "broad" before "Green concrete," because I don't think there is a consensus for what is the meaning of "Green Concrete" yet. For example, it can be as small as a special technology for growing plants on concrete.
On the other hand, it can be large enough to comprehensively include the production of cement, mix design and production of concrete, and the production and use of all constituent materials in as many environmentally-friendly ways as possible. Perhaps we should define the exact meaning of the term "Green Concrete" if we want to create concrete that is more "Green" in the future.

What are the important issues to consider when approaching the topic of Environmentally Friendly Concrete (EFC) or Sustainable Construction Technology (SCT)?

What is the meaning of the term "environmentally friendly"? I think that the term should mean less energy consumption and smaller green house gas (GHG) emission. So the EFC would mean concrete that require less energy and emit less CO_2 in its whole life cycle of production, construction, maintenance, operation, disposal, and recycling. About the SCT, Dr. Mehta of U.C. Berkeley wrote an article in a recent issue of ACI's Concrete International where he stressed the importance of consuming less concrete for new structures, less cement in concrete mixtures, and less energy for producing cement. Of course many people would agree with his idea since the production of 1 ton of cement means the consumption of about 4 GJ of energy and more than 1.5 ton of natural resources such as limestone, which results in emission of about 900 kg of CO_2. So should we begin to cut down on the amount of cement production right now? It's a difficult question to answer, especially in Asia. According to a report by the UN Future Forum, the world population is 67 billion currently and the number is expected to grow to 92 billion by 2050. Most of the population increase will take place in developing countries and there are more developing countries in Asia than in Europe. Therefore, these Asian countries need to build roads, harbors, railways, residential and office structures and so on where cement and concrete are required to accomplish these tasks. The statement made by Dr. Malhotra of CANMET in a presentation at a recent sustainability workshop in Taiwan reflects the dilemmas and solutions to this tough question.
"The answer to the question 'Should cement production be phased out?' is of course NOT. On the other hand, the answer to the question 'Should we build new cement plants?' is probably No, because there is the option of using more cementitious substitutions such as fly ash and ground blast furnace slag. We have to find ways to further develop and utilize technologies to use more cementitious materials, utilize more recycled aggregate from waste concrete, and produce less construction waste by designing and constructing more durable concrete structures."

What do you think are the differences between mostly developed continents such as Western Europe or North America to still developing countries such as Asia or Eastern Europe on the issue of EFC or SCT?

In 2005, Asia was responsible for 67.9% of world's cement production (about half of this amount was produced in China) while Europe and U.S. produced 13.6% and 10.4%, respectively. The WBCSD-CSI is an international organization of world's 18 leading cement manufacturers, and they have set up an action plan to reduce 10-25% of the CO_2 emission from the cement industry by 2015. The CEMBREAU of Europe has similar action plans. My point is that the EU countries already have established systems by which they can quantify and report the amount of energy, resources, and GHG and have set up action plans to cut the amount while the Asian countries have not. Fortunately, in the ACF, the TG3 will perform a two-year "Survey on statistical data of constituent materials and production of concrete in Asian countries" and I think it is important to carry this task out. Based on such knowledge-based database, we can start to assess the environmental aspect of the Asian concrete industry, set up a strategic plan, and try to mitigate the environmental impact.

What steps should we take in Asia region to become successful in EFC and SCT?

Perhaps I can give you an efficient response to this question using Korea as an example. As you may already know, in Korea, nine cement manufacturers have produced about 51 million tons of cement last year. Also, as a bi-product of steel manufacturing, 9.5 million tons of blast furnace slag was supplied while 77% of this was utilized by Korean cement industry. The amount of ground blast furnace slag supply will increase in the future as new blast furnaces are under construction. Over 5 million tons of fly ash was produced from coal fired power plant and about 70% has been utilized by the cement and concrete industry.

The construction waste constituted about 53% of all waste generated and the amount of waste concrete was 40 million tons in 2006. Therefore, to become successful in EFC and SCT in Korea, we need to use more recycled cementitous materials and use more waste byproducts, for example, in the form of recycled aggregate in concrete.

Other recycled materials can be utilized as aggregate such as copper and zinc slag, and slag from electric arc furnace mills although further research is needed in this area. There are needs for more research on the high-volume fly ash in Korea. Let me add that the Korea Concrete Institute (KCI) is developing a performance-based concrete design code and concrete specification which, in my opinion, is another important sustainable concrete technology.

One of the most important policies of the Korean government presently is the development of "Low carbon green growth" technologies since Korea is a producer of a large amount of green house gases (for example, 590 million tons of CO_2 in 2005). Recently, the Korean Ministry of Land, Transportation and Maritime Affairs (MLTM) requested the KCI to submit research proposals that are in line with this Low Carbon Green Growth policy. I proposed to suggest a new guideline for Environmental Performance Verification for Concrete Structures, a document similar to JSCE-7 developed by Dr. Sakai of Kagawa Univ. I agree with the fundamental idea in that from this day on a concrete structure should be designed to satisfy requirements regarding the structural safety, serviceability, durability as well as environmentality.

Would you like to make any final comments before we end the interview?

The ACF may consider announcing some type of environmental declaration in the near future. I know that AIJ already did this in 2000. ACI also announced a strategic document called Vision 2030 that includes commitment for sound energy use and environmental protection. A similar declaration by the ACF would heighten the level of environmental awareness in many ACF member countries.

What's ACF objective ?

- Initiation and support of international collaborative activities for development of research and technology relating to various aspects of concrete and concrete structures.
- Dissemination of useful information on concrete and concrete structures by way of publications, conferences, symposia, workshops and/or seminars.
- Promotion of updating and revising concrete codes/standards on structural design, materials, construction and maintenance through development of new knowledge to meet the latest needs.
- Interaction with the members and keeping them aware of the activities of the Federation.

Sustainability in Concrete / Construction Sector

Koji Sakai

Professor of Kagawa University

The history of mankind has in some respects been a history of infrastructure building for socioeconomic activities. The history of ancient Rome spanning 1,000 years was only possible because its policymakers were keenly aware of the importance of infrastructure. Writer Nanami Shiono pointed out that the ancient Romans seem to have regarded infrastructure development as a major undertaking essential for humans to live like humans. Any activity of humans needs appropriate facilities. Materials and design/execution techniques are indispensable for constructing facilities. Marcus Vitruvius Pollio, a Roman architect, wrote in the first century B.C. *De architectural*, a treatise on architectural, civil engineering, machine, and weapons technologies. As seen from remains from the dawn of history, mankind has built such facilities since ancient times, seeking to protect the state, make life comfortable, and carry out various activities in a rational manner.

However, humans are now faced by three major problems: food, resources/energy, and climate change problems, which are closely interrelated with one another. As to the food problem, the effects of population growth, improvement in living standards, production of biofuel, and drought induced by climate change have become evident. On the other hand, the wide scatters of coal and crude oil prices and climate change resulting from their mass consumption signify the collapse of the fossil fuel-dependent system mankind has elaborated since the Industrial Revolution. Climate change due to global warming gases is an 'incident' that mankind has never expected. It was the fourth evaluation report by the United Nations Intergovernmental Panel on Climate Change that pointed out for the first time on a scientific basis that human activities can have an impact on the climate of such a large body as the earth. This report led to the agreement urging the world to make efforts to drastically reduce greenhouse gas emissions at G8 summits held in Germany and Japan – a great step forward for mankind.

While developed and developing countries disagree regarding the framework of global warming gas reduction following the expiration of the commitment period under the Kyoto Protocol in 2013, it is definite that the energy system dependent on fossil fuels must change. It is also clear that natural resources depletion will become a serious problem in the near future in consideration of the economic growth of developing countries. Therefore, mankind should seek the establishment of a socioeconomic system whereby maximum benefits can be obtained from minimum energy/resources.

Though enormous resources and energy are currently consumed for infrastructure development, techniques required for this purpose have significantly changed with the times. As for the materials, stone and cement have long been used since ancient times. The use of modern cement dates back to 1824 when Joseph Aspdin, a British cement manufacturer, was granted a patent for its production method. Despite its short history of less than 200 years, the excellent properties of cement concrete as a construction material have led to a dramatic increase in its use over this period.

The world's cement production amounted to 2.77 billion tons in 2007, of which Asia accounts for 70%, and is expected to multiply, or at least double, by 2050. Though the specific CO_2 emission from cement production widely varies from country to country and from plant to plant, the CO_2 emission in 2007 totals approximately 2.4 tons by a specific CO_2 emission of 0.87 (kg-CO_2/kg-cement), the average of data available from countries/regions. Cement production is not the only source of CO_2 emission from the activities of the concrete sector. The author estimates the total CO_2 emission from the world's aggregate production/transportation, cement production, concrete production/transportation, electrical-furnace steel production, blast-furnace steel production, and construction to be approximately 5.5 billion tons. Modestly assuming that this will double in the future, the total CO_2 emission will be 11 billion tons, which is equivalent to 40% of 27 billion tons, the world's total CO_2 emission derived from fossil fuels in 2007. Though this is based on a very rough calculation, the value may not be unrealistic in consideration of the significant growth of the world's future infrastructure development. In other words, infrastructure building has a grave impact on global warming. It is therefore evident that the construction sector must make utmost efforts to reduce its CO_2 emission from now on.

With this as a background, world's academic and industrial societies related to concrete have launched various activities related to sustainability in the concrete sector. In Japan, the Japan Society of Civil Engineers and the Architectural Institute of Japan published "Recommendation of environmental performance verification for concrete structures (Draft)" and "Recommendations for environmentally conscious practice of RC buildings," respectively. In JCI, the Technical Committee on Minimization of Global Warming Gas and Wastes in Concrete Sector carries out its research activities. "fib Commission 3" (Environmental aspects of design and construction) has also published several bulletins. ACI organized a new committee (130: Sustainability of concrete), which has initiated its activities. In the UK, the Concrete Industry Sustainable Construction Forum has published its first Performance Report.

On the other hand, ISO/TC71 organized a working group in 2005 for investigating the environmental aspect of concrete to study the necessity for environmental standards related to concrete and adopted a resolution to set up TC71/SC8 (Environmental management for concrete and concrete structures). In the process of voting by ISO/TMB member countries, there was much debate with the existing ISO Environmental Standard Formulation TC, but its establishment was ultimately accepted in 2008. The first and second meetings of TC71/SC8 were held in Los Angeles (2008) and Cairo (2009), respectively, being chaired by the author, to discuss the draft of its first standard "Part 1: General Principles." The following are the parts of the standards currently on the drawing board:
ISO XXXXX: Environmental management for concrete and concrete structures
Part 1: General Principles
Part 2: System boundary and inventory data
Part 3: Constituents and concrete production
Part 4: Environmental design of concrete structures
Part 5: Execution
Part 6: Use
Part 7: End phase
Part 8: Labels and declaration

In the ISO, TC207 (Environmental management) organized in 1993 and TC59/SC17 (Sustainability in building construction) organized in 2003 are currently active, formulating environmental standards. TC71/SC8 is therefore supposed to formulate a new system of environmental standards specializing in concrete and concrete structures in the existing basic framework of ISO environmental standards, in a mutually complementary manner while ensuring consistency. The establishment of these standards will enable assessment of the environmental loads resulting from activities related to concrete and concrete structures under certain rules. It is anticipated that this will provide an impetus to accelerate the development of environmental load reduction technology in the fields of material production, the design, execution, and maintenance of structures, and the recycling of demolished concrete.

The concrete/construction sector cannot run counter to the global trend toward "green." Instead, the industry should take this as a golden opportunity to abandon the conventional conservative values and acquire an actively green-oriented disposition. The industry has accumulated an enormous volume of technical information related to concrete. However, it seems as if it has technically reached a certain plateau, being unable to find the direction of the next-generation technology. In these circumstances, a new keyword "environmental performance" can be an embryo for the concrete sector to expand and reconfigure its range of thoughts for developing innovative technologies.

Asia is a region where the world's greatest economic growth is expected. To materialize the growth, enormous amounts of infrastructure will be developed. This will cause extremely large environmental loads within the conventional technical framework. The development of green technologies and their application will be a key to the success of sustainable development in Asia

2009 *ACF E-Newsletter* Publication Plans

The Chief Editor of ACF E-Newsletter has been changed from Dr. FX Supartono (Indonesia) to Prof. JHJ Kim (Korea). ACF and its members would like to thank Dr. Supartono for his contributions and dedications in publishing past ACF E-Newsletters. Under the new leadership, the publication plans for 2009 ACF E-Newsletter has been proposed as follows.

1. 3 issues for 2009

2. 200 ~ 300 printed copies per issue

3. Each issue publishing deadline
1st: End of June
2nd: End of September
3rd: End of December

4. Topic of each issue
1st: Environmental Friendly Concrete technology
2nd: Performance Based Design of Concrete and Structures
3rd: High Performance Concrete Technology: Material, Retrofitting, and Structure

5. Number of articles and pages of each issue will follow the previously published issues

6. Format of each issue will follow the previously published issues

7. Printed version of each issue shall be in the form of pamphlet to facilitate delivery and distribution

The 4th ACF President and Vice Presidents Meeting

21 April 2009
Hosted by VCA (Vietnam Concrete Association)

After the inauguration as a new President, President Jongsung Sim convened the first President and Vice President Meeting (the fourth in ACF). The meeting was held at Hanoi, Vietnam on April 21 2009. Many of important issues were discussed and other themes for better service were sought during the meeting. The meeting was hosted by Vietnam Concrete Association and attendees express sincere appreciation for heartwarming hospitality. More detailed explanations of the meeting and its agenda can be found in the ACF homepage.

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Prof. Jongsung Sim
Hanyang University, Korea
Vice President (Policy)
Dr. Le Quang Hung
VCA, Vietnam
Vice President (Technical)
Prof. Tamon Ueda
Hokkaido University, Japan
Treasurer
Prof. Ekasit Limsuwan
Chulalongkorn University, Thailand
General Secretary
Prof. Cheolwoo Park
Kangwon University, Korea

1. Introduction
On 21st April 2009, the 4th ACF President and Vice-President Meeting was held in Hanoi Horizon Hotel, Vietnam.

2. Attendees
The ACF members who attended this meeting were Jongsung Sim (ACF President, Korea), Le Quang Hung (ACF Vice-President, Vietnam), Tamon Ueda (ACF Vice-President, Japan), Ekasit Limsuwan (ACF Treasurer, Thailand), Cheolwoo Park (ACI Secretary, Korea), Tong Van Nga (VCA President, Vietnam), Luong Duc Long (VCA Executive, Vietnam), Le Thi Hao (VCA Secretary, Vietnam)

3. Agenda
1. Opening Remarks from Prof. Jongsung Sim, the President of ACF.
2. Welcome Address by Mr. Tong Van Nga, the President of VCA.
3. Introduction of the Attendees of Meeting Agenda.
4. Distribution of the Handouts and Approval of Meeting Agenda.
5. Progress Report of ACF activities by Prof. Sim
   5a. New ACF account establishment Korea.
   5b. ACF Homepage revision.
6. Membership Expansions
   6a. Other regional nations including USA, Russia, Egypt, New Zealand, and countries in middle East Asia and KCI.
   6b. RM and EC expansion: Possible membership to Laos, Cambodia, India, China, Philippine, Malaysia, Mongolia and KCI
   .- Issues will be discussed further in next EC meeting.
   6d.CM & IM expansion: Complete IM list needed and promote to increase CM memberships.
7. ACF promotion opportunities
   7a. 2009 IABSE promotional session, Bangkok, Thailand
   7b. 2009 APFIS Conference, (Seoul, Korea)
   7c. possible promotions at 2010 ACI Convention (Chicago, IL), 2011 ACF Conference (Taipei, Taiwan), 2010 IIFC (Croatia)
8. Newsletter proposal
   8a. Headed Prof. J.H.J Kim of Korea and submitted proposal accepted by ACF.
   8b. Aimed to publish reader-friendly and light-passing information and news.
9. Merging of ICCMC and ACI
   - Pres. Sim asked up Ueda to prepare a proposal for next EC meeting at Seoul, Korea
   - Further discussion will be made in the next EC meeting.
10. Proposal from ACI for international partnership
   - Future relationship of either Partnership or Membership has to be clarified.
11. Account balance
   - Need to be clarified by the involved personal.
12. TG group activities
   - Need to provide appropriate funds and find out each TG's activities.
13. Mscellaneous
   - Develop Technical Certificate within ACF (Hung, Vietnam)
   - "Green Concrete Declaration (Choi, Korea)
14. Adjournment

President Sim closed the meeting at 1:00PM and attendees were invited to a lunch hosted by VCA at the Hanoi Horizon Hotel, Hanoi, Vietnam.

Concrete Is Remixed With Environment in Mind

By HENRY FOUNTAIN
Published : March 31. 2009, The NewYork Times.

Soaring above the Mississippi River just east of downtown Minneapolis is one remarkable concrete job.

There on Interstate 35 W. the St. Anthony Falls Bridge carries 10 lanes of traffic on box girders borne by massive arching piers, which are supported, in turn, by footings and deep pilings.

The bridge, built to replace one that collapsed in 2007, killing 13 people, is constructed almost entirely of concrete embedded with steel rein forcing bars, or rebar. But it is hardly a monolithic structure : the components are made from different concrete mixes, the recipes tweaked, as a chef would, for specific strength and durability requirements and to reduce the impact on the environment. One mix, incorporated in wavy sculptures at both ends of the bridge, is designed to stay gleaming white by scrubbing stain-causing pollutants from the air.

The project, built for more than $230 million and finished in September, three months ahead of schedule, "might have been the most demanding concrete job in the United States in 2008," said Richard D. Stehly, principal of American Engineering Testing, a Minneapolis firm that was involved in the project. It is a prime example of major changes in concrete production and use-changes that make use basic research and are grounded, in the need

Concrete may seem an unlikely material for scientific advances. At its most basic, a block of concrete is something
like a fruitcake, but even more leaden and often just as unloved. The fruit in the mix is coarse aggregate, usually crushed rock. Fine aggregate, usually sand, is a major component as well. Add water and something to help bind it all together-eggs in a fruitcake, Portland cement in concrete-mix well, pour into a form and let sit for decades. Let a lot of it sit. Every year, about a cubic yard of concrete is produced for each of the six-billion-plus people on the planet.

Think of it this way. The stretch of sidewalk in front of your house? That is you and your spouse's share. That concrete truck rumbling down the street? It holds a yard for each member of the New York Yankees' starting lineup. Add the Mets and the Red Sox, and you have enough for the typical house foundation and basement floor.

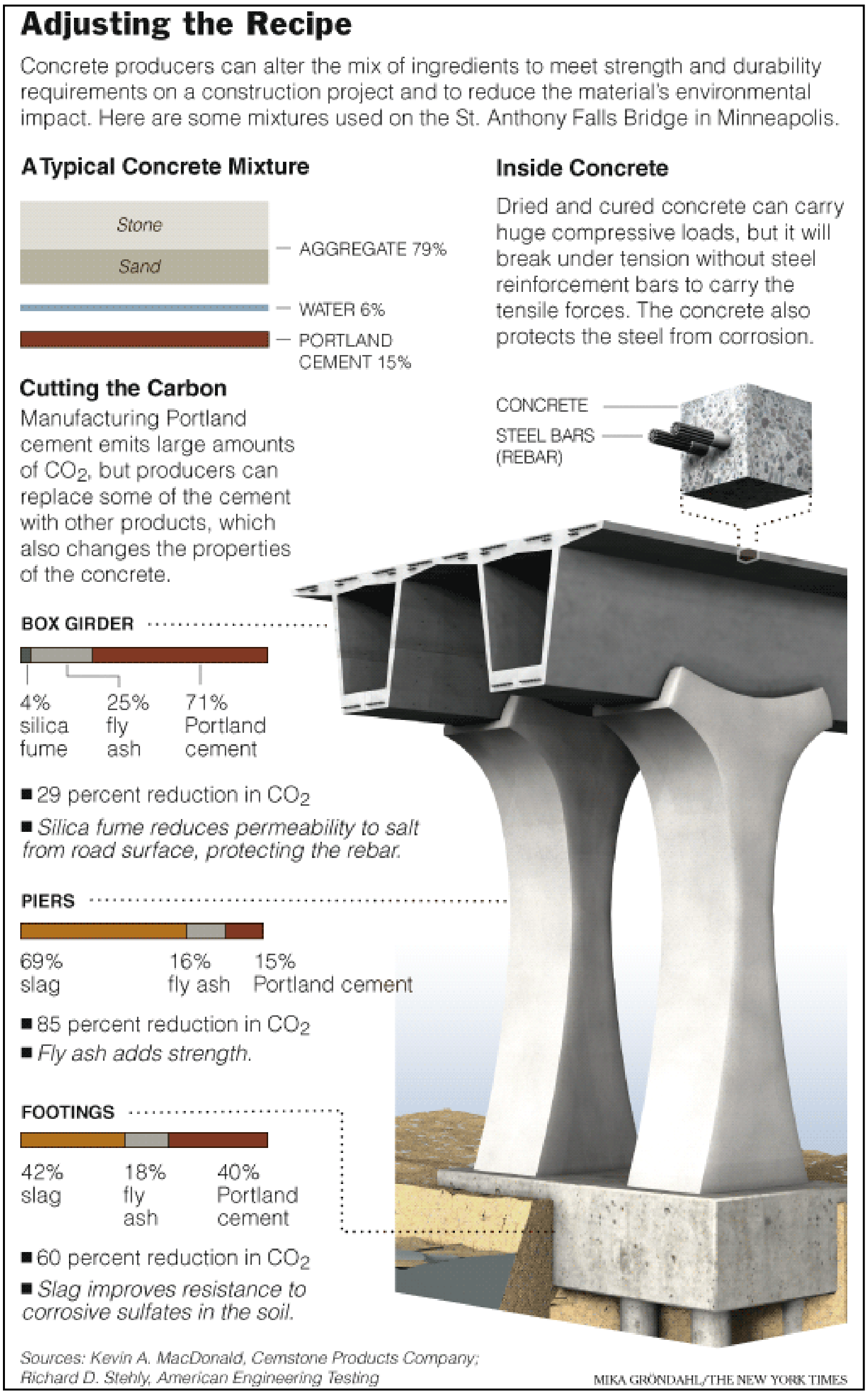
But those are small projects. The St. Anthony Falls Bridge used about 50,000 yards of concrete. Hoover Dam used more than three million. And the Gorges project in China contains more than a yard for every man, woman and child in Canada, population 33 million.

All that concrete may seem the same. And the basic product did remain relatively unchanged since the invention of Portland cement in the early 1800s. (The ancient Romans made concrete, too, but from volcanic ash.) Producers have always tinkered with the mix to find the right proportions of concrete's basic ingredients, but the recipe never varied much.

Now the experimentation is more elaborate, designed to tailor the concrete to the need. Increasingly, that need includes the environment. Aesthetic considerations aside, concrete is environmentally ugly. The manufacturing of Portland cement is responsible for about 5percent of human-caused emissions of greenhouse gas carbon dioxide.

"The new twist over the last 10 years has been to try to avoid materials that generate CO_2," said Kevin A. MacDonald, vice president for engineering services of the Cemstone products Company, the concrete supplier for the I-35W bridge.

In his mixes, Dr. Macdonald replaced much of the Portland cement with two industrial waste products-fly ash, left over from burning coal in power plants. And blast-furnace slag. Both are what are called pozzolans, reactive materials that help make the concrete stronger. Because the CO_2 emissions associated with them are accounted for in electricity generation and steel making, they also help reduce the concrete's carbon footprint. Some engineers and scientists are going further, with the goal of developing concrete that can capture and permanently sequester CO_2 from power plants or other sources, so it cannot contribute to the warming of the planet.



Given the numbers, the possibilities for carbon sequestration are enormous. The United States concrete industry's big annual trade show, held in Las Vegas each winter, is called World of Concrete, and for good reason. Concrete is made and used just about everywhere, with China responsible for half the world's production.

In the making of concrete, the Portland cement and water form a paste in which a series of reactions occur, hardening the paste and licking the aggregates within it. Those reactions use up the water-concrete doesn't "dry out" through evaporation-and produce heat. They also make the product caus tic. While most of the strengthening occurs in the first few days and weeks, the process can continue for years, as long as there is a little moisture around.

Michelle L. Wilson, director of concrete knowledge for the Portland Cement Association, a trade group, described a hydrating cement particle this way: "It's not a piece of popcorn, it's not popping from the inside out. It's more like a jawbreaker-as the water hits it, the hydration is in layers from the outside in. You can continue to hydrate that jawbreaker down."
Just as a dose of brandy or other extra ingredient can improve a fruitcake, concrete can be modified by adding other materials and chemicals. The recipes have become more sophisticated, said Jay Shilstone, a concrete consultant in Plano, Tex.

"It used to be that the chemicals added to concrete were soaps or sugars-very simple," Mr. Shilstone said. "Now we're doing designer chemicals to work on specific components."

Some Chemicals make wet concrete flow better into a form's nooks and crannies without separating. Others prevent the cement particles from flocking together, so the amount of water can be reduced-which means that less cement is needed as well. Chemicals can be added to slow the reactions to give contractors more time to work with the wet concrete. Isocyanates and other catalysts can speed the reactions up, if the concrete needs to reach a certain strength in a short time.

Increasingly engineers are also paying attention to the internal structure of the concrete to improve strength and reduce permeability. "There's been a major push to look at the particle size distribution," Mr. Shilstone said.

Although powdery, on a microscopic scale cement actually consists of relatively large grains. So researchers are looking at even smaller particles, "microproducts that can do in and go magical things with the cement matrix, "Mr. Shilstone said.

Dr. MacDonald added a small percentage of silica fume, another industrial waste material, to the mix for the bridge's box girders, to make the concrete more impermeable to road salt, which corrodes rebar, eventually destroying concrete from within.

One large cement producer, the Italcementi Group, adds titanium dioxide particles to one of its products. The cement makes the concrete white by acting as a catalyst under sunlight to break down organic pollutants in the air. "It speeds up the natural oxidation process," said Dan Schaffer, a product manager for an Italcementi subsidiary, Essroc, which supplied the cement for the I-35W bridge sculptures.

Some researchers want to eventually eliminate Portland cement entirely and replace it with other cements to produce zero-carbon, or even carbon-negative, concrete.

Portland cement is at the heart of concrete's environmental problems. About a ton of CO_2 is emitted for every ton of cement produced. The basic manufacturing process involves burning limestone and other minerals at about 2,700 degrees Fahrenheit to create an intermediate product called clinker.

"Essentially, we're trying to make the same minerals that they did in 1825," said Mr. Stehly, who is head of a committee addressing sustainability issues the American Concrete Institute. The cement industry, particularly in the United States and Europe, has reduced CO_2 emissions through the use of more efficient kilns and processes, and is now allowed to add some ground unburned Limestone to the clinker, reducing the actual cement in the mix. But about half of the CO_2 from cement cannot be eliminated-it is produced in the reaction, called calcinations, that occurs as the limestone(which consists of calcium carbonate) is being burned.

So to reduce concrete's carbon footprint to near zero or less, different approaches are needed. Novacem, a British startup, is developing a cement that does not use carbonates and can make concrete that absorbs carbon dioxide. Carbon Sense Solutions, in Halifax, Nova Scotia, wants to bubble CO_2 through wet cement, sequestering the gas through carbonation(a process that occurs naturally, through very slowly, under normal conditions).

At a site adjacent to a gas-fired electricity generation plant in Moss Landing, Calif. The Calera Corporation is developing a process to bubble power plant flue gases through seawater or other brackish water, using the CO_2 in the gases to precipitate carbonate minerals for use as cement or aggregates in concrete. The process mimics, to some extent, what corals and other calcifying marine organisms do.

Calera calculates that producing a ton of these minerals consumes half a ton of CO_2, so the resulting concrete could potentially be carbon negative-sequestering carbon dioxide permanently.

Brent R. Constantz, the company's founder, has a background in cements, having made specialty products for use in orthopedic surgery. But he does not describe Calera as a cement company. "we're primarily driven by the need to capture large amounts of CO_2 and sequester it," he said.

The company probably will begin by making aggregate, because the barriers to making a commercially acceptable product are lower than with cement. Even with aggregate, any new product must meet standards and must be accepted by the concrete industry, which can be conservative." Any time you introduce anything new," Dr. Constantz said, "it's a challenge."

Next Coming Concrete Events

1. FraMCoS-7

7th International Conference on Fracture Mechanics of Concrete and Concrete Structures & Post-Conference Workshops

Seogwipo KAL Hotel, Jeju, Korea
May 23~27, 2010
http://www.framcos7.org
secretariat@framcos7.org

Introduction of IA-FraMCoS and FraMCoS-7

The IA-FraMCoS (International Association of Fracture Mechanics for Concrete and Concrete Structures) was founded in 1992 in USA to promote and advance the theoretical and experimental aspects of fracture mechanics and cracking of concrete structures. The activities of IAFraMCoS provide great advances on new technological development in concrete materials and concrete structures. Among the important roles of IA-FraMCoS, the primary role is to hold the international conferences on a triennial basis to communicate and compile recent advances on the related subject areas. The FraMCoS-7 is the seventh international conference on fracture mechanics for concrete and concrete structures which will be held in May 2010 in Korea. The FraMCoS-7 Conference is organized by IA-FraMCoS and sponsored by Korea Concrete Institute. It is also scientifically supported by internationally-renowned concrete societies, i.e., ACI, RILEM, JCI, and ACBM.

Previous FraMCoS Conferences

The series of International Conferences on Fracture Mechanics of Concrete and Concrete Structures (FraMCoS) has taken place in different parts of the World on a triennial basis. The previous FraMCoS conferences were so successful in that several hundreds eminent experts have participated in each conference from universities, research institutes, industries and public organizations from all over the world. The previous conferences of the series were successfully held as follows.

FraMCoS-1 1992 Breckenridge, Colorado (USA)
FraMCoS-2 1995 Zürich (Switzerland)
FraMCoS-3 1998 Gifu (Japan)
FraMCoS-4 2001 Cachan-Paris (France)
FraMCoS-5 2004 Vail, Colorado (USA)
FraMCoS-6 2007 Catania (Italy)

Board Members of IA-FraMCoS

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C.S.Choi	*J.D.Jaung*	*W.J.Kim*	*J.H.Moon*	*J.G.Song*
D.U.Choi	*N.Y.Jee*	*D.H.Lee*	*C.M.Park*	*J.P.Won*
J.J.Choi	*C.K.Jeon*	*H.S.Lee*	*H.G.Park*	*W.H.Yi*
K.H.Choi	*B.W.Jo*	*J.H.Lee*	*S.K.Park*	*S.W.Yoo*
S.H.Choi	*S.J.Jung*	*J.Y.Lee*	*S.K.Park*	*Y.S.Yoon*
Y.W.Choi	*B.S.Kim*	*K.M.Lee*	*S.M.Park*	*H.D.Yun*
L.Chung	*E.K.Kim*	*S.H.Lee*	*C.H.Seo*	*G. Zi*

Conference Topics

The major topics for FraMCoS-7 conference are as follows:
A. Recent advances in fracture mechanics of concrete
B. Fracture and cracking behavior of reinforced and pre-stressed concrete structures
C. High-performance and high strength concretes
D. Fiber reinforced cementitious composites and FRC
E. Advancement in structural design codes
F. Structural monitoring and assessment
G. Repair, strengthening, and retrofitting
H. Durability and corrosion-induced cracking
I. Interface fracture and debonding phenomena
J. Constitutive relations, time-dependent effects, bond, cyclic and fatigue behavior, thermal, impact behavior
K. Brick masonry, concrete-like and quasi-brittle materials (rocks, soils, ceramics, refractory, asphalt, ice, etc.)
L. Practical Applications of Fracture Mechanics

Besides the FraMCoS traditional topics related to concrete and reinforced concrete, concrete-like and quasi-brittle materials may also be considered, when the related experimental methods and theoretical/numerical models are analogous to those utilized for concrete.

Key Dates and Deadlines

May 31, 2009 - Submission of Abstracts (via website)
June 30, 2009 - Acceptance of Abstracts to Authors
Oct. 5, 2009 - Submission of Complete Camera-Ready Manuscripts (via web)
Dec. 15, 2009 - Notification of Final Acceptance
Feb. 15, 2010 - Advanced Registration
Feb. 28, 2010 - Final Announcement
May 23~27, 2010 –Meeting at Seogwipo KAL Hotel, Jeju

Registration Fees

Conference registration fees include: admission to all scientific programs, conference portfolio, proceedings, opening reception, refreshments, lunches and the conference banquet.

Fees	**Before Feb. 15, 2010**	**After Feb. 15, 2010**
Registration Fee	US$ 590	US$ 690
For Students	US$ 350	US$ 400
Accompanying Persons Program	US$ 120 (Reception, Banquet, Technical visit)	

Preliminary Registration

The organizers of FraMCoS-7 would be grateful if intending participants would complete (without any obligation) the preliminary registration form found on the conference web site. Please visit the conference web site and just log in to register your name (**http://www.framcos7.org**).

Conference Venue / Hotel Accomodation

The conference will be held at the Seogwipo KAL Hotel located in Seogwipo-city of Jeju island in Korea. The Seogwipo KAL Hotel(5-star hotel) is located on the southern coast of Jeju Island where the exotic surroundings are magically harmonized with the breath-taking scenery of the beautiful ocean view and spectacular mountain view. Please visit the conference website (http://www.framcos7.org) for hotel reservation with specially-discount room rate.

2. Asia-Pacific Conference on FRP in Structures

Seoul, Korea, 9-11 December, 2009

About APFIS 2009

APFIS 2009 (Asia-Pacific Conference on FRP in Structures) is the Second IIFC (International Institute for FRP in Construction) biennial conference which will be held in Seoul, Korea from 9 to 11 December, 2009. APFIS 2009 will inherit the main themes from the first conference: basic research and application of FRP in civil and architectural engineering structures in the Asia-Pacific region and elsewhere in the world.

Call for Papers

Participants wishing to present a paper are invited to submit a 250-300 word abstract and full paper in English. The papers should present original and unpublished advances of knowledge in accordance with the Conference's themes. Papers should be submitted by website in MS-WORD format to www.apfis2009.hanyang.ac.kr. Detailed guidelines for preparing and submitting papers may be found on the conference website. Papers will be reviewed by the International Scientific Committee and Local Organizing Committee.

Keynote Lecturers

Name	Title of Paper
L.C. Bank	Aggregate-coated FRP plank as formwork and crack controlling device for reinforcement-free bridge decks
B. Benmokrane	Mechanical, physical and durability characterization of pre-stressed GFRP reinforcing bars
N.F. Grace	Deployment of CFRP strands in the first cable-stayed bridge in USA
T. Keller	Multifunctional sandwich structures with encapsulated photovoltaic cells
S. Lee	The current and future applications of FRP decks
D.J. Oehlers	A structural mechanics shear capacity model for FRP plated RC members
S.T. Smith	Strengthening of RC slabs with large penetrations using anchored FRP composites
T. Ueda	Effect of thickness of adhesive on bond behaviour of carbon fiber sheet

Conference Topics

The major topics for APFIS2009 conference are as follows:

A. Materials
B. Strengthening of Concrete, Metallic, Timber and Masonry Structures
C. Bond Behavior and Debonding Failures
D. Confinement and Seismic Retrofit
E. Reinforcing or Prestressing of Concrete, Timber or Masonry Structures with FRP
F. Durability and Long-term Performance
G. Fire and Blast Loading
H. FRP and Hybrid Structures
I. Structural Health Monitoring and Intelligent Sensing
J. Field Applications and Case Studies
K. Codes and Standards

Key Dates

Submission of Abstracts	November 30, 2008
Abstract Acceptance Notification	January 31, 2009
Submission of Papers for Review	May 31, 2009
Paper Acceptance Notification	July 31, 2009
Submission of Final Camera-Ready Papers	September 30, 2009
Conference	December 9-11, 2009

Registration

Regular registration fee is set as US$750[1] (US$500[2] for students) for early registration. With the payment of the registration fee, IIFC members and non-IIFC members who are qualified to join IIFC will be provided with a one year complimentary IIFC membership for 2010.

[1] Registration covers attendance at the conference, conference proceedings, welcome reception, and all lunches and refreshments.

[2] Registration covers attendance at the conference, conference proceedings, and all lunches and refreshments.

Registration Fees	Before 01. Oct. 2009	After 01. Oct. 2009
[1] Regular	US$ 750	US$ 850
[2] Student	US$ 500	US$ 550

Conference Venue and Hotel Accommodations

Hotel	Room type	Discount Room rates (USD)	Contact information
Sheraton Walkerhill Hotel (Conference Venue)	Club Suite Room	320	+82 02 4555000 www.sheratonwalker-hill.co.kr
	Deluxe Room (River view)	185	
	Deluxe Room (Mountain view)	165	
	Douglas	130	
Hankang Hotel	Deluxe Twin	80	+82 02 4535131 www.hankanghotel.co.kr
Hotel Dongseoul	Double/Twin	70	+82 02 4551100 www.idshotel.co.kr

Conference Chair

Prof. J. Sim
Department of Civil Engineering
Hanyang University, KOREA

Local Organizing Committee

D.H. Choi *Hanyang Univ.*
D.U. Choi *Hankyong Univ.*
O.C. Choi *Soongsil Univ.*
M.Y. Han *Ajou Univ.*
G.H. Hong *Hoseo Univ.*
H.S. Jang *Pukyong Univ.*
S.M. Jeong *Handong Univ.*
W. Jung *Kangnung Univ.*
B.S. Kim *KICT*
G.B. Kim *Dongbu Co.*
J.H.J. Kim *Yonsei Univ.*
K.D. Kim *Konkuk Univ.*
K.H. Kim *Kongju Univ.*
S.E. Kim *Sejong Univ.*
H.K. Lee *KAIST*
J. Lee *Yeungnam Univ.*
S.W. Lee *Kookmin Univ.*
H. Oh *Jinju Univ.*
C. Park *Kangwon Univ.*
S.K. Park *SKKU.*
S.Y. Park *Cheju Univ.*
Y.H. Park *KICT*
S. Shim *Daelim Co.*
J. Sim *Hanyang Univ.*
A. Song *Canadian Emb.*
H.S. Song *KSCE*
J.P. Won *Konkuk Univ.*
C.K. Yi *Korea Univ.*
Y.H. Yoo *Conclinic Co.*
S.J. Yoon *Hongik Univ.*
S.G. Youn *SNUT.*
G. Zi *Korea Univ.*

International Scientific Committee

K. Neale (Chair), *Canada*
B. Bakht, *Canada*
L.C. Bank, *USA*
N. Banthia, *Canada*
J.A.O. Barros, *Portugal*
B. Benmokrane, *Canada*
J.F. Chen, *UK*
E. Cosenza, *Italy*
S. El-Gamal, *Canada*
R. El-Hacha, *Canada*
E. El-Salakawy, *Canada*
A. Fam, *Canada*
H. Fukuyama, *Japan*
N.F. Grace, *USA*
I.E. Harik, *USA*
A. Ilki, *Turkey*
J.O. Jirsa, *USA*
V.M. Karbhari, *USA*
A. Katz, *Israel*
T. Keller, *Switzerland*
R. Kotynia, *Poland*
P. Labossière, *Canada*
L.D. Lorenzis, *Italy*
F. Matta, *USA*
S. Matthys, *Belgium*
U. Meier, *Switzerland*
A. Mirmiran, *USA*
M. Mottavalli, *Iran*
A. Mufti, *Canada*
A. Nanni, *USA*
D.J. Oehlers, *Australia*
C.E. Ospina, *USA*
K. Pilakoutas, *UK*
S.F.A. Rafeeqi, *Pakistan*
A.G. Razaqpur, *Canada*
S.H. Rizkalla, *USA*
B. Samali, *Australia*
R. Seracino, *USA*
C.K. Shield, *USA*
J. Sim, *Korea*
S.T. Smith, *China*
L. Taerwe, *Belgium*
B. Täljsten, *Denmark*
K.H. Tan, *Singapore*
J.G. Teng, *China*
G. Thiagarajan, *USA*
T. Triantafillou, *Greece*
T. Ueda, *Japan*
P. Waldron, *UK*
Z.S. Wu, *Japan*
L.P. Ye, *China*
X.L. Zhao, *Australia*

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