Driving Nails

Developing an Approach for Sustainable Concrete Pavements Through the CP Road Map Concrete Pavement Sustainability Track

History of the Hammer

- The use of simple tools dates to about 2,400,000 BCE when various shaped stones were used to strike wood, bone, or other stones
- Stones attached to sticks with strips of leather or animal sinew were being used as hammers by about 30,000 BCE

Evolution of the Hammer

- Rock tied to a wood handle
- Copper, bronze, and iron replace stone
- Steel introduced with tempering
- Evolution in shape and size, optimization for desired purpose/specialization
- Improved design and materials

Modern Hammers


2005 MALENE THYSSEN

Introducing the Ti-Bone® titanium hammer from Stiletto. It's solid titanium – including the handle. And, it features a replaceable steel face so it's built to last a lifetime. This hammer has total dead blow, which protects your wrists and forearms by dampening vibration. There's virtually no shock transferred back to your arm; titanium handle transfers swing energy to the nail head better, while dampening shock waves to your hand and wrist. And, it's built to withstand a beating without damage. The magnetic nail holder makes for much easier nail starts. The titanium 15-oz., hammerhead has the same nail driving force as a 24-oz. steel hammer. Solid titanium handle is stronger than wood or aluminum, and has an ergonomic injection-molded grip for greater comfort and control. Replaceable steel nose with milled face. The next generation of hammers has just arrived. 18" length. Made in USA.

Only $249.99

So Who Cares About Hammers?

- A rock tied to a wood stick with sinew or leather still drives nails
  - Just not as efficiently as a modern Stilleto Ti-Bone titanium hammer
- We must not wait for the “tool” to be perfected before we move forward in driving nails
  - In the extreme, people (e.g. researchers) become more focused on the tool than on the nails that need to be driven

CP Road Map Concrete Pavement Sustainability Track

- When the CP Road Map was developed, it was decided that environmental considerations were to be considered under each of the 12 Tracks
- With the increase in emphasis on sustainability and the environment, the CP Road Map Executive Committee designated the advancements in concrete pavement sustainability and the environment as a full track on September 11, 2007
  - Focus is now on sustainability

Where Are We At With Regards to the Sustainability Track?

- A draft “Considerations” document has been prepared
  - Precursor to the development of a Framework document
  - It is a bit rough, but represents a start
- In the process of garnering input from a broad range of sustainability experts as well as cement, concrete, and pavement specialists

Track Goal

To achieve more sustainable concrete pavements by considering **economic, environmental, and societal impacts** and contributions in the manufacturing, designing, constructing, maintaining, restoring, and recycling of concrete pavements, so as to **meet today's needs without compromising the ability of future generations** to meet their own needs

Track Mission

Through a **commitment to sustainability**, conduct **research and technology transfer** that transforms the way concrete pavements are manufactured, designed, constructed, maintained, rehabilitated, restored, and recycled to improve economic, environmental, and societal benefits and acceptance

Track Objective

The objective of this Track is to **identify and complete research and implementation** on concrete pavement as it relates to sustainability. This would include quantification techniques and modeling, strategy selection criteria, the use of recycled and industrial byproduct materials, environmentally friendly production and construction methods and equipment, and innovative maintenance, rehabilitation, and recycling processes. It would also include research and implementation to improve air and water quality as well as reduce energy usage through improved rolling resistance and increased surface reflectivity

Challenges/Opportunities

- Increase the use of fly ash, ground slag, and other supplementary cementitious materials
- Increase the use of recycled or industrial byproduct materials in concrete and concrete pavement systems
- Further reduce CO_2 per yd^3 of placed concrete
- Optimize pavement design to use less concrete
- Increase pavement longevity through conventional and innovative means
- Optimize surface characteristics to reduce noise, heat, lighting costs, and air pollution while improving fuel efficiency

Challenges/Opportunities

- Enhance surface drainage
- Improve business processes to increase efficiency while minimizing waste
- Rehabilitation of material extraction sites for recreational uses
- Adoption of a rigorous LCA process with usable software tools to accurately account for various economic, environmental, and societal impacts
- Implement strategies to optimize use of readily available materials
- Demonstrate that sustainable solutions are at their core good economic, environmental, and societal solutions

Milestones

- Prior to July 18, 2008
  - Identify four to five key players in the infrastructure sustainability arena
  - Conduct conference call/video conferencing to identify another 8 to 10 influential stakeholders to create the leadership group
  - Identify a number of priority projects that will be used to jump start the sustainability track framework prioritization program
- July 18 to December 31,2008
  - Hold an initial track leadership meeting to establish the priority framework
  - Interface with researchers, research institutions, and sponsors of research to establish a collaborative research program to initiate projects in accordance with the priority framework

Measuring Progress Toward Achieving Goals

- Much more difficult than it would seem
- Metrics might include the normal suspects
  - Embodied energy, global warming potential, others?
- Governance issues must also be considered that provide “credit” for sustainable solutions
- A number of gaps exist at this juncture, and it is up to us to fill them in

Some of the Gaps

- How can various concrete pavement strategies be compared economically, environmentally, and socially versus a baseline standard?
  - What is the baseline standard?
- How can sustainability factors related to concrete pavement design, specification and purchasing process, material selection, acquisition, transport, mixing, construction, maintenance, rehabilitation, and terminal life of product and materials all be considered in a full and integrated system?

Additional Gaps

- Can incentives be provided for the use of environmentally superior technologies?
- How can societal benefit be quantified and incentives provided?
- Can the sustainability of recycling pavement, including pavement breaking, hauling, crushing, remixing, hauling, and placement strategies be demonstrated?
- How can innovative materials, design, construction, and rehabilitation practices be incorporated into the sustainability analysis making sure that the analysis itself does not become a barrier to innovation?

Ideas For Initial Projects

- Quantify and validate assumptions of environment, economic, and social impacts
  - Metrics and baseline for various strategies
- Organize and conduct a conference on sustainability of concrete pavements to increase our awareness of how economics, technology, and legislative/policy initiatives interact
- Select two research projects that address specific technology advances that improve concrete pavement sustainability
- Recommend a project that assesses an environmental property in place (such as reflectance or ability to clean the air)

Must Produce Products That Will Be Used

- Guidelines (short-term)
  - Pick the low hanging fruit
  - Get the people working in our industry comfortable with the concepts of sustainability
  - Assist them in making choices with confidence that improve the sustainability of concrete pavements
- Software tools (long-term)
  - These need to be developed
  - Based on some type of LCA modeling and relevant sustainability metrics, with accurate data
  - Versatile and adaptable

Wrapping It Up

- We will fail if we lose focus on what we are trying to achieve
  - e.g. focusing on the tool instead of the solution will not promote implementation
    - A titatium hammer will obliterate your thumb just as efficiently as a rock if you don’t focus on the nail
- It is an exciting time to be working in concrete pavements and opportunities to improve our economic, environmental, and societal well-being abound
- Now let’s go out and pound some nails

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