

Delta-Therm Corporation Feature for Quarterly Newsletter

Delta-Therm helps civil engineering majors win first

Pick a problem and solve it. This was the challenge extended to a group of engineering majors at University of Illinois at Chicago (UIC). There were no limits on presentations for their senior projects. The students would be free to come up with an idea, design it, give an oral presentation, and have professionals in the field judge them.

Rose Sadleir quickly got to work with two other girls – Raguez Taha and Shraddha Adhikari - on a group project that would involve Delta-Therm's radiant heating cables embedded in concrete.

When the group of civil engineering majors considered the past winter season here in Illinois, Sadleir's thoughts turned to the blizzard, ice and bridges. With some assistance from Craig Foster, UIC civil engineering department advisor, the team decided to address the issue of pollution from road salt.

□“We thought that coming up with a better solution which would be environmentally conscious would be a good project,” said Sadleir.

They decided to look at various bridges in the area, bridges that were susceptible to black ice. Then they investigated radiant heating cables and how they'd work with concrete used in bridge decks. They selected Old Orchard Road Bridge in Skokie, Ill. as their model for which they'd compile data.

“We narrowed our search to bridges that needed to be redone,” said Sadleir.

Old Orchard is scheduled for renovations in 2012.

Just how Sadleir was inspired to investigate radiant heat is an interesting story.

“Where my mom lived, she had old-fashioned radiant heat in her house,” she recalled. “It was old copper pipes and I knew that it had to have improved, so we researched online and we found Delta-Therm in Illinois.”

It was then that the team arranged for an interview with owner Ada Cryer and engineer Ed Witte back in February.

“We discussed the principles of radiant heat, ASHRAE data, power requirements, installation requirements and variables and benefits of electrical heating versus other means of snow and ice removal,” said Witte. “One benefit of this project was the understanding of how easily an MI cable can be included in the design and construction of a bridge deck and other concrete structures.”

Cryer and Witte spent three hours explaining radiant heat, and pointed the student trio in the right direction for code information and additional references. Beyond that, they supplied the UIC girls with a working sample for their presentation.

“It was a concrete sample with insulated cable running through it and it heats up,” said Sadleir. “They did a wonderful job because it also shows a cross section of how it’s installed.”

After working diligently for five months, the students had compiled a ver detailed report that proved their hypothesis.

“We did a cost comparison of salting a bridge, and salt shortened the life of a bridge because it eats away at the metal structure,” said Sadleir. “We found that radiant heat would be more financially feasible over the lifespan of a bridge.”

The group reported the following data to illustrate the problem:

- 366,000 car accidents occur each year due to icy conditions (source: IDOT);
- chemical deicers have detrimental effects on the surrounding environment;
- additionally, chemical deicers intensify freeze/thaw cycles causing the concrete to crack and corrode the reinforcing steel thereby reducing the lifespan of the bridge.

Their design details began with an introduction to radiant heating systems and how they work. This included information about the MI cable, ambient and slab sensors, and panels. Next, they described the properties of flexible concrete as compared to traditional concrete. They discussed their analysis of heat transfer, and examined three types of concrete. Based on their assumptions, they created an accurate model and reported their findings.

“We were trying to determine which type of concrete would be most efficient paired with the radiant heat, and we did a cost analysis,” said Sadleir.

For a 45-year period, they surmised it would cost \$2,110,000 to radiantly heat a bridge using Delta-Therm products and ultra high performance concrete versus \$6,330,000 for traditional concrete and salting methods.

Furthermore, the lifespan of the bridge would be extended if radiant heat was used, and the impact on the environment would be lessened due to the elimination of chemicals.

“I was surprised by the significant difference between the cost of radiant heating and salting,” said Raguez Taha. “Radiant heat showed to be the better choice for de-icing even with its high initial costs.”

“I can see communities appreciating this new technology since more durable structures require less rehabilitation which means less tax dollars going for maintenance and less congestion on bridges during reconstruction,” added Shraddha Adhikari.

The bottom line is that it is more cost effective in the long run to radiantly heat a bridge.

A total of 63 teams presented projects at the 22nd Annual Engineering Expo at UIC held in April, a senior design competition that covered all types of engineering from chemical to industrial. The teams were judged by experts in the field, and Sadleir's team won first place in Structure and Site Design with the “Integration of Radiant Heat and Flexible Concrete in Bridge Decks” entry.

“We spent countless hours in our school computer lab working on finite models, bridge design calculations, cost analysis numbers and lots of research,” said Taha. “To see all our hard work being recognized made it all worth it.”

The fact that Delta-Therm shared its cross section model as well as a piece of the MI cable to show at the presentation helped a lot, added Sadleir.

“Delta-Therm is very dedicated, feel very strongly about their product, and I think that they feel that radiant heat is a great solution as a deicing method,” she said.

“Our team received \$500 from the college of engineering, but most importantly we received recognition for our hard work,” added Adhikari.

The girls also created an awareness about radiant heating at the expo.

“Those who attended Expo were really intrigued by our proposal and were interested in seeing it implemented,” said Taha. “I think the integration of 'flexible' concrete and radiant heat really sparked interest in many attendees and they looked forward to considering this method of deicing in the future.”

