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## COLD IN-PLACE RECYCLING: The Mystery Unveiled

by Royce Fichtner, P.E., APAI Eastern Iowa Field Engineer



**C**old in-place recycling (CIR) has been successfully utilized in Iowa for over thirty years and the benefits are obvious: utilizing the existing asphalt roadway *in situ*, reducing reflective and thermal cracking and creating a smoother longer-lasting roadway. As Larry Mattusch, Asphalt Paving Association of Iowa (APAI) Western Iowa Field Engineer, and I travel across this state, we are often asked what type of oil is best, how much oil to add, what is the best depth to CIR, how to determine when to place the overlay, and what are the limits of the construction period? While the IDOT Specification 2318 answers most of these questions, due to the variability of the process, it must be augmented with good engineering judgment. I contacted several experts in the field: engineers, suppliers and contractors for their opinions and have summarized as follows:

### CHOOSING THE RIGHT OIL

Iowa DOT Specifications allow the use of four types of rejuvenating additive (CSS-1, HFMS-2s, Engineered Emulsion and Foamed Asphalt). Looking at which oil to use, I found that all products are good with the best choice coming down to personal preference or special conditions. CSS-1 has been around the longest in Iowa and remains the

*(Continued Page 5)*



## Tales from the Road

### “Take A Chance On Me”

**L**ast weekend I watched my son, Henry, interacting with Jake (age 15), his cousin from Texas. Jake is Henry’s hero. He is cool, funny, and actually listens to what his 7-year-old cousin has to say. Unfortunately, Jake is also the knucklehead that turned Henry into a Minnesota Vikings fan. Watching these two made me think about who were the people that made the biggest impact on my life. My father will always be my greatest hero, but he was more of a molder, slowly shaping who I would become in life. I have come to the conclusion that it was the people who took a chance on me that have had the biggest impact on my life. There are many who deserve to be listed here: Gaylord, Brady, Brad, Wayne and Marcus, to name a few, but I have chosen these three people as representatives of the aggregate.

**Tania.** My beautiful wife. Tania and I met when I was traveling through Scotland at age 22. She has been the love of my life for 25 years. She took a chance on a long-haired construction worker from the middle of nowhere and has supported me, chastised me, encouraged me and unconditionally loved me. We have shared great adventures, great heartbreak, and our greatest joy, Henry. She is the one.

*(Continued Page 2)*

<b>Inside This Issue</b>	Upcoming Events.....	2
	This Old Road.....	3
	Brown Deer Golf Outing Sees \$10,000 Hole-In-One!.....	6
	Summer Meeting Shines at Okoboji.....	6

## Upcoming Events

*(Click event for more information)*

### 2014 Western Iowa Golf Outing

**Date:** August 26, 2014  
**Location:** Majestic Hills Golf Course  
Denison, IA

### August Open Houses

**Dates:** To Be Announced  
**Locations:** To Be Announced  
These Open Houses will feature PCC demolition, Perpetual Pavements, and Asphalt Interlayers. Watch your inbox for more information.

### APWA/Iowa Chapter Fall Conference

**Dates:** September 10-12, 2014  
**Location:** Scheman Building, ISU  
Ames, IA

### Strategic Asphalt Committee Field Trip

**Dates:** September 17-18, 2014  
**Location:** Tour of Northwest Iowa  
Overnight at Hilton Garden Inn, Sioux City.  
Additional information will be forthcoming.

### Iowa League of Cities

**Dates:** September 24-26, 2014  
**Location:** Mid-America Convention Center  
Council Bluffs, IA

### APAI 59th Annual Convention

**Date:** December 3-5, 2014  
**Location:** West Des Moines Marriott  
West Des Moines, IA

### 2014 County Engineers Convention

**Date:** December 9-11, 2014  
**Location:** Scheman Building, ISU  
Ames, IA

### 2015 Greater Iowa Asphalt Conference

**Date:** March 4-6, 2015  
**Location:** Holiday Inn Convention Center  
Des Moines, IA 50312

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*(Tales from the Road – Cont. from Page 1)*

**Chuck.** Chuck Finnegan is President of the L.L. Pelling Co., and he took a chance on a 29-year old not-quite-as-long-haired construction worker, that he thought had what it took to be an estimator and project manager. He gave me the tools and room to succeed and he picked me up when I failed. He taught me the ethics of our industry. Behind my father, Chuck is the man I respect the most. I worked for Chuck for twelve years at LL Pelling. We shared in the growth and success of the company during those years, but when the opportunity came up to take the APAI job - Chuck was the man who came and told me that he would support me if I chose to pursue the position. One word of discouragement from him to the APAI Nominating Committee and I would never have been considered. His unselfishness allowed me the opportunity to pursue my dream job.

**Randy.** Randy Starr was a project manager for Determann Asphalt and was Vice President of APAI in the fall of 2008. He, along with Randy Zeigler, interviewed and took a chance on a balding (who are we kidding) estimator to be the next Executive Vice President of the Asphalt Paving Association of Iowa. Randy Starr was an asphalt man. We recognized that quality within each other. Randy Starr was also a passionate man. He loved his family, he loved Determann Asphalt and he loved asphalt. Randy and I talked a lot during my first year at APAI and I was always left feeling that he had given me something of himself after each conversation. During his year as President of the APAI he was on a mission to increase the use of unclassified RAP in our asphalt mixes. His drive, leadership and passion succeeded in changing the landscape of Iowa's asphalt industry forever. Randy Starr died on June 20, 2014. I was deeply troubled when I heard about Randy's death. I felt angry that I hadn't told him how much he had

helped me, I hadn't told him how much he inspired me, and I hadn't told him thank you.

I would encourage you to think about the people who have changed your life; people who reached out to you, people who believed in you, people who took a chance on you. Tell them thank you before it is too late. The next step is to take a chance on someone in your company, on your crew, or in your life, and help them to achieve their potential. I believe that we all have the opportunity to change peoples' lives. Is there anything more gratifying in life than lifting up another human being?

Thank you, Randy Starr. Thank you Tania and Chuck. Thank you to all of you who took a chance on me and changed my life.

Smoother is Better.

A handwritten signature in black ink, appearing to read "Bill Rosener".

Bill Rosener



Randy Starr  
1961-2014





## Interstate 80 MP 174 - MP 183



### “SUMMERTIME”

*Summertime, and the livin' is easy  
Fish are jumpin' and the cotton is high  
Oh, your daddy's rich and your ma is good-lookin'  
So hush little baby, Don't you cry*

– Ella Fitzgerald



Summertime is vacation time. Family time. It's also Road Construction time. The traveling public wants smooth, long-lasting roads to travel across the beautiful State of Iowa without being held up in road closures. The nine mile stretch of I-80 from mileposts 174-183 in Jasper and Poweshiek counties delivers on these qualities in spades. Originally constructed in 1962, this initial stretch of I-80 was paved with 14 inches of asphalt treated base (ATB) with a three inch asphalt surface, another two inches was added in 1968; a two inch mill, with a three inch HMA fill, in 1984; and four inches of hot-mix asphalt paved at night in 2004, brings us to current day. That is a total of 52 years of service for this full-depth asphalt Perpetual Pavement with only three minor rehabilitations. The bordering sections of I-80 that were constructed in PCC in 1964 were reconstructed in 1985 and 1995, respectively. As these nine miles prove, full-depth asphalt provides long-lasting, smooth roadways to make your “Summertime” travels easy. Considering the condition of the existing roadway, there is no reason to believe this stretch of I-80 won't last another 52. Hush now PCC, don't you cry.

**59<sup>TH</sup> APAI  
ANNUAL CONVENTION**

**RACING**  
TO THE FUTURE  
**...0 TO 60**



**DECEMBER 3-4, 2014**

WEST DES MOINES MARRIOTT HOTEL  
WEST DES MOINES, IOWA

**SAVE THE DATE**



*(Cold In-Place Recycling - Cont. from Page 1)*

favorite of many older engineers. The Iowa DOT and some contractors tout Foamed Asphalt as the oil of choice. Engineered Emulsions and HFM-2s also have their fans. Only the foamed product is almost pure bitumen, while the others have some form of additive ranging from water to chemicals. The costs may appear to vary but one should keep in mind that we are adding bitumen to the RAP to rejuvenate and bind the product into a recycled asphalt product. The goal is to add the correct amount. Because the amount of

pure bitumen in each product varies, so does the application rate. The advantages of the CSS-1 emulsions are availability, working temperature, longer shelf life, softer final product and set time. This must be tempered with a high water content that must be expelled and more problems getting all fine particles evenly coated. HFMS-2s contains some form of cutback to soften the existing asphalt in the RAP. Engineered emulsions are simply emulsions designed specifically for the existing roadway. Additional

products may be added to enhance the design for the specific roadway. This comes at a higher cost, and success can vary if the weather conditions at time of placement vary from the conditions assumed at the time the emulsion was engineered. Foamed asphalt has been described as giving a better coverage of all particles with improved workability and a better consistency. It also furnishes a faster set time since little, if any, added moisture must be first expelled. Due to its higher temperature at time of placement it works better in the cooler times of the year. It has the disadvantages of a shorter shelf life raising concerns about the projects distance from the supplier and concerns with handling a higher temperature product.

In summing up, used correctly, any of the products will do a fine job at a reasonable cost. I would suggest that

CSS-1, the emulsions, will give superior crack retardation for normal to lower truck volumes found on most county roads. The finished product remains flexible longer to retard cracks. HFMS-2s, due to the use of cutbacks, can add too much softness early, resulting in a longer set time. If you are still undecided as to the correct product to use for your project, you could consider using an Engineered Emulsion. Although this product is more expensive, the oil is specifically engineered by the asphalt cement supplier to match the CIR needs



of your pavement. Due to higher traffic and truck loadings, the IDOT uses primarily foamed asphalt. This gives an early set time and a firmer final product. The heavy traffic loading helps to offset the reduction in crack retardation with the kneading effect of the traffic.

The amount of additive to be used is covered in the IDOT Specification 2318 but this should just be treated as a starting point. The actual amount to add is governed by many project specific variables including: ambient and pavement temperature, amount of sun, wind, humidity and most important, the amount and condition of the residual asphalt in the existing asphalt pavement. Prior surface seals and treatments on the roadway can influence this greatly. Therefore, there is not a "pat" additive dosage for all projects-this is where the

engineer and inspector should rely upon the experience and knowledge of the cold-in-place-recycling contractor. They work with these products every day and know by look and feel when the dosage is correct for your project.

## BEST CONSTRUCTION PRACTICES

The correct depth to CIR is 3"-4". Since the specification allows for a maximum grind size of 1½", the 3" minimum depth should not be changed. As depth exceeds 4", the ability to achieve the desired density diminishes. Remember that a 4" CIP recycled product will "fluff" from ½" to 1". A greater depth can require one to compact over 5" of material at a time. The smoothness of the finished ride will also suffer considerably as the depth is increased beyond the 4" level.

The earliest that the recycled product can be covered up with a new asphalt mat has been debated throughout the years.

Specifications speak of maximum moisture content. However, due to residual and added moisture in the form of rain, there are times when these limits simply cannot be attained. Extended exposure of the CIR to traffic can cause raveling and damage the surface. A contractor should not be expected to wait for extended periods before they can proceed with the overlay. This is the most important time when good engineering judgment should control. The most important consideration before the placement of the surface mat is the stability (under loaded trucks) of the CIR. Once initial set has occurred, moisture diminishes as a controlling consideration. Many suggest that after "initial set" has been attained, usually in 7-10 days, the ability of the CIR to reduce its moisture content comes to a stop, or

*(Cont. Page 7)*

## Brown Deer Golf Outing Sees \$10,000 Hole-In-One!

What an event! The APAI Golf Outing held on June 25th at the spectacular Brown Deer Golf Course in Coralville was a HUGE success!. Over 120 golfers attended the four-person best ball tournament, but best of all, the event raised over \$2300 for the APAI Scholarship fund. The golfers played, celebrated, and won fabulous prizes at this sun-kissed outing.

As in the past, Flint Hills Resources sponsored a “Hole-in-One” competition for a \$10,000 grand prize. This year we had a Grand Prize winner at one of the hole-in-

one prize holes. Bill Kubacki of Bituminous Materials & Supply Inc. who hit his second hole-in-one of his career at our event, won the \$10,000. Congratulations Bill and thank you to Flint Hills Resources for sponsoring this event.

Thank you to all our attendees, our volunteers: Billie Willie and Carrie Diaz of L.L. Pelling Co., Kim Oltmann of Burroughs Consulting Group, and Riley Freiling and Jordan Krull of University of Northern Iowa and to our very generous sponsors for this year’s events:



*Click here to view more photos.*

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In addition, another eighteen companies were Hole sponsors.

**Thank you to all our Sponsors!**

## Summer Meeting Shines at Okoboji



The 6th Annual APAI Summer Meeting was a great triumph for this successful annual event. APAI Contractors, Consulting Engineers and Associate Members gathered at the Bridges Bay resort in Okoboji for two days of fun and fellowship. APAI thanks Toby Shine of the Classic Car Museum in Arnold Park for his hospitality as our members viewed his magnificent car collection. If you haven’t made it to this event yet, make sure to get it on your calendar for next year! Click here, to see the rest of the event in photos!



*(Cold In-Place Recycling – Cont. from Page 5)*

at a minimum, is greatly reduced. Most agree that nothing of value is gained by not allowing the CIR to be covered up at this time. This does not mean that moisture is to be ignored. Higher moisture contents in the CIR at time of placement of the overlay can cause problems as the hot asphalt comes in contact with the moisture in the CIR.

The IDOT specification limits CIR to be performed only between the dates of May 1 through Oct. 1. These dates can also be varied by the engineer. The factors used to set these dates were the average temperature and humidity for the construction period. If you are experiencing a non-typical year weather-wise, you could allow work to proceed beyond this period. Remember the temperature of the pavement and continuation of favorable ambient weather is a must. Working in a cooler environment can lead to raveling and the breakup of the CIR mat. Sunshine can heal the raveling, but continued absence of sufficient warmth in the mat can cause non-curable damage.

## **WIDENING USING COLD-IN-PLACE**

In many cases, it is advantageous to widen the roadway as part of the design. A 22' pavement can easily be widened to 24' by simply including one foot of existing shoulder in the milling and recycling process. This incorporated extra foot of non-asphalt material does not affect the final product, it actually matches the width of the mill head better and is accomplished with only the cost of the small amount of additional oil used for the CIR process. By painting the edge line at 11', future edge rut of the pavement is greatly reduced. If a wider shoulder is desired, it can be created by removing the existing shoulder to CIR depth ahead of the operation, deeper milling and simply spreading

the CIR material to the full finished pavement width, including shoulders. This is accomplished by calculating the depth of milling needed to fill the shoulder widening trench and adding this depth to the planned CIR depth. If additional shoulder depth is needed due to higher anticipated loading, it is advisable to widen the shoulder with HMA to the height of the finished CIR. This can be done either prior to, or after, the cold-in-place



recycling process. However, if done prior to, the contractor may be required to let the asphalt plant set idle while waiting for the CIR to become ready for the asphalt overlay. Idle time can cause an extra cost if a portable plant is involved. Placement of HMA after construction of the CIR can be difficult when dealing with the softer uncovered CIR edge.

## **DESIGN FOR SUCCESS**

As with all projects, the design can affect the cost. While CIR is a valuable tool in the rehabilitation on asphalt roads, it should not be used blindly. Before choosing to rehabilitate with CIR one should check out the condition of the sub-base and remaining existing pavement material. Will it support the CIR train? I suggest a minimum of 1½ -2" of existing pavement should remain under the CIR. Is there excess moisture in the sub-base? The sub-base should be as dry as possible. If problems exist, perhaps sub-drains should be added at least a year before the

CIR operation. This will give the sub-base the opportunity to dry out prior to construction. Excess moisture can work its way up through the pavement and cause the CIR to fail. Finally the timing of the CIR letting is also important. One should remember that most CIR work is done by sub-contractors who work for many contractors around the state. In order for them to complete their summers work, they must schedule the various projects well in advance. This will allow for the most reasonable bid for CIR. A late letting or tight construction period can easily add unnecessary expense thus resulting in a higher bid. Another technique that can reduce costs is to specify pavement milling prior to the CIR operation if the existing asphalt pavement thickness allows. This will reduce pavement rise, decrease the amount of shoulder stone needed and furnish the bidding contractors recycled asphalt pavement (RAP) for use in the new overlay.

## **CONCLUSIONS**

Cold-in-place recycling is an excellent method to rehabilitate your aging asphalt roadways. Recent data from the Iowa DOT has shown that typical CIR projects last an average of 23.2 years before the next rehabilitation, outperforming straight asphalt overlays by nearly 3-5 years. Selecting the right oil and dosage, doing your homework on the existing roadway, and designing the project for success will allow you to achieve a beautiful, smooth and long-lasting roadway. If you would like further information please contact the author through the APAI Offices at 515-233-0015 or at [apai@apai.net](mailto:apai@apai.net).

Royce Fichtner has worked for 42 years in various Iowa counties road departments serving as county engineer for 38 of those years before joining APAI as the Eastern Iowa Field Engineer.

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