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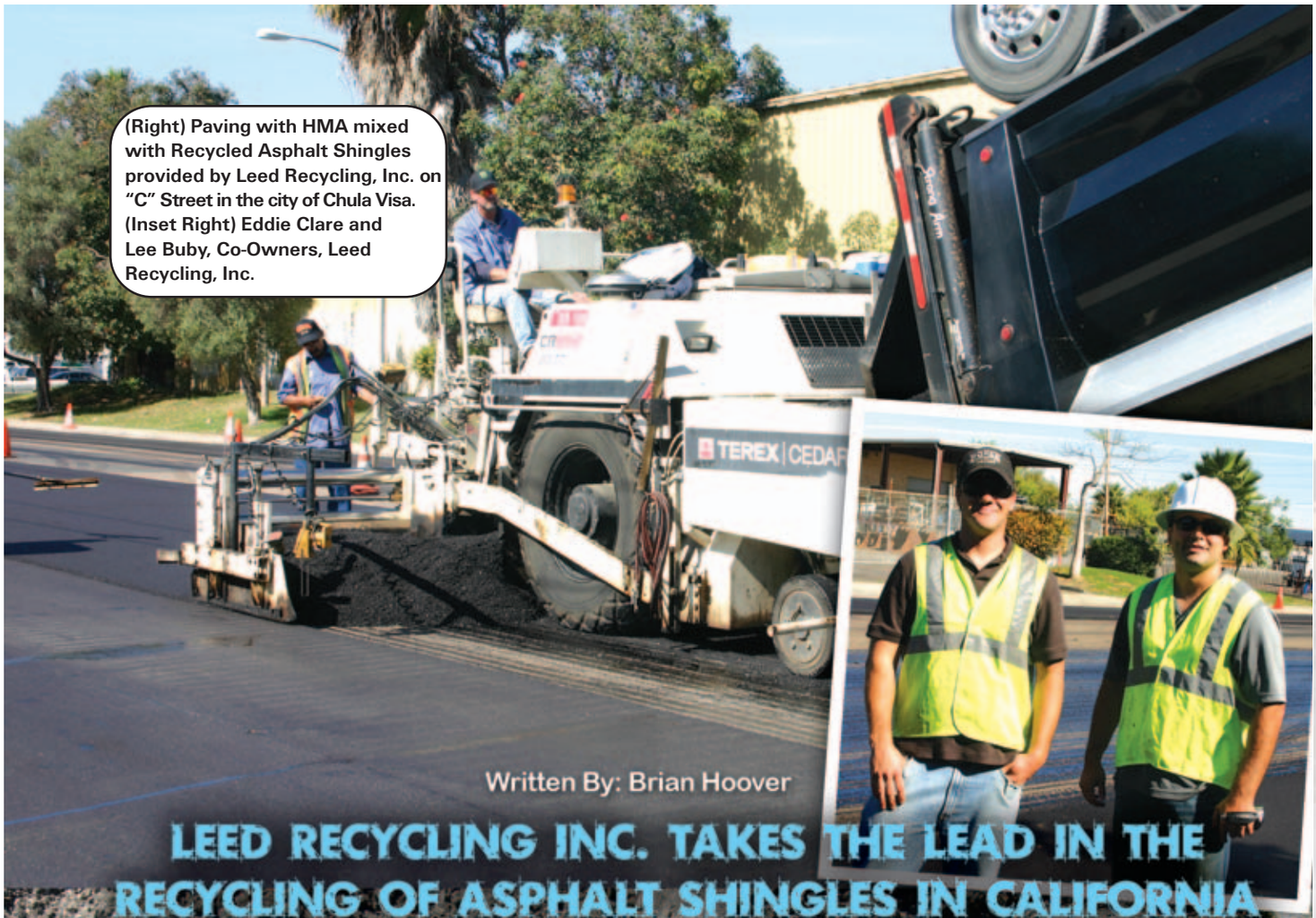

(Right) Paving with HMA mixed with Recycled Asphalt Shingles provided by Leed Recycling, Inc. on "C" Street in the city of Chula Visa. (Inset Right) Eddie Clare and Lee Buby, Co-Owners, Leed Recycling, Inc.

Written By: Brian Hoover

LEED RECYCLING INC. TAKES THE LEAD IN THE RECYCLING OF ASPHALT SHINGLES IN CALIFORNIA

First California Pilot Project Accomplished with the help of the City of Chula Vista & California Commercial Asphalt

Approximately 10-million tons of asphalt shingles ("tear-offs") are removed from existing residential and commercial buildings every year in the United States. An additional 1-million tons of factory rejects and tab cut-outs ("factory scrap") are also generated annually. Several universities, state agencies and public and private organizations have collected relevant research on the use of recycled asphalt shingles in pavement and have presented only minor deviation in details and results.

By far, the bulk of laboratory and field research on the use of roofing shingles in pavement has been on hot mix asphalt. Testing has been performed, or the material has been used, in several states including: Florida, Georgia, Indiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nevada, New Jersey, New York, Ohio, North Carolina, Pennsylvania, Tennessee and Texas. A number of these states have also incorporated recycled asphalt shingles into their HMA specifications.

Currently, potential end markets for recycled asphalt shingles include: feed stock for hot mix asphalt (HMA) and cold patch, dust and erosion control on rural roads, aggregate for road bases, recycling into new shingles, and fuel. The composition and properties of asphalt shingles are characterized in studies by the states of Minnesota and North Carolina , the University of Maryland, the National Asphalt Pavement Association, asphalt plant manufacturer Astec Industries Inc., and others like LEED Recycling, Inc., located in San Diego, California.

Lee Buby and Eddie Clare are co-owners in LEED Recycling, Inc., which they formed in 2009. Lee Buby explains their initial concept and inception; "We noted that several other states had been recycling asphalt shingles for use in hot mix asphalt for many years. The state of California remained a holdout. We were determined that the timing was right to pursue this venture, and so we started moving forward with the

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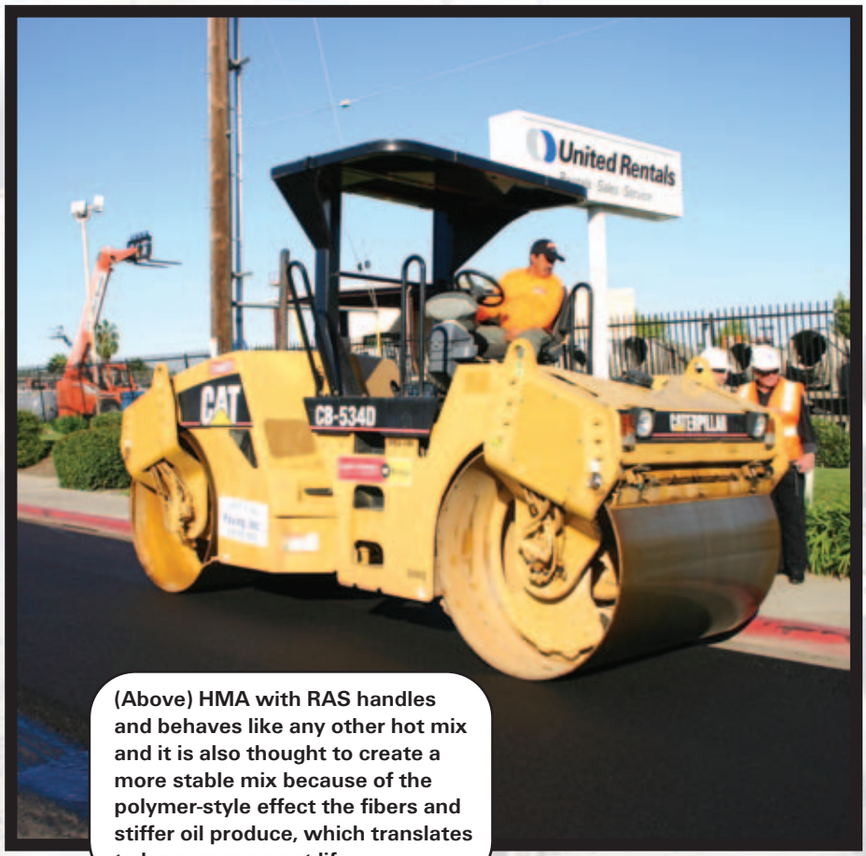
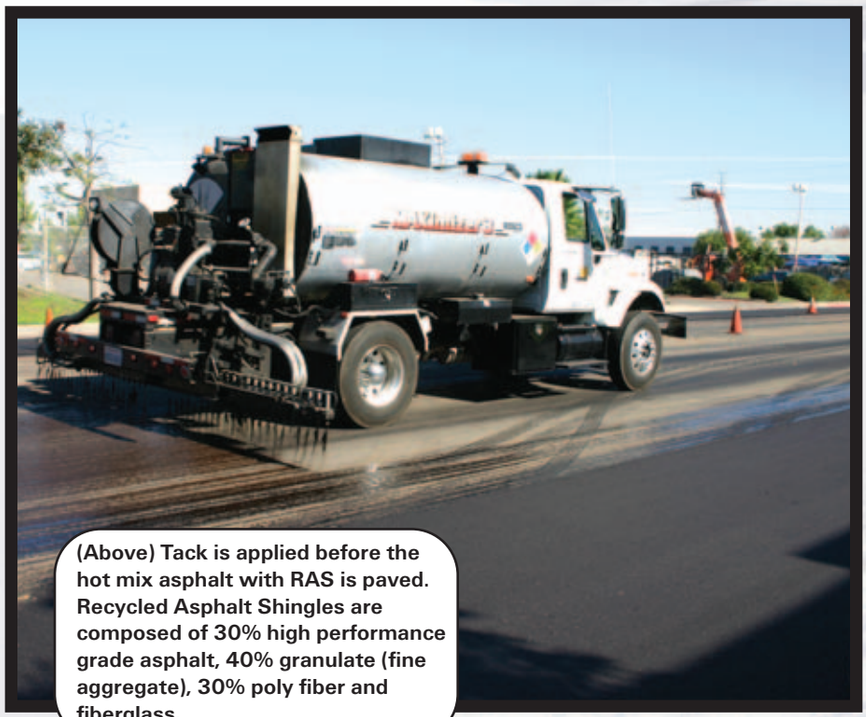
political efforts required and began accepting shingles in 2009. We address half of the challenges before the material even hits our yard by working very closely with the contractor or shingle suppliers to ensure that they are not bringing in any material that could potentially have asbestos or other unwanted components. We inspect every load before it comes in and if it has too much deleterious material or is not properly separated then we turn them around. Then it is a matter of putting the shingles through a grinder to achieve a 100% 3/8" minus gradation. Our plant is also equipped with a redundant magnet system to make sure we get all the metal out. Since our inception we have accepted hundreds of tons of asphalt shingles. More than half of this material has been sold for use on dirt roads for dust control, which sheds the water from rain and stops rutting. It really forms a fantastic dust free road and entities like organic farms are quite fond of our product. Applied correctly and maintained, these roads can as long as pavement with similar characteristics at a fraction of the cost. We have also donated hundreds of tons of RAS for demonstration projects and for hot mix plants to utilize on an experimental basis."



(Above) HMA with RAS handles and behaves like any other hot mix and it is also thought to create a more stable mix because of the polymer-style effect the fibers and stiffer oil produce, which translates to longer pavement life.

LEED Recycling, Inc. has been very active in the local technical committee meetings of the Asphalt Pavement Association of California. Through these meetings they have gained access to a fair number of lead engineers at various cities and municipalities. The City of Chula Vista is one of those agencies and they have earned a reputation for being open-minded and aggressive when it comes to new beneficial technologies. During one of the technical meetings, Jose Gomez who is the project manager and land surveyor for the City of Chula Vista, expressed an interest in participating in a pilot project with LEED Recycling, Inc. Jose Gomez PE, PLS comments, "The City of Chula Vista is always looking for ways to stretch our budget, while remaining environmentally conscious. LEED Recycling agreed to supply the processed shingles to the plant at no extra cost to the City. Then we had to find an appropriate project and create the specifications. We were initially going to use three residential streets as the demonstration areas, however the budget got squeezed tighter, so I made the decision to switch to a regular arterial main street that we already had scheduled. This scenario actually worked out better, as we decided on a heavily traveled throughfare, located at "C" Street, between Broadway and 5th Ave. This 4-lane street, with a wide median measured at approximately 1,300 feet in length and ran adjacent to Route 54. The street has a Caltrans maintenance yard off of it, apartments, a large rental yard and also feeds into a Walmart shopping center. We utilized the same local contractor, Frank & Sons, Inc., who won the bid for the entire $1.4 million project to install the asphalt with RAS incorporated into the mix. We also paved part of the area with conventional asphalt for later comparison. The finished product looked and performed like any conventional asphalt. A pilot project like this would usually take many years to evaluate, but I think we will have an idea in a year or two. We look forward to adding this process to our already very active recycling program here in the City of Chula Vista. We are also keeping our eye on

"...The greatest benefit is that RAS has the potential to replace around 20% of the virgin asphalt used, which is obviously the most expensive component in asphalt pavement."



(Above) Tack is applied before the hot mix asphalt with RAS is paved. Recycled Asphalt Shingles are composed of 30% high performance grade asphalt, 40% granulate (fine aggregate), 30% poly fiber and fiberglass.

the other RAS jobs that are going on in states like Texas and across the country. The LEED Recycling guys and everyone else involved in this project were extremely educated and prepared and they presented a very compelling presentation. It is our hope that our willingness to go forward with this product will challenge others to do the same."

Before this demonstration project was conducted, officials from the City of Chula Vista met with representatives from California Commercial Asphalt (CCA) for a debriefing of the results of lab testing. CCA's lab results confirmed additional benefits that enhance its desirability and the tests also suggested that the 5% RAS mix actually generates a 2% greater yield which could translate to significant additional cost savings on large projects. It is also thought to create a more stable mix because of the polymer-style effect the fibers and stiffer oil produce, which translates to longer pavement life. And, most importantly, used as a 5% additive, it appears to consistently add about 1% of binder oil to the mix. This can translate to significant savings when you consider the average surface mix to use only 5-6% liquid asphalt, which means that RAS could contribute 20% of the oil needed. These results were consistent between all various internal test batches, as well as the samples taken from the demonstration project and with what users have reported nationwide.

California Commercial Asphalt (CCA) was the official supplier of the RAS mix to the City of Chula Vista. Wade Anderson is the Operations Manager at CCA and he explains their involvement, "The guys at LEED Recycling approached us and asked if we would be interested in running some RAS through one of our plants. We saw this as an opportunity gain some valuable knowledge and experience running RAS. In this age of environmental consciousness it makes sense to find an alternative use for anything going to the landfill. To begin preparations for running RAS asphalt, we first made contact with other producers back east and in states like Texas, where they were already using the RAS product. We found that the most standard practice was to incorporate 5% shingles by weight and that typically resulted in a 1% reduction in virgin oil binder usage in the mix. We did not feel that it was necessary to reinvent the wheel and therefore put great stock in other suppliers' experiences. We don't have HVEEM mix design procedures incorporating RAS, so we decided to produce some trial batches of RAS HMA in the plant and test the material. We also decided to add a small percentage of sand to the RAS to allow the material to flow better and prevent sticking and hot spots. We knew that the pilot project would call for around 700 to 800 tons of HMA, so we loaded the existing RAP hopper with RAS and fed it into the drum mix plant at 5%. The product was produced at normal hot mix temperatures and acted and appeared identical to standard hot mix. We produced about 25 to 30 tons during each trial batch of RAS. Hot samples were pulled and sent to our lab for testing, which included gradation analysis, HVEEM stability and lab air voids. This process was repeated approximately 3 times in order to verify our results and they were all consistent. Our lab air voids were good and stability was actually a little higher than conventional hotmix. The stability increased 5 to 6 points with the RAS mix compared to the same conventional HMA. There are fibers involved in manufacturing shingles and perhaps these fibers in the ashalt matrix helped to provide more stability. As a producer we are interested in manufacturing a top quality product with as much recycled material as possible, as long as it is economically viable without being detrimental to the overall mix. I did not see any detriment to the usage of 5% shingles, only positives. It is my opinion in the years to come, RAS asphalt will be developed, tested and become an accepted hot mix practice here in California. If CalTrans were to develop some specifications for RAS in State projects, it would help promote this recycle material for use in local agency projects. In the meantime, RAS can be developed and promoted cooperatively between interested local producers and the agencies and private sector projects

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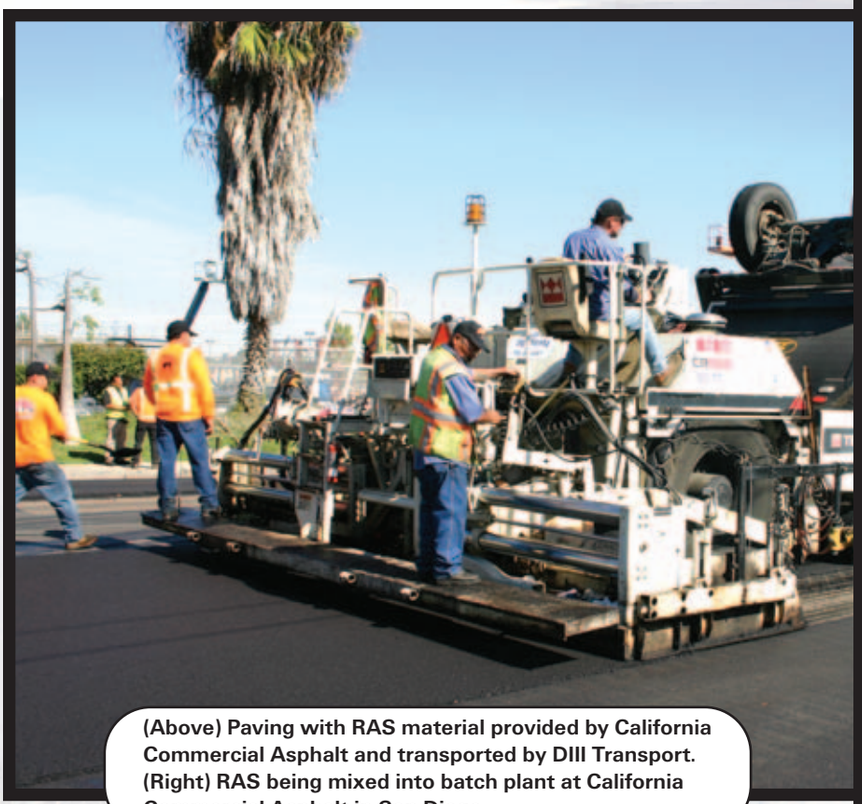

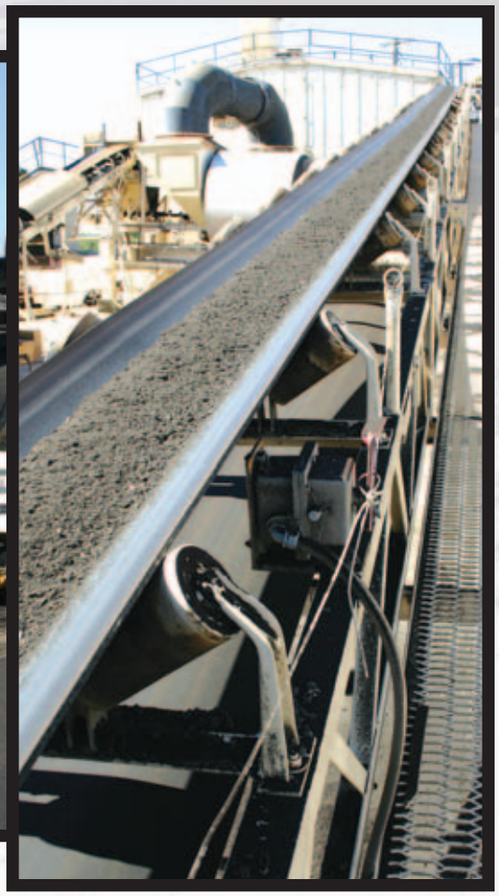

(Above) Paving with RAS material provided by California Commercial Asphalt and transported by DIII Transport. (Right) RAS being mixed into batch plant at California Commercial Asphalt in San Diego.

they supply. We are the first hot mix producer that I am aware of in the San Diego market that has produced a RAS product. It took a Lee Buby to spearhead this new product and he is doing a very fine job. That is why we wanted to support his efforts. We are also very excited about the potential of using RAS along with RAP in our asphalt products. Blending these two recycle materials is commonly and acceptly done in other parts of the U.S. and we see no reason why it shouldn't be done here in those California markets where RAS is available. We will continue to grow and evolve with products like RAS, as we continue our quest to be the producer of choice in our market area."

Lee Buby of LEED Recycling, Inc. concludes, " The most fortunate part of the RAS pilot project was that it was very boring - It goes down like any other asphalt. The greatest benefit is that RAS has the potential to replace around 20% of the virgin asphalt used, which is obviously the most expensive component in asphalt pavement. Lab tests show that RAS creates a slightly less dense mix, which means it has a higher yield. So in theory one ton will cover more than a conventional mix will. In the end it is about prolonging the life and durability of the asphalt pavement. Obviously time will tell the story, but the higher stability values indicate RAS might ultimately increase the quality of our roads while offering opportunities for cost savings. This is a win-win for everyone involved and is in every sense of the phrase a "no brainer": Keeping material out of landfills while providing an inexpensive source of liquid asphalt with equivalent or greater performance than virgin oil. Now that the City of Chula Vista has taken that first step, I can not imagine that it would be too long before other municipalities follow suit and jump on the band wagon."

California Commercial Asphalt currently has three asphalt plants in San Diego County. They produce and supply all types of asphalt products from Greenbook, Caltrans and FAA specifications to warm mix and recently added an emulsion and seal plant at their Miramar location. For information on California Commercial Asphalt, call Wade Anderson at 858-513-0611.

For more information on the City of Chula Vista and their role in this project or other environmentally sustainable programs, please contact Jose Luis Gomez, PE, PLS, Project Manager-Land Surveryor at 619-476-2301 or visit their offices at 276 Fourth Ave., Chula Vista.

LEED Recycling, Inc. also currently offers contract grinding services for roofing shingles, green waste and other materials. They are currently located at 8725 Miramar Place in San Diego. For more information please visit them online at www.rooftoroad.com or call Lee Buby at 858-550-0919.