Asphalt-Rubber Chip Seal (SAM and SAMI) applications have been “Main Stream” since 1985!

By: Jeff Smith

Background

Asphalt-rubber binder and asphalt-rubber pavement preservation systems have been utilized by various city, county and state DOT’s since the early 1970’s. After years of consistent use and verified long term performance asphalt-rubber systems have become a standard for many of these agencies. This use pattern is especially true in Arizona and California as agencies in these states have established their own standard use criteria and continue to include asphalt-rubber systems in their pavement preservation efforts.
In 2004 International Surfacing Systems (ISS) began development of other “field blend” binder materials, such as RAB (Rubberized Asphalt Binder or PG 76-22TR) and RASS (Rubberized Asphalt Scrub Seal) along with reviving a previously utilized technology, PMAR (Polymer Modified Asphalt-Rubber). With many decades of “field blending” experience ISS was interested in applying their expertise in the manufacture of these other binder materials and thus have the ability to control and verify (Crumb Rubber Modifier (CRM) and/or SBS Polymer) percentage and most importantly, the end result binder quality. This would enable the user agencies the ability to specify the desired pavement preservation system(s). These systems would then be applied based on the existing pavement condition, climate and traffic meeting the agencies expectations concerning initial cost effectiveness and the absolute best opportunity for long term performance. The initial research and development was done in conjunction with Mactec Engineering and Consulting, Inc. of Phoenix Arizona and with the partnership between ISS and Mactec the resulting strategies continue to evolve and improve. Currently, this overall effort has now become a potential design and usage concept very unique to the pavement preservation industry.

A-R and PMAR History and Development

Asphalt-rubber binder was developed by Mr. Charles McDonald in the early 1960’s and was soon proven to be highly effective at resisting reflective cracking from the underlying deteriorated pavement. By the early 1970’s Sahuaro Petroleum and Asphalt Company of Phoenix Arizona had begun commercial production and application of this asphalt-rubber material which continued and grew until 1983 when Sahuaro divested themselves of their asphalt-rubber division and a new company, International Surfacing Inc. (ISI) was formed; the development of asphalt-rubber chip seal (SAM and SAMI) applications continued, expanded and improved. ISI not only perfected the use of asphalt-rubber binder in SAM and SAMI chip seal applications but were also the pioneers concerning the use of asphalt-rubber as a binder in Gap and Open Graded Hot Mix applications.

This “new” use for asphalt-rubber binder (as a binder in hot mix) began commercially in 1987 and has grown substantially now considered standard practice in many states and throughout the world; as this technology has gone global through the efforts of the Rubber Pavements Association (RPA), located in Tempe Arizona.

ISI continued the early research and development efforts, and further expanded these efforts, working in conjunction with Crafco, Inc. to apply their current crack seal binder technology concerning the use of CRM and SBS polymer combinations in surface treatment applications for pavement preservation. The first (PMAR) project was done in Casa Grande Arizona during the 1984 and 1985 construction seasons, proving that the existing asphalt-rubber technology could be “upgraded” and binder formulation could be focused on specific project variables, resulting in reduced maintenance costs and further improved long term in-place performance.
This binder and subsequent system development has in turn become the model for what ISS has done since 1998, after acquiring the assets of ISI. The research has continued and is ongoing as ISS has revived the use of the original ISI/Crafco PMAR binder along with the perfection of the RAB and RASS materials. Composition of accurate and useable specifications has led to improved usage criteria and construction procedures. There is no doubt that this evolving effort has given specifying agencies the ability to focus specifically on individual project variables and utilize the various pavement preservation strategies and systems to account for these variables.

It is very important to note that due to the increased viscosity of A-R and PMAR binder materials the application rates, when constructing a pavement preservation system that includes a SAM or SAMI chip seal application, range from .55 to .75 gallons per square yard. These heavier application rates allow the specifying agency flexibility to specify the various pavement preservation systems for use on roads and streets that are in very poor condition, usually ranging from 3 or 30 to 5 or 50 on the pavement condition index. Other binder materials with lower viscosities simply cannot be applied at the heavier application rates, which has proven to be a negative when considering long term performance. This also holds true when utilizing the lower viscosity binder materials in gap and open grade hot mix manufacture.

**Field Blending vs. Terminal Blending**

When comparing the concept of “field blend” with “terminal blend” manufacture, it can be as simple as a difference in philosophy. When considering field blend technology the PG asphalt cement and modifier(s) are blended/milled to meet certain specification requirements, which is the case with terminal blend technology. The main difference between the two types of manufacture, when considering the RAB or PG 76-22TR binder type, is modifier particulate is present in the field blend binder and in the terminal blend binder the modifier(s) are blended/milled to a point of having no particulate, which is specified to meet a minimum percentage of solubility. To our knowledge solubility has no correlation to long term performance; however both methods of manufacture result in improvements to binder quality and potential increased longevity.

**Benefits of Field Blending**

Currently there are over 25 contracting/blending companies that specialize in the field blending of PG asphalt cement, CRM and other modifiers. As an industry we believe the presence of CRM particulate in the various binder materials that are manufactured in the field, result in higher quality, better performing materials and the resulting pavement preservation systems that are placed for the specifying agencies. This includes the ability the agency has to confirm modifier percentage and the origin of the CRM and not simply relying on a manufacturer’s certification. We also believe by avoiding long term storage and utilizing the modified binder directly after the reaction and interaction is complete allows for a higher level of consistency which is directly related to long term performance. This performance has been proven and documented with the use of A-R and PMAR binder materials over the past 30+ years.
Asphalt-Rubber Cape Seal – Before (2005)

Asphalt-Rubber Cape Seal – After (2008)
There Should be no Confusion

Terminal blend binder materials are not asphalt-rubber, regardless of the “claimed” rubber percentage. There is no rubber particulate in the binder so the “swelling” of rubber particles and resulting viscosity increase does not happen in the same way as demonstrated by the requirements for asphalt-rubber binder in ASTM D6114. The terminal blend process results in varied and different binder properties and should not be considered an asphalt-rubber material. We believe that all terminal blend binder materials or field blend binder materials that contain less than 15 percent CRM should be classified as a Rubberized Asphalt Binder (RAB), PG 76-22TR or “modified binder” in California. Asphalt-rubber binder has always been classified in a category by itself and the justifications for this classification are very evident and clear. We believe this category will soon include the PMAR type of binder.

Conclusion

It is important to understand that all the binder materials, processes and systems discussed in this document are considered by the industry to have improved the quality of pavement preservation applications. There is no question, regardless of opinion, that this is the case. We encourage specifying agency personal to be educated and gain an understanding of specifications, construction procedures, materials manufacture, and pavement preservation system use to confirm what they should utilize, and account for the variables and conditions they individually have to deal with. This has been previously stated as the “right product on the right road at the right time”.

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