Using Asphalt Modifiers and Additives
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THE USE OF ASPHALT MODIFIERS has gained popularity for one reason. Agencies are not satisfied with the performance of readily available asphalts. Many situations require more closely defined characteristics than have historically been used for paving asphalts. As we become more able to identify our needs in an asphaltic binder, the modification of available asphalts is indicated.

You have been introduced to asphalt modifiers and additives through seminars, trade publications and industry literature. These modifiers and additives are manufactured to improve one or more properties of the binder. The use of Polymerized Asphalt Cements seems to indicate the best solution to broad spectrum problems in hot mix pavements.

One of the most important areas of modified asphalts is the use of modified asphalts. No matter how improved the asphalt or the resulting mix, if it cannot be reasonably handled and placed it is of little value. The items that should be considered in the use of any modified system are:

- Equipment Modification
- Production and Handling
- Specification Compliance
- Mix Design

EQUIPMENT MODIFICATION

Many new asphalt products have been part of a system...the new product, the new equipment, or the new contractor. The expenses incurred in purchasing new equipment, regardless of how well engineered, the expense of high mobilization costs for limited numbers of the machines with the new capability have infrequently been justified by the improvement in quality or durability. Many products have been short lived, and costly equipment, unsuitable for other uses, sits idle.

The ideal material would use equipment already owned by any of your present contractors or immediately available. The ideal material would not require modification to this equipment, but allow better utilization by increasing its use. The present state of hot mix plants, provide us with a consistent product. The system has computer controls that allow near instantaneous verification of temperature, asphalt content and controlled aggregate proportioning. A major change in the configuration would certainly create problems greater than those we are trying to address with the modifier.

PRODUCTION and HANDLING

Blending modifiers with the asphalt at the hot mix plant can present several problems. This can include installing stainless steel tanks, transfer lines and pumps. Mixing is usually accomplished by agitation with a mechanical mixer or impeller. Latex would require a flash tank large enough to accommodate the steam volumes generated and require a tank for bulk storage of the product. Due to disposal problems, drum storage is not recommended. When tanks are eliminated and injection systems are used, the consistent distribution of materials is suspect. This is why engineers almost unanimously specify pre-blending asphalt with the modifiers prior to delivery.

Transportation Conventional insulated tank trucks should be used to deliver the modified asphalt from the shipping point to the hot mix plant. The trucks should require no additional insulation, no elevated shipping temperatures, agitators or special apparatus.

Pumps The modified asphalt should be pumped into the storage tanks without fear of undesirable complications. Pumping equipment in place could be used without incidence. Temperatures consistent with accepted practices for like grades of conventional asphalts would be expected.

Tanks No modification to the storage tanks at the hot mix plant is required. The tanks are insulated to retain the heat from transportation. Electric or hot oil heating should be utilized. Tanks may be gently circulated to distribute the heat to the entire tank. As with any petroleum product, direct heat and open flame should be eliminated near the tanks.

Temperatures and Rates Many additives need higher temperatures to adequately mix with the aggregate. Polymers introduced in the batch plant dry mix cycle may increased mixing times by 500%. They are not compatible with continuous drum plants. Wet mix times can be double that normally encountered.

Due to the characteristics of PAC, normal mixing times and temperatures are retained, with no loss of production. Different projects may be prepared for by simply changing supply tanks. This allows uninterrupted service and easier scheduling. Plant operators report no problems with handling, mixing, silo storage, or truck loading. Indeed, without prior knowledge, the plant operator would be unaware that a change in materials has taken place. In hot mix asphalt paving, production rates control the costs.

Mix Transportation Since some modifiers require the heightened temperatures from mixing to continue through the compaction phase, special handling may be necessary. Insulated truck beds have been required. Rejection of trucks for low temperatures at the paver can be
Many modifiers require special release agents for their use. Fuels, soaps, or specially prepared release agents may be used as with conventional binders. Trucks may be loaded directly into the plant or insulated storage silo. All dump trucks now in use for hot mix may be utilized for PACs. Weighing, loading and dumping procedures are normal.

Polymerized Asphalt Cements have been successfully used in all types of asphalt plants. This includes both batch plants and continuous drum mixers. There have been no problems in utilizing either system. This includes the addition of RAP for hot recycling. Plants meeting agency certification policies may use PACs without additional equipment, modification or maintenance.

Paving Several modifiers require special paving systems for proper placement. The modified mixture could be placed directly into the paver, or a window pickup device may be utilized as with standard agency practice. All makes and sizes may be used. No extra modifications are called for in the use of PAC. The mixture should flow freely through the paver and into the screed. All electronic controls for depth and slope should be utilized. The paving foreman and inspectors may go about their duties with no interruptions.

Compaction Many types and brands of rollers are suitable with PAC mixtures. All have proven effective. Vibratory, static, and combinations of these have been used. Setting rolling patterns is easy and remain unchanged. In many instances density requirements were met with less effort than conventional hot mixtures. Temperatures are not elevated or need special control. Traffic may be opened under normal procedures.

SPECIFICATION COMPLIANCE

Project All agencies are interested in quality. Most have written specifications. Quality assurance demands that inspectors familiar with agency policy be on site to provide guidance to the crews and to keep records. This guidance and record keeping includes date and time, thickness, materials and performance of all phases of the construction technique. Materials inspection requires the gathering of random samples for field testing, testing at a central laboratory or independent laboratory.

PAC mixtures can be scrutinized by normal extraction practices. Relative quantities can be easily determined. The mixtures can be obtained from the plant, truck, cores taken with core drills using water or refrigerants, and by sawing with appropriate equipment. This again allows consistent sampling technique between projects. Densities may be determined by familiar methods.

Materials One of the pitfalls of hot plant introduction of additives is isolating non-compliance. Is it the injection or handling system, the materials or incompatibility between components. When the asphalt supplier combines all of these materials, compatibility and proportioning problems are corrected before they become part of the road.

Gathering samples and testing for compliance should not be complicated by using enhanced asphalts. Samples of PAC may be obtained at the point of shipment from the producers tanks or directly from the truck transport. Similar sampling points occur at the hot mix plant. This allows each agency to follow standard asphalt sampling techniques. It allows complete quality assurance. PAC provides for only one specification, that of the binder. With plant injected modifiers this may be impossible. Blended modifiers need two specifications; one for the modifier, the other for the the asphalt cement. Consistency and performance cannot be monitored or guaranteed. With PACs, the whole is equal to the sum of the parts.

MIX DESIGN

Mix design follows normal procedures. This may be by Marshall Method, Hveem Method or by modifying or combining the two. Mixing and compaction temperatures should not vary from those established for like grades of refinery asphalts. Standard parameters may be used for determining the suitability of the mix for its intended use.

This usage of standard mix design methods allow testing to be done by any approved laboratory. This includes those of the agency, whether in-house or contracted, suppliers laboratory, or those of the paving contractor. This insures the confidence and comparison of PAC mixtures. In addition, when information about traffic patterns changes, new developments or construction become available after design, change orders are easily accommodated without unnecessary delays.

SUMMARY

Not all current asphalts can be used for all applications. When needed, asphalts may be modified to upgraded specifications. There are many modifiers on the market today. They are reported to provide many benefits; reduced rutting, reduced stripping, resistance to cracking, increased longevity and cost efficiency.

Each agency will have to evaluate the performance of present materials and research the appropriate modifier for their situations. Cooperation between users, contractors and suppliers is necessary to determine specifications and procedures that will allow predictable and reliable performance of their asphalt pavements.

For proper modifier use, specifications should require that the modifier be incorporated into asphalt at the shipping point. This insures compatibility of the resulting binder through the supplier’s quality assurance process. It also allows predictable mix design and ease of sampling. Samples can then be taken at the usual points and tested for compliance.

The specifications for modified asphalt mixes should state that no new equipment or specialized modification be required by the contractor. Deviations from standard construction practices will not be allowed. Inspection practices for density and compliance to the job mix formula must not change. This allows the contractor to bid with confidence.

To date, Polymerized Asphalt Cements have shown the
The greatest promise for the broadest range of pavement deficiencies. PACs are ready mixed, compatibility problems are the responsibility of the supplier. PACs provide ease of use, ready availability, fast contractor acceptance, and reliability. Field performance is documented. PACs allow performance specification on the actual binder to be used. With wider use and cooperation between user and supplier, modified asphalts will allow continued success with the familiar process of hot mix asphalt paving for all situations.