



HANDLING, STORAGE AND USE OF ECR MIXES IN PRODUCTION AND TRANSPORT

ECR (Engineered Crumb Rubber) mix production is like standard hot mix production with fiber additions. When a JMF with ECR has been developed, it will call for a neat binder addition, the addition of specific percentages of RAP and RAS (where allowed), other specified additives added directly to the mix, a specific aggregate gradation and the addition of ECR. Plant personnel are already familiar with binder, aggregate, and additive addition processes and equipment, but like cellulosic fibers, the addition of ECR requires a separate metering/feeding device.

HANDLING AND STORAGE OF ECR

ECR can be delivered in polypropylene bulk bags or in bulk tank trucks. Typical truckload quantities of ECR will range from 22.5 to 25 Tons. Bulk bags can be delivered palletized on a flat-bed truck or in a box trailer if desired, and each bag will weigh approximately 2150 lbs. They can be unloaded with a fork-lift (most efficient) or by crane using the lifting loops on each bag. Bulk loads will require a bulk tank set up to receive pneumatic feed from a bulk tanker.

ECR polypropylene bulk bags are designed to shed water as long as the tops are closed and tied. Ideally, the bags should be stored inside or under a roof, but the bags can be stored outside on a temporary basis. If they are stored outside with or without overhead protection, Asphalt Plus recommends the following procedures:

- Keep the bags on pallets,
- Do not store the bags in wet areas or in

standing water,

- Do not leave ECR bags outside for months at a time. Polypropylene can become brittle with extended exposure to sunlight and may tear or break easily.

When stored properly and kept dry, ECR powder has a shelf life of at least two years.

Bulk bags of ECR are typically used with a loss-in-weight feeder (usually an adapted fiber machine or a bulk silo). In order to load the fiber feeder, bags are suspended over the surge or feed hopper, the bag bottoms are cut with a razor and the contents discharged into the receiving hopper. Care should be taken to follow all applicable safety procedures when unloading bags, as each bag will release over a ton of fine rubber powders.

Bulk loads can be pumped into a receiving silo for metering during production.

In the event of any spillage, we recommend cleaning up the powder like any other inert, non-hazardous dust. Unmodified ECR powders can be considered as a Subtitle D non-hazardous waste that can be swept up and disposed like normal office wastes.

ECR FEEDING DURING PRODUCTION

ECR is a very fine engineered rubber product. It can be fed into the plant using either a free-standing loss-in-weight feeder (typically a fiber machine modified for ECR feeding) or a loss-in-weight cone-bottom tank that utilizes either a vein feeder and pneumatic blower or a feeder and an

auger to transport the ECR into a batch or drum plant. Specifications for allowable feeders, feeder setup and feeder accuracy vary by state. Please make sure your selected feeder method complies with applicable state standards.

In all feeder systems, the goal is to deliver the right proportion of ECR to the mix, whether it is in a continuous or batch asphalt mix production plant.

- In batch plants, feed accuracy is maintained by adding the correct weight of ECR to a mix batch based on a pre-determined Job Mix Formula. Batch mixing does not begin until all of the ingredients are added into the chamber.
- In continuous or drum plants, the plant speed can vary during startup and production. When plant speed varies, the ECR feed rate must be modified in order to maintain the proper proportioning of ECR and mix tonnage. Most specifications will allow manual modification of the feeder during production during temporary or trial setups. Once the feeder setup is a permanent part of the plant, those specifications will require the feeder to accept a signal from the plant whenever the plant speed changes, and the feeder must include the ability adjust the feed rate to match the plant speed. In most applications, the plant signal to the ECR feeder comes from the binder pump, as it will always adjust the binder feed as the plant speed is modified.

All feeder systems should be periodically calibrated for feed accuracy per applicable specifications and feeder manufacturer recommendations.

ECR FEED TRACKING AND RECORD-KEEPING

As a part of many QA/QC systems, road agencies are interested in verifying the presence of designed amounts of ECR in produced mixes.

Many state and local/regional specifications

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require the collection of tracking data on ECR feed rates, so data collection systems are an important part of your feeder system.

Most free-standing fiber/ECR feeders are equipped with a system that can record instantaneous feed rates at user-specified intervals. As long as the feeder is properly calibrated per the manufacturers recommendations and the sampling intervals and feeder times are set properly, the feeder will record all feed rates and feed amounts during a production interval or production run. Initial Feed Rate Settings for fiber/ECR machines are typically input through the feeder controls when the unit is free-standing. When the feeder is installed as a part of the plant control system, feeder inputs and adjustments will be a functioning part of that plant's control system, and the feeder will be set to adjust feed rates based on input data from the plant. The feed rate data from the feeder can be recovered from the feeder, either through manually accessing the data storage chip in the unit or downloading the data into plant records. Please follow the manufacturer instructions and applicable specifications for data storage and retrieval on the feeder specific to each plant.

Regardless of plant and feeder design, we recommend that a full record of the feed rates and amounts during each production run be retained as a part of plant recordkeeping.

PLANT PRODUCTION WITH ECR AND MIX DWELL TIME

As noted in Technical Bulletin 1, ECR will swell when it is exposed to heated asphalt binder. Larger swollen grain sizes increase opportunities for crack pinning and deflection, which increases mix fracture energy. Swelling speed is tied to the temperature of the binder or mix. Hotter mix temperatures/higher plant temperatures mean less reaction or "dwell" time will be required to achieve near-maximum swelling. Asphalt Plus recommends a plant temperature of 315 F or higher and at least 30 minutes between mix production and loading into the paver.

As long as a mix is hot enough for laydown and compaction, additional/extra dwell time will not harm the ECR.

POST-PRODUCTION VERIFICATION OF ECR ADDITIONS

It should be noted that post-production testing of produced mixes and cored, compacted samples with attention to binder content and/or binder modification, solvent recovery of asphalt binders in those samples will not include most of the ECR added as a mix modifier. Please see the Asphalt Plus Technical Bulletin # 5 for additional detail on mix testing after production.