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Mixing Gilsonite into Bitumen or Asphalt mix

Gilsonite's Benefits in Asphalt Paving Mixes

When Gilsonite is added to bitumen it modifies bitumen to lower its penetration, increase its viscosity and increases its softening point. For the manufacture of road paving mixes, Gilsonite increases the mix stability, thus reducing shoving, rutting and other types of deformation problems that occur from heavy traffic and hot weather conditions. Gilsonite reduces the temperature susceptibility of most bitumen, thus achieving the high temperature performance economically in low temperature characteristics. Gilsonite is extremely easy to add, either to the paving mix directly or to the hot bitumen mix. It also causes minimal disruption of the contractor's operation. The cost of Gilsonite is a small fraction of the cost of most other modifiers. Gilsonite easily combines with other hot mix components; forms stable solutions that do not separate during hot storage and using it does not require changes in pavement design, nor in the contractor's standard pavement laying practices.

Methods of Addition

Gilsonite can be easily added to hot mix in a variety of ways. It can be dissolved in hot bitumen prior to the addition of bitumen to the mix. The most popular method is to add Gilsonite directly to the asphalt mix in the batch plant or drum mixer. As a free flowing, dry and granular solid it can be added directly in small, absorbable plastic bags or added in bulk using vein or screw feeders. It can typically be added directly to the bitumen tank. The temperature of the bitumen should reach approximately 170°C and in continuous recirculation through the top of the tank to create splashing action. The product dissolves easily with moderate mechanical agitation. Even faster dissolution can be obtained by using a mixer capable of generating a vortex. Gilsonite is readily combined and completely compatible with the other hot mix components and paving operations are virtually unaffected, i.e., no specialized equipment is required.



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Technical Information

Mixing Gilsonite Into Bitumen

A bitumen tank with a propeller agitator with enough agitation action to create a vortex is recommended. The best choice is a "lightning" mixer or some other type of electrically powered mixer. An explosion proof motor is preferred if large dust concentrations are likely to occur. Gilsonite should be added slowly at the vortex. Provisions should be made to recirculate the hot bitumen through recirculation piping.

The most important item is that the minimum temperature should be about 170 to 175° C. Anything significantly less than this will extend mixing time. For typical (5-10%) substitution concentrations, 2-4 hours of mixing after addition is completed should be sufficient. For master batch concentrations (over 10% Gilsonite) recirculation overnight is preferred.

If the bitumen cannot be heated higher than 170°C then you may consider using our lower grades of Gilsonite for a lower softening point. However, each one of our available grades will require slightly more Gilsonite to be added to achieve the same level of bitumen modification.

The dry Gilsonite should be poured into the hot bitumen slowly. If it is added too fast then it may agglomerate at the surface. If this happens then some manual stirring to disperse the agglomerations may be required. If a horizontal, cylindrical tank is used, then Gilsonite should be added at an opening at the top (about 0.5-1.0 meters in diameter). Recirculation piping will be necessary to insure some agitation effect and proper dissolving.

Recirculation is very important to achieve proper dissolution. If mixing is done in a horizontal tank then it is essential that the Gilsonite-modified bitumen be recalculated from the front of the tank to the back, or vice versa. This should be accomplished, even if some re-plumbing of the tank is necessary.

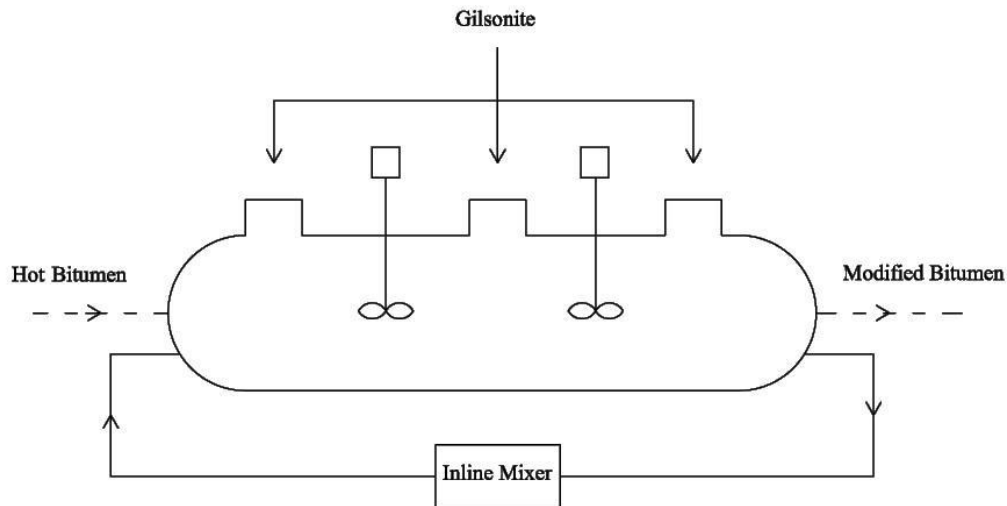
Gilsonite does not dissolve instantly. Mixing a tank containing 10-15 MT bitumen and 5% Gilsonite addition will take about 2-4 hours to add in, and an additional 2-4 hours mixing time afterwards. Naturally, higher Gilsonite dosage levels will require longer mixing times.

Unfortunately, during mixing there is no test or checklist to determine whether the Gilsonite is blending well in the bitumen. However, if it is not, then large balls or chunks will be visible in the bitumen if it is in an open tank. Afterwards, the best method to check whether Gilsonite was fully mixed into the bitumen is by comparing the original and final penetrations of the bitumen. This method requires that the original bitumen must be sampled and its precise penetration be determined.



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As it shows below, process is in the batch system. Cut off line of feed and product indicates the batch system. The mixing will be finer if the recycle flow is higher. Three hoppers design can be better than one hopper design since because it causes perfect distribution of Gilsonite into the mixer



Batch Plant (Pug Mill)

Mixing First, Gilsonite should be added during the dry cycle of the mixing procedure, onto the hot aggregate rocks, before the bitumen is added. We recommend extending the total cycle time by about 15 seconds to insure proper dissolution. We have found that 5 additional seconds of dry mixing and 10 additional seconds of wet mixing maximized the Marshall Stability of the paving mix.

Gilsonite can be stored in an additional silo at the pug mill and sprayed into the mixer. A screw feeder or vane feeder that measures out the amount of Gilsonite per batch can be calibrated to measure the dosage level of Gilsonite per batch. Afterwards, the only residue left behind in the silo will be Gilsonite powder that can be easily cleaned out.

Polythene Bags

It may be much easier to pre-package Gilsonite into small, polyethylene bags with a measured amount of Gilsonite and toss them onto the hot aggregate in a batch plant. The sidewall thickness of the bag should be about 0.5 mm. The aggregate temperature should be around 180°C. It is the aggregate temperature that is melting the bags and the Gilsonite, not the heat from the bitumen. Therefore a temperature of 150-165°C entering the pug mill is acceptable, as long as the aggregate is sufficiently heated.

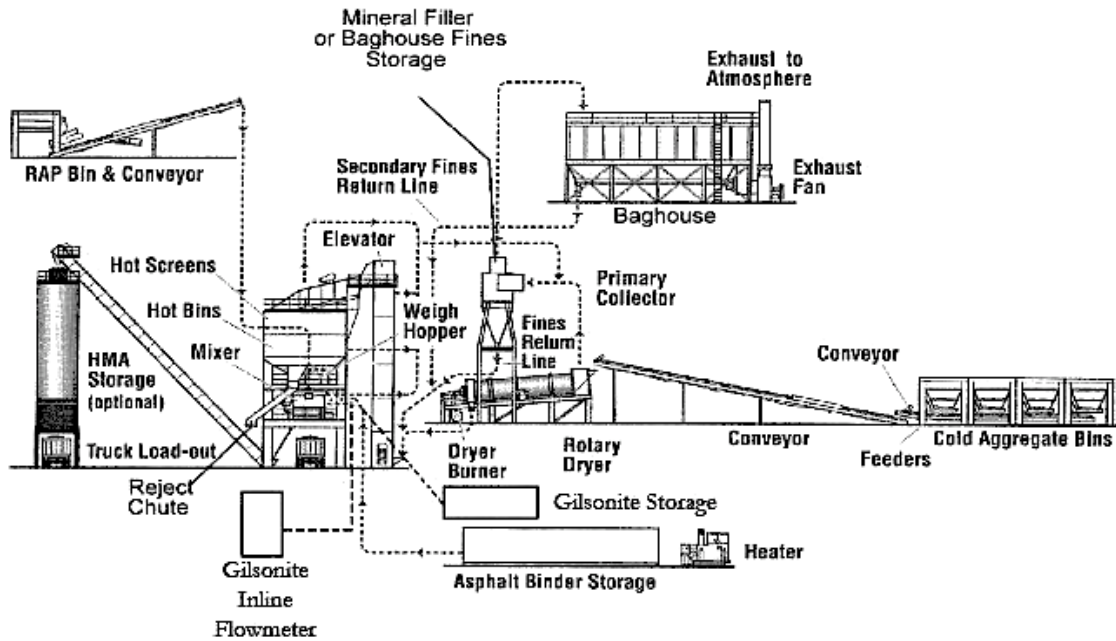
In either case, spraying Gilsonite onto aggregate or tossing bags into the pug mill, we conservatively recommend increasing the mixing time an extra 15 seconds. This will insure the Gilsonite is melted properly and dissolving into the bitumen.

Finally, it is possible to shovel a precise number of kilos of Gilsonite per batch onto the hot aggregate.

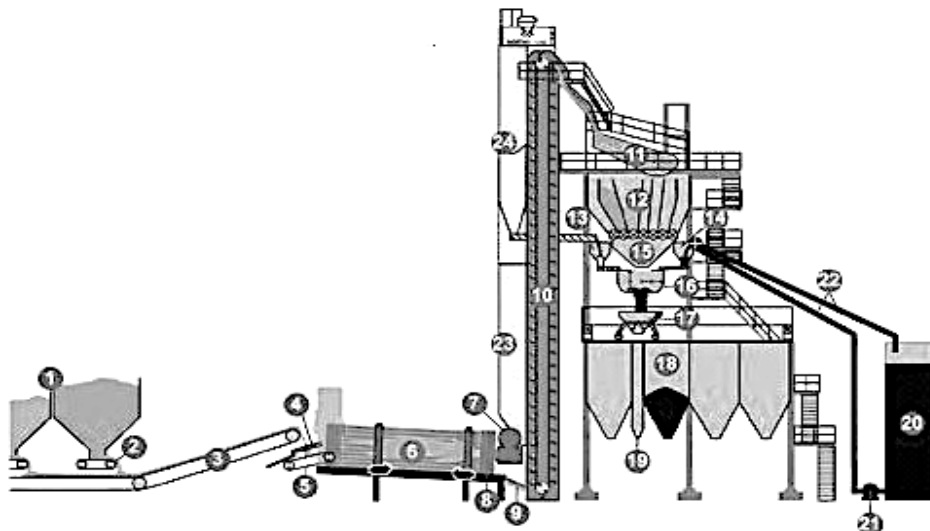


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The below figure shows a cross section view of the pug mill and shows the system that Gilsonite storage is at the pug mill, and a weigh bin controls the amount of Gilsonite added to the mixer.



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|--------------------------|-------------------------|-------------------------|
| 1 Aggregate Hoppers | 9 Dryer Exit Chute | 17 Travelling Skip |
| 2 Feed Conveyor | 10 Hot Stone Elevator | 18 Hot Storage Bins |
| 3 Collecting Conveyor | 11 Screen | 19 Reject Bin |
| 4 Oversize Reject Screen | 12 Hot Bins | 20 Bitumen Tank |
| 5 Dryer Feed Conveyor | 13 Gilsonite Weigh Bin | 21 Bitumen Pump |
| 6 Rotating Dryer Drum | 14 Bitumen Weigh Kettle | 22 Hot and Return Lines |
| 7 Burner | 15 Aggregate Weigh Bin | 23 Reclaim Dust Silo |
| 8 Collecting Ring | 16 Batch Mixer | 24 Gilsonite Silo |





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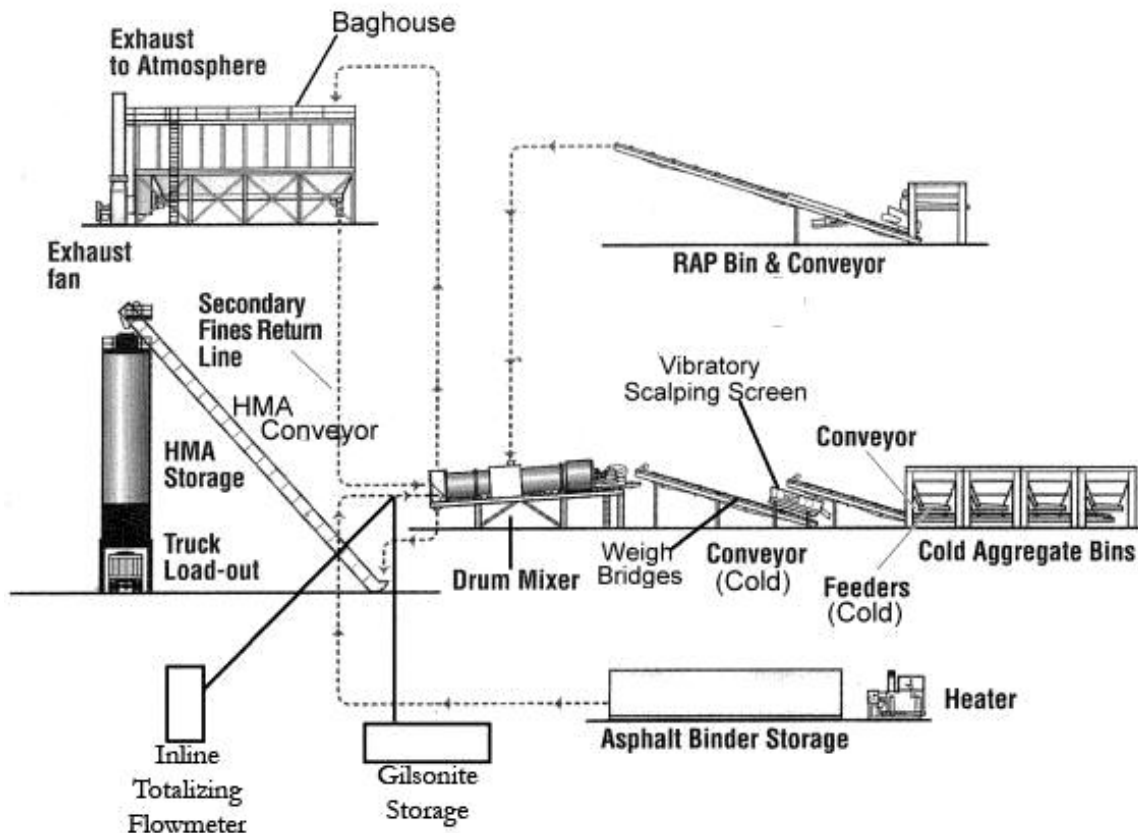
Continuous Plant (Drum) Mixing

Gilsonite may be introduced into a continuous mixing plant via a screw auger. It should be added at a point inside the drum where the bitumen is added. A drive motor that is calibrated to the plant's production rate should control the screw auger. The auger should enter the drum at the opposite end from the flame.

Care should be taken to insure that Gilsonite is not caught up in the air stream and delivered to the bag house. It should be added right under the bitumen output so that a part of the Gilsonite is taken down by the bitumen to mix with the aggregate.

As it's seen in the diagram, Gilsonite incorporated into drum by a feed line that must be equipped with an in-line blending system capable of metering the Gilsonite within plus or minus 10 percent of the amount specified. Considering the following instructions is necessary:

- Interlock the metering device with the asphalt binder control equipment in such a manner as to automatically vary the Gilsonite feed rate to maintain the required proportions and which will automatically indicate in the plant control room when flow is obstructed or stops.
- Inject the Gilsonite into the asphalt binder feed line prior to introduction into the aggregate.
- Equip the feed line with a blending device to thoroughly mix the Gilsonite with the asphalt binder prior to mixing with the aggregate.
- Provide a system capable of being calibrated, checked and monitored for accuracy and quantity of the amount used. The in-line blending system will be equipped with an in-line totalizing flow meter.





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Paving Procedures

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