Texas Department of Transportation

Technical Advisory

Fly Ash Supply Update

Fly ash, a by-product of coal-fired power plants, is the most commonly used supplementary cementitious material (SCM) in the world.

Fly Ash Supply Update

Over the last 20 years, TxDOT has relied heavily on fly ash to improve the long-term durability of concrete. Given the current EPA regulations for pollution control and the continuous low price of natural gas and the increase of wind generated electricity, the future supply of fly ash is less predictable.

Current Status of Fly Ash Supply

There are 44 approved fly ash sources on TxDOT's Material Producer List, 16 are in Texas and supply the vast majority of ash to TxDOT projects. Of the 16 Texas fly ash sources, six are Class F and 10 are Class C.

Most fly ash sources and the majority of the Texas lignite coal deposits are located in central to northeast Texas. A few Class C sources are in and around the Texas panhandle. Figure 1 shows a map of Texas Fly Ash sources giving more details about the locations of Texas fly ash sources.

Currently, there are 15 fly ash type F sources listed in the MPL that are not produced in Texas including three foreign sources. The out of state as well as imported sources can help to address a portion of the demand. Another alternative to replace Class F fly ash and mitigate ASR are Blended SCMs which are already produced by some manufacturer. Work is underway to modify TXDOT's specifications to handle these materials. Finally, reclaiming fly ash from disposal facilities is being considered by some fly ash suppliers which can potentially increase supply in the future.

Scheduled and unscheduled maintenance (outages) to power plant equipment tends to affect the supply of fly ash. At any given time, there is enough fly ash in the state, just not necessarily in locations where the demand is high. Customers (concrete suppliers) typically do not want to pay more in shipping cost for fly ash from farther distances.

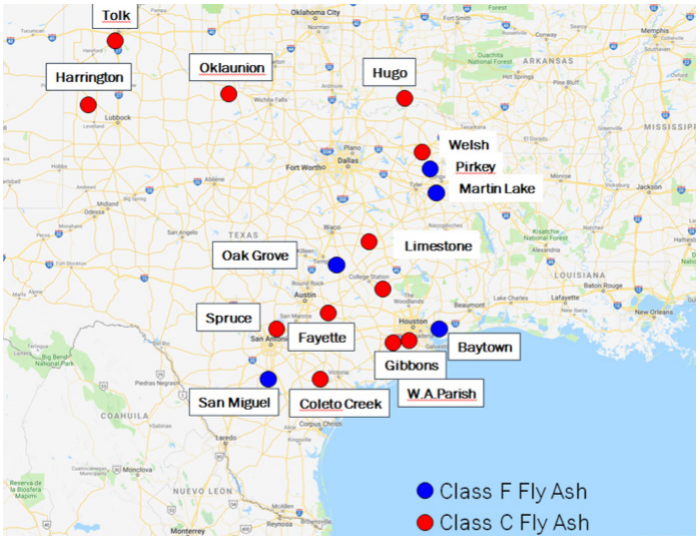

Fig. 1. Map of Texas Fly Ash Sources

Uncertain Future of Fly Ash

The future availability of Class F fly ash is difficult for the industry to predict because it is currently dependent on several factors. These factors include, but are not limited to:

- using Powder River Basin (PRB) coal or blends of Texas lignite coal and PRB,
- using Activated Carbon Injection for the removal of mercury,
- using selective catalytic reduction controls for the removal of NOx and Sox, and
- increased use of solar and wind power generating units.

Pollution control measures may change the quality or composition of the fly ash, thus reducing the amount of Class F fly ash available in the state.

The EPA rulings and any additional pollution control measures installed at the utility plants create uncertainty in the future of fly ash supply in Texas. However, any shortages will likely be regional in nature and could be resolved by transporting fly ash over farther distances from other approved sources.

Fly ash, especially Class F fly ash, is an important component of durable concrete. With the potential for shortages in fly ash supply in parts of Texas, contractors and concrete suppliers should prepare to transport fly ash from farther distances and TxDOT should expect a resulting increase in the price of concrete.

Mix Design Options

One of the primary reasons fly ash is used in concrete is to mitigate ASR. The concrete mix design options listed in Item 421 were developed to be a prescriptive measure to prevent ASR from occurring in new concrete structures. Deviation from these prescriptive options elevates the risk of ASR to occur, so allowable deviations are generally going to be more conservative than the prescriptive options listed in Item 421.

Switching to a Class F ash, from either another Class F or a Class C ash, is the less concerning switch. Generally, Texas Class F ashes are very similar in their ability to mitigate ASR when used at minimum prescribed dosages. This switch may only require trial batch testing to substantiate other job requirements.

Because Texas Class C ashes are much more variable in chemistry and less efficient at mitigating ASR than Class F ashes, performing ASTM C 1567 testing is required up front when switching to Class C ash from a Class F or switching to a different Class C ash source to determine the minimum dosage of Class C ash needed. Without this test data, the only option is to require high dosages of only certain Class C ashes (CaO contents ≤ 26%). When taking this route, ASTM C 1567 testing is still recommended to determine if reduced dosages are acceptable or if other local Class C ashes can be used.

A second option is to design non-structural classes of concrete mixes that contain ≤ 520 lb./cu. yd. of cementitious material. The low cement content drastically reduces the potential for ASR; therefore, any Class C ash can be used without additional testing. This only applies to classes of concrete other than structural classes (A, B, or P).

The third option is to use Class C ash as part of a ternary mixture (Item 421, Option 5) or to completely remove the ash from the mix designs and limit the alkali loading to ≤ 3.5 lb./cu. yd. (Item 421, Option 7).

The following flow chart can help concrete suppliers determine the acceptable options when switching ash sources due to supply shortages.

CONTACT INFORMATION

If you have questions regarding fly ash supply in your area, please contact:

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