Meet New Airport Spec

P-601 resists fuel, kicks out coal tar

BY *ASPHALTPRO* STAFF

The Logan International Airport received its fuel-resistant asphalt pavement in 2004 and is still holding strong today. *Photo courtesy of Axeon's Ron Corun.*

Editor's Note: While some of this article appears with permission of Hawai'i Asphalt Pavement Industry's Jon Young, it has been edited to include updates from Ron Corun, the director of asphalt technical services for Axeon Specialty Products, Stamford, Conn.

It's been more than a decade in the making, but the Federal Aviation Administration (FAA) approved the P-601 specification for airport mixes Aug. 21, 2014. The P-601 FAA spec solves a couple of problems while allowing contractors to use standard construction practices to give airports a cost-effective product. Let's take a look.

Airports experience jet fuel spills on aprons and taxiways during fueling operations. When you consider the construction industry has—in the past—used liquid diesel as a cleaning agent, you can see how a jet fuel spill can cause weakening of pavement bonding. If you take a standard HMA core and soak it in jet fuel for 24 hours, the core will lose approximately 10 percent of its weight, according to Ron Corun of Axeon Specialty Chemicals, Stamford, Conn.

What happens is the fuel softens the pavement and allows permanent deformations. To prevent spilled fuel from harming their pavements, airport maintenance engineers have used coal tar sealers on airport aprons, alleys, etc.

The use of coal tar sealers poses a problem for three reasons.

- First, due to a different coefficient of thermal expansion for coal tar and asphalt, the coal tar tends to crack in two to three years.

The surface at Logan Airport in 2004

The surface at Logan Airport in 2014

The grooves cut in the surface at Logan Airport have remained unfractured as of August 2014. *Photos courtesy of Axeon's Ron Corun.*

- Second, coal tar contains polycyclic aromatic hydrocarbons (PAH), which are compounds that have been identified by the Environmental Protection Agency (EPA) as "probable human carcinogens" and toxic to aquatic life. In fact, in March 2012, Congressman Llyod Doggett (D-Austin) introduced the Coal Tar Sealants Reduction Act of 2012 in the House of Representatives because he wishes to amend the Toxic Substances Control Act to prohibit the manufacture, processing, distribution in commerce, and use of coal tar sealants.
- Third, engineers need to decide what to do with a pavement that has been coated with a coal tar sealer. What becomes of the coal tar sealer in recycled asphalt pavement (RAP)?

Fortunately, the asphalt industry has the fuel-resistant polymer-modified asphalt solution. Engineers placed fuel-resistant asphalt (FRA) internationally, and then at LaGuardia Airport in New York in 2002. That was a test section of 450 tons, paved at 330 degrees F on a taxiway. Inspection of that pavement in October 2003 showed no rutting, no cracking and no surface deterioration, according to Corun. When crews placed the FRA at Logan Airport in June 2004, they placed 1300 tons on Taxiway N and Runway 4L-22R.

Corun further explained that the location for the FRA mix at Logan was an area where the pavement had shown rutting and shoving after each summer season in the past. The P-401 spec for the Logan FRA project was modified by CITGO Asphalt, a predecessor to Axeon Specialty Products, and the engineers at the Massachusetts Port Authority to optimize the performance of the FRA mix. The AC content was increased by lowering the target air voids to 2.5 percent and reducing the Marshall mix compaction from 75 blows to 50. Increased AC content reduces permeability of the FRA mix, which prevents fuel spills from soaking into the pavement structure. It also increases the fatigue life and durability of the FRA pavement. The FRA spec developed for Logan Airport was the model for the new FAA P-601 spec. The Logan FRA and FAA P-601 spec modifies P-401 as follows:

Mix Spec:

1. ½-inch P-401 mix
2. Target 2.5% air voids
3. 50 blow or 50 gyrations (regardless of aircraft size)

Liquid Asphalt Spec:

1. minimum PG82-22
2. minimum 85% elastic recovery
3. establish standard test procedure for 24-hour soak in jet fuel to measure fuel resistance
4. maximum 2.5% weight loss in fuel resistance test

The FRA graded as PG94-22. It was a ½-inch P-401 mix designed at 2.5 percent air voids with a 7 percent AC design target. The asphalt pavement analyzer (APA) suggested a 0.70 mm rutting for the mix. A drum plant produced the mix at 340 degrees; the crew placed it at 325 and met the density spec.

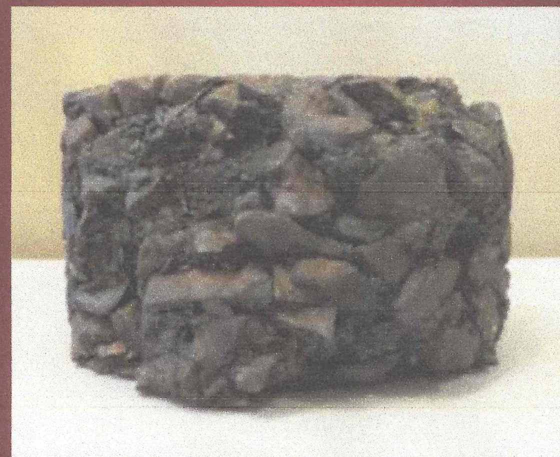
After four summers, the pavement showed no rutting, no raveling and no cracking. As of Aug. 21, 2014, after a decade in service, the FRA pavement at Logan still looks as good as the day they placed it, according to Corun.

That's not the only success story in service. The Bob Sikes Airport in Florida completed a $1.8 million apron project with the

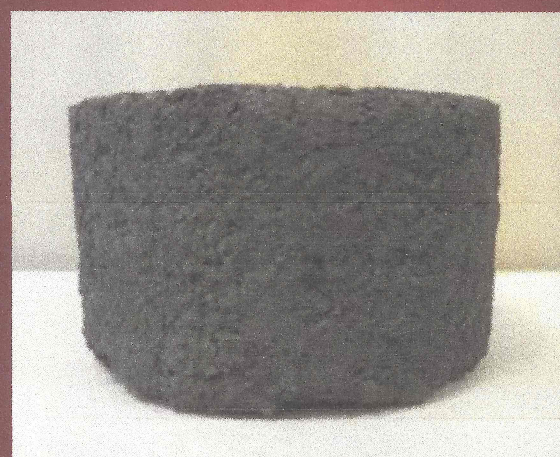
Grooves cut in the Logan Airport pavement in 2004

Grooves still look great in the Logan Airport pavement in 2014

A TALE OF TWO CORES



If you soak a standard hot-mix asphalt core in jet fuel for 24 hours, it will lose approximately 10 percent of its weight. This HMA core went through that torture and researchers photographed the results. *Photo courtesy of Axeon's Ron Corun.*



If you soak a core made of fuel-resistant polymer-modified asphalt in jet fuel for 24 hours, it will lose approximately 0.5 percent or less of its weight. This FRA core shows the result. *Photo courtesy of Axeon's Ron Corun.*

fuel-resistant mix in December 2011. The crew there refer to it as the "Crestview Mix," and it's demonstrated a high tolerance to rutting and shoving while providing resistance to aircraft fuels, hydraulic fluids and petroleum oils. The mix for the surface course included a ½-inch nominal maximum size aggregate with a PG82-22 asphalt binder. The Sikes project used the Logan Airport FRA spec. The FRA surface was between 1.5 and 2 inches thick. Sources said it worked well due to four key factors:

- The mix design called for a fine aggregate so the mix would be tight.
- The highly modified binder together with the 2.5 percent design air voids made a dense and waterproof mix.
- The use of superfine aggregate in the mix made good compaction possible. (96 percent of maximum theoretical density)
- Stringent compaction was required to ensure acceptance.

With success stories on the ground and FAA's stamp of approval, this polymer-modified asphalt not only eliminates the need for coal tar sealers that have already been outlawed in some states, but also provides the resistance to spill damage and surface irregularities that lead to further deformation.