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Measuring In-Place Density of Asphalt – Your Choices in Testing

I had the opportunity to talk with John Lamond, Sales Manager at the APAI Winter Conference in December. I would like to share what I think may be a benefit to APWA Members, but more specifically municipality Engineers or QC personnel on a newer technology. Specifically, I got to see the PQI 380 which is a non-nuclear asphalt density gauge.

Everyone agrees that the density of hot-mix asphalt is an important construction variable in the long-term durability of paved surfaces, whether it be a six-lane highway, municipal county or city road or parking lot. The mix designs may vary but the basic technical principle involved is the same. With each roller pass you are attempting to achieve the desired % compaction or air voids value. By not achieving the specified density and/or air voids value the long-term life expectancy of that pavement will reduce, increasing maintenance and rehabilitation costs which in turn, will increase the overall carbon foot print of the project.

"The rule-of-thumb that emerges is that each 1 percent increase in air voids (over a base air void level of 7 percent) results in about a 10 percent loss in pavement life (or about 1 year less)."

In recent years much more emphasis has been placed on the quality of local government projects and several documents have been written to assist municipal engineers in the design and specification of parking lots and similar projects.

The examples from several publications below support the importance of monitoring and checking the asphalt compaction to achieve a high quality, durable finished product fit for the purpose it was designed for.

California Hot Mix Asphalt – Local Government (HMA-LG) Model Specification 2021
"*HMA-LG, after the completion of rolling, shall be compacted to not less than 92 percent and not more than 97 percent of the maximum theoretical density (MTD) as determined in accordance with AASHTO T 209."*

"*If the percent of theoretical maximum density does not comply with the specifications, the Engineer must accept the HMA-LG lot and take a payment deduction as shown in the following table"*
Plant Mix Industry of Kentucky (PAIKY) -Asphalt Parking Lot Guide

"*Asphalt mixtures that have a good track record on highways and roadways are not always desirable for parking lot applications. Mixtures that perform well under posted speed conditions may experience distresses with slow and stopped traffic. Additionally, parking lot pavements are*

more susceptible to brittleness caused by light and limited vehicle traffic and ongoing exposure to the elements.

The following factors should be considered: » Design air voids in the range of 3.5 to 4 percent – air voids provide for long-term durability of the pavement"

Asphalt Pavement Alliance – Construction Checklist for Asphalt Parking Lots
"*Compaction is the most critical part of pavement installation. Properly compacted asphalt mats provide many years of reliable service. Proper compaction of the mat will keep moisture out of the pavement and prevent future problems. The plans and specifications should specify how density is tested. The inspector needs to monitor the specified compaction density with a gauge to ensure that final target densities are achieved*."

The ability to have immediate and repeatable density data as the pavement is being laid is a crucial factor in giving the engineer the confidence that the relative compaction and specified air voids values are being achieved.

The density-reading device of choice needs to be a critical tool in the engineer's arsenal of instruments. How to get these final readings and reports, in real-time, can be just as critical for the contractor. Failing to achieve the desired density will result in reduction in pay or potential removal of the pavement. The instant checking of density behind the finish roller allows for re-rolling to achieve the acceptable density.

It is no secret, beginning in the early 1960's, the two options to assist contractors with this critical information was the nuclear density gauge, or drilling core samples, the latter of which is destructive to the paved surface. However, since the late 1990's, other non-nuclear, non-destructive options have become available. This newer non-destructive technology provides repeatable, quicker, and accurate readings, without the additional burdens of the 1960's technology.

The innovative non-destructive option offers other benefits – there are no nuclear sources, no densometer badges for their team, no licensing or reporting hassles, no transportation restrictions, non-destructive to their fresh asphalt mat, and faster readings without compromising the quality of the density readings.

Figure 1: Checking asphalt density with a non-nuclear, non-destructive method

Quality control managers and engineers should take the time to know their options. Understand the safety issues, appreciate the potential cost advantages and the timeliness of getting the necessary information to have a successful, long-lasting paved surface.
Do the homework. Find the choice of measuring in-place density of asphalt that makes sense for your project and your quality team.

Using a safe, clean, efficient, easy to use QC tool to determine the in-place density of asphalt that reduces the possibility of failing pavements just be considered a viable option for many municipalities engineering departments.

I hope that the members of APWA Indiana Chapter can understand and realize the benefits of looking for alternatives and researching on their own what options are available and what they can do for you and your company or municipality.

I would like to thank Jon Lamond, Sales Manager at TransTech Systems, Inc. for sharing this information to the Chapter.

For more information on the PQI 380 visit the website @ http://transtechsys.com/