Macrotexture and Microtexture Influence Pavement Safety

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The Texas Pavement Preservation Center would like to thank the late **Mr. Gary Billiard** for his years of service to the industry, and hopes to honor his memory in endorsement of his presentation on friction and texture enhancement which is available for viewing online at the TPPC website (see *News Briefs,* Fall 2013, p 29).

The *Pavement Preservation Strategies: Friction Restoration Conference* was held at the Center for Transportation Research in Austin. The workshop, which was jointly sponsored by Skidabrader and TPPC, can be accessed on the TPPC webpage under "conferences" (ww.utexas.edu/research/tppc).

These proceedings included presentations from direction of the TPPC **Dr. Yetkin Yildirim, Thomas Yager** from NASA Langley Research Center, and Mr. Billiard, former president of Skidabrader.

Surface texture and friction are the main factors affecting the safety of pavements. The friction force that develops between the tire and pavement surface is an essential part of the vehicle-pavement interaction; it gives the vehicle the ability to stop safely. The greater the frictional resistance, the quicker the vehicle can be slowed or stopped. Skid resistance is the friction force which develops at the tire-pavement contact area.

Many factors influence the level of skid resistance on a paved road such as: microtexture and macrotexture, age of the road surface, seasonal variation, traffic intensity, aggregate properties, and road geometry. The **macrotexture** of the pavement surface is related to mixture design, compaction level, as well as aggregate gradation. The **microtexture** is related to the texture and shape characteristics of aggregates. Pavement **texture** is defined as a road surface property that describes the interaction between the road surface and vehicles tires.

When in a dry and clean state, roads generally provide insignificant differences in friction levels, regardless the type of pavement and surface configuration. Hence, the operation on dry runway surfaces is mostly satisfactory. Many studies have revealed that 15 to 18 percent of traffic crashes occur on wet pavements. When in this state, the water acts as a lubricant between the pavement surface and the tires, which reduces friction. For this reason, most of the equipment dealing with pavement friction measurement operates in wet conditions.

Microtexture and macrotexture greatly influence the skid resistance of road surfaces. Fig. 1 illustrates the difference between microtexture and macrotexture. Adequate macrotexture provides good drainage of water from the pavement surface. Microtexture, on the other hand, provides the direct contact between the tires and road surface and contributes to the adhesion part of the pavement friction. Pavement with rougher texture provides better skid resistance; however, it may increase noise, vibration, and tire wear.

Aggregate, being part of asphalt mixtures, plays a major role when it comes to skid resistance. The aggregate properties such as gradation, shape, and mineralogy dictate its ability to resist polishing action by traffic. This ability to resist polishing is the most significant characteristic to skid resistance of pavement surfaces.

Hogervorst (1974) explained that skid resistance changes with vehicle speed, and it depends on both microtexture and macrotexture. The results of this study showed that the skid resistance decreased as vehicle speed increased, and pavements with a coarse and rough surface provided better skid resistance compared to those with fine and polished surfaces.

Because of the great importance of pavement surface skid resistance, many pieces of testing equipment are developed and correlated to each other in order to measure friction. The need for improvement of pavement friction performance in existing roads has led to the development of different treatments like shot-abrading, grooving, grinding, and overlays. These topics were presented in more detail at the Pavement Friction workshop which can be accessed on the TPPC webpage.

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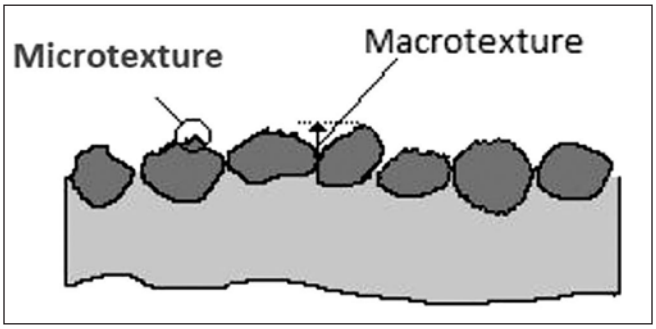

Fig. 1: Microtexture and macrotexture greatly influence the skid resistance of road surfaces