National Institute of Technology Rourkela

Registration Seminar

Seminar Title	: Development of Microwave-Induced Thermal Activation Methodology for Self-healing of Asphalt Mixtures
Speaker	: Malaya Kumar Sahu (Rollno : 523ce1002)
Supervisor	: Gourab Saha
Venue	: Seminar Hall, Civil Engineering
Date and Time	: 11 Jul 2025 (3:30 PM)
Abstract	: In flexible pavement, fatigue cracking is one of the major failure modes, which occurs due to repetitive traffic loading. In the initial phases of fatigue cracking, minor cracks develop, which eventually prelude to major cracks, if not repaired. Repairing these minor cracks is challenging and often not feasible. With the advent of new technologies, it is possible to carry out preventive maintenance by using the self-healing behaviour of these cracks. The objective of this study is to develop a comprehensive self-healing methodology based on the heating of the asphalt mixture to obtain maximum healing properties. A multi-stage heating procedure for optimal healing efficiency at various damage levels is proposed to evaluate the healing behaviour of asphalt mixtures. The major scope of this study encompasses performing laboratory investigations to evaluate the healing efficiency of asphalt mixtures and develop a systematic, staged thermal healing methodology for asphalt mixtures. As part of the experimental investigation, this study considered aggregates with BC-I gradation and VG-30 asphalt binder. At first, Marshall mix design was carried out, followed by compaction study using Superpave gyratory compactor (SGC). Semicircular bending (SCB) test was employed to understand the healing and recovery behaviour of asphalt mixtures at 25 ^{o}C. A concept of Damage Degree (*DD*) was considered to perform the SCB test at different levels of damage accumulation levels. Two separate sets of SCB tests were carried out to differentiate healing and recovery efficiency. For healing, 12 combinations of microwave power and heating duration were considered, out of which one combination was adopted, which included 360 W and 120 s. Two important indices, Healing Efficiency (*HE*) and Recovery Efficiency (*RE*), were introduced to quantify and differentiate healing and recovery. The preliminary investigation revealed that *HE* and *RE* were reduced with an increase in *DD*. A higher *HE*, with reference to *RE*, was also noticed, which indicated that healing was higher than recovery. Thus, test methodology demonstrated that it was possible to quantify the impact of thermal-based heating on the self-healing behaviour of asphalt mixtures.