

# **Development of Vehicle Intelligent Monitoring System (VIMS)**

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Tokyo Metropolitan Expressway, an urban highway network in the Tokyo metropolitan district, has 283.3 km roads in service. Almost all of them are viaducts and there are 22,000 expansion joints. About one third of the total length is over 30 years old. Traffic volume of vehicles is 1.12 million per day, and the ratio of heavy trucks is about 9%. The road pavements and expansion joints are severely damaged, so monitoring of road pavement and expansion joint is a very important issue for the road maintenance.

At present a road profiler system is being used to measure the condition of road pavement once every two years. The disadvantages of using the profiler system are that the measurement frequency cannot be higher because the operating cost is very expensive and the system cannot show the real-time condition because the processing of surface condition from the measurement needs a few months to be completed.

Inspection of the expansion joints from the inside is generally very difficult because of the narrow space and visual inspection from the road surface is practically the only way. The road profiling system cannot be applied to the expansion joints, because the condition of the expansion joints are not well captured and failure of expansion joints indeed occurs, resulting in traffic accidents in some cases.

To solve these problems for the road maintenance, “Vehicle Intelligent Monitoring System (VIMS)” is being developed. An accelerometer, a microphone, a GPS and a laptop PC are installed in an ordinary road patrol car. The accelerometer measures the vertical dynamic response of the car and the microphone measures the tire noise to determine the condition of road pavements and expansion joints quantitatively. The GPS identifies the positions where the measured responses (dynamic and sound pressure) occur. The laptop PC stores the measurement data.

A prototype of VIMS is installed in an ordinary car and measurements are made at the actual roads. At present, we can measure the data without difficulty. In this presentation, the repeatability of the measurement data is confirmed, the locations of large response on Metropolitan Expressway are demonstrated and the possibility of detection of abnormal sound is showed.

For the future, development of the diagnostic system, like setting of the criteria which evaluate the abnormal response, will be needed.