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Tractor fuel consumption, exhaust emissions and their normative assessment during field application

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The paper gives an overview of possibilities to determine the values of tractor's fuel consumption and exhaust emissions in real operating conditions by using data accumulated in electronic control units. There is ecological and economic importance for the tractors to be operated correctly: time of engine idling, operation at low and too high loads or high speeds should be shortened. Fuel consumption and exhaust emissions, including harmful components, can be reduced only by rationally use of the tractors engine power and speed. To monitor tractor's operating performance, tools and techniques are necessary that would allow to determine the controlled indicators. Currently used emission control standards are suitable for testing all types of mobile machines, but the weighting factors are not applied for tractor performing agricultural applications. Today, no data are collected about fuel used, exhaust emissions and their interaction in the real agricultural and transport activities. Reasonable that it is practically impossible to create a weighting factor to suit various working machines for proper evaluation of the various terms and conditions. Studies has shown that the specific fuel consumption and exhaust emissions during field applications can't be calculated without regard to the actual engine load and speed mode. As well, studies have found that the engine load, during typical field operations under different conditions, varies very much. For resolving the issue expected to substantiate the tractor engine fuel consumption and exhaust emissions monitoring instruments. For tractor fuel consumption and exhaust emissions evaluation, during tractor's field application, the information collected in integrated digital microprocessors, applied for engine, transmission and other tractor systems operation and control, will be used. Expected, theoretically and experimentally justify microprocessor data use, fuel consumption, exhaust emissions and their interaction assessment methods and tools. The paper presents research of tractor's engine load factor during field application. The research is conducted on the base of data accumulated in engine's electronic control units. Histograms presenting show time intervals of the field processing, fuel consumption and emission components (CO₂, NO_x and CO) in various engine speed and cyclic fuel injection modes. Test results are analyzed separately for the processes of field process and work at headlands. Test results during field application showed that main amount of fuel was consumed and CO₂ emitted during technological process and CO – during the work at headlands. Large quantities of NO_x were emitted during technological processes and during the work at headlands as well. The research results will be compared with today's valid exhaust emission standards applied for agricultural engines.

Biography

Antanas Juostas is a Doctor Service Development Manager in Baltics, at Konekesko Lietuva Company in Lithuania. He completed Doctor of Science in 2012 under Dr. Lector at Institute of Agricultural Engineering and Safety, Aleksandras Stulginskis University (ASU). His dissertation was prepared at Institute of Power and Transport Machinery Engineering, Aleksandras Stulginskis University (ASU). His publications include 25 scientific publications and research interests include tractors parameters from dynamic, ecological and economical point of view.

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