Necessity of Full Implementation of Type Approval for Non-Road Mobile Machinery in the Republic of Croatia

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Abstract

Along with continuous progress in the reduction of emissions from road vehicles, the Non-Road Mobile Machinery (NRMM) becomes a more and more important source of emissions.

Namely, although the EU Regulation 2016/1628 for NRMM introduces the latest limit emission values known as Stage V, their values are still considerably higher than those of road vehicles. Also, the average age of the NRMMs is always significantly higher than the average age of road vehicles. Additionally, a significant share of NRMM is used in highly urbanised areas.

To enable the emission inventories of higher quality, it is necessary to enable a better data collection on usage and working conditions of NRMM required for the development of emission inventories.

With that goal in mind, an organisational scheme for implementation of rules on type approval for Non-Road Mobile Machinery in the Republic of Croatia is proposed. Besides, an organisational scheme for market surveillance is proposed. An additional benefit of proposed market surveillance is the collection of data and development of corresponding emission factors for NRMMs.

Keywords: Emissions, Type Approval, EU Regulation 2016/1628, Emission Inventories, Market Surveillance

1. Introduction

Long-term efforts to have a better insight at emission sources that have adverse environmental impacts have resulted in the development of different methods for their assessment as well as conclusions on the necessary measures on how to reduce them.

Although in the Republic of Croatia emission inventories are regularly updated and improved, still there is a missing part which is every year more and more significant. That missing part is emission inventories from Non-Road Mobile Machinery (NRMM).

The main differences between NRMMs and road motor vehicles can be considered in several areas. For NRMMs there is no periodic technical inspection, unlike for the road motor vehicles where periodical technical inspection (in most of the cases annual) is mandatory. After the sale of NRMM, virtually there is no access to the machine and even less to its activity data. Though the brand new NRMMs, when placed on the market, are equipped with engines that are on one or two generations behind the engines of road vehicles. Additionally, for NRMM, there is still a significant lack of emission factors which will enable the making of reliable emission inventory from NRMM.

The main problem of emission inventory from NRMM is missing data on the structure (type, size, emission standard, …) and activity data of NRMM. Uncertainty on activity data and unreliable emission factors for engines of NRMM lead to significant uncertainty on emission inventory for NRMM.

The basic equation for calculating emission is:

$$Emission = Activity\ Data \times Emission\ Factor$$

Activity Data comprise data on how long machine works and under which working conditions (idle, partially loaded, fully loaded), while Emission Factor depends on engine type, engine size, technology level, exhaust aftertreatment system, i.e. emission standard.

For calculation of emission of a specific pollutant, several methods can be used (Tier 1, Tier 2, Tier 3).

2. Status of Emission Inventory from NRMM

Despite several attempts to make emission inventory (EI) from NRMM, it has been noticed that there is no structured data and their compilation required for making EI is virtually impossible without significant estimates and assumptions. Therefore, as the main assumption for the introduction of the order, i.e. structuring of the data about NRMM is the necessity of implementation of a type approval for NRMM. Given that a similar procedure exists for road motor vehicles and has been operating well for many years (Rešetar et al., 2018), as a logical goal, the need for establishing a similar system and for NRMM is embedded.

Although EU Regulation 2016/1628: Requirements relating to gaseous and particulate pollutant emission limits and type approval for internal combustion engines for non-road mobile machinery should be in power in all EU member states since 1.1.2017, in the Republic of Croatia it is still not completely implemented.

EU Regulation foresees fulfilment of necessary technical specification for some NRMM to be placed on the market, but if there is no type approval, those specifications are not checked nor recorded.

3. Proposal for Type Approval and Market Surveillance System in the Republic of Croatia

A proposal on how Type Approval for NRMM should be organised in the Republic of Croatia is shown in Figure 1.

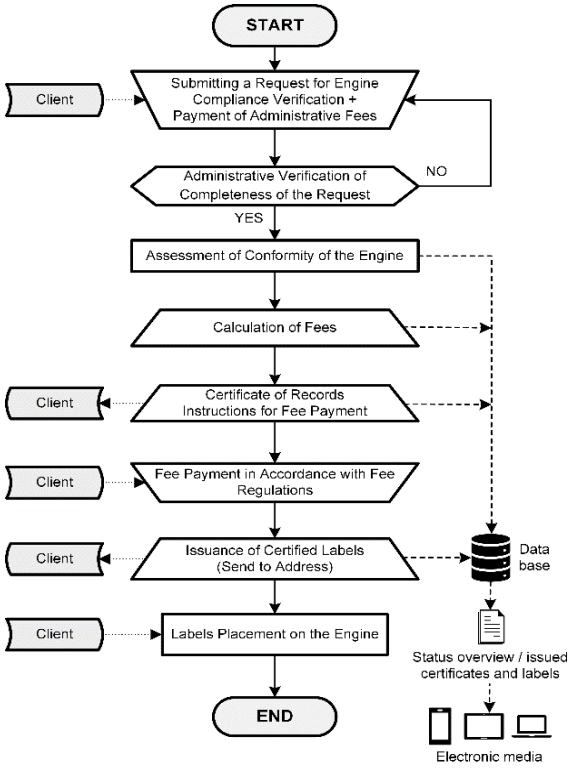

Figure 1. Type Approval Scheme for NRMM which should be implemented in the Republic of Croatia

Based on the collected data stored in the database, it is much easier to make estimates that will be based on structured data and thus significantly improve the uncertainties of EI. Moreover, the introduction of market surveillance of NRMM will enable control if the NRMMs on the market fulfils requirements of EU Regulation and collection of emission data and development of new, more reliable, emission factors for NRMMs.

Proposal for market surveillance algorithm of NRMM in the Republic of Croatia is shown in Figure 2.

To create the preconditions for full implementation of type approval of NRMM the project, financed by European structural funds, *National Laboratory for Emissions from Non-Road Mobile Machinery* is being implemented.

The new laboratory will be equipped with two new engine emission test cells with emission analysers, one for small engines of NRMMs and one for engines in mid-power range. Also, the laboratory will be equipped with two PEMS devices, the first one for Low-Duty engines and the second one for Heavy-Duty engines.

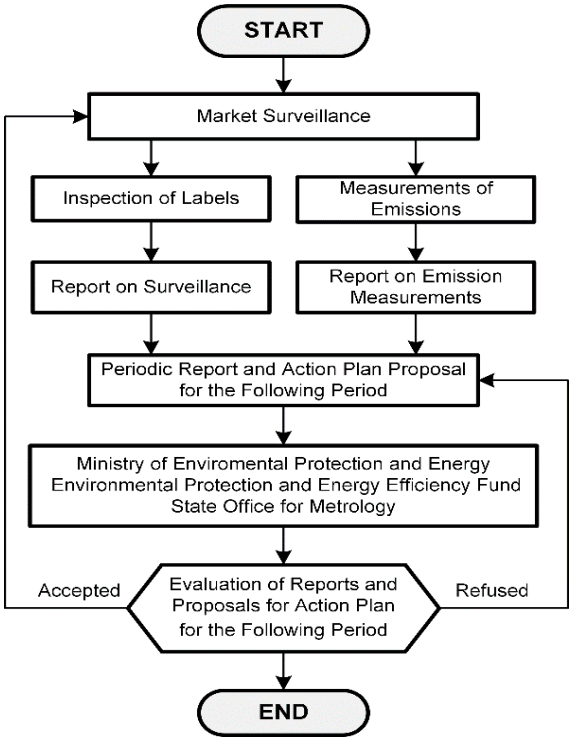

Figure 2. Scheme for market surveillance system for NRMM in the Republic of Croatia

In order to make the proposed system self-sustainable, it is planned to introduce an appropriate environmental fee. The amount of the fee would be calculated based on the main technical specifications and emission standard of the NRMM. Unfortunately, as no further monitoring of NRMM is envisaged, it is obvious that still it will be difficult to get reliable activity data.

4. Conclusion

The proposed algorithms would allow systematic data collection on the new NRMM, which would provide a more qualitative basis for the necessary estimations of NRMM numbers. By introducing market surveillance, it would be possible to check emissions in real life conditions and better determination of NRMM emission factors.

To be able to set up both algorithms and after that to have them as a self-sustainable fully functional systems, a way of financing the entire mechanism should be designed. At the moment as the simplest and fastest solution, the introduction of an environmental fee for all new NRMM can be proposed.

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