Consultation Questionnaire Exemption Request No. 2016-1

Exemption Request for „Lead in bearings and bushes of professional-use non-road equipment engines that meet the following criteria:

I. 15 litre and larger total displacement professional use

II. Less than 15 litre engines for professional non-road equipment designed for use where the time between a signal to start and full load is required to be less than 10 seconds, for example in emergency, standby generators and peak shaving generators

III. Less than 15 litre engines for professional non-road equipment designed for operation in harsh and dirty environments such as construction sites, quarries, mines, etc. for example, in drills, air compressors, rock crushers, irrigation pumps and tub grinders“

Abbreviations and Definitions

Cat. 6	RoHS Annex I category 6 covers electrical and electronic tools
Cat. 11	RoHS Annex I category 11 other EEE not covered by the categories 1-10
Pb	Lead
EUROMOT	The European Association of Internal Combustion Engine Manufacturers

Background

The Oeko-Institut and Fraunhofer IZM have been appointed by the European Commission, within a framework contract[1], for the evaluation of applications for exemption from Directive 2011/65/EU (RoHS 2), to be listed in Annexes III and IV of the Directive.[1]

The European Association of Internal Combustion Engine Manufacturers (EUROMOT) has submitted a request for the above mentioned exemption, which has been subject to a first completeness and plausibility check. The applicant has been requested to answer additional questions and to provide additional information, available on the request webpage of the stakeholder consultation (http://rohs.exemptions.oeko.info/index.php?id=271).

According to the applicant[2], internal combustion engines are used as components of a variety of types of professional equipment that is in scope of the recast RoHS Directive. It is explained that internal

[1] The contract is implemented through Framework Contract No. FWC ENV.A.2/FRA/2015/0008 of 27/03/2015, led by Oeko-Institut e.V.

[2] EUROMOT (2015), The European Association of Internal Combustion Engine Manufacturers, Exemption Request Form, submitted 29.7.2015, available under:

combustion engines designed for professional use need to use bearings and bushes that contain lead in order to achieve satisfactory reliability. Such engines are large sized engines and those that are required to be used in harsh or demanding environments[3]. They are diesel and gaseous fuel powered internal combustion engines with a capacity of 15 litres and greater, as well as engines with a smaller capacity that are designed for specific applications that require lead in bearings and bushes to provide the required reliability. These engines have a wide variety of applications but are not intended solely for transport (vehicles) or for non-road mobile machinery as defined by RoHS.

EUROMOT[4] provides the following table, detailing non-exhaustive examples of equipment understood to be of relevance for the request:

Table 1: Equipment specified by EUROMOT as relevant or this request for exemption

Non-stationary heavy equipment designed for professional use in applications including but not limited to mining, petroleum, construction and power generation, and which does not require either mobility or continuous or semi-continuous movement between a succession of fixed working locations while working	Comment	Equipment designed for professional use in harsh and/or dirty environments	Comment
Mobile Power Generation Units	Because of the mobile or portable nature of the equipment, it does not qualify for the LSFI exclusion, nor does it fit the RoHS II definitioni of Non-Road Mobile Machinery because it does not require either mobility or continuous or semi-continuous movement between a succession of fixed locations while working.	Power Generation Equipment Powered by Diesel or Gaseous Fuel Internal Combustion Engine	All of the equipment in this category is designed for professional use. However, due to its size, power output or other limiting factor, it may not qualify for an exclusion as a large scale fixed installation. These applications by design, operate in dusty, dirty, or otherwise harsh conditions which require the use of lead containing bearings and bushes so that reliability may be assured.
Mobile HVAC Units		HVAC Units Powered by Diesel or Gaseous Fuel Internal Combustion Engine	
Mobile Dehumidifying Machines		Dehumidifying Units Powered by Diesel or Gaseous Fuel Internal Combustion Engine	
Mobile Air Compressors		Air Compressors Powered by Diesel or Gaseous Fuel Internal Combustion Engine	
Mobile Welding Equipment		Welding Equipment Powered by Diesel or Gaseous Fuel Internal Combustion Engine	
Mobile Mixing, Grinding, Cutting and Crushing Equipment		Drilling or Trenching Equipment Powered by Diesel or Gaseous Fuel Internal Combustion Engine	
Mobile Fluid Pumping Equipment		Fluid Pumping Equipment Powered by Diesel or Gaseous Fuel Internal Combustion Engine	
Mobile Vacuum Equipment		Vaccum Equipment Powered by Diesel or Gaseous Fuel Internal Combustion Engine	
Mobile Cranes, Hoists, or Man Lifts		Crane, hoists, or Man Lifts Powered by Diesel or Gaseous Fuel Internal Combustion Engine	

EUROMOT explains that lead coatings and alloys give bearings low friction and high load absorbing properties which provides seizure resistance and conformability not replicated by any currently known alternatives. Lead also provides resistance to debris failures, when debris is introduced during service procedures or from the environment the engine operates in. Lead is present as an alloy element or thin layer in such bearings and bushings. As a thin coating, lead provides a tribological interface, which helps prevent seizure and can absorb debris, which might otherwise cause engine failure. As an alloy element in bearing and bushing materials, lead provides conformability to help the bearing deal with slight misalignments that may occur following service or extreme high load operation. There are

http://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_Pack_11/Request_2016-1/RoHS_Lead_Bearings_Exemption_Request_Form_EUROMOT_2015-07-27.pdf

[3] According to the applicant, it is not possible to define “harsh and dirty” environments quantitatively, as engine manufacturers do not use such values for engine design. The experience they have gained over many years has indicated the types of operating environment where lead bearings are needed to cope with the dust and dirt that is present. The environment inside mines is especially harsh as the engine is operating in dirty air almost continuously. Quarries and construction sites are two other examples where the machinery itself may be the source of the dust in which it is required to operate. Engines of moving vehicles do not experience the same level of dust and dirt as equipment that operates at fixed locations. Vehicles usually move into and out of dusty areas so that for most of the time, they are not located in the harshest conditions whereas a rock crusher, for example creates dust and operates continuously in dusty air.

[4] EUROMOT (2016), The European Association of Internal Combustion Engine Manufacturers, Answers to 1st Questionnaire Exemption Request No. 2016-1, submitted 24.2.2016, available under: http://rohs.exemptions.oeko.info/fileadmin/user_upload/RoHS_Pack_11/Request_2016-1/20160225_Ex_2016-1_1st_round_of_Clarification-Questions_for_EUROMOT_Final_version_24.02.16.pdf

currently no known materials suitable for a typical tri-metal bearing for professional heavy duty applications. [5]

According to EUROMOT[6], research has shown that the lead-free bearing materials have a higher tendency of seizing, are less able to conform when misalignment occurs and are less able to cope to particulate debris in the lubricant. Engine manufacturers have carried out extensive bench tests to investigate these phenomena as well as field testing engines with lead-based and lead-free bearings. The bench tests show that lead-based bearings give the best reliability. Field testing clearly shows that in harsh and demanding conditions, engines with lead-free bearings failed on average much sooner than engines with leaded bearings. This exemption is therefore requested on the basis of the inferior reliability of lead-free substitutes.

EUROMOT[7] argues that all equipment for which the exemption is needed is covered by Category 1 of Annex I of the Directive, as it is all diesel and gas-powered equipment, which would thus according to the WEEE guidance not be understood to fall under Cat. 6 (electrical and electronic tools).

For details, please check the applicant's exemption request at:
http://rohs.exemptions.oeko.info/index.php?id=271

The objective of this consultation and the review process is to collect and to evaluate information and evidence according to the criteria listed in Art. 5 (1) (a) of Directive 2011/65/EU (RoHS II), which can be found under:

http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:32011L0065:EN:NOT

If you would like to contribute to the stakeholder consultation, please answer the following questions:

Questions

1. EUROMOT[8] was asked as to possible modifications of the wording initially proposed (see above) and confirmed the following exemption wording as a possible alternative:

   Lead in bearings and bushes of diesel or gaseous fuel powered internal combustion engines applied in:

   i. Non-road professional use equipment and where engine total displacement is >15 litre;

   ii. Non-road professional use equipment and where engines have a <15 litres displacement, designed to operate in applications where the time between signal to start and full load is required to be less than 10 seconds;

   iii. Non-road professional use engines with < 15 litres displacement designed for operation in applications, where regular maintenance is typically performed in an outdoor environment, such as mining, construction, and agriculture applications.

[5] Op. cit. EUROMOT (2015)
[6] Op. cit. EUROMOT (2015)
[7] Op. cit. EUROMOT (2016)
[8] Op. cit. EUROMOT (2016)

a. Do you agree with the scope of the exemption as proposed by the applicant?

b. Please suggest an alternative wording and explain your proposal, if you do not agree with the proposed exemption wording.

c. Please explain why you either support the applicant's request or object to it. To support your views, please provide detailed technical argumentation / evidence in line with the criteria in Art. 5(1)(a) to support your statement.

2. EUROMOT[9] specifies equipment for which the exemption is assumed to be relevant (see Table 1 above);

   a. Do you agree with the scope of articles specified? I.e., please specify additional equipment of relevance or alternatively please specify for what types of equipment lead-based bearings can be phased out (lead-free already applied in such equipment);

   b. Please specify if you agree that all relevant equipment should be considered to fall under Cat. 11 and explain why (or why not) if your views differ from those presented by EUROMOT (2016);

3. Please provide information as to alternatives that may cover part or all of the applicability range of bearings and bushes applied in professional use equipment;

   a. Particularly please provide information as to experience with copper/tin/bismuth alloy based substitutes;

   b. Please provide quantitative data as to application specifications to support your view, such as test results, etc..

4. Please provide information as to research initiatives which are currently looking into the development of possible alternatives for some or all of the application range of *bearings and bushes in use in professional use equipment*;

   a. Please explain what part of the application range is of relevance for such initiatives (in what applications substitution may be possible in the future).

   b. Please provide a roadmap of such on-going research (phases that are to be carried out), detailing the current status as well as the estimated time needed for further stages.

5. It is understood that in some of the relevant equipment, both lead-free and lead-based bearings and bushes are applied, depending on the exact application.

   a. Please provide information and data to specify in what cases (on the basis of what performance requirements) lead-free bearing and bushes can be applied;

   b. In your answers, please refer where possible to performance indicators and benchmarks above or below which alternatives can be used.

6. EUROMOT[10] states the following: "*There are only a handful of bearing manufacturers with the capability and capacity to produce bearings for professional use diesel and natural gas*

[9] Op. cit. EUROMOT (2016)
[10] Op. cit. EUROMOT (2016)

engines. As a result, engine OEM's typically have a very strong relationship with these manufacturers. Engine bearing designs are typically owned by bearing manufacturer, meaning the bearing manufacturer derives the construction, materials, and manufacturing techniques with input from the customer (engine OEM) regarding end use requirements."

a. Please provide details as to the differences in end-use specifications provided from customers (engine OEM) to bearings and bushings manufacturers in relation to engines that would require the use of the requested exemption and engines that would not. What specifications are relevant in respect for example of the conditions of use of such engines (dust and dirt environments); the typical maintenance in field conditions; etc.?

In case parts of your contribution are confidential, please provide your contribution in two versions (public /confidential). Please also note, however, that requested exemptions cannot be granted based on confidential information!

Finally, please do not forget to provide your contact details (Name, Organisation, e-mail and phone number) so that Oeko-Institut/Fraunhofer IZM can contact you in case there are questions concerning your contribution.