7th Adaptation to scientific and technical progress of exemptions 8(e), 8(f), 8(g), 8(h), 8(j) and 10(d) of Annex II to Directive 2000/53/EC (ELV)

Consultation Questionnaire Exemption No. 10(d)

Review of exemption 10(d) "Lead in the dielectric ceramic materials of capacitors compensating the temperature-related deviations of sensors in ultrasonic sonar systems"

Input of the automotive industry expert group, represented by ACEA, JAMA, KAMA, CLEPA, et al.
Base of the contribution has been provided by JAPIA and completed by other associations.

The above mentioned industry stakeholders suggest following rewording of the exemption:

10(d) Lead in the dielectric ceramic materials of capacitors compensating the temperature-related deviations of sensors in ultrasonic sonar systems:
"Vehicles type approved before 1 January 2019 and spare parts for these vehicles"

Questions & Answers

1. ***Please explain whether the use of lead in the application exempted under exemption 10(d) of the ELV Directive is still unavoidable so that Art. 4(2)(b)(ii) of the ELV Directive would justify the continuation of the exemption.***

   This capacitor uses dielectric ceramics which contain lead.
   The output precision of the sensors such as ultra-sonic sensors used for the back sonar of the car is influenced by the capacitance that is one of the property values of the sensor. The capacitance of the sensor is very temperature-sensitive and the temperature coefficient of the capacitance is larger than +0.5%/°C. Therefore, measurement is strongly influenced by temperature, and correct measurement in a wide temperature range is difficult.
   To improve this problem, the special capacitor which has a large reverse change of capacitance for the temperature is used in combination with a sensor to obtain the stable accuracy of measurement within a wide range of temperature.
   The special capacitor has a large negative capacitance temperature coefficient of more than -0.4%/°C and is composed of lead containing dielectric ceramic. Temperature coefficient of the capacitance of lead-free ceramic is between +0.3%/°C +0.1%/°C.
   Even a difference of only 0.1%/°C is insufficient to achieve stable measurement accuracy in cars in a wide temperature range.
   Now, this large, negative temperature coefficient of capacitance is not obtained by lead-free capacitors. Therefore, a dielectric substance ceramic material which contains lead is necessary.
   However, JAPIA and capacitor manufactures have been taking efforts to develop lead-free technology for lead contained temperature compensating capacitors since after the previous review in 2009/2010.Up to now applicable products which do not contain lead and can reach the required performance have been found. As the next step, evaluation of reliability for temperature compensating capacitors and sensors in ultrasonic sonar systems will be proceeded step by step.

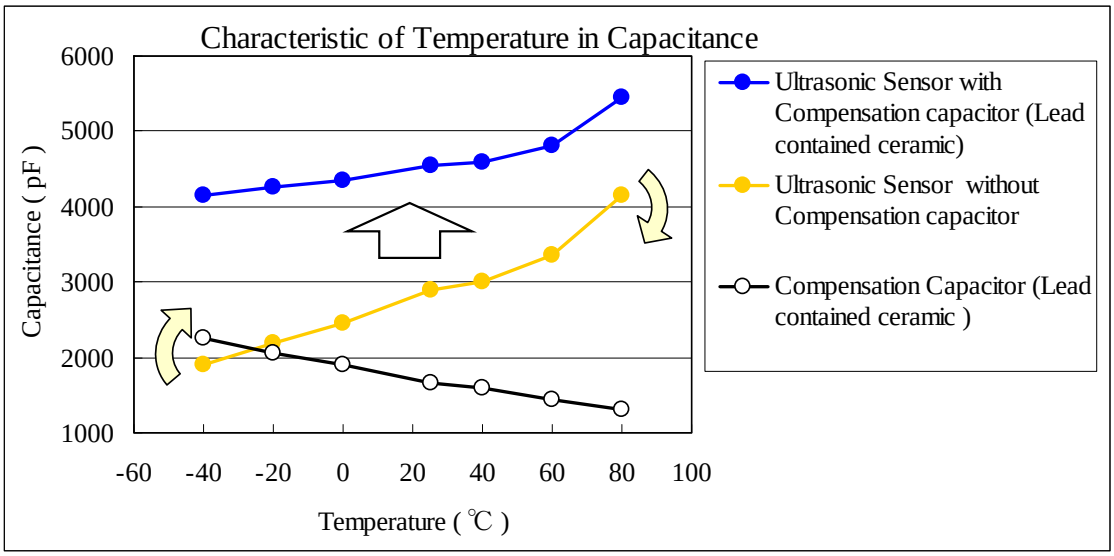

Fig 1.: Temperature characteristics of capacitance in sensor and temperature compensating capacitor

2. ***In case the substitution of lead is not viable, please explain the efforts you undertook to find a lead-free alternative.***

   Please refer to the above Answer 1.

3. Please indicate how much lead would be used under this application and substantiate the amount of lead with a calculation for vehicles put on the European market, and worldwide.

Total EU Annual Amount

Data used for this calculation is shown on Table 1.

Table 1: Mass of lead (Pb) in capacitors compensating the temperature-related deviations of sensors in ultrasonic sonar systems

A	B	C	D	E	F	G
Number per vehicle	mass of ceramics per piece[1]	Mass of Pb[2]	mass of Pb per vehicle[3] (A*C)	average ratio[4]	average mass of Pb per vehicle (D*E)	overall mass of Pb per vehicles on the market in 2012[5]
(pieces)	(mg)	(mg)	(mg)	(%)	(mg)	(ton)
2	**150**	**18**	**36**	**20%**	**7.2**	**0.096**

1: this is the mass of ceramic containing Pb
2: pure Pb (metal) content
3: vehicles of category M1 and N1 acc. to ELV are considered
4: the number of vehicles that use this type of component
5:13.4 mio., according to ACEA

4. ***Please provide a roadmap towards ELV-compliance if the use of lead is still unavoidable. Please break down the roadmap into steps to be performed, and present and explain the related timelines.***

Figure 2 shows a roadmap for the substitution of lead contained in temperature compensating capacitors.
Based on our estimation and considering the above mentioned situation, we should say that we need around five years from now to substitute existing lead contained temperature compensating capacitors. Therefore, we propose the following new regulatory proposal:

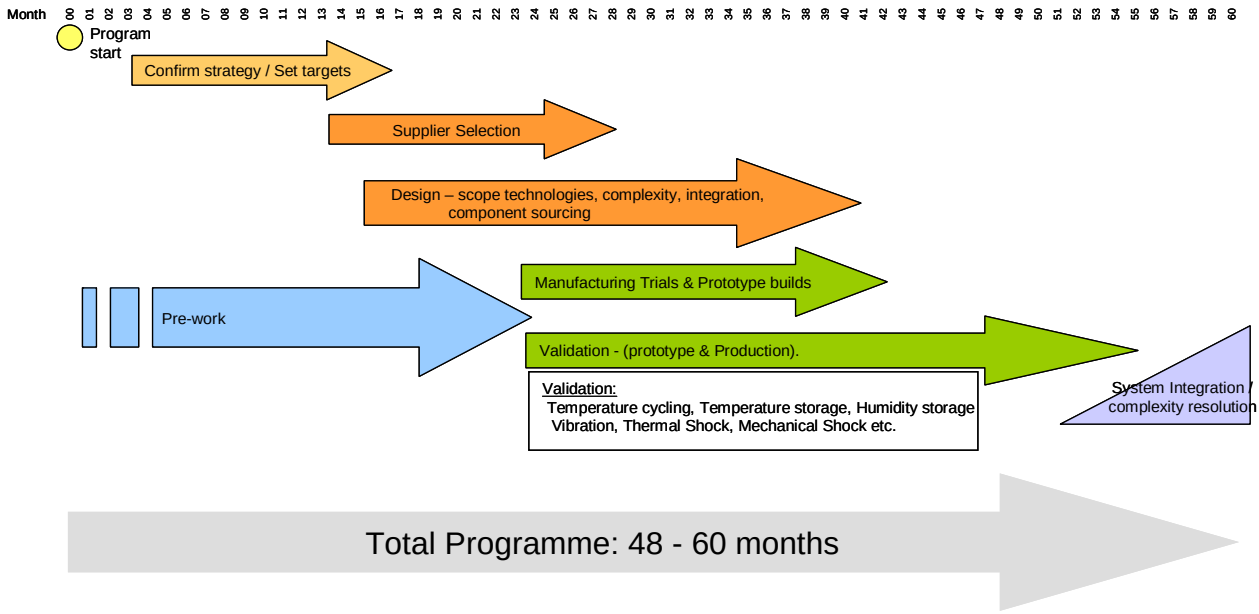

Fig.2: Time-Scale for Transition to new Material for Replacement of lead contained temperature compensating capacitor

The following wording is proposed:

10(d) Lead in the dielectric ceramic materials of capacitors compensating the temperature-related deviations of sensors in ultrasonic sonar systems:
"Vehicles type approved before 1 January 2019 and spare parts for these vehicles"

Date: 4 November 2013

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