

## **THIRD MEETING OF THE GRPE INFORMAL GROUP ON HEAVY DUTY HYBRIDS (HDH)**

**Brussels, 25 and 26 October 2010**

### **MINUTES OF THE MEETING**

Venue: European Commission, Brussels

Chairman: Petter Åsman (European Commission)

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#### **1.- WELCOME AND INTRODUCTION**

The Chairman welcomed the participants.

#### **2.- ADOPTION OF THE DRAFT AGENDA**

(Working paper HDH-03-02)

The draft agenda was adopted.

#### **3.- DRAFT MINUTES OF THE SECOND MEETING**

(Working paper HDH-02-08)

The draft minutes of the 2<sup>nd</sup> meeting were approved.

#### **4.- CONFIRMATION OF TERMS OF REFERENCE AND RULES OF PROCEDURE**

(Informal document GRPE-60-11)

The Terms of Reference (ToR) and rules of procedure were confirmed.

#### **5.- PRINCIPLES OF HYBRID CERTIFICATION**

##### **5.1 Initial remarks by the Chairman**

The Chairman emphasized the major elements of a hybrid certification procedure. First priority for regulators is a transparent method that allows to assess the environmental performance of a hybrid vehicle and that ensures sufficient accuracy and a level playing field for the manufacturers. Consequently, the results of the procedure must be quantifiable, verifiable and reproducible and allow for assessing real world compliance.

##### **5.2 Presentation by the Secretary**

(Working paper HDH-03-07)

Mr. Stein presented working paper HDH-03-07. Engine operation in a hybrid vehicle is different from operation in conventional vehicles and depends on interactions between the engine and the hybrid components. The interactions will lead to a specific hybrid engine duty

cycle, which can be very different from the conventional engine duty cycle, and will affect both criteria pollutant (gaseous pollutants and PM) and CO<sub>2</sub> emissions. It is therefore necessary to certify engine and hybrid components as a set. The elements of a hybrid certification procedure that result from these basic requirements are listed on page 8 of working paper HDH-03-07.

The proposed hybrid procedure deviates from the averaging approach of current emissions legislation and introduces an individual vehicle approach. Mr. Steininger and the Chairman therefore required that boundary conditions need to be defined to accurately taking different strategies into account. Mr. Schulte indicated that strategies might depend on GPS signals, which would further complicate certification.

### **5.3 Presentation by Japan** (Working paper HDH-03-04)

Mr. Osaki presented working paper HDH-03-04, which gives the rationale for applying HILS in Japan. Overall, the major advantage of HILS is a certification efficiency superior to chassis dyno testing. While chassis dyno testing requires a high number of testing, HILS much better deals with the certification burden of complex systems, such as hybrids. No Japanese manufacturer uses the chassis dyno approach, though it is permitted in Japan.

### **5.4 Presentation by Japan** (Working paper HDH-03-03)

Mr. Morita gave an overview on the status of the open source model for HILS. The newly developed rigid-body model has sufficient accuracy and was successfully verified against the proprietary spring-mass model used today. Further models will be developed in 2011 and would be made available to the IG. All participants agreed that verification of the models will be an important part of the HDH work program.

### **5.5 Presentation by Cummins** (Working paper HDH-03-06)

Mr. Andreae presented working paper HDH-03-06. He emphasized the three pillars of a hybrid system, i.e. regenerative braking, start/stop and engine optimization, which need to be properly reflected in a certification procedure. Cummins is proposing a powerpack test with engine, motor/generator, RESS, (transmission) as a complete set while HILS only requires the engine to be tested. It has the same advantage as HILS (one certification, many applications), but does not simulate the hybrid components. Mr. Andreae indicated that there is diversity of opinion on this approach in the USA. He asked if powerpack testing could be added to the HDH mandate.

### **5.6 Presentation by India** (Working paper HDH-03-05)

Due to the absence of a delegate from India, the paper was not discussed. Discussion will be resumed at the 4<sup>th</sup> HDH meeting.

### **5.7 Discussion**

Mr. Kawai (Japan) underlined the importance for HILS for efficient hybrid certification. Due to the complexity of hybrid vehicles, HILS is preferable over the other two options, including

powerpack testing. HILS based certification takes about one week, powerpack based certification about three weeks according to the Japanese experience with both methods.

Everybody agreed that open source models must be the basis for the HDH work program. Mr. Steininger noted that the complete source code must be available.

Powerpack test procedure will be further assessed by EPA and EMA within the US GHG discussion. The result will be reported back to the HDH IG.

Mr. Dekker suggested powerpack testing in the EU as an interim option before finalizing HILS. Mr. Steininger supported powerpack testing to be added to the HDH mandate.

Mr. Rijnders does not consider chassis dyno testing as an immediate priority but says that evaluation of chassis dyno testing should be done in parallel to the other IG activities.

## **6.- ROAD MAP AND PROJECT PLANNING**

### **6.1 Work program** (Working paper HDH-03-08)

The Chairman summarized the discussions so far in working paper HDH-03-08. The major conclusions are:

- ToR is confirmed,
- HILS is the first step of the work program,
- engine and hybrid components will be certified as a set,
- procedure must allow for technology development.

Japan informed about their 2009 – 2012 work program. Biggest task is the open source model. Budget is made available by JAMA, most work is conducted by JARI. JARI results may be used by HDH IG.

NTSEL confirmed that component testing, as laid down in the Japanese test procedure, is good enough for certification purposes.

One of the most important items for the HDH work program is definition of state of charge (SOC). Mr. Kawai indicated that  $\Delta$ SOC of a hybrid is zero over life time. Tolerance of  $\Delta$ SOC during certification needs further discussion.

Mr. Signer (OICA) indicated that use of multiple ECU's, assessment of cold start test, engine conditioning and investigation into the vehicle model need to be part of the work program.

Mr. Blubaugh (EMA) informed that EPA is conducting some research. Currently, there is no collective industry research project, and EMA does not plan any activities, at this time.

Mr. Williams (Cummins) asked how to deal with OBD. It was decided to transfer this item to the GRPE/OBD group, which would need to be revived.

Based on the above input, a draft work program should be prepared by the Secretary by December 2010.

## 6.2 Potential research institutes

The Secretary informed that the following institutes had been contacted and would be interested in conducting the work program.

- Technical University Graz (Prof. Hausberger)
- Chalmers University Gothenburg (Prof. Sjöberg)

The institutes will be contacted again after agreement of the work program and clarity on the budget (see point 6.3).

## 6.3 Budget

OICA will make available a budget of 200.000 €. The Secretary reminded the participants that further budget from Contracting Parties is needed for successfully performing the work program.

## 6.4 Relation to ongoing CO<sub>2</sub>/GHG programs

The Chairman reported on the EU HD program. Aim is to develop a test procedure for CO<sub>2</sub> emissions from heavy duty vehicles. The basis for the test procedure is currently elaborated by a consortium. Final report is due by end of 2011. A close cooperation between DG-ENTR (responsible for HDH) and DG-CLIMA (responsible for CO<sub>2</sub>) is needed.

Mr. Blubaugh reported on the US GHG rule for heavy duty vehicles. The proposed rule (NPRM) was released on 25/10/10. Comments to EPA are due by end of January 2011. The final rule is expected to be published by 30 July 2011. The rule includes CO<sub>2</sub> limits for vehicles (dependent on vehicle category) and separate limits for the engine.

## 7.- CONTRIBUTION FROM CONTRACTING PARTIES

None.

## 8.- NEXT MEETINGS

The next HDH meetings will take place, as follows

- 4<sup>th</sup> HDH meeting: 10/01/2011 at 14:30 in Geneva
- 5<sup>th</sup> HDH meeting: mid March 2011 in Ann Arbor, USA (date to be confirmed)
- 6<sup>th</sup> HDH meeting: 06/06/2011 in Geneva (date to be confirmed)
- 7<sup>th</sup> HDH meeting: Oct./Nov. 2011 in Japan (date and place to be confirmed)

## 9.- SUMMARY AND CONCLUSIONS

See working paper HDH-03-08. In addition, work program needs to be drafted and budget availability needs to be checked.

## 10.- OTHER BUSINESS

None.