

Sébastien Paternotte

From: Sébastien Paternotte
Sent: 28 July 2023 11:53
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Cc: Bernie Frost
Subject: [EMB Expert Group on Energy] 230725 meeting minutes
Attachments: 2023-07-21_EBSIG_Subgroup Energy_mission_schedule_material.pptx

Dear all,

Please find in attach the meeting minutes of the first call of the Expert Group on Energy.

Date/Time: 25 July (9:00-12:00)

Discussion

1. Compliance Policy (Sébastien Paternotte - CLEPA)
2. Welcome and Introduction (Heiner Hunold - CLEPA)
 - Introduction by the Chair of the group and roll call
3. Questions on Energy (Heiner Hunold – CLEPA)
 - Tasks of the expert group defined by the 1st SIG EMB were explained. The 2nd task can be easily answered if the first one is solved.
 - Slides 3 & 4: Heiner explained the methodology to apply. The detailed explanation is developed in the next slides.
 - Everything developed for EMB will be derived from a pneumatic system. That's the reason why it is useful to make a comparison between both technologies.
 - It would be good to apply the measures developed to some use cases to explain and illustrate the concept.
1. Difference between a Pneumatic Braking System and an EMB System, in regard to energy (Dr. Huba Nemeth – CLEPA)
 - Slides 5 to 7
 - The EMB architecture shown here is the most similar to a conventional system. It is important to note that the clamping force is depending on the power output delivered by the energy reserve and must meet the level requested.
 - On EBS system at full-stroke brake actuation, the clamping force must remain above the secondary brake force limit after 8+1 applications. In EMB, the clamping force is approximately constant as long as the energy reserve can provide the necessary energy and power output. After a critical energy level, the clamping force decreases drastically.
 - As there is a sudden drop of the clamping force, the question was raised if there is a need for a continuous monitoring or if it should only start at a certain time. See slide on battery sensor for detailed explanation.

- We need to agree on the way how to monitor and derive regulatory requirements for the energy level.
 - **Agreement on the explanation given in the slides about the impact of the energy reserve**
2. Means of energy control (Jonas Stueble – CLEPA)
- Slide on battery sensor and BSD (Battery State Detection) (slides 8 to 10)
 - The origin of these sensors is when the start/stop systems were introduced to ensure there is enough energy to restart the engine at the traffic light. These battery sensors are available since a long time on the market.
 - Bosch explained one technology available on the market. Many other suppliers have similar technical solutions.
 - Voltage, current, temperature are the main entrance values to be measured. But it is not enough to determine the energy level contained in the battery.
 - The battery model (BSD) has current, temperature and sub-algorithms as input. The voltage is derived and compared with the voltage measured from the battery. All values are recorded in a module and the model is adapted if necessary (= memory capability). Several outputs may be predicted by the battery model like SOC, ...
 - **Need to agree, if the regulation should mandate a model characterizing the reserve of energy dedicated to the braking system, some algorithms (e.g. ageing) which, in real time, whenever it is energised, “know” what energy is available and whether it is enough to guarantee specific braking (and other critical safety system) performance. In this regard it is necessary to prove that BSD is the only means to achieve this purpose.**
 - **BSD needs to ensure that enough energy is available to fulfill the brake performance requirements.**
 - BSD applies only to the batteries directly providing energy to the brakes (meaning the green ones in the EMB diagrams on slide 5 for the 2 independent circuits), which means the reserve of energy dedicated to or shared with the braking system.
 - DE asked if the influence of extreme temperatures will be considered.
3. Conclusions and Next Steps (all)
- JAMA confirms that they will check the slides provided to the group and come back with detailed questions on understanding before the next meeting, if necessary.
 - If the concept of a battery model (BSD) in regard to measure and monitor the reserve of energy dedicated to the braking system will be agreed, certain requirements against such a model has to be developed and proved.
 - The group agreed to apply uses cases in order to check, if a battery model may work properly.
 - Mrs. Beck (KBA – Germany) requests to extend uses cases not only on low temperature use cases, but also on high temperature use cases

Next meetings of the subgroup:

No	Subgroup
2	01-08-2023 (09:00 AM-12:00 AM CET)
3	08-08-2023 (09:00 AM-12:00 AM CET)
4	16-08-2023 (09:00 AM-12:00 AM CET)

Best regards,

Sébastien Paternotte
Consultant Technical Regulations



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