

Position on the compensation method as proposed by BAM

24 June 2022

EXECUTIVE SUMMARY AND RECOMMENDATIONS

EPEE, the voice of the air conditioning, heat pump, and refrigeration industry in Europe, welcomes the opportunity to provide comments to the results presented for the compensation method proposals by the German Federal Institute for Material Research and Testing (Bundesanstalt für Materialforschung und -prüfung; BAM). The BAM developed the compensation methods to determine the energy efficiency of heat pumps and air conditioners. EPEE highly appreciate the activities carried out by BAM for the investigation of the compensation method.

We believe that many essential aspects need to be further developed and resolved before any regulatory consideration. Please see our recommendations with further explanation below.

1. General comments

1. More data is needed to support findings
2. Testing time needs to be reduced
3. Interaction with manufacturers remains time -and resource-consuming

2. On air-to-water units

1. Scope and comparability need to be considered properly
2. Tank size need to be considered properly

3. On air-to-air units

1. Both types of testing room need to be considered
2. Room size, inertia and humidity (wet bulb control) need to be considered.

Introduction

EPEE, the voice of the air conditioning, heat pump, and refrigeration industry in Europe, welcomes the opportunity to provide comments on the compensation method results, which is currently under development by the German Federal Institute for Material Research and Testing (Bundesanstalt für Materialforschung und -prüfung; BAM). The BAM develops the compensation method to ensure independent testing without intervention of manufacturers, reflect better real-life performance of products, show the merit of better control systems, allow comparability of different appliances, and reduce testing time, costs and to increase reproducibility.

The compensation method allows for testing with unfixed compressor. To support the objectives of the introduction of the compensation method, three Round Robin Tests (RRTs) have been organised by the BAM. Several of our members had the opportunity to participate to the RRTs.

EPEE highly appreciate the activities carried out by BAM for the investigation of the compensation method. Nonetheless, we believe that certain aspects still need to be further investigated and resolved and that the method is not ready yet for implementation. Please see our recommendations with further explanation below.

1. General comments

The compensation method should allow to dynamically evaluate the energy efficiency of heat pumps and air conditioners by not only considering the hardware but also by including the interaction with the control system of a unit. Conventional tests of variable speed units were carried out with fixed speed, neglecting the controls' effect on performance. Differences due to controls at dynamic conditions are currently not being considered nor evaluated. Although there seems to be a potential to improve the energy efficiency of these appliances under dynamic conditions, further analysis on the subject is required.

In addition, the compensation method should also allow accurate low-load performance evaluation. If the load is precise, the method only requires the measurement of energy input. However, if the load and operating conditions are not properly made, ACs/HPs may react differently than under actual installed units and may show different performances. Therefore, reflecting of real-life operations shall be ensured.

1. More data is needed to support findings

Based on the data shared by BAM following the Round Robin Tests for air-to-air units and air-to-water units, the results are currently still showing high deviations between labs. The source of the encountered issues behind these deviations cannot always be identified with certainty. Due to the diversification of data and lack of details, the data does not show enough coherence to create a level of confidence, resulting in a difficulty to understand and assess properly the readiness of implementation of the compensation method.

Lab test data relative to actual field data is not presented. The compensation method is developed intending to mimic actual ACs/HPs behaviour in the field, but almost all data shown are the RRT results without actual field data. At least air-to-air unit behaviour in labs is different from the one of installed unit. The current compensation method may generate another data far from reality in the field. We need more information on test results to show that the method provides good representative data for the operation of tested unit, repeatability, and reproducibility.

2. Testing time needs to be reduced

It has been noticed that when applying the compensation method during actual testing and re-testing of a unit, the testing time is longer in comparison to the current standardised method (EN 14825). A longer testing time significantly impacts the manufacturer's development process and market introduction and reduces the current testing capacities for all stakeholders (manufacturers, MSA, etc).

Solutions as automation of testing can only resolve to a limited extent the longer testing time. Automation will require overnight testing, but a 24/7 day test is not always possible, and its application differs from country to country or from facility to facility (applies only to those facilities that invested in such an approach and are allowed to test 24/7 day, depending on local labour laws). Introducing the automation of testing will impact the resources and procedures already in place and require the necessity of test operators to remain available to control the potential process and errors occurring overnight. Some labs currently already test with automation and still encounter longer testing times.

In terms of implementation of this test, it is not possible to benefit from testing and calculation. In such a methodology, all units must be individually tested for each capacity, combination, and set up of the unit (no series/range test). This imposes much more testing of units within the same series/range before and after market introduction and therefore increases the test load for all stakeholders (manufacturers, certification bodies, MSAs, etc.).

3. Interaction with manufacturers remains time -and resource-consuming

Another reason for why the compensation method was proposed is allowing market surveillance authorities to test without requiring the intervention of manufacturers. Based on the RRT, interaction with manufacturers remains relevant and necessary to understand the unit, the construction of the unit, and how to do the settings of the unit. An example is the bypassing of certain "out of the box settings" to enable the compensation method testing.

A solution to this may be to ask for test manuals and explanatory technical testing instructions. In this case, it should be considered that this will take resources and create additional burden for manufacturers, as such manuals are today not available, and are different depending on the type of product. This increases the administrative impact, without any clear benefit towards the efficiency of the unit nor the consumer. This observation was raised by several participants in the RRT for air-to-water and air-to-air units. Additionally, the understanding and correct application of test manuals by third parties is not ensured, increasing the risk of mistakes and allowing no guaranteed proper testing of the unit.

2. EPEE comments on air-to-water units

1. Scope and comparability need to be considered properly

The scoping of the tested units must be considered more properly as there are main differences between units of different capacities. The current test results are limited in that sense that they do not reflect the impact on different capacities (up to 400 kW) and technologies (variable flow, unit control logic, and other central heating solutions are not included). From this perspective, it seems relevant to add more tests to understand this better. Currently, there is no proper comparability of appliances possible. For a level playing field, the method shall be applicable to all technologies and all capacities under the scope of ENER Lot 1.

2. Tank size need to be considered properly

We observed that the tank sizing might result in extremely large volumes of water and therefore creates issues with performing the test for high-capacity units falling in the scope of ENER Lot 1 (up to 400 kW). As such, this will require additional investments for testing facilities. Furthermore, big tank sizes will increase the test time as it will take longer to reach stability. This point shall be carefully considered.

3. EPEE comments on air-to-air units

1. Both types of testing room need to be considered

The compensation method requires the use of calorimeter room method. So far, the compensation method is not applicable for an air enthalpy room. It is necessary to consider also whether the test can be conducted in air enthalpy room. As such, adapting the testing facilities to an air enthalpy room in order to apply the compensation method will require additional investment by stakeholders, evaluation, Round Robin Testing, and time for implementation.

On standardisation level, ISO TC86 SC6 ('Testing and rating of air-conditioners and heat pumps') informal group on testing methodologies is discussing the method, aiming at improving and completing it, as the method still shows large disadvantages that need further completion. For air-to-air units, the current tentative conclusion is to use air enthalpy method together with virtual load generator rather than calorimetric chamber. The proposal from BAM does not take the heat capacity effect of the test chamber on the energy efficiency, which hampers a fair comparison of ACs/HPs units of different capacity.

2. Room size, inertia and humidity (wet bulb control) need to be considered

The technical discussions have shown that the wet bulb control of the units has not been taken into consideration by BAM. The current results did not show the necessary confidence whether the wet bulb control was done adequately by every lab or even performed in the same manner. Different methods exist and that results also in different test results.



THE VOICE OF THE REFRIGERATION, AIR-CONDITIONING AND HEAT-PUMP INDUSTRY IN EUROPE

Therefore, this must be further studied and evaluated by BAM, especially towards the room size. We appreciate that BAM is also initiating work on ISO level to assess this further.

ABOUT EPEE

EPEE represents the Refrigeration, Air-Conditioning and Heat Pump industry in Europe. Founded in the year 2000, EPEE's membership is composed of over 50 member companies as well as national and international associations from three continents (Europe, North America, Asia). With manufacturing sites and research and development facilities across the EU, which innovate for the global market, EPEE member companies realize a turnover of over 30 billion Euros, employ more than 200,000 people in Europe and also create indirect employment through a vast network of small and medium-sized enterprises such as contractors who install, service and maintain equipment. Please see our website (<https://www.epeeglobal.org/>) for further information.