FORD MOTOR COMPANY (FORD) RESPONSE TO PE24-002

Request 11

ODI understands that the subject vehicles are equipped with enhanced flooded batteries while peer Ford and Lincoln models built on the same platform are equipped with absorbed glass mat batteries. Describe in detail the differences between these battery types and all design criteria, testing, and other factors considered in selecting the original equipment batteries for the subject and peer vehicles.

Answer

The Bronco Sport, Escape, Maverick, and Corsair models can use either an Enhanced Flooded Battery (EFB) or an Absorbed Glass Mat battery (AGM). These batteries are industry standard designs and are available globally. EFB and AGM batteries used by Ford meet the same criteria for form, fit, and function. The batteries meet the same Ford internal performance and environmental requirements.

Both the EFB and AGM battery utilize 6 cells (nominally 2 volts each) and each cell contains anode (positive) and cathode (negative) plates made of lead (Pb) grids that are pasted with powdered lead. The plates are electrically connected with lead (Pb) busbars, commonly called “cast-on straps”, which are cast onto the lead plates. The end of the cast-on strap has a feature called a tombstone and these are welded together to complete the battery electrical circuit.

The differences between EFBs and AGMs relate to their design architecture, specifically the insulation and the pressure under which they operate. EFB’s lead plates are insulated with polyethylene sleeves, are suspended in liquid acid electrolyte, and operate at atmospheric pressure (see generally Figure 1). AGM’s lead plates are insulated by a glass mat, physically compressed together, and the acid electrolyte is absorbed by the glass mat (no free liquid) (see generally Figure 2). Further, AGM batteries operate under pressure, about 1 PSI.

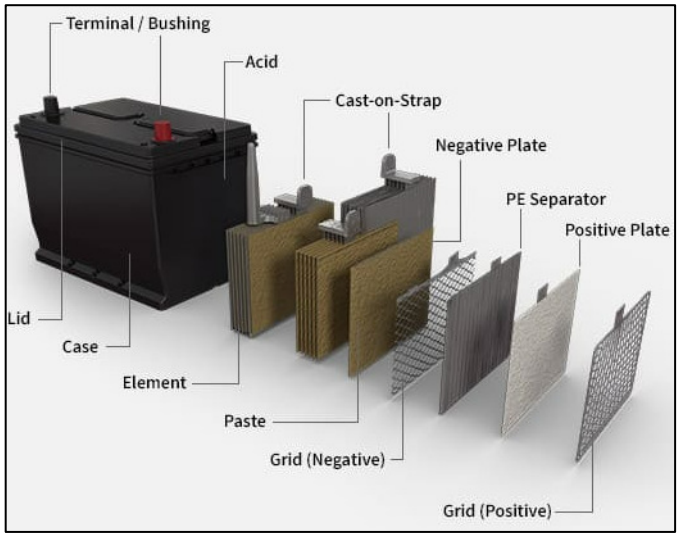

Figure 1. Generic Example of Enhanced Flooded Battery

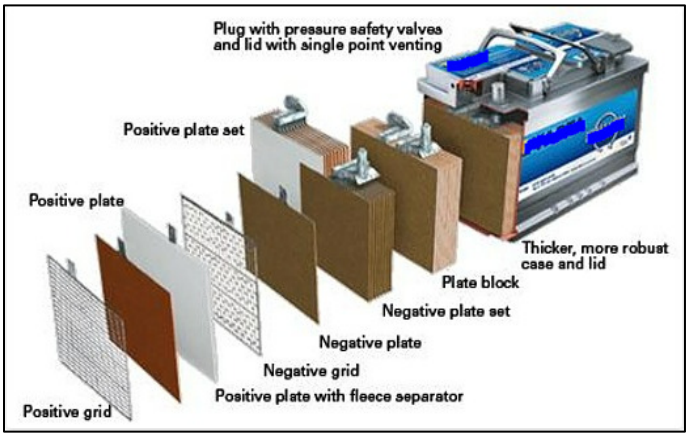

Figure 2. Generic Example of Absorbed Glass Mat Battery

For all high load cycling applications, such as vehicles equipped with auto stop/start, the Ford battery testing specification is the same. This specification is described in detail in Ford's Engineering Specification ES-DS7T-10655-A. The engineering specification includes test criteria for performance requirements on engine cranking, electrical key off load demand, and electrical throughput. The amp-hour size of the battery is selected to support common key-off loads for 40-days. An engineering model for key-off load is performed for each vehicle program. The electrical throughput requirements are determined for each unique vehicle program. The battery is sized by amp-hour capacity, cold cranking amps, battery throughput capability (Cn), and considers the applicable warranty period.

The Bronco Sport (subject vehicle) as well as the Escape, Corsair, and Maverick (peer vehicles) share a common platform architecture that was initially developed in Europe. The first vehicles on this platform architecture to be manufactured in North America were the Escape and Corsair. At the launch of Escape and Corsair, a qualifying EFB design was not

available in North America, so an AGM battery that met the vehicle sizing and testing criteria, as described above, was selected. The launch of the Bronco Sport and the Maverick in North America followed the Escape and Corsair, at which time Ford had a supplier available to manufacture EFB designs to support North America vehicle production. This EFB met the requirements for these vehicle lines for similar applications manufactured globally in markets where EFB designs were available, and therefore was selected for Bronco Sport and Maverick.