

Test Report of the Performance of Electric Vehicles Powered by Zinc-Air Fuel Cells Developed by Powerzinc Electric (Shanghai), Inc.

Upon the request of Powerzinc Electric (Shanghai), Inc., on-site continual driving tests of four electric vehicles (EVs) powered by its DQFC series of zinc-air fuel cells were conducted on September 11, 2001 from 9 a.m. to 6.30 p.m. The atmospheric temperature was 25 ~ 30°C, drizzled after 2 p.m. and the wind grade was NW 4-5. The test site was located at Huajing Road, Xuhui District, Shanghai. The length of the road is two kilometers from east to west with two traffic lights along the road; frequent but smooth flow of traffic, similar to regular city road condition.

Speed Requirement:

The speed of the two Taiwan-made electric scooters were kept between 30 - 35 km/h. The scooters were stopped when the speed was below 25 km/h. The actual continual driving distance was recorded by the scooters' odometer.

The speed of the Shanghai-made electric scooter was kept between 20 - 24 km/h. The scooter was stopped when its speed was below 15 km/h. The actual continual driving distance was recorded by the scooter's odometer.

The speed of the electric bicycle was kept between 15 - 20 km/h. It ran till the fuel cell exhausted.

Result of the Tests:

EV#1

The electric scooter, jointly manufactured by Impression Power Tech. Corp. and Jing Shing Fa Co., Ltd. of Taiwan, was previously powered by four sealed lead-acid batteries (12V, 26AH) with a total energy capacity of 1,250Wh. During the test, it was powered by two Powerzinc's DQFC-24-3000 zinc-air fuel cells. The total weight of the fuel cells was 32 kg with a total energy capacity of 6,540Wh. The weight of the scooter, without the fuel cells, was 84.75 kg while its gross vehicle weight (GVW) was 116.75 kg. The actual continual driving distance covered was 198 km.



EV#2

The electric scooter, manufactured by EVT Technology Co., Ltd. of Taiwan, was previously powered by four sealed lead-acid batteries (12V, 40AH) with a total weight of 60 kg and a total energy capacity of 1,920Wh. During the test, it was powered by two Powerzinc's DQFC-24-3000 zinc-air fuel cells. The total weight of the fuel cells was 32 kg with a total energy capacity of 6,540Wh. The weight of the scooter, without the fuel cells, was 68.95 kg while its GVW was 100.95kg. The actual continual driving distance covered was 250 km.

EV#3

The electric scooter, manufactured by EV Electric Vehicle Co., Ltd. of Shanghai China, was previously powered by two sealed lead-acid batteries (12V, 40AH) with a total weight of 31 kg, a total energy capacity of 960Wh, and a continual driving distance of 45 km. During the test, it was powered by one Powerzinc's DQFC-24-3000 zinc-air fuel cell. The weight of the fuel cell was 16 kg with an energy capacity of 3,270Wh. The weight of the scooter, without the fuel cell, was 65.95 kg while its GVW was 81.95 kg. The actual continual driving distance covered was 146 km.

EV#4

The electric bicycle, manufactured by Huahang Electric Vehicle Co.,Ltd. of Hangzhou China, had a custom-made 12V low voltage electric motor to accommodate Powerzinc's zinc air fuel cell. During the test, it was powered by one Powerzinc's DQFC-10-1350 zinc-air fuel cell. The weight of the fuel cell was 7.5 kg with an energy capacity of 1,485Wh. The weight of the bicycle, without the fuel cell, was 27.45 kg while its GVW was 34.95 kg. The actual continual driving distance covered was 153km.

Conclusion:

These tests prove that the zinc-air fuel cells developed by Powerzinc Electric (Shanghai), Inc. are applicable to two-wheel EVs. Its technical specifications, such as the specific energy, energy density and maximum continual driving distance per refuel etc., are better than the lead-acid batteries currently used on the market.

Quality Examine Institution for Environmental Product, Shanghai

Yuan Qing Hua

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