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Training System of the Technical Supporting Staff for the EV Demonstration in Beijing

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Abstract

In China, Beijing Municipal Government takes the lead in promoting the demonstration and operation of pure electric vehicles (EV) in public transportation. This research introduces the overall situation of EV operation in Beijing and the construction of the technical supporting system. It clarifies the importance of training the operation staff. It then introduces the training system from the angle of training target, course arrangement and training content. Finally, it gives suggestions combining the feedback and effects of the training staff.

Keywords: Battery electric vehicle, public transport, training

1 Introduction

This new energy vehicle is identified as one of the seven strategic new emerging industries. Beijing is one of the 25 cities in "1000 Electric Vehicles in 10 Cities" project and also the demonstration city of the 6 cities in "Private Consumer of New Energy Vehicles". Based on the successful demonstration in Beijing Olympic Games, Beijing Municipal Government promotes the demonstration in public transportation and civil service represented by pure electric commercial vehicles, and the demonstration in business cars, taxies and private cars, represented by pure electric cars [1]. Up till 2010, more than 1000 pure electric vehicles have been produced. In 2011, 1060 pure electric sanitation vehicles and 200 pure electric buses are put into operation in Beijing. In 2012, more than 1300 electric buses, electric sanitation vehicles and pure electric cars will be added. Therefore, the safety and efficiency of the service system become the essence of electric vehicle's development.

Since pure electric vehicles are a kind of new-generation vehicles, there are only a few professionals in current society. For the purpose of smooth operation of electric vehicles, a professional training of EV staff becomes crucial. Only by mastering the professional skills can the staff shoulder the responsibility of operating EV well. Otherwise, the consequences are hard to imagine.

2 Operation Mode and Overall Situation of Pure Electric Vehicles in Beijing

Many problems are commonly existing in the application of pure electric vehicles, such as infrastructure construction, technology guarantee

and data collection/evaluation. Based on the experiences of 2008 Beijing Olympic Games, 2010 Shanghai Expo and 2010 Guangzhou Asian Games, our EV operation adopts the charge station/battery pack quick automatic exchange system, distance safety supervision and intelligent dispatching system and maintenance system, etc. The configuration is symmetric, independent controlled, charge/exchange compatible and charge in respect packs. To operate small-scale demonstration of pure electric sanitation vehicles, it proposes mobile charge cabin. Concentrating in the public transportation and sanitation vehicles, Beijing launches demonstration of pure electric commercial vehicles. It constructs 3 large-scale charge/exchange stations to offer services for more than 2000 vehicles, among which 300 are pure electric buses, 1700 are pure electric sanitation vehicles.

As an important element of the technical guarantee for EV operation, the establishment of EV maintenance system, the data management information platform and training system becomes quite necessary.

3 The Training System for Pure EV Operation in Beijing

3.1 Training Target

According to the operation safety needs, the training targets are categorized into four types: management staff, drivers, maintenance staff and charge staff, whose responsibility is listed as following.

Management Staff: It includes the leaders of pure electric bus/sanitation vehicle fleet, the staff in charge of maintenance and safety and the staff in charge of EV charge stations, etc. The total amount is estimated to be 400, all of whom should pass the strict examinations before taking up their quarters.

Driver: It includes the operators who take charge of operating electric vehicles. Each EV fleet chooses the drivers in proportion of 1.5 drivers per vehicle and 4000 drivers are chosen to take the training. Meanwhile, the driver should possess the required license.

Maintenance Staff: It includes the maintenance staff on electric sanitation vehicles and electric buses. The past experiences tell us one kind of electric vehicle should have 14 staff (2 for motor maintenance, 4 for batteries, 1 for ATM, 2 for chassis, 1 for vehicle control system and 1 for high-voltage distribution box). If we provide the maintenance team for 40 vehicles, that is, each vehicle gets 4-hour maintenance service once a month, 75 maintenance teams (1050 staff) are needed.

Charge Staff: It includes the staff changing/ exchanging batteries for electric vehicles. The estimated amount will be 800.

3.2 Training Content

The training content is designed according to different types of the training targets. The content and requirement of the training differ according to different training targets:

For the Management Staff, they have to know the basic principle and design of electric vehicles, and master the voltage safety knowledge, as well as the emergency handling methods. Additionally, they have to get familiar with the parameters of different vehicles and the way to maintain the vehicles. They are also required to handle the common fault happened on EV.

For the Driver, they have to know the basic principle and design of electric vehicles, and master the knowledge of EV self-check before running on the road. They are required to drive the electric vehicles properly and know how to deal with the emergencies. They have to master EV safety knowledge and the basic parameters of different types of EV. In practical training, they are trained to drive and maintain EV, as well as handle the common fault

For the Maintenance Staff, they have to know the basic principle and design of electric vehicles, and master the voltage safety knowledge, as well as the emergency handling methods. They should know the technical condition of key EV components, the check methods and fault diagnosis. They are required to master the high/low voltage circuit principle and engineering drawing. In practical training, they are trained to use the check tools, to maintain electric vehicles and to change the EV components.

For the Charge Staff, they are trained with basic knowledge of batteries and battery grouping, as well as the safety knowledge of EV charge. They have to know the basic parameters of chargers and know how to deal with emergencies. In practical training, they are trained to charge electric vehicles.

3.3 Course Arrangement

The training course is divided into two parts: theoretical teaching and practices. The theoretical teaching includes General Principles of Electric Vehicles, Safety Knowledge of Electric Vehicles, Emergency Treatment in Electric Vehicle Operation, Instruction of Electric Vehicle Operation, EV Maintenance and Power Batteries and Their Charge, etc [2]. The practices include driving practice and fault simulation operation, etc. The course arrangement and credit hours are different according to the targets.

The training schedule is as follows:

Training Schedule for Management Staff (50 staff per class)

	Day 1	Day 2	Day 3
08:30-9:50	General Principles of EV-I	Emergency Treatment-I	EV Maintenance
10:10-11:30	Safety Knowledge of EVs-I	Introduction of Different EV Types-I	Examination
13:30-14:50	General Principles of Electric Vehicles-II	Emergency Treatment-II	EV Maintenance
15:10-16:30	Safety Knowledge of Electric Vehicles-II	Introduction of Different EV Types-II	Examination

Training Schedule for Drivers (50 staff per class)

	Day 1	Day 2	Day 3	Day 4	Day 5
8:30-9:50	General Principles of Evs	Emergency Treatment	EV Operation	EV Operation	Examination
10:10-11:30	Safety Knowledge of EVs	Introduction of Different EV Types	EV Maintenance and Fault Handling	EV Operation	Examination
13:30-14:50	General Principles of Evs	Emergency Treatment	EV Operation	EV Operation	Examination
15:10-16:30	Safety Knowledge of EVs	Introduction of Different EV Types	EV Maintenance and Fault Handling	EV Operation	Examination

Training Schedule for Maintenance Staff (50 staff per class)

15:10-16:30	Safety Knowledge of EVs	EV Component	Meter Operation	Fault Diagnosis and Handling	Examination
10:10-11:30	Safety Knowledge of EVs	EV Component	Meter Operation	Fault Diagnosis and Handling	Examination
8:30-9:50	General Principles of EVs	Emergency Treatment	EV Operation and Charge	EV Maintenance	Dissembling Practice
13:30-14:50	General Principles of EVs	Emergency Treatment	EV Operation and Charge	EV Maintenance	Dissembling Practice
	Day 1	Day 2	Day 3	Day 4	Day 5

Training Schedule for Charge Staff (50 staff per class)

	Day 1	Day 2	Day 3
8:30-9:50	Basic Knowledge of Power Batteries	Safety Knowledge of EV Charge	EV Charge Practice
10:10-11:30	Power Battery Grouping	Emergency Treatment	Examination
13:30-14:50	Basic Knowledge of Power Batteries	Safety Knowledge of EV Charge	EV Charge Practice
15:10-16:30	Power Battery Grouping	Emergency Treatment	Examination

3.4 Training Management Mode

The executive training office is set to get in charge of the establishment and management of staff's archives, the publication of training materials, and the evaluation of the staff, etc. Meanwhile, the inductors can perform the training mission of the training targets through respective phases based on pure electric vehicle demonstration needs.

3.4.1 Management of the Training Staff Archives

The training office establishes the archives of the training staff. The training records, certifications

and examination results of each training staff will be kept in the office as the personal archive.

3.4.2 Management of the Course Documents

After finishing each course, the office will keep records of time, place, content, training targets and the inductors, etc. The training courses, attendance records and the examination paper will be kept by the office in according to different types.

The documents include:
1) Notice of Training
2) Training Materials
3) Examination Paper
4) List of Training Staff and Attendance Record
5) Results of Written Examination and On-road Operation Test

4 Training Evaluation and Suggestions

For the large-scale operation of pure electric sanitation vehicles, 63 staff took part in the training course in June, 2011 as shown in fig.1. Now the qualified staff begins to offer service for the operation of 38 pure electric sanitation vehicles.

Through the training, the staffs get a deeper understanding of electric vehicles, for example, environment-friendly, zero-emission, less payment and low noise. They hope the country can support more energy and funding to the development of electric vehicles.

Fig.1 Training for the first group of EV service staff

Fig.2 Training for the second group of EV service staff

Different from traditional vehicles, the pure electric vehicles require a complete technical supporting system in technological support, maintenance and driving services, among which the education of the EV operation expertise knowledge is an essential part. As more electric vehicles are put into use, the breadth and depth of the electric vehicle training are faced with higher requirements.

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