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Situation and Proposals of Special Vehicle "Oil to Electricity" in Airport

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Abstract. Civil aviation is the first industry wide unified propulsion electric vehicle applications in china, endeavored to promoting the development of energy-saving emission reduction and green airport in recent years, which gradually deepen into airport vehicles. By analyzing the benefits of "oil to electricity" and the development as well as the existing problems of current situation, five suggestions are put forward in this paper: moderate advanced implement overall planning and unified standards, introduce and upgrade electric vehicles step by step, establish and improve the electric vehicle charging monitoring and operation platform, make full use of electric vehicle policy and strengthen industry guide, using carbon trading to further promote the electric vehicle application.

The "oil to electricity" in civil aviation is promising

Clean energy vehicles will reduce the consumption of primary energy, such as oil, improve energy efficiency and air quality, which will be the vehicle development direction in China. Due to the limited airport area, clear boundary, concentrate management, airport ground special vehicle has the advantage to overcome the weakness of limited endurance and insufficient charging facility of pure electric vehicle, besides, the main working condition of vehicles in airport is low speed or static state, which is suitable for electric transformation.

The implementation of "oil to electricity" in civil aviation, is in favor of reducing the cost of energy consumption as well as beneficial to the quality of the environment. According to incomplete statistics, the existing ground special vehicles and equipment is up to more than 16,000, which is an important source of the ground energy consumption and emissions, accounted for about 13% of the total energy consumption of the airport. If the existing ground special vehicles and equipment mainly achieve electric, about 130 thousand tons oil and ¥700 million of operating costs will be saved annually, environment and economic benefit is prominent.

The "oil to electricity" in domestic civil aviation

Civil Aviation Administration of China put "oil to electricity" as the key task of energy saving and emission reduction. The pilot of airport ground special vehicle "oil to electricity" has launched in 2014, and the pilot experience carried out in 2017, which will be further extended to more airports in the future.

6 airports, such as Beijing, Chengdu, Kunming, Changsha, Harbin, Xiamen, which throughput in millions of people and 29 units on site become the first pilot in 2015. Nearly ¥100 million of special funds for energy conservation and emission reduction have been completed, more than 160 charging facilities have been built, and 412 special electric vehicles have been operated until June 2017.

Among them, Chengdu airport is comparatively a leader, has more than 160 vehicles which covering almost all types of civil aviation ground special vehicles and 68 charging piles, owns the real-time monitoring of the electric vehicles and charging facilities, reducing the emission of nearly 2000 tons of pollutants, saving energy consumption nearly ¥3.5 million each year.

Meanwhile, as the green airport leading airport in the construction, Beijing new airport proposed to strive to reach the proportion of clean energy vehicle to 20% in special vehicles and 100% in normal vehicles in flight area. And Hong Kong airport has built 96 charging piles in the flight area, the flight support equipment electrification ratio is about 30%.

The "oil to electricity" in foreign civil aviation

The airports in United States, the European Union have carried out special vehicles "oil to electricity" project. Seattle airport spent $30 million to build nearly 600 smart fast charging facilities for different types of vehicles, and the proportion of electric equipment has reached 43% in 2015, of which class C aircraft flight support equipment are electric. Stockholm Airport clean energy vehicles account for more than 50% in the flight area, of which flight support equipment electrification accounted for more than 30%.Frankfurt airport plans to increase the clean energy vehicles to more than 60% in 2020.Among them, Chengdu airport is comparatively a leader, has more than 160 vehicles which covering almost all types of civil aviation ground special vehicles and 68 charging piles, owns the real-time monitoring of the electric vehicles and charging facilities, reducing the emission of nearly 2000 tons of pollutants, saving energy consumption nearly ¥3.5 million each year.

Foreign practice has fully proved that the "oil to electricity" project is not only technically feasible, but also has good economic, social and environmental benefits.

Problems of "oil to electricity" in civil aviation

Civil aviation oil power is a system engineering, including the purchase of special vehicles, auxiliary product of charging facilities energy and power grid construction, which calls for a together guarantee of parts enterprises, automobile enterprises, charging facilities, operation management, monitoring platform etc. Although the "oil to electricity" pilot project has accumulated a lot of construction experience, it’s far away from fully mature. To be concretely, the battery performance, motor technology and electronic control technology, battery charging technology are to be further improved in parts enterprises; there is no electric vehicle for various types of special airport vehicle in automobile enterprises; airport charging pile construction, power grid expansion and vehicle maintenance, license management are still in the exploratory stage; the monitoring platform construction has just put on the agenda.

The ground special vehicles is various in airport, such as Aircraft tractor, Belt conveyor, Passenger stairs, Platform car, Food cart, Snow sweeper, Deicing vehicle, Water truck, Sewage vehicle, Power van, Gas vehicle, Air-conditioned bus, patrol car, Bird driving vehicle, Friction coefficient car, Glue removing vehicle, Command car, Lighting vehicle etc. Whereas according to the types of electric vehicles currently on the market, the mature special vehicles can be electric are mainly concentrated in the Aircraft tractor, Belt conveyor, Passenger stairs and Platform car. Especially, the electric demand of large tonnage vehicles cannot be satisfied.

Prospect and proposals of "oil to electricity" in civil aviation

Carrying out “oil to electricity” is necessary and significant in the implement of green civil aviation, power civil aviation and national ecological civilization. Civil Aviation Administration of China has requested the airports annual passenger throughput of 5 million to implement “oil to electricity” following the pilot, “oil to electricity” demand is huge. if the average life expectancy of airport special vehicles is 15 years, there will be 11 thousand vehicles need replacement in the next 10 years, without consider the new vehicles purchased annually.

Although the "oil to electricity" has been vigorously promoted, there are still many problems need to be solved. For the transformation and construction of the “oil to electricity” project, which on the premise of ensuring that the existing vehicle equipment is gradually eliminated and updated according to the life expectancy, the suggestion that should be carried out as follows:

(1) Moderate advanced implement overall planning step by step and partition by partition, meanwhile unified standards. By study on the effect of electric vehicles to the airport, airport should innovate the multi sectoral linkage mechanism of planning, construction, operation and maintenance, as well as launch a unified power grid and layout the charging pile in the first place in considering the solutions of provide electricity on distant seat and wireless charging, then purchase the vehicles and

unify standard and interface protocols of all electric vehicles to reach the compatibility matching of technical product and management mechanism.

(2) Introduce and upgrade electric vehicles step by step according to the market technology development stage. Firstly, apply electric general vehicle to the civil aviation; then the vehicles which had electric reform on the basis of the traditional fuel vehicle chassis and mechanical drive system; finally the vehicles produced to meet the civil aviation performance parameters demand, such as large tonnage platform car, aircraft tractor and trailer luggage etc.

(3) Establish and improve the electric vehicle charging monitoring and operation platform. Explore the integration of the new generation of information technology and electric vehicle management, such as internet of things, big data, to realize a smooth convergence between the hardware operation platform of vehicle equipment, and the intelligent and visualization of vehicle equipment operation and management.

(4) Grasp and make full use of national and local electric vehicle policy, and strengthen industry guide. By using the existing national and local policy, can effectively improve the economic, social and environmental benefits, meanwhile, civil aviation industry should guide in terms of policy, capital subsidies, price, access and operation standards, formulate relevant encourage and support policies, establish electric vehicle charging fees standard to promote the development.

(5) Further promote and lead the promotion and application of electric vehicles by using carbon trading. Aviation industry carbon emissions accounted for about 2% of the global carbon dioxide emissions, of which the airport accounted for 5% of the former. Carbon trading market will be launched in China in 2017, civil aviation is the first batch of pilot with other six industries. Electric vehicles have good carbon reduction benefits, conducive to promoting structural energy saving and emission reduction, strengthening the development potential of China's civil aviation, and improving the overall sustainable development ability of civil aviation.

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