

Airport electric vehicle powered by fuel cell[☆]

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Abstract

Nowadays, new technologies and breakthroughs in the field of energy efficiency, alternative fuels and added-value electronics are leading to bigger, more sustainable and green thinking applications. Within the Automotive Industry, there is a clear declaration of commitment with the environment and natural resources. The presence of passenger vehicles of hybrid architecture, public transport powered by cleaner fuels, non-aggressive utility vehicles and an encouraging social awareness, are bringing to light a new scenario where conventional and advanced solutions will be in force.

This paper presents the evolution of an airport cargo vehicle from battery-based propulsion to a hybrid power unit based on fuel cell, cutting edge batteries and hydrogen as a fuel. Some years back, IBERIA (Major Airline operating in Spain) decided to initiate the replacement of its diesel fleet for battery ones, aiming at a reduction in terms of contamination and noise in the surrounding environment. Unfortunately, due to extreme operating conditions in airports (ambient temperature, intensive use, dirtiness, . . .), batteries suffered a very severe degradation, which took its toll in terms of autonomy. This reduction in terms of autonomy together with the long battery recharge time made the intensive use of this fleet impractical in everyday demanding conditions.

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1. Introduction

Fuel cells are systems that can produce electricity from fuel continuously and much more efficiently than the combustion systems used until now, which have a Carnot limitation in the maximum efficiency reached. Moreover, with the use of fuel cells the CO₂ emission (coming from the hydrogen production, if not renewable) is reduced considerably compared with the

internal combustion motors, at the same time that the emissions of other contaminants such as NO_x, SO₂, hydro carbons, etc. are removed completely.

The fuel cells are expected to play, in the short and long term, an important role in the sustainable supply of energy, since it allows an important energy saving as well as a diversification of energy sources.

Fuel cells have characteristics that make them suitable for their application in the propulsion field, one of the most important sources of contamination emissions and greenhouse effect nowadays. The most adequate fuel cells for this application are the so-called polymer proton exchange membrane (PEMFC) used widely in research and demonstration projects led by several automobile manufacturers.

Focusing on the airport sector, one of the main aviation impacts are the atmospheric emissions of the motors, in a local level in the airport surrounding areas, as well as globally, due to the emissions generated in crossing. The aviation industry is

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