

SELECTION of VEHICLE NEW Energy fuels and life CYCLE assessment

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Abstract: Cycle energy consumption and environment emission assessment model of vehicle new energy fuels was ESTABLISHED. Cycle energy consumption and environmental pollutant emissions of the new energy fuels were. Results showed that the full life cycle energy consumption of alcohol fuels is highest, and the full life cycle Energy Consumption of the fuel cell was lowest, and the fuel consumption is mainly concentrated in the use stage, and that is lowest in the raw material stage. The full life cycle CO₂ emission of methanol is highest, and the full life cycle CO₂ emission of Hybrid was lowest. The full life cycle emissions of VOC, HC, NO_x, PM₁₀ and SO_x of alcohol fuels is highest, and the fuel cell was lowest.

Keywords: life cycle Assessment Fuels; Energy consumption; Environmental Assessment

1. Overview

oil shortages and ecological deterioration are the human face of the 21st century. The two major challenges of pro are. as a symbol of modern civilization the car, in give people brings economic prosperity and convenient traffic, produces air pollution and the many negative effects of energy stress. to LPG (liquefied petroleum gas), CNG (Compressed natural gas) LNG (liquefied natural gas), Bio-Wood oil, alcohol fuels, hydrogen Energy, The rise of new energy for vehicles represented by energy vs. apply, to reduce urban vehicle emission, adjust and improve ability. The source consumption structure provides a section effective way. For this many countries Home and region according to their conditions, different technical routes selected, is committed to the exploration and development of new energy fuel vehicles^M. New Energy source car not only become the industry but also become the government and the community shut. The focus of the note is.

When choosing the right vehicle for new energy fuels, cannot be based solely on

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Assessment of energy consumption and environmental impact during vehicle use, and Review the life cycle of the fuel, i.e. fuel from raw material exploitation, processing, using, until final consumption complete, from economic, energy consumption and impact on the environment 3 aspects on vehicle fuel line LCA (life cycle Assessment) analysis to make science, objective Evaluation^M. face all kinds of cars new energy fuel, How to benefit evaluate correctly with life cycle theory, Choosing to really reduce energy consumption and emissions and economic fuel, Is the problem people need to solve. and ongoing important topics^{1^}.

for this, This article studies the life cycle of new energy fuels for vehicles consumption, Comprehensive evaluation of emissions and economics, gives car new energy analysis methods and structures for fuel selection.

2. life Cycle assessment of new energy fuels for vehicles

2.1 evaluation Boundaries

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The life cycle of a vehicle fuel is the fuel from which the vehicle is fired from the raw material mining, processing, Production and transport of fuel, fuel in the course of vehicle use consumes, until the full process of fuel recovery after vehicle scrap. car fuel life cycle can be summed up into upstream and downstream phases two a section, (chart 1 shows. upstream phase includes raw material production, fuel production and fuel matching; The downstream phase includes the auto manufacturing phase and the vapor Driving phase. current, about vehicle new energy fuel life cycle Research focuses on upstream phase, This is mainly because most new energy Source fuel vehicle is still in trial or small-scale application phase, Some even stop stay in research phase, Because the scale effect is not yet reflected in the, is so difficult to estimate Calculate vehicle Production, Torun, the impact of maintenance and scrap recycling. so, Typically, only the upstream phase is analyzed and studied.

2.2 Evaluation Step

Life Cycle assessment of new energy fuels for vehicles, is the fuel in the entire The energy consumption and environmental impact of the lifecycle after quantization review Price. This method can compare the advantages and disadvantages of different fuel production routes more, finds weak links, and take steps to improve.

Lifecycle Evaluation Procedures, The first identifies and quantifies the entire life consumption of energy and material in the cycle phase and environmental emissions; and then comment Price effects of these consumption and emissions on the environment; final identification and evaluation minus Less chance of these effects. life Cycle Assessment focus on research system in eco-health, environmental impact in the area of human health and resource consumption. Typical automotive new energy fuel life cycle assessment includes four steps:

1) determine scope of study, mainly includes functional units and system edges bounds, system input and output.

2) data collection and analysis, to quantify the in the product system related input and output. First establishes a lifecycle model based on the scope of the research defined by the Target and scope definition phase, do the data collection prepare, then unit process data collection, and based on data collection The result of a calculated rollup is the product lifecycle's manifest results.

3) Analysis of influencing factors, results from inventory analysis phase Evaluate the potential impact of the environment. this process data transfer to specific impact type and Metric parameters, easier to understand product health environment impact of life cycle. Consider the effects of, fuel use on resource consumption and the environment when the vehicle fuel is evaluated by, such as non-renewable resource consumption, environmental pollutant emissions and human health Kang et. In this respect, existing research at home and abroad did not form a unified view, Important degree of influence, How to quantify and compare all have to wait for further research.

4) Evaluation and Analysis, based on data analysis and impact factor analysis, Identify major issues in the product lifecycle, and review the result estimate, include integrity, sensitivity and consistency check, and then give the conclusion and Recommendations.

3. Evaluation Model build 3.1 System Definition

The whole life cycle assessment of new energy fuels for automobiles is defined as from wellhead "to Wheel (ok To wheel) analysis, is evaluation boundary includes entire fuel source from sub-energy mining to car use Lifecycle procedure, Figure 2 is shown in. The external environment for the system includes the ability amount, Capital and pollutant emission. where energy and capital are the entire system External input, and emits pollutants and energy to the external output of the entire system out of. which discharges pollutants including standard emissions (CO, NO_x, PM_{Ten}, VOCs, SO_x) and greenhouse gas (CH₄, N₂O, CO₂). The functional unit energy consumption for the evaluation parameter is kJ/km, emissions are G/km. 3.2 LCA calculation model

The lifecycle energy consumption and emission calculation methods are as follows:

type: E_{TW} full life cycle energy consumption for vehicles using a fuel or amount of emission indicator; E_R energy consumption or emissions for the raw material mining phase; E_F The amount of energy or emission indicators for the fuel production phase; E_V The amount of energy or emission indicators used for the vehicle's use period; S_i is the first stage index weight factor, whose values represent the same emissions life week degree of environmental damage caused by the different stages of the period, Value 0~; (S_r) , for raw material mining phase, for energy consumption or emission metrics for a process amount; (S_f) , for fuel production phase, The energy consumption of a process or the amount of put on indicator.

4. Empirical Analysis

An empirical analysis of the application of new energy vehicles, Description

The impact of the model on the evaluation results. where data from the Raw Mining and fuel production phase comes from the survey, questionnaire, expert, Network Retrieval, Unified count data, measured data, China Statistical Yearbook, number of vehicle use stages from model calculations and tests, weight factor from actual experience. its Medium New Energy fuel selection CNG, LNG, LPG, corn ethanol, coal-based methanol, natural gas dimethyl ether DME, Soy prepared biodiesel, coal-powered pure Power, Diesel-battery hybrid, hydrogen burn Stock battery.

Table 1 Total energy consumption for the fuel lifecycle. full life cycle Total energy consumption, Total energy consumption of ethanol, Other in turn methanol, gasoline, CNG, DME, LPG, Biodiesel, Diesel, Pure Electric, hybrid, Minimum fuel cell energy consumption. can also be issued now, Low level of energy consumption in raw material phase, accounting for total 0.66%; The fuel phase consumes a relatively few, takes up Total 3.82~92% Fuel energy consumption is mainly concentrated in the Use phase, is downstream phase, for the total of 47 ~ 91.71. so, When developing new energy fuels, in a variety of Fuel application research at the same time, the should also take into account the upstream phase effect of the influence.

diagram 3 total emissions for the fuel lifecycle. diagram 3a See: on CO_2 emissions, coal-based methanol highest, The rest is gasoline, LPG, LNG, CNG, DME, bio Diesel, corn ethanol, Pure electric, fuel cell, Diesel, Hybrid. CO_2 as primary greenhouse gas body, Coal-based methanol emissions are much higher than other fuels, and corn ethanol bio-fuels for crop cultivation processes in the raw material phase because of planting The photosynthesis to the CO_2 has a lot of consumption, thereby its full lifecycle CO_2 gas emissions are affected, is lower than methanol 9%. EV Although in use phase no emissions CO_2 Gas, But it is in fuel phase emissions relative quantity CO_2 Gas, full Life week

period CO_2 gas emissions are not least, full life cycle CO_2 The least gas emissions are diesel-Battery Hybrid, only Methanol, 21.2%.

diagram 3b To See: Organic Compounds (VOC) emission aspect, Jadem ethanol highest, over 0. g/km, higher gasoline and methanol also, divideno, 0. g/km and 0. {g/km, The rest is biodiesel, LPG, LNG, CNG, All-electric, DME, Diesel, hybrid and burn battery, where fuel cell VOC to emit only ethanol from 3.7%. corn ethanol VOC emissions mainly concentrated in fuel phase, consumes Large amounts of organics.

diagram 3C To See: full life cycle CO emissions aspects, Vapor oil, corn ethanol, coal-based methanol, LNG, CNG and LPG is larger, all over 2.5G/km, DME, Biodiesel, Diesel, All-electric, Mix Power and fuel cell CO Less emissions, all below 0.5G/km, where fuel cell CO emits only 0.034g/km, is Gasoline 1.2%. In addition to pure electric cars and fuel cell cars without side, The emissions from CO are mainly

concentrated in the usage phase, With the fuel on the launch The burning mode on the machine is closely related, when engine fuel burns locally missing oxygen and low temperature CO emissions larger. diesel combustion mode to pressure burn, belongs to thin burn, Oxygen sufficient, CO Less emissions, and Gasoline machine combustion mode for spark plug lighting, Fuel combustion is thicker with mixed gas, CO Large emissions. fuel similar to diesel combustion mode DME and biodiesel CO has lower emissions, similar to gasoline combustion method fuel such as ethanol, methanol, LNG, CNG and LPG, CO Emissions are large.

diagram 3D-diagram 3F To See: full life cycle NO_x and SO_x Rowput aspect, maximum amount of corn ethanol emissions, is much higher than other fuels, This is primarily caused by the availability of initial energy sources and the preparation process of the Multiple life cycle Emissions. life cycle PM_i. emission aspects. coal-based methanol emissions maximum, is also much higher than the other fuel, this

is primarily a production process, coal-based Methanol in feedstock phase and fuel phase causes more particulate contamination during coal processing. life cycle NO_x, SO_x PM_i. The lowest emissions for are fuel cells.

5. Conclusion

1) Total life cycle energy consumption, alcohol fuel total consumption, Low consumption of electric vehicles, Minimum fuel cell energy consumption.

2) Energy consumption in full life cycle phases, raw material phase Low energy consumption, fuel phase energy consumption slightly more, use phase energy maximum, So while paying special attention to energy consumption during fuel usage, also Takes into account the impact of energy consumption in the raw material and fuel phases.

3) in fuel life cycle total CO₂ Emissions, coal-based methanol CO₂ Highest emissions, Biofuels (Biodiesel and corn ethanol) CO₂ Centers, EV and diesel CO₂ Lower Emissions, Hybrid, CO₂ Emit the lowest.

4) in fuel life cycle total VOC and HC emission aspects, alcohol class fuel and gasoline VOC and HC Higher emissions, gas Fuel, VOC and HC Emissions centered, Electric and diesel VOC and HC Lower Emissions, where the fuel cell's VOC and HC Lowest emissions. This is related to the burning mode of the fuel in use phase.

5) in full life cycle NO_x, PM_i, and SO_x emitters face, The highest emissions of alcohol fuels, far above other fuels, Fuel

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