JSTY5180JSPE

Pure Electric Aviation Catering Series
Going Green and Environment Protection for aviation ground supporting equipment have been written in the National 13th Five Year Plan and Ten Year Developing Schema of Chinese Civil Aviation. The charismatic of the fixed working area, short moving distance and regularity of work make it a massive possible to use New Energy GSE. In September of 2018 CAAC issued work proposal of Three Years Action Battle Plan for Winning Blue Sky, the plan requests to change fuel consumption vehicle into electricity consumption vehicle, also it clearly stated: new adding equipment in the key areas of airport need 100% New Energy equipment, and encouraging technology advantaged equipment since October 1st of 2018.

Tianyi Shareholding is aiming for the highest perspective and taking the leading as a pioneer, cooperating with the academician team directing by the Academician Sun Ying Chun from Chinese Academy of Engineering. Tianyi has developed relative GSE products matching ‘Safe airport, Intelligent airport and Green airport’ principal, the products are world leading and national initiative. At present Tianyi has developed and gained certification of following equipment: new energy baggage belt loader, new energy bulk freight loading vehicle, new energy airport lavatory service truck, new energy clean water car, new energy garbage truck, new energy aviation catering truck, new energy passenger stair truck. Especially the aviation catering truck, it’s belonging to the big technology innovation in the field.

Tianyi is sticking to the brand developing road, based on the GSE features it has derived three brands as ‘TCLOUD’, ‘Tian Yi Yun Cai’ and ‘Tian Yi Yun Duan’, the new technology has bought out new motivation, and new develop by new brands.
Sun Feng Chun
Academician of Chinese Academy of Engineering, exporter of New Energy Vehicle
Professor of Mechanical and Vehicle College of Beijing Institute of Technology
PhD Supervisor

Academician Sun Feng Chun foresees a lot of developing potentiality of the Tianyi Shareholder, and he thoroughly knows the eager demands to the GSE by the aviation field, he is leading the 9 member Academician Team joined by Wu Guang Hui from Chinese Academy of Engineering, and reached strategic cooperation with Tianyi, the cooperation agreement between two sides was signed on January 25 of 2019 in National Electric Vehicle Engineering Laboratory. Both sides invested in the new energy GSE R&D, sales and service.
Company developed electric aviation catering truck has passed the civil aviation test on October 31 of 2019, and obtained Civil Aviation GSE Test Report.

- 9 Computer Software Copyright Certification
- 7 Invention Patents
- 6 Utility Models Patents
- 7 PCT (International Patents)
Topping with New Energy Aviation Catering Truck, TCLOUD series persists the zero emission design concept, aiming and get connected to the international advanced R&D technology, critical parts are imported, vehicles are with features of being safe, reliable, energy saving, long cruising distance and easy for maintenance, comparing to the original fuel consumption vehicles.

New Energy Aviation Catering Truck
Test Standards: MH/T6016-2017 Aviation Catering Truck
AC-137-CA-2019-04 Aviation Catering Truck Testing Criteria

New Energy Baggage Towing Tractor
Test Standards: GB7258-2017 Vehicle Operation Safety and Technology Condition
AHM913 Aviation Ground Equipment Basic Safety
GB/T 18849-2011 Industrial Vehicle Brake Performance and Strengthen of Parts
MH/T6048-2008 Luggage Tractor

New Energy Bulk Freight Belt Loader
Test Standards: AC-137-CA-2015-17 Testing Criteria of Bulk Freight Loader Vehicle
MH/T 6030-2014 Bulk Freight Loader Vehicle
<table>
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<tr>
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<tbody>
<tr>
<td></td>
<td>AC-137-CA-2016-01 Testing Standard of Aviation Cleaning Water Vehicle</td>
</tr>
<tr>
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<td>AC-137-CA-2016-02 Passenger Stair Testing Standard</td>
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<table>
<thead>
<tr>
<th>New Energy Aviation Lavatory Service Truck</th>
<th>Test Standards: MH/T 6015-2014 Aviation Sewage Vehicle</th>
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<tbody>
<tr>
<td></td>
<td>AC-137-CA-2015-19 Testing Standard of Aviation Service Truck</td>
</tr>
<tr>
<td></td>
<td>AC-137-CA-2016-02 Passenger Stair Testing Standard</td>
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<table>
<thead>
<tr>
<th>New Energy Garbage Collecting Truck</th>
<th>Testing Standards: GB/T 31029-2014 Aviation Garbage Collecting Vehicle</th>
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<tbody>
<tr>
<td></td>
<td>AC-137-CA-2016-02 Passenger Stair Testing Standard</td>
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<tbody>
<tr>
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<td>AC-137-CA-2016-02 Passenger Stair Testing Standard</td>
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<tr>
<th>New Energy Corridor Bridge</th>
<th>Testing Standards: MH/T 6028-2016 Aviation Corridor</th>
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<tr>
<td></td>
<td>MH/T 6029-2014 Aviation Boarding Stair,</td>
</tr>
<tr>
<td></td>
<td>Boarding Auxiliary Corridor Bright (Electric aiding and pull-type) Testing Outline</td>
</tr>
</tbody>
</table>
## JSTY5180JSPE Pure Electric Aviation Catering Truck

### Main Specification

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capacity Ah</td>
<td>228</td>
</tr>
<tr>
<td>Assembly voltage V</td>
<td>618.24</td>
</tr>
<tr>
<td>Total Length mm</td>
<td>10620</td>
</tr>
<tr>
<td>Total Width mm</td>
<td>2500</td>
</tr>
<tr>
<td>Wheel Span mm</td>
<td>1970/1840</td>
</tr>
<tr>
<td>Max speed km/h</td>
<td>59.5</td>
</tr>
<tr>
<td>Container Weight kg</td>
<td>14350</td>
</tr>
<tr>
<td>Whole weight kg</td>
<td>19550</td>
</tr>
<tr>
<td>Height of work platform mm</td>
<td>2550~6100</td>
</tr>
<tr>
<td>Container rated beard capacity kg</td>
<td>5000</td>
</tr>
<tr>
<td>Front platform rated bearing weight kg</td>
<td>2000</td>
</tr>
<tr>
<td>Front platform potable part rated bearing weight kg</td>
<td>600</td>
</tr>
<tr>
<td>Dimension of front platform(length * width) mm</td>
<td>1900X2265</td>
</tr>
<tr>
<td>Front platform potable part adjusting range on level mm</td>
<td>0~700</td>
</tr>
<tr>
<td>Container dimension(L<em>W</em>H) mm</td>
<td>7620X2500X2400</td>
</tr>
<tr>
<td>Front platform potable part adjusting range vertical mm</td>
<td>0~600</td>
</tr>
<tr>
<td>Temperature range °C</td>
<td>-35~60</td>
</tr>
<tr>
<td>Endurance mileage</td>
<td>435</td>
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</tbody>
</table>

Battery storage 282 degree, shortest charging-to-full time: 1.67 hrs. A full charged battery can service 28 air flights.
Based on the survey from authoritative organizations and professional institutes, the annual carbon emission of whole Chinese vehicles is about 120 million tons, the toxic emission of each vehicle yearly is 4 times of its weight, for one green energy Catering vehicle, in eight years it can save consumption and maintenance cost of 2.21 million RMB.
High Voltage System
High Voltage Integrate Control Unit is designed by BIT HuaChuang Electric Vehicle Technology Co., Ltd. This control unit integrates all the electrical adapters from different component systems, and it adopts centralized cooling and management for a better design optimizing. And it has the power supply function for DC-AC, DC-DC, oil bump, air bump and air-condition, with high electrical voltage of 576V, and the all the plug-in heads are different shape to avoid the wrongly plugging in. With the DCDC mold. Container air conditioner electric cable has been pre-installed.

Battery System
The battery system has 8 compartments, and is designed into 2 levels which locates in the both sides of the vertical axis, total capacity of 228kwh. It has been designed with a quick releasing clip allowing for a quick electricity charge.

Power System
Direct drive motor is produced by the CRRC Zhuzhou Electric Co., Ltd. The max torque and power of it can reach 2800NM and 200KW respectively, with high rotor speed of 3000rpm. Matching with 5.571 reducer, it can supply the power to the vehicle.
The design loading capacity of the vehicle is 5 ton, the platform elevating height range is 2.55M to 6.1M, platform bearing capacity is 2 ton, it can support all the aircraft types from China made to Boeing with efficient and safe service. Battery capacity is 282 degree and can meet the 28 flights service request. With 80% charged of the battery, it can drive 435 kilometers, work environmental request is -35 to 60 degree Celsius, fire-extinguisher and BIG data security port are equipped.
The vehicle uses the three CAN channels to form the key communication network of the electric aviation catering vehicle, which is used in communication of power system, vehicle running information and charging system respectively. It adopts Intel-based extended frame format and the communication speed is 230kbps. The vehicle control unit (VCU, Vehicle Control Unit) mainly manages the communication data of the whole vehicle, the coordination between different systems to ensure the safety and reliable operation of the whole vehicle and improve the driving comfort of the whole vehicle. The specific functions include torque analysis, fault diagnosis and high voltage energy management, etc. The specific communication architecture is shown below:
Struggling forward, affecting the world

The lifting device and other components are updated and designed with lightweight, high-strength steel new materials, successfully reducing weight of 2.5 tons. The “TCloud” new energy aircraft catering truck is reasonable weight with stable driving and higher safety performance after inspection.

- The box assembly is replaced by high-strength steel, which reduces 200kg.
- Platform assembly is replaced by high-strength steel weight, which reduces 100kg.
- Forklift assembly is replaced by high-strength steel weight, which reduces 800-1000kg.
- Supporting assembly is replaced by high-strength steel weight, which reduces 50kg.
Struggling forward, affecting the world

Charging mode:

It is equipped with the 90KW-240KW double gun charging pile, which can charge one or two vehicles at the same time. The maximum charging time is 1.67 hours.

1: status indicator light
2: Emergency stop button
3: double louver cooling grille
4: color touch screen
5: Card reader
6: DC charging gun
7: Zinc alloy door locker

L Type Integrated DC Charging Pile

Battery changing mode:

The power station can automatically replace the entire vehicle battery within five minutes through the industrial robot arm operating the battery pack’s quick release device.

1. Switching Power station area is 315 m².
2. 120 sets of batteries can be replaced in one day.
3. It is estimated that the vehicle consumes 240 kWh per day and the vehicle battery power is 282 kWh. Each vehicle can be replaced one time that can meets the demand everyday.
4. A single power station can meet the demand for 120 trucks.
"TCloud" - Tianyi Shareholding Civil Aviation New Energy Vehicle Big Data Supervision Platform

'TCloud' is researched by the National Engineering Laboratory of Electric Vehicles. It is an Internet of Big Data supervision platform that was consisted by the airport owner, the vehicle manufacturing enterprise, and vehicle user and a vehicle terminal which consists a three-level platform and also inputting with vehicle terminals. It has a dedicated capacity of up to 100,000 new energy trucks and has the overall supervision capability of data summary, report analysis, and command and dispatch functions. The vehicle-using enterprise can receive various types of operational data reported by the vehicle in real time from 4G or 5G channels, and master the running state of the vehicle to realize efficient operation.

The system was Based on the Internet of Vehicles and Big Data technologies that integrates vehicle information collection, vehicle condition monitoring, battery tracing management, food cold chain transportation, airport security monitoring and other integrated management and service platforms.
Research basis:

1. According to "GB/T 32960-2016 Electric Vehicle Remote Service and Management System Technical Specifications", electric vehicles need to install vehicle terminals, upload information to enterprise platforms and public platforms, and build electric vehicle remote service and management systems.

2. According to the "JT/T 1076-2016 road transport vehicle GPS vehicle-mounted video terminal technical requirements", the vehicle needs to collect vehicle video surveillance information, which has image analysis functions, such as passenger quantity counting, driving behavior analysis, etc., and can be uploaded to Enterprise monitoring platform and government monitoring platform.

3. "MH/T 6016-2017 Aviation Catering Vehicle" regulates the standard specifications for the design, manufacture and use of aviation catering vehicles in civil airports, including general requirements for electric catering vehicles, insulation, and storage batteries, Motor, Specific technical requirements for maneuverability.

Vehicle status monitoring

◊ Meet vehicle real-time message data analysis, historical data analysis, real-time / historical parameter comparison;

◊ Meet the vehicle refrigerating unit status monitoring, historical data analysis, real-time / historical parameter comparison;

◊ The system monitors the real-time status of the vehicle. Time domain analysis, multi-vehicle comparison, message analysis, detailed data query, vehicle daily report and other functions to meet the in-depth analysis of real-time and historical data of vehicles;
Vehicle abnormal state alarm

◊ The vehicle forecasting warning management realizes the monitoring and early warning of the frequent faulty parts information of the vehicle, preventing the accident from happening;
◊ The warning is also applicable to the monitoring of non-fault parameters of the vehicle, and the implementation of the regular warning for the vehicle operation business;
◊ Customers can define their own vehicle warning rules according to actual business needs;

Video monitoring alarm

◊ It is based on the driver's physiological image response, the driver's facial characteristics, eye signals, head movements, etc. Which can infer the driver's fatigue state, and raising alarm, moreover a corresponding measure is taken.
◊ Real-time monitoring the status of the vehicle staff, identifying and recording the identity and location of each person, and promptly alerting the supervisory platform when it is found that there is no reason to leave the position.
◊ Based on edge computing to achieve abnormal behavior monitoring and recognition, it greatly enhances the intelligence of video monitoring, and combines multiple technologies such as computer vision, pattern recognition, psychology, and physiology.

Considering that the traffic cost of monitoring video uploading is relatively large, the monitoring screen can be processed in the vehicle terminal, the abnormal behavior image can be uploaded to the system platform, and the alarm can be reported to the surveillance platform.
Vehicles, charging pile operation reports, working condition reports, abnormal vehicle statistics, covering a wealth of business scenarios, from macro to micro, from statistics to anomalies, multi-dimensional statistical system of vehicles and charging pile operation.

Mobile terminal APP

- Meet the management personnel to view the vehicle charging pile, real-time data, fault data through the telematics;
- The mobile terminal supports the vehicle, the remote diagnosis of the charging pile, and the abnormality reminder and other business requirements.
Tianyi civil aviation new energy equipment Big Data surveillance platform is a major scientific and technological project jointly developed by the Academician Sun Fengchun in the National New Energy Automobile Laboratory. The platform will be put into use in Tianyi New Energy Airport special equipment series and gradually promoted. It will become the basic application of the whole industry. In the future, it will effectively connect all the OEMs, Airlines and resident airports to achieve efficient supervision of the Trinity to improve the security of the airport operation environment and make the operation of the airport more intelligently.
Tianyi’s safety intercom and speed limit monitoring system is targeted for airport ground equipment, which can effectively improve the safety of various airport equipment to prevent accidents and meet the safety standards of IATA MH913 automatic intercom. It is especially suitable for the intercom work for aircraft passenger stairs, baggage conveyor belt loader, platform lift trucks, aviation catering trucks, inconvenient passenger boarding trucks, deicing trucks and other equipment.

The system is versatile and adaptable, and it is widely used in various models and is suitable for new aircraft such as A380, A350, B787, C919, ARJ21, B737max, B777, A320, B737.

◊ The TY-ASD system has passed the safety and reliability technology evaluation by Microelectronics Development Research Center of the Ministry of Industry and Information Technology in China, and it meets the safety and reliability requirements for usage.

◊ TY-ASD system has obtained the software copyright certificate of the National Copyright Administration of China.

4 National Invention Patents.
The system uses 3D sensors to detect the position of the hatch door, collects the vehicle speed signal and the throttle signal for logic control, and realizes overspeed warning and alarm, throttle speed limit, automatic brake control, etc. through professional control software. Entering the aircraft monitoring area: When the aircraft is more than 2 meters and less than 5 meters, the vehicle is controlled to move at the speed of 5km/h. The three-color warning light outside the vehicle flashes green. The ground commander can use the warning light to understand the condition of the vehicle.

Entering the approaching area of aircraft: When the distance from the aircraft is less than or equal to 2 meters, the automatic brake will control the speed near 0.7 km/h.

Vehicle advances in a very slow speed and the three-color warning light flashes yellow. When the speed of this area exceeds 0.5km/h, the display warning icon will be on. When the vehicle speed exceeds 0.7km/h, the red icon of the display will be on. A buzzer sound will remind the driver, and the vehicle will automatically brake to control the speed below 0.7km/h.

The 3D sensor collects the distance between the upper and lower heights of 4m span for the width of the 1.5m obstacle. The sensor's field of view is 95°32 degrees. The detection laser beam is 1024 beams. The distance can be measured in one laser and 0.1S. The speed is calculated from the nearest distance and take the action.
Our company has after-sales maintenance points in Beijing, Shanghai, Guangzhou, Shandong, Chongqing and other places.

The product has a three-year warranty on the whole vehicle, and the three-electric system is guaranteed 8 years for free or 100,000 kilometers. A special person will be dominate by the factory to maintain and supervise Big Data platform, masters the real-time status of the vehicle, and prompts early warning and disposal to ensure the normal and safe operation of the vehicle.

TCloud insists Client First, and provide intimate maintenance service in full weather, all around without distance barrier.

First Policy, Service Can Be Done in Thousands Miles. The company arranges at least one vehicle to provide door-to-door inspection service for users’ vehicles in one year. The accessories are complete in service car and can handle system maintenance upgrades, parts replacement, cutting and welding, structural flaw detection, strength testing, Spraying and other services. It can conduct a full inspection of the user’s vehicle, finding problems on the spot for repairing, checking the appearance and adding butter to all grease tips for free.

Second Policy, Old Vehicle Can Be Replaced With A New One. The vehicle that has been used for 8 years can be replaced with a new one. The old catering truck can transferred into 188,000 RMB when buying a new one.