STUDY GOAL AND OBJECTIVES

This report provides the industry executives with strategically significant competitor information, analysis, insight and projection on the competitive pattern and key companies in the industry, crucial to the development and implementation of effective business, marketing and R&D programs.

REPORT OBJECTIVES

◆ To establish a comprehensive, factual, annually updated and cost-effective information base on market size, competition patterns, market segments, goals and strategies of the leading players in the market, reviews and forecasts.

◆ To assist potential market entrants in evaluating prospective acquisition and joint venture candidates.

◆ To complement the organizations’ internal competitor information gathering efforts with strategic analysis, data interpretation and insight.

◆ To suggest for concerned investors in line with the current development of this industry as well as the development tendency.

◆ To help company to succeed in a competitive market, and

METHODOLOGY

Both primary and secondary research methodologies were used in preparing this study. Initially, a comprehensive and exhaustive search of the literature on this industry was conducted. These sources included related books and journals, trade literature, marketing literature, other product/promotional literature, annual reports, security analyst reports, and other publications. Subsequently, telephone interviews or email correspondence was conducted with marketing executives etc. Other sources included related magazines, academics, and consulting companies.

INFORMATION SOURCES

The primary information sources include Company Reports, and National Bureau of Statistics of China etc.
Abstract

Battery, motor and ECU are the three core components of new energy vehicle. EV drive control is one of core technologies for EV. Design of motor controller and development of control algorithm are critical factors determining performance of the whole drive system.

Motor controller prices vary greatly depending on specification and performance, generally RMB30,000-50,000 for large bus and RMB5,000-15,000 for passenger vehicle. PHEV and HEV usually adopt multi-motor architecture, including TM motor and ISG motor, thus resulting in higher costs of motor controller.

Furthermore, the evolution of EV e-drive system to wheel-side motor or wheel hub motor will also increase the cost of motor controller and complicate control strategy.

In such case, China's demand for EV motor controller was 380,000 sets, generating a market size of around RMB6.3 billion (currently concentrated in commercial vehicle field) and, driven by new energy vehicle and conventional hybrid vehicle, estimated to swell to RMB29 billion in 2020 when passenger vehicle will prevail.

In particular, as hybrid vehicles are expected to be mass-produced on a large scale, either Corun Hybrid System Technology (CHS) co-funded by Geely and Hunan Corun New Energy or localization of Toyota THS will expand the market of homegrown motor controller in China.

Currently, the Chinese EV motor controller market is dominated by domestic brands, compared to fractional share of foreign products at the stage of market fostering and early development due to higher prices and other reasons.

BYD became the largest vendor in the Chinese electric passenger vehicle motor controller market with a share of 28.6% by shipment in 2015. The company purchases IGBT modules to assemble motor controllers which are supplied to its own passenger vehicle production bases. Other players with higher market share are Zhongshan Broad Ocean Motor (including Shanghai E-drive), Zhuhai Enpower Electric, Shenzhen Inovance Technology, and UAES.
# China’s EV Motor Controller Demand and Market Size, 2015-2020E

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<tr>
<td>Average Price of Electric Bus Motor Controller (RMB/set)</td>
<td>45,000</td>
<td>42,000</td>
<td>40,000</td>
<td>38,000</td>
<td>36,000</td>
<td>35,000</td>
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<tr>
<td>Electric Bus Sales (Unit)</td>
<td>96,000</td>
<td>112,000</td>
<td>133,000</td>
<td>159,000</td>
<td>195,000</td>
<td>225,000</td>
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<tr>
<td>Electric Bus Motor Controller Market Size (RMB bn)</td>
<td>4.3</td>
<td>4.7</td>
<td>5.3</td>
<td>6.0</td>
<td>7.0</td>
<td>7.9</td>
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<tr>
<td>Average Price of Electric Truck Motor Controller (RMB/set)</td>
<td>7,000</td>
<td>6,600</td>
<td>6,200</td>
<td>5,800</td>
<td>5,500</td>
<td>5,200</td>
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<tr>
<td>Electric Truck Sales (Unit)</td>
<td>28,000</td>
<td>45,080</td>
<td>72,100</td>
<td>116,000</td>
<td>185,600</td>
<td>295,000</td>
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<tr>
<td>Electric Truck Motor Controller Market Size (RMB mln)</td>
<td>200</td>
<td>300</td>
<td>400</td>
<td>700</td>
<td>1,000</td>
<td>1,500</td>
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<tr>
<td><strong>Passenger Vehicle</strong></td>
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<tr>
<td>Average Price of Electric Passenger Vehicle Motor Controller (RMB/set)</td>
<td>7,500</td>
<td>7,000</td>
<td>6,600</td>
<td>6,200</td>
<td>6,000</td>
<td>5,800</td>
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<tr>
<td>Average Price of Electric Passenger Vehicle Multi-motor Controller (RMB/set)</td>
<td>12,000</td>
<td>11,000</td>
<td>11,000</td>
<td>10,000</td>
<td>10,000</td>
<td>9,000</td>
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<tr>
<td>EV Sales (Unit)</td>
<td>143,492</td>
<td>290,335</td>
<td>475,631</td>
<td>684,703</td>
<td>931,047</td>
<td>1,219,069</td>
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<tr>
<td>PHEV Sales (Unit)</td>
<td>63,746</td>
<td>124,429</td>
<td>208,730</td>
<td>307,620</td>
<td>408,589</td>
<td>522,458</td>
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<tr>
<td>HEV Sales (Unit)</td>
<td>13,187</td>
<td>120,000</td>
<td>250,000</td>
<td>450,000</td>
<td>650,000</td>
<td>900,000</td>
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<tr>
<td>Passenger Vehicle Motor Controller Market Size (RMB bn)</td>
<td>1.8</td>
<td>3.7</td>
<td>6.7</td>
<td>11.4</td>
<td>15.2</td>
<td>19.5</td>
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<td><strong>Overall</strong></td>
<td></td>
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<tr>
<td>Overall Motor Controller Market Size (RMB bn)</td>
<td>6.3</td>
<td>8.7</td>
<td>12.4</td>
<td>18.1</td>
<td>23.3</td>
<td>29.0</td>
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<td>YoY (%)</td>
<td>38.5%</td>
<td>42.5%</td>
<td>45.7%</td>
<td>28.4%</td>
<td>24.4%</td>
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*Note: Passenger vehicle multi-motor controller refers mainly to TM+ISG dual-motor controller, front & rear dual-TM motor controller, or front & rear dual-TM+ISG triple motor controller, etc.*

*Source: ResearchInChina*
From the perspective of industrial chain, IGBT module is the most core upstream component of motor controller. Global market size of EV IGBT module was about USD1 billion in 2015. Fairchild, Infineon, and ST have an upper hand in automotive IGBT market. However, Chinese BYD now is also engaged in IGBT. China accounts for about 1/3 of global IGBT demand but imports over 90% of its own demand. The IGBT modules produced by local companies are primarily used in low-power fields, such as air conditioner, induction heating, etc.

EV motor controller now employs mainly silicon-based IGBT module. However, SiC-dominated wide bandgap semiconductor devices have overcome the limitations of silicon-based semiconductor devices in terms of withstand voltage level, operating temperature, switching loss, and switching speed. For example, Nissan's Leaf has integrated motor, speed reducer, and controller. This represents a trend in which the product can be more compact and standardized.

Another aspect of system integration is functional integration. EV may serve as an energy storage element of new energy grid in future, requiring bidirectional correlation of vehicle and grid (V2G). Vehicle-mounted motor control inverter can also be used as the inverter between battery and grid for charging and grid feedback, thus realizing integration of motor drive and bidirectional charger.

China EV (Electric Vehicle) Motor Controller Industry Report, 2016-2020 by ResearchInChina highlights the followings:

- Main technology roadmaps and development trends of EV motor controller;
- Upstream IGBT & thin-film capacitor and downstream EV industry (market size, competitive landscape, main policies, etc.);
- EV motor controller (industrial policy, market size, supply chain, and competitive landscape), global mainstream EV motor electronic control system;
- 19 Chinese EV motor controller enterprises (operation, motor controller business and technology, etc.);
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