Yano Research Institute
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RESEARCH SUMMARY

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In-Vehicle Current Sensors: Latest Research Findings in 2009

- Indispensable for fuel economy improvement! Installation is increasing on conventional vehicles as well as on the HEV & EV. -

Research Outline

Yano Research Institute has conducted a study on the in-vehicle sensors market in Japan as described below.

1. Research period: April to June 2009
2. Research targets: Vehicle system manufacturers, current sensor manufacturers, etc.
3. Research methodologies:
   Face-to-face interviews with relevant personnel, supplemented by interviews via telephone and e-mail, and literature researches.

<What is in-vehicle current sensors market?>

In this research, the in-vehicle current sensor market is defined as comprised of 4 major application fields, accessory battery applications, HEV (hybrid electric vehicle) and EV (electric vehicle) battery monitoring applications, HEV/EV motor control applications and PHEV/EV battery charger applications.

Key Findings

- **The in-vehicle current sensor market continues to grow, reaching to 12,681 million yen in 2009 (up by 27.4% compared to the previous year)**

  The market is expected to grow considerably in 2009, reaching to 12,681 million yen in value (up by 27.4% compared to the previous year) and 13.34 million pieces in volume (up by 26.1% compared to the previous year) based on the shipments from the manufacturers.

- **In addition to the steadily growing accessory battery applications, applications for hybrid electric vehicle/electric vehicle systems will rapidly expand.**

  In 2009, about 90 percent of the in-vehicle current sensors will be used for charge/discharge control systems of the accessory batteries. The ratio of installation will keep increasing for fuel economy improvement. The remaining 10 percent is for HEV/EV battery monitoring and motor control applications, which will increase rapidly in the future, along with the spreads of these vehicles in the market.

- **The market will continue to grow significantly, with annual increase by 20 to 30 percent until 2012, and reach to 33.01 million pieces in volume and 26,595 million yen in value in 2015.**

  In addition to the increasing installations in the battery charging control systems of the passenger cars centered on European and Japanese market and the world expansion of HEV/EV market, the recovery of the passenger car market will contribute to considerably expanding the in-vehicle current sensor market. The average annual growth rate (CAGR) up to 2015 is expected to be 17.7 percent in shipment volume and 15.1 percent in shipment value respectively.

Report format:

Published report: “In-vehicle Power Management Systems and Devices Market 2009 to 2010”
Issued in: June 2009
Language: Japanese
Format: 130 pages in A4 format
Price: 130,000 yen (6,500 yen of consumption tax shall be charged for the sales in Japan.)

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Research Summary

1. Market overview & forecast

With the progress of electronic control and motor drive of the vehicle systems, the demand for on-board electricity, especially for high-power consuming devices is increasing. Under the strict environmental regulations and incentive polices for eco-cars in every countries, fuel economy is becoming a commercial value, and the demand for power management (how to store and use the electricity efficiently) is increasing, as well as the importance of current sensors used in such power management systems. The total in-vehicle current sensor market in 2009 is estimated to be 12,681 million yen (based on the shipment).

Impacted by the global economic recession, new car sales are expected to fall into the doldrums, especially in the advanced countries. In the meantime, however, the current sensor market is expected to grow, with increasing demand for accessory battery applications as the installation of charge-discharge control system on passenger vehicles will increase in European and Japanese market. In addition, the demand for HEV and EV applications will increase along with the spreads of HEV and EV.

The market size in 2015 is estimated to be 33.01 million pieces in shipment volume (CAGR: 17.7%), and 26,595 million yen in shipment value (CAGR: 15.1%).

2. Trends by application

1) Accessory battery applications

The market size of the current sensors for accessory battery applications in 2009 is estimated to be 11,336 million yen (based on the shipment in value from the manufacturers). About 90 percent of the total in-vehicle current sensors are for accessory battery applications.

Since 2001 or so, the installation of charge-discharge control system on gasoline and diesel engine vehicles has been promoted for avoiding useless power generation and saving power consumption, and for load control based on the power supply priority. Together with such movements, the installation of current sensors on/around the accessory batteries has been progressed.

The charge-discharge control system for accessory batteries is an indispensable item for fuel economy improvement, which many automakers plan to install on all passenger vehicles for domestic and European market Note (Some automakers plan to install on the vehicles for North American market as well.). It is likely, therefore, that the current sensor market for accessory batteries will expand along with the vehicle model changes and new vehicle model launches.

In engineering aspects, as there are needs for functions such as 1) battery status detection and 2) dark current measurement (electric current consumed even when the engine is OFF), diversification of functions and detection ranges is expected to progress from now on. It is likely, in line with these changes, that the detection elements and detection methods may be changed in the future.

Note: In North American market, DRL (Day Running Light) has been enforced by law in certain areas, which requires drivers to keep the headlamp on all the time even in daylight while driving. It is said that the needs for charging control is not so great in these areas, as the electricity is consumed all the time while driving.

2) HEV/EV battery monitoring applications

The market size of the current sensors for HEV/EV battery monitoring applications in 2009 is estimated to be 478 million yen (based on the shipments in value). The current sensors will be installed close to the HEV/EV drive battery and used for monitoring the status such as charging condition of the battery.

For HEV/EV battery monitoring applications, the demand for higher accuracy will increase in the future, as lithium-ion batteries will be installed on HEV/EV, on which it is much more difficult to detect the battery conditions compared to the existing nickel hydrogen batteries, and higher accuracy sensors are required. Currently, Open-Loop method or Closed-Loop method with Hall Element are used, which is likely to be replaced by higher accuracy sensors (such as a sensor with magnetoresistance element) in the future.

3) HEV/EV motor control applications

The market size of the current sensors for HEV/EV motor control applications in 2009 is estimated to be 862 million yen (based on the shipments in value). For HEV/EV motor control application, about 2-3 sensors will be required for each motor/generator.

4) PHEV/EV in-vehicle charger applications

Full-fledged introduction of EV (Electric Vehicle) and PHEV (Plug-in Hybrid Vehicle) into the market will start in 2009. A vehicle charger will be installed on these vehicles, and current sensors will be used on these in-vehicle chargers. The market size in 2009 is estimated to be 5 million yen (based on the shipments in value)

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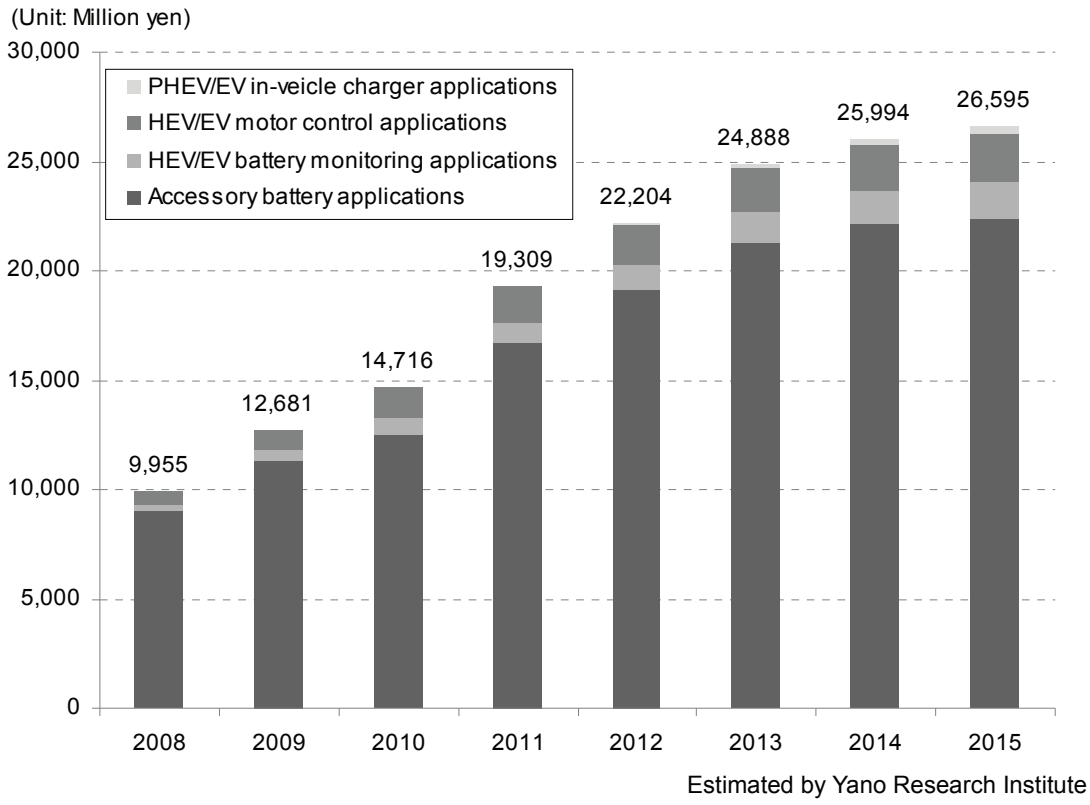
Fig. 1: Market Size Forecast for In-Vehicle Current Sensors by Application



(Million yen)

	2008	2009	2010	2011	2012	2013	2014	2015
Accessory battery applications	9,063	11,336	12,536	16,736	19,168	21,345	22,132	22,363
Year/year	—	125.1%	110.6%	133.5%	114.5%	111.4%	103.7%	101.0%
HEV/EV battery monitoring applications	274	478	759	912	1,132	1,380	1,535	1,705
Year/year	—	174.9%	158.6%	120.2%	124.1%	121.9%	111.2%	111.1%
HEV/EV motor control applications	619	862	1,399	1,620	1,805	1,997	2,093	2,196
Year/year	—	139.2%	162.3%	115.8%	111.4%	110.6%	104.8%	104.9%
PHEV/EV in-veicle charger applications	0	5	22	41	98	166	234	331
Year/year	—	—	474.2%	187.0%	238.7%	168.6%	141.3%	141.3%
TOTAL	9,955	12,681	14,716	19,309	22,204	24,888	25,994	26,595
Year/year	—	127.4%	116.0%	131.2%	115.0%	112.1%	104.4%	102.3%

Estimated by Yano Research Institute

Note 1: Actual figures for 2008, and forecast for 2009 and after
Note 2: Based on the shipments in value from the manufacturers
Note 3: As figures are rounded, the total of individual figures may not equal to the figures listed as total.