

Research Report
ABOUT Automotive

The Global Market for Stop-Start Systems

Trends & Forecasts to 2020

May 2014 edition

By David Saddington



ABOUT
Publishing Group

Contents

1	Executive summary
3	Chapter 1: Introduction
3	1.1: Regional differences
4	1.2: The rise of the hybrid
5	1.3: Manufacturer investment
6	1.4: Report coverage
7	Chapter 2: The market
8	2.1: Tightening global emissions standards and legislation shaping the market
8	2.2: Current and planned regulation: preparing for 2020
10	2.3: CO ₂ limitations
14	2.4: Tightening emissions standards for commercial vehicles
16	2.5: The changing geographic profile of vehicle production - global trends
17	2.6: Focus on economy boosts ICE investment
19	2.7: Market outlook
19	2.7.1: Europe
20	2.7.2: China
21	2.7.3: North America
22	2.7.4: Japan
23	2.7.5: Rest of World
24	2.8: Market forecast
25	2.9: Manufacturers
26	Chapter 3: Technical review
26	3.1: Overview
28	3.2: Stop-start systems: defining the elements
28	3.3: Belt-driven starter generator (BSG)
30	3.3.1: BSG systems on the market
30	3.3.2: Valeo's i-StARS / StARS+X
31	3.3.3: INA Schaeffler Technologies' Hydraulic Generator Tensioning System
32	3.4: The Enhanced starter
33	3.4.1: Enhanced starter systems on the market
33	3.4.2: Bosch's Efficiency Line Products
33	3.4.2.1: Enhanced starter motor
34	3.4.2.2: Efficiency line (EL) alternator
36	3.4.3: DENSO's Enhanced Starter Products
36	3.4.3.1: Advanced engagement (AE) starter
37	3.4.3.2: Tandem solenoid (TS) starter
38	3.4.3.3: Permanently engaged (PE) starter
41	3.5: Direct starter
42	3.5.1: Mazda idling stop technology (i-Stop)
43	3.6: Integrated / crankshaft starter generator (ISG / CSG)

45	3.6:	Representative supplier solutions
45	3.6.1:	Continental's Integrated Starter Alternator Damper (ISAD)
46	3.6.2:	ZF Group DynaStart Crankshaft Starter Generator
48	3.6.3:	Bosch's Integrated Motor Generator (IMG)
49	3.6.4:	Honda's Integrated Motor Assist (IMA)
50	3.7:	Comparative strengths and weaknesses
51	3.8:	Implications for battery systems and the move to 48V

53 **Chapter 4: Manufacturers**

53	4.1	Major suppliers
53	4.1.1:	Bosch
53	4.1.2:	Continental
54	4.1.3:	DENSO
55	4.1.4:	Valeo
56	4.2:	Other suppliers
56	4.2.1:	BorgWarner
57	4.2.2:	Delphi Automotive
59	4.2.3:	Gates Corporation
59	4.2.4:	INA Schaeffler Technologies
60	4.2.5:	ZF Group

List of tables

Table 1:	EU: emission standards for passenger cars (ECE + EUDC chassis dynamometer test)
Table 2:	Summary of European Parliament 2020 emissions target - key provisions
Table 3:	CO ₂ emissions and weight by manufacturer 2011 fleet with 2015 and 2020 CO ₂ targets (passenger vehicles only)
Table 4:	China's Fuel Consumption Standards, 2005 to present (L/100km)
Table 5:	Emission standards for light commercial vehicles
Table 6:	EU emissions standards for heavy duty diesel engines
Table 7:	Emissions standards for heavy goods vehicles
Table 8:	Europe stop-start system demand to 2020 (thousand units)
Table 9:	China stop-start system demand to 2020 (thousand units)
Table 10:	North America stop-start system demand to 2020 (thousand units)
Table 11:	Japan & South Korea stop-start system demand to 2020 (thousand units)
Table 12:	ROW stop-start system demand to 2020 (thousand units)
Table 13:	Automotive stop-start system market value by region to 2020 (million USD)
Table 14:	Examples of BSG stop-start systems in the market
Table 15:	Bosch stop-start starter motor range and specifications
Table 16:	Bosch Efficiency Line 14V generator technical specs
Table 17:	Examples of Enhanced starter stop-start systems on the market
Table 18:	Examples of Direct starter stop-start systems on the market
Table 19:	ZF DynaStart operational summary
Table 20:	Examples in the market
Table 21:	Delphi key customers

List of figures

Figure 1:	Comparison of global CO ₂ regulations for passenger vehicles (NEDC gCO ₂ /km)
Figure 2:	2013 Regional share of global vehicle production
Figure 3:	Technology investment priorities

Figure 4:	Degrees of vehicle electrification
Figure 5:	BSG system layout
Figure 6:	Valeo i-StARS system
Figure 7:	Enhanced starter - system layout
Figure 8:	Bosch nose-type starter motor
Figure 9:	Bosch noseless starter motor
Figure 10:	Bosch Efficiency Line 14V generator
Figure 11:	Bosch's stop-start system layout
Figure 12:	DENSO's Advanced Engagement (AE) starter
Figure 13:	DENSO Tandem Solenoid (TS) starter
Figure 14:	DENSO Permanently Engaged (PE) starter
Figure 15:	Required sensors and actuators
Figure 16:	Direct starter system layout
Figure 17:	Mazda's i-Stop system
Figure 18:	Integrated starter generator (ISG) system layout
Figure 19:	Continental's Integrated Starter Alternator Damper (ISAD)
Figure 20:	ZF DynaStart starter generator
Figure 21:	Bosch Integrated Motor Generator (IMG) layout
Figure 22:	Bosch IMG generator
Figure 23:	Honda's Integrated Motor Assist (IMA) layout
Figure 24:	Honda's IMA in different driving stages