

Automotive electric motors: A global market review (sample)

Author: Matthew Beecham

Published January 2003

No part of this publication may be copied, reproduced, stored in a retrieval system, or be transmitted in any form by any means electronic, mechanical, photocopying, recording or otherwise without the prior permission of the publishers. All material published within this report is copyright Aroq Limited.

This report is provided for individual use only. If you would like to share this report with your colleagues, purchase additional copies or sign up for a company wide licence please contact Oliver Wilkinson:

Tel: +44 (0)1527 573 609. Fax: +44 (0)1527 577 423. Email: oliver@just-auto.com

Aroq Limited

Registered in England no: 4307068

Seneca House, Buntsford Hill Business Park, Bromsgrove, Worcs, B60 3DX, UK.

Tel: +44 (0)1527 573 600 Fax: +44 (0)527 577 423 Web: www.aroq.com

© 2003 All content copyright Aroq Limited. All rights reserved.

Table of Contents

| | |
|--------------------------------------|-------------------------------------|
| Table of Contents | i |
| List of Tables | ii |
| List of Figures..... | iii |
| Chapter 1 Introduction | 1 |
| Electric potential | 1 |
| Report coverage..... | 1 |
| Chapter 2 The market..... | 2 |
| Product applications | 2 |
| Air conditioning | 2 |
| Automated manual transmissions | 3 |
| Door closure | 4 |
| Electronic braking systems..... | Error! Bookmark not defined. |
| Engine-cooling systems..... | Error! Bookmark not defined. |
| Mirrors | Error! Bookmark not defined. |
| Seats | Error! Bookmark not defined. |
| Seatbelts..... | Error! Bookmark not defined. |
| Steering | Error! Bookmark not defined. |
| Sunroofs | Error! Bookmark not defined. |
| Wheel assemblies | Error! Bookmark not defined. |
| Window-lifts | Error! Bookmark not defined. |
| Wipers | Error! Bookmark not defined. |
| X-by-wire | Error! Bookmark not defined. |
| Market forecast..... | Error! Bookmark not defined. |
| Chapter 3 Manufacturers | Error! Bookmark not defined. |
| ArvinMeritor | Error! Bookmark not defined. |
| Bosch..... | Error! Bookmark not defined. |
| Conti Temic Microelectronics | Error! Bookmark not defined. |
| Denso | Error! Bookmark not defined. |
| Globe Motors..... | Error! Bookmark not defined. |
| Johnson Electric | Error! Bookmark not defined. |
| Siemens VDO..... | Error! Bookmark not defined. |
| Valeo | Error! Bookmark not defined. |

List of Tables

Table 1 OE production of electric motors for passenger car HVAC blower applications, Western Europe, NAFTA, Japan, 2000 - 2005 3

Table 2 OE production of electric motors for passenger power front electromechanical seat adjustment systems, Europe, NAFTA, Japan, 2000 - 2005..... **Error! Bookmark not defined.**

Table 3 OE sales of motors for electrically assisted steering systems for passenger car applications, Europe, NAFTA, Japan, 2000 - 2005 **Error! Bookmark not defined.**

Table 4 OE production of electric drive motors for passenger car electric sunroof applications, Western Europe, United States, Japan, 2000 - 2005 **Error! Bookmark not defined.**

Table 5 OE production of electric gear motors for passenger car power window-lift applications, Europe, NAFTA, Japan, 2000 - 2005 **Error! Bookmark not defined.**

Table 6 OE production of electric motors for all passenger car applications, Europe, NAFTA, Japan, 2000 - 2005..... **Error! Bookmark not defined.**

Table 7 OE wholesale value of electric motors for all passenger car applications, Europe, NAFTA, Japan, 2000 - 2005 **Error! Bookmark not defined.**

List of Figures

Figure 1 Apportioned cost of car seat components (% of total cost of seat) **Error! Bookmark not defined.**

Figure 2 Siemens' smart window-lift and sunroof-slide motors **Error! Bookmark not defined.**

Figure 3 Siemens's smart window-lift **Error! Bookmark not defined.**

Figure 4 Bosch's electronically controlled reversing motor for compact wiper drives **Error! Bookmark not defined.**

Figure 5 Continental's Brake-by-Wire System **Error! Bookmark not defined.**

Chapter 1 Introduction

Electric potential

Electric motors perform a variety of functions that were formerly consigned to cranks, gears and levers. The number of electric motors in automotive applications is increasing rapidly. In Europe, for example, we forecast that electric motor production will rise xx% from 570 million units in 2000 to 830 million units by 2005. Motorists' insatiable demand for safety, comfort, economy, a clean environment and overall quality of driving are the main drivers behind this explosive growth. The gradual increase in drive-by-wire technologies, such as electric steering systems and electronic throttle control, are also fuelling demand. Throttle-by-wire technologies have already appeared. By 2005, brake-by-wire and steer-by-wire systems are expected to appear on some BMW and Mercedes-Benz models in Europe as well as on Cadillac models in the US.

As electric motors proliferate in the modern car, manufacturers have developed lighter and more compact units. Bosch, for example, has introduced a new generation of lightweight miniature motors for use in various systems. Its new generation of actuator motors has an installation depth of just 30mm with an armature shaft diameter of 4mm. These motors are designed for use in power windows and seat adjusted mechanisms. In addition to using these motors for conventional applications such as seat and steering column adjustment functions, they are also being produced for side-window blinds, convertible folding tops and seat belt extenders.

Report coverage

Continuing our series of component market studies, this just-auto.com report reviews the key market drivers for automotive electric motors, providing some forward-looking analysis for certain applications. **Chapter two** reviews a range of componentry found inside a typical modern car, highlighting some recent innovations. It also sets out our forecast fitment levels for electric motors for particular applications in the major car producing regions through 2005. **Chapter three to ten** will provide you with brief profiles of the major electric motor manufacturers: Arvin Meritor, Bosch, Conti Temic Microelectronics, Denso, Globe Motors, Johnson Electric, Siemens VDO and Valeo.

Chapter 2 The market

Product applications

All systems such as intelligent brake-control, throttle-by-wire and steer-by-wire require a sensor, a control unit and an electric motor. Electric motors are found in anything that has an electrical movement or solenoid function - such as window-lifts, fuel pumps, mirror and headlamp adjusters, anti-lock brake systems (ABS), clutches, automatic manual transmissions, parking brakes and electric steering.

Although electric motors have long since been used in wiper systems and to power engine-cooling fans, these markets have matured. There are, however, some promising applications to improve comfort and convenience in the mid-range car segments, such as power windows and anti-lock brake systems. Electric steering is also becoming a common feature in small cars. Here we look at the main product applications for electric motors, highlight some recent innovations as well as provide product forecasts for certain applications. The final part of this chapter sets out our estimates and forecast for the volume and value of electric motors in Europe, NAFTA and Japan through 2005.

Air conditioning

The future growth in the European air conditioning sector looks assured with factory-fit penetration of air-conditioning expected to reach nearly xx% by 2004, up from xx% in 1998. All the major HVAC manufacturers are now working to enhance the air conditioning system through the use of multi-zone control. This has the advantage of allowing the rear seat passengers to adjust their localised climate control. In a multi-zone system, two HVAC modules are required - one for the front of a car and one for the rear - each with a blower motor, heater core and evaporator.

The new Mercedes-Benz E-class, for example, features a four-zone climate control system, known as the Thermotronic and the multi-contour seat will actively support the driver during hard cornering. The Thermotronic system includes a microcomputer and no less than 12 electric motors to distribute air to the four zones. This system automatically switches to recirculation mode if nitrogen oxide and carbon monoxide exceeds pre-set values. The electronic ignition key of the car automatically stores the individually set temperature controls, enabling the system to automatically revert to the pre-determined settings following a break in the journey.

In the US, the air conditioning market is nearing saturation point, with around xx% of new cars fitted with the comfort feature. That is up from around x% in 1960, xx% in 1970, xx% in 1980 and xx% in 1990. Like the North American market, the Japanese air conditioning market is also mature, the OE fitment rate being xx% this year, rising to xx% by 2005. On this basis, table 1 sets out our estimates and forecast for electric motors for HVAC blower applications in each major car producing region through 2005.

Table 1 OE production of electric motors for passenger car HVAC blower applications, Western Europe, NAFTA, Japan, 2000 - 2005
(million units)

| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 |
|----------------|------|------|------|------|------|------|
| Western Europe | | | | | | |
| NAFTA | | | | | | |
| Japan | | | | | | |
| Total | | | | | | |

Sources: just-auto.com and industry estimates

Automated manual transmissions

A sophisticated clutch development is the pedal-less clutch; the electronically controlled automatic clutch that is sometimes referred to, misleadingly, as clutchless transmission. Such clutches have the benefit of an automatic transmission in that only the accelerator and brake pedals are now required, while retaining the manual gearbox with the driver still choosing when to change gear, and performing the operation himself. The difference to the conventional manual gearbox, and the similarity to the automatic transmission, is that he does not have to depress a clutch pedal.

In a technology partnership with the German clutch maker, LuK, Bosch helped develop an automated manual transmission in which a central electronic module controls the electric motors that operate the clutch and actuate the gearshifts. Bosch's contribution to this project included development of high-performance, compact electronic selector and switching motors and clutch actuators.

Door closure

Electrically operated door locks are also becoming standard issue. In the US, more than three-quarters of domestically produced vehicles are fitted with power door locks. Either pneumatic or electric actuators can be used to power central locking systems for vehicle doors, luggage compartments and fuel-filler flaps. In pneumatic systems, an electric motor drives the reversible dual

