2002 Roundup of European Auto Electronics Suppliers

Bosch Automotive Technology Sector
2002 Sales: €23.3 billion ($25 billion)
Change from 2001: Sales growth was flat in 2002.

Lower vehicle production in Western Europe and a stagnant economy kept Bosch sales in 2002 about the same as the prior year, despite strong sales of diesel systems and higher penetration of Bosch’s ESP (electronic stability program). According to Bosch, in 2002, diesel systems accounted for €6.5 billion ($7 billion) of sales; chassis systems generated €5 billion ($5.4 billion). The Automotive Technology Sector in 2002 made up 67% of Bosch Group sales.

Robert Bosch Corp., Bosch’s North American subsidiary, has not yet released sales figures for 2002, but the company expects sales will come in at about $4.2 billion, the same as 2001.

In July 2002, Bosch restructured its Japanese subsidiary businesses Bosch Automotive Systems Corp. (formerly Zexel), Bosch Electronics Corp. and Bosch Braking Systems into one entity, keeping the name Bosch Automotive Systems Corporation.

Hermann Scholl, chairman of the board of management of Robert Bosch GmbH, noted in January 2003 press conference that the business climate for 2003 was highly uncertain and “not encouraging,” given the possibility of war in Iraq.

Brose Group
2002 Sales: €1.548 billion ($1.660 billion)
Change from 2001: up 6.8%

A family-owned business with roughly 7,000 employees worldwide, Brose is a leading producer of window regulators and door modules.

A Few Carmakers Consider Airbag Bus Standards

Safe-by-Wire Ahead of BST

For the last seven years or so, a number of carmakers have been developing advanced airbag and restraint systems that are capable of connecting multiple airbags and sensors to the same restraint system controller. Sensors could include seat-occupant and position sensors, pressure or acceleration crash sensors and seatbelt latch sensors; actuators could include single and multistage airbag igniters and seatbelt pre-tensioners.

In response to carmakers’ need to simplify these systems, eliminate some wiring and reduce the cost of future airbag components, a number of suppliers have been developing airbag bus systems with a view that someday the world will need a standard bus. Leading the development of potential airbag bus standards are two supplier consortia: One is Safe-by-Wire, founded in November 2001 by Autoliv, Delphi Delco Electronics, Philips Semiconductors, Special Devices Inc. and TRW; the second is a joint development effort of Bosch, Siemens and Temic, begun in February 2000, whose bus architecture is called BST.

Safe-by-Wire is today’s leading contender of the two competing safety-restraint protocols. With 13 airbag systems and component suppliers as members, the Safe-by-Wire consortium published the final Automotive Safety Restraints Bus Specification, Version 1.0 in January 2003. The specification covers the physical layer, the data link layer and those parts of the application layer that are not supplier specific.

GM Considers Safe-by-Wire

General Motors is the first paying customer to develop a bus that conforms to Safe-by-Wire specifications for possible future use in production vehicles. General Motors has hired TRW to participate in that development effort. Philips has already supplied prototype Safe-by-Wire silicon devices for beta testing by TRW and GM.

By mid-2003, all beta testing of Philips’ prototype chips will be completed, after which Philips will begin designing the final chips. Philips said the earliest it would be ready to deliver finished chips to customers is mid-2005, in time for the 2006 model year.

While GM is in the midst of its Safe-by-Wire development project with TRW, Ben Baker, manager of GM’s North American electrical center, told us that the carmaker hasn’t yet made a decision on which protocol it will adopt. “My experts tell me they are not ready to jump into this with both feet,” said Mr. Baker. Still, Mr. Baker believes Safe-by-Wire could benefit GM, “especially in cases where we have multiple variants: multiple sensors and multiple firing loops. I think there is some credibility to it, and if done right it can certainly be a cost saver, because of the simplification.”

However, GM has concerns about potential failure modes when high-speed sensors are hooked together on the bus. High-speed sensors such as crash sensors deliver more information than low-speed sensors such as buckle switches. If two bus wires short against each other, you have a...
door systems. In 2002, sales of window regulators grew 5%, to €745 million ($799 million); door system sales grew 7%, to €528 million ($566 million) and sales of seat adjustors rose 11%, to €275 million ($295 million).

In November 2002, Brose acquired Bosch’s latch systems business, which includes mechanical and electronic components.

Brose expects its sales growth for 2003 will be less than 2%, or €1.810 billion ($1.94 billion), due to lower worldwide vehicle production volumes.

Continental AG
2002 Sales Estimate: €11.3 billion ($12.1 billion)
Change from 2001: up 0.9%
2002 EBITA Estimate: €607.3 million ($651.2 million), compared with a loss of €257.6 million ($276.2 million) in 2001.
Continental Automotive Systems
2002 Sales: €4.6 billion ($4.9 billion)
Change from 2001: up 15.4%, due mainly to the acquisition of Temic from DaimlerChrysler.

Please see page 4 for more on Continental.

Hella KG Hueck & Co.
Fiscal year ends May 31.
FY 2002 Sales: €2.9 billion ($3.1 billion)
Change from FY 2001: up 2%
The majority of Hella’s sales come from lighting products including halogen and xenon headlamps, signal and interior lights, plus sensors and control units for body electronics, powertrain, heating and lighting controls. The company developed an adaptive front lighting system (A FS), which comprehends curves in the road and bends the light accordingly. Hella’s A FS is available on the 2003 Audi A 8.
Fifty-nine percent of Hella’s sales are made in Germany.

Please refer to The Hansen Report, September 2002 for more on Hella.

Magneti Marelli
2002 Net Sales: €3.3 billion ($3.5 billion)
Change from 2001: down 19.3%
2002 Operating Loss: €16 million ($17.2 million), compared with a loss of €74 million ($79 million) in 2001.

Magneti Marelli’s electronics business was sold in April 2002 to Magneti Marelli (Italy), but the company retains some electronics capability in its Powertrain division. Parent company Fiat had been attempting to sell the remaining Magneti Marelli businesses for several years but found no buyers. According to a Automotive News, Fiat has taken Magneti Marelli off the market.

Siemens VDO Automotive
Fiscal year ends September 30.
FY 2002 Sales: €8.515 billion ($9.138 billion)
Change from FY 2001: up 49%. 2001 sales included only five months of revenue from the VDO acquisition, which was completed in April 2001. Sales for fiscal year 2002 include a full 12 months of VDO sales.
FY 2002 EBIT: €65 million ($69.7 million), or 0.8% of sales, compared with a loss of €261 million ($280 million) in fiscal year 2001.
Siemens VDO grew sales in North America, Europe and Asia in 2002. Among its promising new products and technologies, Siemens VDO cites its piezo common rail diesel injection system, a Java-based software platform for infotainment systems and Tire Guard tire-pressure monitoring systems. With approximately 43,000 employees, the company is organized in three business divisions—Powertrain, Chassis/Car Body and Interiors and Infotainment—plus some aftermarket sales.

Please refer to The Hansen Report, October 2002 for more on Siemens VDO.

Valeo
2002 Sales: €9.803 billion ($10.512 billion)
Change from 2001: down 4.4%
2002 Net Income: €135 million ($145 million), or 1.4% of sales. In 2001, Valeo lost €591 million ($634 million).

Electrical and electronics systems account for 46% of Valeo’s sales. Thermal systems contribute 25%, aftermarket sales, 19%, transmissions, 5% and security systems, 5%. The only region where Valeo achieved any substantial growth during 2002 was Asia, where sales improved 17%. Sales in Europe declined 2% as a result of lower vehicle production volumes, while in North America sales grew just 1%.

An approved reorganization plan for subsidiary company Valeo Electrical Systems Inc. (Rochester, New York), which filed for bankruptcy in December 2001, became effective October 7, 2002. Valeo, the parent, will contribute $226 million toward the reorganization plan. The company expects VESI to become profitable by 2004.

ZF Friedrichshafen
2002 Sales Estimate: €9.4 billion ($10.1 billion)
Change from 2001: up 4%
ZF Car Chassis Technology division increased its business in the United States, contributing to the division’s 6% sales growth in 2002. The ZF Powertrain and Chassis Components division (the former Mannesmann Sachs, acquired by ZF in 2001) increased sales 8% last year.
ZF employs 55,400 people, 60% of them in Germany. The company is expanding its facilities in North America, including ZF Technical Center in Northville, Michigan, and expects to generate 30% of sales in the NAFTA region by 2005. ¬
single-point failure that will bring down all the sensors tied to that parallel bus. Carmakers will need to decide how much risk they are willing to tolerate. A cording to TRW, two wires shorting together is a very uncommon event, and there are no other failure modes in the Safe-by-Wire system. (Low-speed sensors, airbag igniters and pretensioners are hooked up differently, such that they are protected from the A-to-B shorting failure.)

One way to avoid this failure mode is to wire some high-speed sensors directly to the restraint controller. But that can lead to a proliferation of pins and connectors going to the restraint system controller. Mr. Baker observed: “We are trying to develop a common design, so we don’t want to put 64 pins on every box. ... With so many pins it would get too expensive.”

The Safe-by-Wire bus architecture is getting support from some Japanese restraint system and component suppliers who have joined the consortium. Denso is a Toyota affiliate and one of Toyota’s top airbag systems suppliers. Daicel Safety Systems is a top inflator supplier to Toyota. Denso’s and Daicel’s involvement lends credibility to unconfirmed reports that Toyota is seriously considering Safe-by-Wire for use in future vehicles.

BMW installed its own proprietary byteflight bus system into the BMW 7 series, and it will consider byteflight or possibly FlexRay for future restraint systems. Byteflight was the predecessor of FlexRay, the standard X-by-wire protocol that will be used in electromagnetic braking systems and steer-by-wire systems.

If standard restraint system buses become available, BMW would seriously consider using one and would base its choice on cost and performance. “If I had to pick between Safe-by-Wire and BST today, I would of course pick Safe-by-Wire,” said Detger Pollehn, head of safety and body systems electronics at BMW. “Safe-by-Wire is better, and they are farther along in development compared to BST.” A according to Mr. Pollehn, which standard will win depends a lot on which standard first gets adopted for production by a major carmaker. No carmaker has yet committed to either the Safe-by-Wire or the BST standard.

While the Bosch Siemens Temic bus description was published on April 24, 2001, well before Safe-by-Wire’s, BST is seeing less activity than Safe-by-Wire. The consortium still consists of just the three founding members. While BST has not yet received a production or development contract from a carmaker, Siemens engineer Christian Celger explained that there is still interest in the airbag bus system. “Customers show up at Siemens once a year to check out the status of BST and to get samples.” While BST can’t yet offer silicon devices, the company can provide silicon samples from predecessor systems BoTe (for Bosch Temic) and from Siemens’ earlier specification, SURF (Siemens Universal Remote Firing System). Those chips could be modified to support BST. The BST consortium intends to attach a royalty fee to each communications chip purchased. Royalties will become part of the purchase price of the module. It’s not at all clear when BST might first be used in a production vehicle.


Electronics Service and Repair Improving

Electronics modules have had some reliability issues over the past several years, but in recent interviews, a number of service managers at some of the nation’s largest auto dealerships said things are improving rapidly. Better diagnostics and the ability to upgrade software instead of replacing modules are two big drivers of improved electronics serviceability.

The service technicians and managers at dealerships aren’t likely to criticize the quality of the brand names above the front doors to their shops. But they freely admit that the quality of electronics has improved dramatically in the past two or three years, underscoring the fact that at the start of the decade, they were replacing a lot of modules. “The amount of money we’re spending on warranties every month is going down,” said Tom Sherwood, service manager at Stew Hansen’s Dodge in Des Moines, Iowa. That’s borne out by some recent estimates by General Motors. “Overall warranty is down approximately 40% (measured in terms of incidents or cost) on electrical components,” a GM spokeswoman said.

One of the key reasons for the improvement is a change in the way upgrades are handled. Until recently, most changes were made by replacing the modules. Decreasing costs for rewriteable memory chips that hold software and firmware, primarily flash memory, have changed that. “Years ago, we would replace modules. Now we erase the software and write in the latest version,” Mr. Sherwood said. He noted that CD-ROMs with updated software arrive at the dealership twice each month. Whether the module is replaced or reprogrammed, it usually takes much longer to diagnose the problem than to fix it.

While dealerships have had easy access to software, it’s been a bit more difficult for independents to get the most recent updates. That began to change in March 2003, when a CARB (California Air Resources Board) mandate requiring automakers to make engine controller software more readily available went into effect. The EPA (U.S. Environmental Protection Agency) is expected to join CARB in requiring carmakers to provide software updates in a timely fashion.

“With its new ruling, the EPA wants to ensure that the service industry is able to maintain emissions systems,” said Wayne Juchno, managing director of the SAE’s Service Technician Society (STS) in Warrendale, Pennsylvania.

Equally important in improving quality is the increased diagnostic capability automotive electronics designers now put on each module. That has shortened the amount of time it takes for technicians to find errors. “A bad module tells on itself now. It used to be that you had to spend time checking it out,” said Steve Downing, service manager at Christopher’s...
The Company Profile... Continental

Corporate Headquarters: Vahrenwalderstr. 9, D-30165 Hanover, Germany; telephone 49 511 938 1278; www.conti-online.com

2002 Sales (Estimate): €11.3 billion ($12.1 billion)
2002 EBITA Estimate: €607.3 million ($651.2 million)

Major Products: Tires, technical rubber products, brake systems, electronic brake systems and other automotive electronics

Employees: 64,700 as of September 2002
2002 Sales per Employee: €175,000 ($187,656)

Top OEM Customers: DaimlerChrysler, Ford, Volkswagen Group, PSA Peugeot Citroën

Continental Automotive Systems*
2001 Sales: €3.986 billion ($4.274 billion)
2001 EBITA: 4.6% of sales
2002 Sales Estimate: €4.6 billion ($4.9 billion)

Products: Electronic brake systems, brake actuation, automotive electronics and air-spring systems

Employees: 18,480 as of September 2002
2001 Sales per Employee: $215,693

*Includes Teves and Temic.

Corporate Background

Since its founding in 1871 as a manufacturer of rubberized fabric and solid rubber tires for bicycles and carriages, Continental has grown into a worldwide supplier of tires, foundation and advanced brake systems and automotive electronics. A publicly listed German corporation, Continental shares today are traded on all eight German stock exchanges, three other European exchanges and in the OTC market in the United States. Tires still provide the majority of Continental's sales today. In fiscal 2001, 56% of Continental sales were made to OEM customers.

As a consequence of the global economic slowdown, Continental reported a net loss €258 million ($277 million) in 2001, and in the restructuring that followed, 4,773 Continental jobs were eliminated.

Continental Automotive Systems (CAS)

Continental Automotive Systems division was established in 1995 to expand the company's automotive product line. Through several strategic acquisitions in the 1990s, including the brake and chassis business of ITT Teves, and in 2001, the electronics products of Temic, Continental is well-positioned to provide fully integrated, intelligent chassis and safety systems, from tires to electronic controls. With its acquisition of Temic from DaimlerChrysler, CAS also gained a strong position in comfort electronics.

In 2001, CAS generated 35% of total Continental sales. The top revenue-producing product category for the division is electronic brake systems, followed in order by hydraulic brake systems and electronics. In electronic brakes, Continental claims it enjoys roughly a 44% market share in Europe and a 29% share in the NAFTA market. Ninety-six percent of CAS sales go to OEM customers.

Recently, CAS added 6,179 employees to the division as a result of the inclusion of Temic people and the new CAS subsidiaries purchased from Mazda in Japan: Shin-Ei and SinTec.

CAS believes its focus on chassis and safety systems is a key competitive strength. A nother customer-winning advantage lies in Continental's size. “The company is small enough not to be overloaded by bureaucracy but big enough to be a world player in focused areas,” said Wolfgang Ziebart, deputy chairman of Continental AG and head of Continental Automotive Systems. As a result of its

Continental AG Share Price 1999-2003

Source: Yahoo

Continental AG Sales by Division

2001 Sales: €11.2 billion ($12.1 billion)

Continental

Tires North America, 16%
Commercial Vehicle Tires, 8%
Passenger Car Tires, 25%

Continental Employees by Division as of May 2002

Automotive Systems, 35%*

*Includes Teves and Temic.

Continental’s Manufacturing Plants

<table>
<thead>
<tr>
<th>Division</th>
<th>Number of Employees</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tires</td>
<td>26</td>
</tr>
<tr>
<td>ContiTech</td>
<td>49</td>
</tr>
<tr>
<td>Continental Teves</td>
<td>21</td>
</tr>
<tr>
<td>Temic</td>
<td>10</td>
</tr>
</tbody>
</table>

The Hansen Report on Automotive Electronics, Portsmouth, NH USA  www.hansenreport.com
that in the future, 90% of all evolutionary
pared to 20% at present. Experts predict
45% of the cost of a motor vehicle com-
years electronics will account for 40% to
market. In a speech given May 29, 2002 at
Continental’s executive board, is very op-
program) by 2003, according to CAS.
11% of cars in the NAFTA region will be
Roughly 33% of all cars in Europe and
electronics content aboard the vehicle.
control systems and from the general rise
installation rates for electronic stability
Systems division will profit from higher
pany says it is not now seeking.
additional acquisitions, which the com-
company’s electronics sales are growing
and will continue to grow at roughly 20%
year. That growth will come without
ment, which the company says it is not now seeking.
Despite uncertainties in the number of
ologies within the market—its technol-
gy, flexibility and sharp focus—Dr.
Ziebart noted that CAS is growing twice
as fast as the automotive electronics mar-
Continental sees the auto electronics
market growing at 10% per year, while the
company’s electronics sales are growing and
will continue to grow at roughly 20%
year. This growth will come without
additional acquisitions, which the company
says it is not now seeking.

Continental Automotive Systems
Sales by Year in € Millions ($ Millions)

<table>
<thead>
<tr>
<th>Year</th>
<th>€ Millions (€)</th>
<th>$ Millions ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>629</td>
<td>660</td>
</tr>
<tr>
<td>1999</td>
<td>2,544</td>
<td>2,728</td>
</tr>
<tr>
<td>2000</td>
<td>3,023</td>
<td>3,242</td>
</tr>
<tr>
<td>2001</td>
<td>3,986**</td>
<td>4,274</td>
</tr>
<tr>
<td>2002</td>
<td>4,600**</td>
<td>4,933</td>
</tr>
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</table>

EBITA as % of Sales

<table>
<thead>
<tr>
<th>Year</th>
<th>1998</th>
<th>1999</th>
<th>2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>0.8**</td>
<td>2.3</td>
<td>5.6</td>
</tr>
<tr>
<td>2000</td>
<td>4.6**</td>
<td>2001</td>
<td>2002 (est)</td>
</tr>
</tbody>
</table>

*Includes only the fourth quarter of Teves, which was acquired in 1998 from ITT.
**Includes Temic for the second, third and fourth quarters. Temic was acquired in 2001 from DaimlerChrysler.

Continental Automotive Systems
Sales by Business Unit

<table>
<thead>
<tr>
<th>Business Unit</th>
<th>2001 Sales (€)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Spring Systems</td>
<td>3,985.7 million</td>
<td>45%</td>
</tr>
<tr>
<td>Brake Actuation</td>
<td>1%</td>
<td></td>
</tr>
<tr>
<td>Electronics</td>
<td>13%</td>
<td></td>
</tr>
<tr>
<td>Foundation Brakes</td>
<td>26%</td>
<td></td>
</tr>
<tr>
<td>Electronic Brake Systems</td>
<td>45%</td>
<td></td>
</tr>
<tr>
<td>Aftermarket-Business</td>
<td>4%</td>
<td></td>
</tr>
</tbody>
</table>

While blending a major new acquisi-
tion into a company is usually problem-
ic, Continental’s Temic acquisition went
fine. “[Temic] was a straightforward inte-
gration,” said Dr. Ziebart. “We set a
target to integrate the company to an
80% degree within a three month period.
This was achieved, including exploiting
synergies, rectifying the organization, in-
stalling new information technology sys-
tems, bringing in financial control
instruments and so on.” Because Temic’s
sales and profits have been stronger than
anticipated, Temic has not had to lay off
any employees since the acquisition. In
2001, CAS realized sales of €3.99 billion
($4.27 billion), an increase of 31.8% over
2000. CAS EBITA rose 8% to €185 mil-

A company, no longer a captive supplier. A
is that Temic is truly an independent

Continental Automotive Distance Control
Systems G mbH

The acquisition of Temic also brought
A automotive Distance Control G mbH to
Continental. According to Continental,
A DC has won a 75% share of the global
market for radar and infrared adaptive
cruise control systems (ACC), though the
market for ACC is still quite small, well
under $100 million at the OEM level.
A DC was the world’s first supplier to de-
velop forward-looking radar sensing and
detection good enough to detect vehicles
in the same lane ahead of the vehicle. A
Temic system marketed under the
continued on following page
Mercedes name Distronic was installed in the 1999 Mercedes S class. ACC was a joint venture between the camera and instrument company Leica Corporation, which contributed its infrared detection technology, and Temic, which contributed its radar technology. Continental Teves now owns 60% of ACC; Continental Teves owns 40%. Information from the radar detection system is used to automatically adjust the vehicle's cruising speed to keep the vehicle a safe distance away from the vehicle ahead.

**Continental Teves**

Teves was acquired from ITT Industries in September 1998 after the conglomerate decided to depart from the automotive industry. Formerly the Brake and Chassis division of ITT, Teves was a strategic development partner with Temic before Temic became part of Continental. With 1997 sales of $2.2 billion, Teves' purchase price was $1.9 billion, equal to 86% of sales. Continental Teves currently supplies electronic stability control systems to Audi, BMW, Ford, Mercedes-Benz, Volkswagen and Volvo. Continental Teves is the world's top producer of disk brakes and ranks number two worldwide in ABS and brake power assist units, according to the company.

Continental Teves employed 10,775 people in 2002, around 120 of whom worked in hardware and software development. The company has partnerships with Motorola, Philips, Siemens, Temic and Texas Instruments.

**Most Promising Electronics Products**

**ABS with Pressure Control**

Today when a driver of an ABS-equipped vehicle steps forcefully on the brake pedal and the sensors detect wheel-slip, the ABS hydraulic solenoid pulses on and off until the wheel stops skidding. With Continental's new pressure control system, the brakes are not pulsed to control skidding, rather, the brake solenoids are variably controlled to maintain maximum braking pressure while minimizing skidding. With the addition of analog valves, a new control algorithm and five pressure sensors—one for each wheel plus one to monitor boost pressure—test cars have stopped one to one-and-a-half meters before vehicles without the pressure control system. “The key parameter we are controlling is the slip curve,” explained Peter Rieth, manager of technology and vehicle systems. “We achieve maximum road adhesion to give optimum brake performance. … Today an ABS control system is only acting with the information of the slip. With pressure, we have information on braking forces.” The pressure sensors measure hydraulic pressures ranging from 150 to 200 bar.

The first generation of this product will run at low production volumes and will be expensive. Part of that cost comes from the 32-bit, 50 MHz processor and the requirement for roughly 2 megabytes of program memory.

Continental has already received production orders from three luxury carmakers for the company's new pressure control ABS system. The company will say only that the orders have come from “one German carmaker, one European carmaker and one global carmaker.” Production will begin in 2005.

**Pre-Filled Brakes**

While an ABS with pressure control stops a car one to one-and-a-half meters shorter than an ABS equipped vehicle, Continental is developing a new feature that will reduce stopping distances even further, by as much as 15% to 20% compared with conventional ABS. Called pre-filled brakes, the new system combines a sophisticated braking algorithm with a Continental adaptive cruise control system, which detects the headway distance to the vehicle ahead. The new feature pre-loads the brakes, so when an obstacle is sensed and the driver hits the brakes, the brakes respond much more quickly than if there was a normal air gap.

While the market for ACC equipment has stayed relatively small, Dr. Rieth said the market will grow considerably faster once ACC evolves from a comfort system to a safety system. However, new safety systems can worry carmakers, because if they don't work 100% of the time, the carmaker may be exposed to lawsuits. So Continental has designed the system to involve the driver, who must still step on the brake pedal to activate braking. Only the pre-filling function is automatic.

Continental has already demonstrated working prototypes of pre-filled brakes to
Continental Automotive Systems Products

Safety and Comfort
- Tires
- Run flat tires
- Deflation detection systems
- Electronic brake systems: ABS, ESP and ACC
- Hydraulic brake systems
- Rollover protection
- Sensor systems
- Airbags
- Tire pressure monitors
- Air suspension systems
- Adaptive damping control
- Comfort/environment sensors
- Adaptive cruise control
- Anti-trap [window] function
- Keyless entry/lock

Powertrain
- Engine sensors
- Engine management
- Gear box controls
- Radiator/Cooling modules
- Electric drive units (ISAD)

Continental’s Electronic Stability Program is available on these models:
- Audi TT
- BMW 3 series
- Ford Focus
- Ford Explorer
- Ford Expedition
- Ford Lincoln Navigator
- Ford Jaguar XKB/
- S-Type
- Mercedes SLK
- Mercedes C class
- Porsche Cayenne
- Renault Laguna/
- Espace
- Volkswagen Golf

Key Sales Accounts

Sales executives are assigned to these customer groups:
- BMW / Rover Worldwide
- DaimlerChrysler Europe
- Ford Europe / Jaguar / Volvo
- GM Europe / Saab / Fiat
- PSA Group Worldwide
- Renault Worldwide
- VW Group / Porsche Worldwide
- Japanese Vehicle Manufacturers

Continental Automotive Systems Daily Production (in Units)

- Brake hoses: 127,000
- Calipers: 115,000
- Wheel speed sensors: 79,000
- Body electronic modules: 58,000
- Cylinders: 44,000
- Electronic brake systems*: 37,000
- Brake boosters: 33,000
- Airbag systems: 26,000
- Engine cooling fans: 24,500

*ABS, ESP and other electronic brake features

The Company Profile Continued

◆ Vision Systems

In five years, Continental’s vision-based lane-keeping systems will be installed in production vehicles. Continental will work with a semiconductor-maker who will provide the CMOS vision-sensing element. Continental will package the element into a camera and develop the pattern recognition algorithm. In the past, a major obstacle to implementing vision systems has been the cost of processing power. A 32-bit, 60 MHz processor is needed for pattern recognition, but processing and memory storage prices have come down.

Continental has been working hard to implement systems that fit comfortably within the driver’s capabilities. The question is, How should such systems inform the driver when he wanders outside of his chosen lane? The company has some working concepts that influence the steering.

◆ Electric Parking Brakes

A nother attractive braking feature Continental expects a lot of new business for is electric parking brakes. Instead of using a hand- or pedal-lever to manually actuate the parking brake, the electric parking brake is turned on by activating a switch. An electric motor powers the cable that actuates the brakes. To properly implement the electric parking brake, the system must accurately measure the force on the cables and also the inclination of the vehicle, so the brake will be initiated with the required forces. To release the parking brake if the battery fails, an auxiliary self-locking manual brake release is provided. A ready available for a year on the Renault Vel satis crossover vehicle, Continental expects to implement another four to six applications over the next two years.

◆ ISA D

Not much has been written about Continental’s integrated starter alternator damper since carmakers have, for now, backed off from plans to quickly install 42-volt power generation and storage systems in vehicles with large electrical loads. Dr. Ziebart pointed out that there is another feature of ISA D that to date has not been widely marketed but could be used with 12-volt systems to reduce fuel consumption. Installed between the engine and the transmission, the ISA D is well-suited to convert braking energy into electrical power, which can be stored for later use to help power the vehicle down the road. Twelve-volt regenerative braking systems can deliver fuel savings of 5%. With the start-stop feature, which shuts the engine off each time the vehicle is stopped and restarts the engine when the accelerator is depressed, fuel economy is improved by an additional 5%. When driving mostly in cities, where frequent stops are required, an additional 5% of savings can be added, bringing the total potential fuel savings from ISA D to 15%.

The first application of a Continental ISA D will be in the United States in a GM truck. A major obstacle to the use of regenerative braking has been the inability of lead-acid batteries to quickly take on large current flows. So instead of lead-acid batteries, GM will employ an auxiliary storage device, an ultracapacitor. Ultracapacitors store energy electrostatically and can be charged and discharged hundreds of thousands of times.◆

Potential customers and expects its first order within 12 months. With a three-year development cycle, brake pre-filling will make it to production by 2007 at the earliest.
Repairs...

Dodge in Golden, Colorado.

While the modules themselves have more diagnostics, technicians don't have a lot of positive things to say about the diagnostic tools they use every day. Some say that test equipment often points to the modules when the problem lies elsewhere. "Even when the tests say replace the module, which they often do, we look further and often the problem is a sensor," said Steve Levin, shop foreman at Ricart MegaMall in Columbus, Ohio.

A nother criticism of diagnostic tools is that there are still no general-purpose tools that handle all types of modules. "Perhaps the biggest issue is having capable tools with the right abilities," M r. Juchno said. "There are cost issues and time issues if [shops] have to purchase and use two or three tools."

Possibly the most vexing part of a repair is when the module tests out, yet there's a problem with the electronic control system. Many technicians say that the modules themselves are usually not the problem when electronics go bad. "The majority of the time, the problems are with I/O, the connectors, pins, sensors or actuators," M r. Levin observed. He noted that at least half the time, electronics problems involve the components surrounding an electronic module such as the solenoids linked to a transmission.

"Often our most time-consuming problems are chasing wiring problems," said M r. Downing. Newer modules work with lower voltages, so they're more susceptible to noise issues that occur when two wires run side by side, for example. That diagnostic will be done manually for quite some time, since it will be difficult to create diagnostic equipment that can track down this type of trouble, he predicted. Though wiring remains a thorny problem, both wiring and connectors have improved in the past few years.

Service managers feel that most technicians are pretty knowledgeable about electronics, perhaps because more than half the STS members have been practicing since 1981, when a single electronics module typified a luxury car. Those technicians grew up with electronics, which are now a key part of every aspect of the vehicle. "My transmission guys today would have been my top electronics specialists 15 years ago," M r. Levin said.

Still, each shop has specialists in every field, whether it's transmissions or electronics. Some have just a few specialists in electronics, while other shops focus on it more. "About half" of his 30 or so technicians in Columbus are "very good at electronics," M r. Sherwood said.

The need for skilled technicians is still fairly high, with most managers saying they're ready to hire more. A whopping 81% of the technicians in an STS survey conducted in March 2001 said they needed more training, but most managers say training is readily available. However, the tight labor market and pressure to turn jobs around quickly makes it tough for technicians to spend much time training.

Telematics Test Bed Collaboration in the Works

On February 13, 2003, representatives from IBM and Sun Microsystems (software), T-Mo bile (wireless communications), BM W, DaimlerChrysler, V W, Nissan, H onda and Ford (by telephone) met at DaimlerChrysler research facilities in Palo A lto, California, to discuss the potential for a collaboration that would build and manage a test bed to support rapid evaluation of custom developed telematics elements. Referred to as CARTEC, the test bed would be used by members to quickly, easily and inexpensively try out new components, new business models and applications. Members could use the CARTEC facility not only to test proper functioning of a telematics product, but also to run market tests and get feedback from real users. The test bed itself would also serve as a reference implementation on which developers could make certain their proprietary implementations will work in real systems.

One of the first tasks of the consortium would be to create a CARTEC architecture to enable the delivery of proprietary services and content to users. The architecture would describe a service infrastructure that manages the relationship between terminals and service providers and a communications infrastructure that moves voice and data between the service infrastructure and in-car terminals. The CARTEC architecture would be designed to work with any in-car terminal, such as an AM I-C terminal or one based on the W indows CE for Automotive platform.

"What we are trying to do is break the logjam," said Scott A ndrews, who conceived CARTEC with his partner, A xel Fuchs, of C ogenia Partners, L LC. "CARTEC is an answer to the question, How can a company realistically launch a telematics service without putting the entire company at risk?" said M r. A ndrews. A s a top electrical engineer with Toyota, M r. A ndrews was one of the founders of A M I-C, the Automotive Multimedia Interface Collaboration. Formerly with DaimlerChrysler, M r. Fuchs co-founded the DaimlerChrysler research office in Palo Alto, California.

A t the next meeting, set for mid-M arch, M r. A ndrews hopes to find a few like-minded carmakers and a couple of software and communications companies ready and willing to become CARTEC founders. For more information call Scott Andrews in California at 650-279-0242.

Toshiba Tackles Automotive Electronics

At a time when suppliers are witnessing unprecedented competition and downward price pressure, new companies are still targeting automotive electronics. In January 2003, Toshiba announced the establishment of a new organization, the Vehicle Systems Division, a.k.a. Jidosha System Jigyo Tokatsubu, in Tokyo. Toshiba says that by 2005 the new division will double Toshiba's sales to the automotive industry, to ¥100 billion ($842 million), a 26% annual growth rate. To achieve its goal, Toshiba will have to take market share away from its competitors, probably by offering lower prices.

Explaining why it decided to expand this way, Toshiba wrote, "In Japan most industries face a tough recession now, while the automotive industry shows a positive [trend]." Initially the new division will target Japanese carmakers and subsidiaries. Toshiba plans to develop business in North America and Europe in a few years. The company will offer a wide range of products from components to systems, including semiconductors and LCDs (liquid crystal displays) plus system integration.

Page 8, March 2003 The Hansen Report on Automotive Electronics, Portsmouth, NH USA www.hansenreport.com