Electronic Engine Controls Update

Challen and Stobart Weigh In On Trends and Developments

By far the largest automotive electronics market segment in the world, electronic engine controls have been advancing steadily for nearly 20 years, and will continue to do so for the foreseeable future. What's driving continued improvements in electronic engine control systems? "One of the top five [drivers], emissions, emissions and emissions stands first, followed by driveability, and certainly in the U.S., the bottom of the list is fuel economy," explained SAE Fellow Bernie Challen, chief executive, Shoreham Services, Shoreham-by-the-Sea, England. M. r. Challen, along with Richard Stobart, Professor of Automotive Engineering at Sussex University, Brighton, England, organized and moderated nine technical sessions on electronic engine controls at the March 4-7, 2002 SAE Congress in Detroit. We recently interviewed both gentlemen on the state of engine controls technology around the world.

More Respect

According to M. r. Challen, the greatest change in electronic engine control won't necessarily come from faster microprocessors or other technological developments. Rather, change will come because electronic control engineering is finally being accepted after 30 years in research. "We are almost to the point where engine developers look at electronics as the heart of the engine," asserted M. r. Challen. "Today maybe 20% of engine developers believe they must 'collaborate' with the electrical engineers and electronic algorithm developers. In ten years time, 80% will see it that way," declared M. r. Challen. "A lot of the control methodologies that five years ago people said were pipe dreams, will soon go into production," he concluded.

Coordinated Model-Based Controls

Back in March 1998, when we published a similar article based on interviews with Stobart and Challen, model-based electronic engine controls were the biggest trend in the engine management field. Applying algorithms that mathematically model correct subsystem behavior, model-based controls continuously sense engine variables and properly adjust actuator settings from calculations. Model-based controls replace map-based controls, where the actuator settings come directly from look-up tables. Model-based controls, which don't require the time-consuming calibration task of confirming each actuator setting, are easier and less time consuming to develop, particularly as engine control algorithms get more complicated and interdependent. "In ten years, more than 50% of the controls used will be model-based," said Bernie Challen.

A s model-based controls progress, people increasingly want to link the various independent controllers of such things as air supply, fuel, exhaust gas, ignition and catalytic after-treatment into one coordinated control algorithm. "Today each controller operates on a peer-to-peer basis. To coordinate several independent controllers, you would instead introduce a supervisory level of control, which is a broader view of what can be controlled," asserted Professor Stobart. M. r. Challen agreed, "What's most exciting according to some of the papers delivered in our sessions is that we can grab a couple of quite complex variables and manage them together. We are actually becoming good systems engineers. That is the key."

Torque-based control models are a good example of coordinated controls. Professor Stobart: "Here we regard the engine simply as a means of delivering torque. When more torque is called for, the supervisory controller would consider the best way to provide that torque with...

2001 Roundup of North American Auto Electronics Suppliers

Autoliv
2001 Consolidated Sales: $3,991 million
Change from 2000: down 3.1%
2001 Net Income: $94.7 million, or 3.8% of sales, about the same margin as in 2000; with unusual items included, net income was just $47.9 million.

Prospects for 2002: 1% growth in sales

A utoliv's airbag sales, which make up 70% of total sales, decreased 4% in 2001.

Turn to Roundup, page 2

Worldwide Vehicle Production Estimates in Millions of Units

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<thead>
<tr>
<th>Region</th>
<th>2000</th>
<th>2001</th>
<th>% Change</th>
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Data: Pemberton Associates, Southam, Warwickshire CV47 7SP UK; Telephone and fax: 44 1327 263074; maxpemberton@php.freeserve.co.uk
Slower sales in 2001 resulted from the drop in light vehicle production, according to A utoliv, as well as high material costs. (A ccording to Pembro n Associates, worldwide vehicle production was down 3.8% in 2001. S ee t able, page one.) In response to cutbacks in vehicle production, and to improve its operating margin, A utoliv in O ctober 2001 announced a restructuring program through which the company plans to reduce manufacturing costs by consolidating production facilities and moving labor-intensive operations to low labor-cost countries, especially Mexico and Poland. During 2001, A utoliv cut 2,000 employees in high-cost countries, and increased employment in low-cost countries by 1,400; now 25% of A utoliv’s employees are in low labor-cost countries.

E arlier this year, A utoliv agreed to buy Visteon’s R estraint E lectronics B usiness, which operated in D earborn, M ichigan; M arkham, O ntario, C anada; and P almela, P ortugal. A utoliv’s E lectronics D ivision currently has manufacturing facilities in F rance and S weden. W ith the Visteon acquisition, A utoliv will increase its sales of safety electronics from $150 million annually, to $325 million, or roughly 15% of the worldwide market.

DaimlerChrysler H untsville E lectronics
2001 S tandard C osts: $970 million
C hange from 2000: down 2.5%
H untsville E lectronics, as an in-house supplier to DaimlerChrysler’s U.S. operations, reports its shipments as standard costs, rather than as sales. H untsville’s 2.5% decline in shipments reflects DaimlerChrysler’s 11% drop in U.S. car and light truck production in 2001. A s part of its recovery plan, DaimlerChrysler has been trying to raise cash through the sale of some of its component suppliers, including H untsville.

D elphi A utomotive S ystems
2001 N et S ales: $26,088 million
C hange from 2000: down 11.7%
2001 N et I ncome: $200 million, or 0.8% of sales, down from 3.8% of sales in 2000
2001 S ales b y S ector
E lectronics and M obile C ommunication: $4,818 million, 11% lower than 2000. M obile M ultimedia sales, which are included in this sector, grew 16%, to $373 million, with an operating loss of $33 million
S afety, T hermal and E lectrical A rchitecture: $9,028 million
D ynamics and P ropulsion: $12,630 million
O ther: ($388 million)
In M arch 2002, D elphi A utomotive S ystems formally changed its name to D elphi C orporation, because the company wants to expand into nonautomotive markets. For some years now, automotive industry players have been unable to command nearly as high price to earnings ratios as other industries have.
Delphi’s largest customer, by far, remains G eneral M obil otors N orth A merica; G M (w orldwide) accounted for 67% ($17.5 billion) of Delphi’s sales in 2001. G M ’s N orth A merican vehicle production was down 13% in 2001, compared with 2000. Delphi’s S upply A greement with G M , which gave Delphi certain bidding rights for new G M business after Delphi became an independent company, expired on J anuary 1, 2002 and Delphi now bids on new G M contracts on the same footing as its competitors.
Under Delphi’s 2001 restructuring plan, the company has completed seven of nine scheduled plant closings and reduced its workforce by 10,100. M ore plant closings, consolidation and workforce reduction are planned for 2002. Delphi acquired Eaton C orp.’s V ehicle Switch/ E lectronics D ivision in A pril 2001.
Delphi expects sales to decline further in 2002, to $25.5 billion, with net income of $275 million, 1% of sales.

L ear C orp.
2001 C onsolidated S ales: $13,624.7 million
C hange from 2000: down 3.3%
2001 N et I ncome: $26.3 million, 0.2% of sales; net profit margin in 2000 was 2% of sales.
L ear breaks out financials for its three operating segments: Seating, Interior, and E lectronic and E lectrical. E lectronic and E lectrical net sales for the year were $1.9 billion, down 11.7% from 2000, due to lower production volumes on existing customer programs. Operating income for the segment, before amortization, was $174 million, or 9.2% of sales, compared with 12.4% of sales in 2000.
General M obil otors and Ford together accounted for 60% of Lear’s total sales; other major customers are DaimlerChrysler, B M W and F iat.

T RW A utomotive S ector
2001 S ales: $10,111 million
C hange from 2000: down 8.0%
2001 N et P rofit B efore T axes: $228 million, or 2.3% of sales, compared with 4.6% of sales in 2000.
T RW attributes the decline in the automotive sector’s sales to lower vehicle production in N orth A merica, which was partially offset by higher production in Europe. Other factors were currency exchange rates, price reductions and divestitures (Lucas Diesel Systems and LucasVarity electrical products and some aftermarket business).
T RW A utomotive E lectronics, C hassis S ystems and C ustomer S afety S ystems were consolidated into a single operating segment called A utomotive, eliminating 6,100 employees. In M arch 2002, the

Continued from page 1
Engine Controls

out compromising other requirements. In a gasoline engine, advancing the spark is a good way to increase torque, but the amount of the advance must be limited to keep from emitting too much nitrogen oxide. While not a radical change, it is a new way to think about the structure of engine management.

Digital Device Requirements Going Up

One result of this trend toward greater electronic control of the engine will be an accelerated demand for faster, more capable and highly integrated digital signal processing components. “The challenge is not so much the development of algorithms, those can be found; the question is, how much digital processing power are you willing to deploy to solve the algorithm?” said Professor Stobart. He is hopeful that the makers of digital signal processors have been sufficiently challenged by the A/C motor control industry and by the cellular phone industry and that advancements made in those industries will cross over into automotive applications. “Applications such as these [A/C motors and cell phones] are driving down the cost of digital signal processors.”

For more on electronics engine controls, please contact Richard Stobart, telephone 44 (0) 1273 606755, or email r.k.stobart@sussex.ac.uk; and Bernard Challen, telephone 44 (0) 1273 452977, or email B.J.Challen@Shoreham-Services.com. ◆

Selected SAE Papers

Of the 43 technical papers delivered at the Electronic Engine Control sessions at SAE 2002 Congress, these were among the outstanding ones, according to Challen and Stobart.


A good example of what can be done with model-based controls from a top university that is close to Mercedes, the paper documents successful laboratory operation of a model-based system that detects if particular cylinders have defective fuel injection. One oxygen sensor fitted behind the turbocharger helps determine which cylinder is malfunctioning.


Another example of the increasing use of calculation methods, this paper describes a method for calculating back from one air-fuel ratio sensor in the exhaust, to determine the air-fuel ratios of each individual cylinder. The sensor is placed in the exhaust manifold where the branches from the different cylinders are joined.


Hitachi demonstrated significantly improved emission performance in an operating engine by using two new controls: an individual cylinder air-fuel feedback control, which “reduced emissions drastically,” and a confluence point air-fuel control, which “improved emission performance, compared with conventional PID control.” When integrated, the combined control showed good performance.

◆ 2002-01-0196 “Engine Monitoring of a Formula 1 Racing Car Based on Direct Torque Measurement,” ABB Automation Technology Products AB; Jordan Grand Prix Ltd.

Measuring torque, the most fundamental engine control variable, has a number of potential uses: It can turn the vehicle into a dynamometer to tune the engine and transmission. It can be used for closed-loop control of the engine or transmission. It can be used to diagnose engine degradation and wear. And it can be used to monitor the performance of gearshifts. The paper demonstrates that magnetostrictive torque sensors, long used in laboratories, can be made sufficiently robust to be used in Formula 1 racing cars.


“This paper is exciting because it demonstrates that complex controls can be implemented cheaply and effectively,” declared Bernie Challen. According to the paper, H-infinity control technique can be used to stop longitudinal and pitching oscillations that can occur when driving with the manual transmission in gear with the foot off the accelerator. Such oscillations can be controlled by dynamically varying the quantity of fuel injected into the engine.

Roundup...

company announced that in six to nine months it would spin off the Automotive segment, which last year accounted for 62% of TRW’s sales. In 2001, Automotive won $1.8 billion worth of new annual sales, and launched new programs in electric power steering, vehicle stability control and rollover airbag inflators.

TRW Automotive’s largest customers are Ford, which accounted for 18% of Automotive sales in 2001, followed by DaimlerChrysler with 17%, GM with 13% and Volkswagen with 13%.

For 2002, TRW expects vehicle production in North America and Europe will fall 3% or 4%, and price pressures from the OEMs will continue.

Visteon

2001 Consolidated Sales: $17,843 million
Change from 2000: down 9.1%
2001 Net Income (Loss): ($118 million)

Major production cuts by Ford in the second half of 2001 contributed to Visteon’s losses; Ford’s light vehicle production in North America was down 17% for the year. Sales of Visteon products to Ford declined $1.8 billion, or 11%, while Visteon sales to other customers grew 6%. Ford, Visteon’s parent company until Visteon was spun off in June 2000, accounted for 82% of total sales in 2001, compared with 84% in Visteon’s first year as an independent company. In 2001, three-quarters of Visteon’s $1.5 billion in new business contracts were with non-Ford customers, including DaimlerChrysler, GM, Nissan and Renault. Non-Ford business is expected to account for 19% of sales in 2002. Visteon supplies over sixty types of products to eleven carmakers on more than 40 MY 2003 vehicles.

Some of Visteon’s cost-cutting measures in response to the weaker U.S. economy include reducing its supply base from 2,500 to 500, reducing its workforce by 5.7% and reducing R&D spending by 7%. A nother 10% cut in R&D is scheduled for 2002. ◆

The Hansen Report on Automotive Electronics, Rye NH USA www.hansenreport.com
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The Company Profile... Blaupunkt

**Thumbnail Sketch**

**Address:** Robert Bosch Straße 200, 31139 Hildesheim, Germany; telephone 49 5121 49-0; fax 49 5121 49-4154

**Parent:** Robert Bosch GmbH, Stuttgart, Germany

**Products:** Car radios, amplifiers, antennas and speakers, as well as navigation and telematics systems

**Customers:** In Europe, practically all European and U.S. carmakers, as well as some Japanese brands; as yet, no OEMs in North America

**2001 Sales Estimate:** €1 billion ($1.14 billion)

**Blaupunkt North America 2001 Sales:** $50 million, all aftermarket

**R&D:** approximately €120 million ($136.3 million)

**Investments:** More than €10 million ($11.4 million)

**Employees:** About 7,500, worldwide: 2,700 in Germany; 35 in the U.S., plus Bosch workers at other facilities including manufacturing plants who make other Bosch items as well

**Background**

Blaupunkt is the mobile electronics division of the Robert Bosch GmbH, the world's largest privately-held automotive parts supplier. Blaupunkt designs and manufactures high-quality and high-performance car audio, video and navigation products for sale worldwide. The Blaupunkt logo is a blue dot, and the company name translates in English as blue (blau) dot (punkt). The logo stands for progress and quality—in Germany in the 1930s, a blue dot stamp stood for passing a quality inspection. Expanding on the point, company literature states “At Blaupunkt, the emphasis is on performance ... not flash.”

In 1932, the forerunner of Blaupunkt introduced Europe's first car radio, the A 55, which was the size of a microwave oven. Because of its bulk, it could not be mounted within reach of the driver, and a remote control on the steering wheel operated it. Since car radio antennas were not available, wires were run over the roof and along the running boards. The radio cost 465 Reich marks, or about one-third the price of a small car at that time. Since then, Blaupunkt has produced over one hundred million car radios.

Blaupunkt's headquarters, development and research centers are located in the city of Hildesheim, Germany. Navigation systems are manufactured in Germany, and most audio parts and components are manufactured in Portugal, Hungary and Malaysia.

**Blaupunkt North America**

For nearly fifty years, Blaupunkt has had a presence in the United States via its sales offices. U.S. headquarters are located in Broadview, Illinois, within the main offices of the Robert Bosch Corporation headquarters for North America. The Blaupunkt group in the U.S. receives support from the Bosch Research and Technology Center North America in Palo Alto, California, and its affiliate site in Pittsburgh, Pennsylvania.

A full Blaupunkt North American sales are made in the aftermarket, although the company is currently talking to OEMs and says it has one piece of business coming up. Like Bosch, Blaupunkt no longer reports aftermarket sales for both North and South America but breaks them out separately: NAFTA aftermarket sales were roughly $50 million in 2001.

“We are just starting over here in North America in the OEM business and are fortunate to have our first program, which we will be launched in the fall,” said Mark Peters, Blaupunkt director for information electronics, responsible for OEM business in North America. “It is a radio with DigiCeiver and MP3 capability on the CD player,” added Joachim Creutzburg, Blaupunkt marketing man-

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**Blaupunkt Estimated Sales By Year**

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<tr>
<td>1998</td>
<td>1,560 (705.4)</td>
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<tr>
<td>1999</td>
<td>1,838 (831)</td>
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<tr>
<td>2000</td>
<td>2,044 (924)</td>
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<tr>
<td>2001</td>
<td>€1 billion ($1.14 billion)</td>
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</table>

**Blaupunkt Sales By Product**

- **Radio, 50%**: $210 million
- **Speakers and In-Car Video, 25%**: $115 million
- **Amplifiers and Navigation, 25%**: $106 million

**Unit Sales in 2001**

- Navigation Systems: 500,000
- Car Radios: 7,000,000

**Blaupunkt Top 5 Customers Worldwide**

1. DaimlerChrysler
2. Fiat
3. Ford
4. General Motors
5. Volkswagen

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The Company Profile Continued

Blaupunkt Timeline and Distinctions
1920  The forerunner of Blaupunkt, Ideal, a maker of headphones, is established.
1932  First car radio in Europe
1933  Bosch acquires Ideal.
1938  The company name is changed to Blaupunkt, and following the Second World War, the company moves to Hildesheim, Germany.
1952  First FM car radio.
1959  The one-millionth car radio rolls off the production line; each radio consisted of 1,693 separate parts.
1969  First stereo car radio.
1970s  The Phillips Compact Cassette is incorporated into Blaupunkt radios.
1974  First traffic message receiver: Blaupunkt develops a safety feature known as the ARI traffic news detector, which evolved into the RDS-TMC (Radio Data System Traffic Message Channel) receiver.
1982  A microprocessor digitally-tuned radio cassette is introduced.
1983  First car radio equipped with EON (enhanced other networks) station identification is released.
1988  First CD player is incorporated into a dashboard-mounted radio.
1999  TravelPilot is introduced.
2000  100 millionth car radio is shipped.
2001  The telematics system OnlinePilot is introduced with dynamic route guidance and email.

Blaupunkt prides itself on its technological innovations in automobiles, yet the company refuses to release much information about its technologies, products, future developments or finances. The company won’t even say what distinguishes Blaupunkt from its competitors. Like parent Bosch, Blaupunkt is not a public company and as such, apparently does not rely on good public relations. Mr. Creutzburg believes it is in the best interests of Blaupunkt’s customers to release as little information as possible.

Nevertheless, Blaupunkt has issued some press releases that briefly describe some of its car audio and information service products and technologies.

◆ Blaupunkt sees real-time traffic information as vital to navigation and has incorporated RDS-TMC (Radio Data Service Traffic Message Channel) reception capability into all its car radio/navigation systems sold in Europe. The constantly-updated traffic data come from police traffic information centers, from traffic control centers processing data collected via traffic control installations with sensors and from congestion reporters, like those in German automobile clubs.

◆ In 1998, the company introduced the RadioPhone, an integration of the car radio and mobile telephone. The device fits into the standard radio compartment and required little installation except for the microphone and antenna; VOCOS (Voice Control System) allowed hands-free speaking and listening.

◆ The company introduced its first navigation system in 1989, and has since introduced two generations of the TravelPilot system, based on GPS and onboard digital map CDs. In 2001, OnlinePilot debuted as not just a navigation system, but also a car radio system that can receive email and connect to the Internet and/or telematics services. Wolf-Henning Scheider, a member of the Blaupunkt GmbH Management Board, responsible for sales and marketing, called OnlinePilot the first “hybrid navigation system,” because it is a route guidance system that also allows the driver to take advantage of external off-board servers.

continued on following page
Blaupunkt

For instance, a driver can download the current cultural events for the local area into the navigation system, including map coordinates of the event.

◆ In 2001, Blaupunkt presented the TwinCiever, a small tuner with two receiver paths on a single chip. A digital antenna control built into the integrated circuit, together with the two tuner inputs, improves radio reception in the vehicle. This “diversity” reception system will be marketed as the DDA (Digital Directional Antenna) and is expected out in the summer of 2002. Called a phased array antenna approach, it has two antennas placed 30 centimeters apart inserted into the glass of the back window.

◆ In 2001, Blaupunkt's Woodstock Digital Audio Broadcasting (DAB) radio was the first in the world to unite two digital technologies in a single housing: DAB reception and Internet music playback with the M3 standard. Blaupunkt claims the sound quality is essentially indistinguishable from CDs, and the radio can play M3 files stored on a CD or multimedia card (MMC), which can be connected to a home computer to record M3 files. MMC storage is used in many personal MP3 players and with an optional USB, an MMC reader/writer can be connected to a PC to record and re-record M3 files as many times as desired.

◆ Blaupunkt is still making significant innovations in car radios and considers tuners one of its core competencies. In 1999, Blaupunkt introduced DigiCiever, receiver, which converts the analog signal to digital and then manipulates the RF signal totally in the digital domain. Unlike other so-called digital tuners, Blaupunkt's DigiCiever actually digitizes radio-frequency waves to allow filtering, detection and noise to be processed digitally. As a result, DigiCiever tuners produce low-noise, high-separation audio at greater distances from transmitters than conventional tuners. Blaupunkt director of engineering and product planning, Jim Frazer, told us that DigiCiever is the most sensitive tuner on the market, noting Audio Review magazine's positive comments. While the DigiCiever tuner is used in six of Blaupunkt's 21 car radio models sold in the North American aftermarket, it is in almost all Blaupunkt car radios sold to OEMs in Europe, including Volkswagen, Mercedes, Ford, Alfa Romeo, Fiat, Lancia, Nissan and some upscale French vehicles.

Awards at CES 2002

In January 2002 at the Consumer Electronics Show (CES) in Las Vegas, Nevada, Blaupunkt received five Innovations 2002 Design and Engineering Showcase awards for its mobile electronics including two amplifiers, "glow-through" transparent speakers, a 12-inch "saucer" subwoofer that is just 2 inches deep and a hard-disk-based mobile music storage device that can hold over 18 hours of MP3 recordings.

The Blaupunkt Compact Drive MP3 record and playback system offers up to 18 hours of music storage on a one-gigabyte removable drive, the IBM microdrive. With the included USB reader/writer station, consumers can connect to a home PC so M3 files can be loaded onto the IBM microdrive. The portable drive makes it easy to retrieve M3 files and take them on the road. Blaupunkt Compact Drive M3 record and playback system includes software that with your home computer, speeds up and simplifies the process of creating M3 files from audio CDs or the Internet. The suggested retail price is $849.

DigiCiever Adds DSA and DNC to Create Clear Sound

With the clever sales pitch, "A car stereo that listens to its car," Blaupunkt has introduced a car CD radio that can deliver acoustic correction for any car. Called the San Francisco, it was introduced in January 2001 at CES, with a suggested price of $700. The radio uses DSP (digital signal processing) software that is integrated with the DigiCiever's operating system.

Peter Aczel, editor of the audiophile magazine The Audio Critic, commented that the San Francisco radio outperformed his much more expensive home tuner. The radio has 24 FM and 12 AM presets. Where available, RDS traffic information can be displayed in the center of the radio faceplate. Moreover, it is one of the few radios with worldwide FM tuning.

Digital Sound Adjustment (DSA), a digital signal process used in the San Francisco radio, uses a microphone to listen to the way the acoustic characteristics of the car distort the sound, and then it corrects for that distortion. The technology analyzes the noises particular to that vehicle in that time and place. Such noises are usually concentrated in narrow frequency bands, where they can drown out music and voices at the same frequencies.

A second process, called Dynamic Noise Covering (DNC), listens to wind, mechanical and tire noises, and then boosts the sound level only at those problem frequencies. Some conventional car
stereos raise the volume at all frequencies to overpower noise.

Correcting for a car's acoustics is not new. Until now, however, carmakers needed to measure each different car model in order to determine the acoustic corrections, and often a separate, factory-installed system was designed for each different car model. Blaupunkt's DSA uses a microphone and digital spectrum analyzer installed in the vehicle to measure the acoustic characteristics of the car, as heard at the driver's ears (See Figure 1a, page 6.) A digital signal processor (DSP) then generates a corrective equalization curve (Figure 1b). When the correction is added to the original audio signal, the result is an essentially flat response heard by the driver (Figure 1c).

Blaupunkt Navigation System Sales in Europe (in units)

<table>
<thead>
<tr>
<th>Year</th>
<th>Sales</th>
</tr>
</thead>
<tbody>
<tr>
<td>1998</td>
<td>130,000</td>
</tr>
<tr>
<td>1999</td>
<td>250,000</td>
</tr>
<tr>
<td>2000</td>
<td>400,000*</td>
</tr>
<tr>
<td>2001</td>
<td>500,000*</td>
</tr>
</tbody>
</table>

*Total sales of navigation systems in Europe in 2000 were about 775,000; in 2001, they were about 1,000,000, according to Blaupunkt.

TravelPilot Navigation System

Despite the loss of the Mercedes-Benz business, Blaupunkt considers itself the navigation market leader in Europe and the world, the result of developments that began in the 1980s. Blaupunkt makes about half of all navigation systems sold in Europe; more than half of all European navigation sales are in Germany. The one-millionth Blaupunkt navigation system rolled off the production line at the beginning of 2001.

Blaupunkt introduced TravelPilot RNS 149 in 1999 and is now selling the second generation, the TravelPilot RNS 150. A nother version, TravelPilot DX-R70, available only in Europe, has a dynamic route guidance function, which can calculate the route to avoid traffic congestion, based on information received from RDS-TMC. The system recommends if it is better to bypass the congestion or drive right through it.

Both versions of TravelPilot are radio/navigation systems and use the totally digital DiGiCiever to provide clear radio sound. For navigation route guidance, both have a simple icon appearing on the radio display to direct the driver straight, left or right, replacing information usually shown on a monitor. Spoken turn-by-turn directions are also given, via the front speakers of the audio system without interrupting the music program. The navigation system, including display, is incorporated into the faceplate of the radio, which flips down for the insertion of a CD.

Blaupunkt claims that TravelPilot can usually find its location to within one car length. The system uses not only GPS satellite positioning, but also an electronic gyroscope and the vehicle's speed sensor to precisely track the direction and distance the vehicle has traveled. Map matching software analyzes data to find the car's location on a virtual map. Ten CDs can hold maps of the entire United States, including Alaska and Hawaii.

In late 2000, Blaupunkt and Microsoft Corp. formed a strategic alliance to create in-vehicle computing, communications, navigation and telematics devices. Blaupunkt will use WindowsCE for a automotive as its platform for future navigation and telematics products.

Canadian DAB, Plus MP3 and MMC Storage

Blaupunkt's Board of Management director M. Scheider believes that before ten years have passed, the general public in Europe and Canada will have accepted Digital Audio Broadcasting (DAB) as the successor of traditional FM radio. "We are preparing to sell more DAB than FM car radios by 2010 at the latest." However, he cautioned that such a change will require lower-cost, high performance receivers.

In Canada, more than 50 DAB stations currently broadcast interference-free, CD-quality sound, without satellites, to audiences in Vancouver, Toronto, Windsor, and Montreal. DAB technology uses multiple transmitters and receivers that automatically select the optimal signal; multi-path interference and fluctuating signal strength do not interfere with car radio reception. Blaupunkt has developed the D-Fire 2 DAB integrated circuit for the Woodstock DAB 52 radio. This new generation of radio circuit processes incoming DAB signals, as well as FM and AM. DAB is free, just like AM and FM.

The Woodstock DAB 52 incorporates MP3 decoding, the format of choice for Internet and home computer audio files. The use of MP3 encoding/decoding to compress and store audio files allows up to 12 hours of music to be stored on a single CD-ROM. The Woodstock DAB 52 contains an in-unit MMC reader/recorder to allow up to two hours of DAB programs to be recorded in MP3 format. The Woodstock is also equipped for RDS-TMC, although it is only available in Europe. Available in the spring of 2002, the radio is expected to sell for about $1,000 CAN (US $667).

In-Car Video Products:
Rear-Seat Entertainment

Blaupunkt's line of mobile multimedia products include TFT LCD monitors with a variety of mounting options, an in-dash DVD player with surround sound processing, a 5/5-channel dedicated signal converter and a TV tuner. These components allow as many as five passengers to view different sources simultaneously; sources include a DVD player, TV tuner, rear camera, video game or navigation system. With a separate external processor added, the in-dash DVD-player is both Dolby Digital and DTS compatible for 5.1-channel surround sound, and it installs in a standard 1-DIN chassis. Installed behind the flip-down radio faceplate, it can play DVD-video, VCD, CD, CD-R, CD-RW and MP3 CD-ROMs. Suggested retail price is $900.

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Electronics Could Slow at Mercedes and BMW

When it comes to automotive electronics, BMW and Mercedes have led the world in innovation. Engineering driven, both carmakers have been devoted to building the best cars in the world. This they have been able to do because the companies serve luxury car buyers who want and can afford to pay for new technology. Bellwether companies, the rest of industry looks to BMW and Mercedes to see what might come next.

Electronics plays a role in 80% to 90% of all automotive innovation, yet, stung by electrical and electronics quality and reliability problems with M ercedes and BMW vehicles, the two carmakers now appear to have put out the caution flag. Higher electronics content seems to correlate with a greater number of quality problems. In the Hansen Report’s analysis of Consumer Reports data on electrical system reliability, over the last few years, Mercedes has trailed both the Japanese and U.S. carmakers; BMW dropped from fourth to eighth place in 2001.

Reorganization at Mercedes

Recent organizational changes at Mercedes indicate that electrical engineers have lost some influence within the company. The department responsible for electrical and electronics (E/E) development was recently put into the hands of Stephan Wolfsried, a mechanical engineer who is also in charge of brake and chassis development. While the E/E division at Mercedes was left largely intact, the E/E part relating to chassis has been placed within the chassis development group, and the E/E part relating to brakes was rolled into brake development.

A nother example of Mercedes’s more cautious approach to electrical engineering can be found in the way telematics will now be brought to market. In the past, E/E engineering could make product planning and engineering decisions about telematics technology on its own. Now engineering must have agreement from the new telematics business manager who must first create a viable business model.

Even though electronics can account for up to 35% of the value of a luxury vehicle, electrical engineers at Mercedes and other carmakers point to a growing disconnect from upper management, where mechanical engineers are well represented, but electrical engineers are not. To help management make well-informed decisions regarding electronics, top electrical engineers need to do a much better job communicating to management, using terms they can understand.

Given the organizational changes at Mercedes, one top official at a key supplier suggested that the carmaker has lost its electrical and electronics focus. “Mercedes hasn’t managed to bring the whole car under one E/E strategy,” he said. “There is no common architecture. Instead of a central control, the carmaker will leave the engineering to electrical engineers at Mercedes and other carmakers point to a growing disconnect from upper management, where mechanical engineers are well represented, but electrical engineers are not. To help management make well-informed decisions regarding electronics, top electrical engineers need to do a much better job communicating to management, using terms they can understand.

New Hansen Report Study Takes a Realistic Look at Telematics

Ever since the markets for ABS and airbag systems began to mature, the automotive electronics industry has been looking for the next big application that would support the continued growth in demand for electronics, electrical components and software. Some expected that a new application would be navigation, but while telematics applications will eventually take root, they will not do so anytime soon. The problem: nobody has yet been able to come up with a credible business model that provides sufficient return on invested capital.

In order to plan, suppliers need to know exactly where the carmakers are going. They can’t do that, because when it comes to electronics today, DaimlerChrysler doesn’t exactly know where it’s going.

BMW also has changed vis-à-vis electronics, but less obviously. In the past the company’s management was quite technically oriented; some top decision makers even had electronics backgrounds. But some of those managers went away when BMW sold Rover. According to one insider, BMW is now more project-oriented and more corporate—technical decisions are made more slowly, with more consensus.

A nother change involves BMW’s software development programs. BMW now wants to focus more on in-house software development, so it has been hiring and will continue to hire more software engineers. BMW engineering will maintain control over the essential vehicle features that distinguish a BMW car, such as the human machine interface or the engine control, the carmaker will leave the engineering of less visible features, a window-lift motor for instance, to outside suppliers. Such moves seem positive, but one key supplier worries that the emphasis on software could leave the company without a clear hardware strategy. “BMW doesn’t have a standard electronics platform and that leaves them at the whim of their suppliers, who will first serve their own interests, not the carmaker’s.”

The Hansen Report on Automotive Electronics, Rye NH USA www.hansenreport.com

Targeted at management from every business involved with or affected by telematics, our 36-page report, Telematics Service Providers—Near-Term Prospects Diminish is available now for only $577. Order your copy today. Call us at 1-603-431-5859 or place your order at www.hansenreport.com.