The ongoing economic turmoil shaking up the automotive electronics industry was manifest in the departure of two European industry veterans from Continental and Valeo. Hubertus von Gruenberg resigned as chairman of Continental’s supervisory board following a dispute with the Schaeffler Group, now the company’s largest shareholder. After a loss of €270 million and an €18.7 million investment by the French government, Valeo’s board removed its chairman and CEO of eight years, Thierry Morin.

**Bosch Automotive Technology**

**2008 Sales:** approximately €26.4 billion  
**Change from 2007:** down 7%  
**Outlook for 2009:** no growth for Bosch Group as a whole. No outlook for the Automotive Technology sector will be given until the annual report is released on April 23, 2009.

Automotive sales in North America fell 15%; in Europe sales were down 2% compared with 2007. Sales in Asia were up 2.3%. Excluding currency exchange effects, sales in Asia were up 7%, and North American sales declined by only 10%.

Bosch increased its company-wide R&D spending in 2008 by roughly 8%, to €3.9 billion. In the Automotive Technology sector, this meant that automotive R&D spending as a percent of automotive sales rose to about 12%.

Bosch created some new strategic alliances during the year including a joint venture with Samsung to develop lithium-ion batteries, and a joint venture with Mahle to produce turbochargers. A strategic partnership with PSA Peugeot cut to Roundup, page 2

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**HEV Component Sourcing Limitations**

No U.S. Suppliers of Inverters or Traction Motors

U.S. carmakers have to go abroad to get key components for hybrid and electric vehicles. “There are no inverter assemblies made in the States, none. And there are no electric motor assemblies built in the States either, not one,” declared Larry Nitz, General Motors’ executive director of hybrid powertrains. “The supply base is in Asia to a large extent, not the U.S.”

Sherif Marakby, chief engineer for hybrid systems at Ford, concurs. “The reality is that volumes are still low, except for the Toyota Prius,” he said. “Very few suppliers have invested in the technology, because the investment for one component can run in the tens of millions to hundreds of millions of dollars. The companies that specialize in power electronics are usually makers of large industrial drives, and most of those companies are Japanese or German. [With other automotive parts] usually you have two, three or four suppliers in the world that are either already capable or willing to invest the money.”

Toyota has built 1.7 million Priuses, now in its third generation, since first introducing the model in 1997. Hybird electric vehicles represent a huge potential market for the automotive parts industry. Carmakers must pay from $3,000 to $4,000 extra for the electrical and electronics parts needed to implement a hybrid automobile. A ditional components include the battery pack, battery management electronics, DC/DC converters, DC/AC inverter, motor control unit, traction motor and high-voltage wiring. According to the German semiconductor maker Infineon, a hybrid vehicle contains 700 euros ($945) worth of semiconductors, 415 euros ($560) of which is for the extra components needed to electrify the vehicle.

The companies that have experience in power electronics from serving industrial markets deal with high cost, low volume applications, where size and weight are not nearly as important as they are in automobiles. Inverters must handle 80 kilowatts of power or more, and putting that in a small, light package creates unusual heat dissipation challenges. Not enough companies have been able to make the investment necessary to make these technologies ready for automotive applications.

**IGBTs**

The key component in the inverter is the power electronics module, which consists of several IGBT (insulated gate bipolar transistor) chips plus some diodes. IGBTs combine the features of the bipolar junction transistor with MOSFETs. They are fast-switching power devices capable of handling high voltages and currents, with minimal losses. Water-cooled IGBT modules are designed to dissipate heat and keep device temperatures low.

IGBT makers with automotive capability include Fuji Electric Device.

**Turn to Sourcing, page 8**

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### Additional Semiconductor Content Required for Full Hybrids

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>IGBT* and diode chips</td>
<td>34%</td>
</tr>
<tr>
<td>Logics, including microcontrollers</td>
<td>10%</td>
</tr>
<tr>
<td>Sensors</td>
<td>3%</td>
</tr>
<tr>
<td>Other ICs</td>
<td>5%</td>
</tr>
<tr>
<td>Voltage regulators</td>
<td>4%</td>
</tr>
</tbody>
</table>

*IGBT* stands for Insulated Gate Bipolar Transistor. Data: Infineon
Citroen was announced in December 2008, through which Bosch will co-develop and supply parts for PSA’s diesel hybrid scheduled to launch in 2011. Bosch will supply the rear electric motor, high voltage alternator and power electronics.

Bosch is well-positioned to serve the growing market in Europe for fuel-saving technologies including start-stop and diesel common rail systems. Bosch supplies start-stop systems for Fiat, BMW, Mini and Kia vehicles. The company predicts that start-stop penetration will reach 50% of new vehicles in Europe by 2012.

**Continental A utomotive Group**

Continental maintains two core businesses: the Automotive Group and the Rubber Group, which primarily makes passenger and commercial vehicle tires. Within the Automotive Group are three divisions: Chassis & Safety, Powertrain and Interior.

**2008 A utomotive G roup Sales:** €14.9 billion

**Change from 2007:** up 104.2% (Continental acquired Siemens VDO in 2007, but 2007 sales included only one month’s contribution from the former Siemens VDO.)

**2008 N et Income (Loss):** €(1,123.5 million), vs. net income of €1,020.6 million in 2007. Special effects including plant closings, sales of businesses and cancelled orders reduced consolidated earnings by a total of €1,571.3 million.

**Outlook for 2009:** Conti did not give specifics regarding sales other than to say there will be large deviations from last year, particularly in the first half of 2009, and significant restructuring measures.

**2008 Sales and EBIT by Segment**

Chassis & Safety Sales: €5,134 million, up 10.4%

Chassis & Safety EBIT: €303.1 million, 5.9% of sales

Powertrain Sales: €4,040.0 million, up 243.2%

Powertrain EBIT: €1,046.2 million, (25.9%) of sales

Interiors Sales: €5,856.7 million, up 282.4%

Interiors EBIT: €462.6 million, (7.9%) of sales

Late in 2008, Schaeffler KG completed a €12.7 billion purchase of 90.2% (49.9% voting rights) of Continental’s stock at €75 per share. The stock was trading at just over €12 per share in late March 2009. That the company’s stated top priority is to reduce its debt is not surprising, considering the combined total of Schaeffler’s borrowing and Continental’s remaining debt from its acquisition of Siemens VDO in 2007 is estimated to be roughly €22 billion. Continental reported its net debt at the end of 2008 at €10,483.5 million. In January 2009, Standard & Poor’s downgraded Continental’s credit rating to BB (below investment grade), outlook negative. Moody’s rates Continental Ba2, negative. Continental reported that it had €3.5 billion in cash, cash equivalents and unused credit as of January 2009.

The executive board recommended carving out the Rubber Group as a separate company that could be sold off. The Rubber Group had sales of €9.4 billion in 2008, but sales of tires for light vehicles declined by 15% in 2008 and are likely to continue to slump along with global vehicle production. Continental in March announced it was closing at least two tire plants in Europe.

Schaeffler in early 2009 requested loans from the German government, and in March submitted a restructuring plan to its creditor banks. Analysts suggest the Schaeffler family share in Continental could drop below 10% if a debt for equity swap becomes necessary. In April 2009, Schaeffler and Continental began the process of combining their purchasing operations, a move that they hope will save between €350 million and €400 million in the next two years.

**Valeo**

**2008 N et Sales:** €8,815 million

Sixty-six percent of sales were in the European market; North America accounted for 12%; Asia, 15%; and South America, 7%.

**Change from 2007:** down 9.0%. Valeo estimates its customers’ vehicle production declined 6.3% for the year compared with 2007. In the fourth quarter, vehicle production was down 25.2%.

**Net Loss:** €207 million, compared with a net profit of €81 million in 2007. Valeo’s net loss includes a fourth quarter charge of €241 million associated with a workforce reduction of 5,000 people, announced in December.

**Outlook for 2009:** For the first half of 2009, Valeo expects an operating loss due to a 30% global vehicle production decline during the period. It expects to keep its debt to equity ratio below 120%, in compliance with its financing agreements.

In addition to cutting personnel, Valeo hopes to preserve liquidity by slashing operating expenses, optimizing inventory management and cutting investment expenses by one-third. The company’s net debt rose by €22 million in 2008, to €821 million, but there are no repayments due until 2011. At year end, Valeo had €1.2 billion in credit available. The company does not expect the current economic crisis to end before 2011.

In February 2009, the French government’s Strategic Investment Fund acquired a 2.35% stake in Valeo. Together with the shares already held by the state-controlled CDC bank, the French government now owns 8.3% of the company.

continued on page 3
Ludwigsburg Conference on Automotive Electronics

If you are a top manager with a company that has set its sights on the global automotive electronics market, the place to be this July 15–16 is Ludwigsburg, Germany, at the annual Automotive Electronics Fachkongress.

Germany pioneers much of the electronics that ends up in the world’s cars, and this conference is where you’ll find the decision makers from the German carmakers and suppliers. General Motors will be represented by its top electrical engineer, Hans-Görg Frischkorn, who will give the keynote address on the second day.

Since carmakers around the world are exploring all possible means to improve fuel economy and reduce CO₂, the conference will feature several presentations related to the electrification of vehicles. Ricky Hudi, head of electronics engineering for Audi, will speak on the changes in the development of electrical/electronics on the way to the fully electric car. Joerg Grotendorst, executive vice president of Continental’s hybrid electric vehicles business unit, will discuss platform design and hybrid power electronics. Hardware and software architecture is another focus area of the conference.

BMW’s top electrical engineer, Elmar Frickenstein, will address the future of E/E architecture and will be followed by Tom Phillips, who runs Microsoft’s automotive business. After that, members of the GEN I VI alliance will make a presentation about their open-source infotainment platform, which will compete directly with Microsoft’s platform.

For the first time, the Ludwigsburg conference will include a session devoted to development tools and processes. Presenters include Mathias Klau da from ETAS, Herbert Hanzelmann, president and CEO of dSpace, Thomas Beck, managing director of Vector Informatik, and Dirk Wälliser, MBtech vice president of electronics solutions.

Integrated safety and driver assistance will be covered by presenters from Conti, Bosch, Autoliv, Hella and others. “Everyone now is focused on fuel consumption issues, but safety will be a topic again tomorrow, and always,” noted conference chairman, Peter Thoma, member of the supervisory board of Elmos Semiconductor and formerly BMW’s top EE.

For more information, please visit www.elektronik-tagung.de; telephone 49 8191/125-321; or email Tina Drexler, tina.drexler@m-i-c.de. Program information will be available in English on the website near the end of April.

Freightliner’s Predictive Cruise Control Saves Fuel

In July, Freightliner will begin shipments of heavy duty trucks that feature its optional Predictive Cruise system that anticipates changes in road grades and automatically adjusts the vehicle’s speed to maximize fuel efficiency.

The feature employs a scaled-down GPS navigation device that keeps track of current position and, using a map provided by Navteq that has been enhanced with slope information, varies the truck’s speed, within 6% of the set speed, based on the upcoming road profile. The system looks at road slope data for more than a mile in front of the vehicle.

Predictive Cruise reduces fuel costs up to about 2%, said Derek Rotz, manager of advanced engineering at Daimler Trucks of North America. “The amount of fuel savings depends on the type of terrain. The most savings come when the truck is covering rolling hills, for example in the Midwest or Appalachia, where the slope of the road constantly varies between 0 and 2.5% or so,” Mr. Rotz said. Freightliner is a division of Daimler Trucks.

Starting with some research from Daimler Trucks that proved the concept, M r. Rotz’s organization developed the marketing strategy and worked with the company’s development team to develop the Predictive Cruise control algorithm and bring the application to maturity. Daimler Trucks partnered with Navteq, which used specially equipped vehicles to collect slope information along the 200,000 miles of U.S. Interstates and other highways where long-haul truckers typically operate.

Daimler Trucks also partnered with John Deere subsidiary Phoenix International, who developed and is manufacturing the onboard control unit. The control unit consists of an electronics controller, GPS, microcontroller and a Flash memory device capable of storing the 60-megabyte map. The controller communicates with the cruise control system via a CAN bus.

“Our customers are very keen to save fuel,” M r. Rotz emphasized. “A Class 8 truck hauling 80,000 pounds of freight gets about 6.5 miles per gallon. They are driven about 130,000 miles per year. That consumes 20,000 gallons of diesel fuel, which at $3.00 per gallon costs $60,000 per year. Each percent of fuel savings gets you $600 per truck per year, which is significant.”

Daimler Truck engineers are looking for other ways to benefit from knowing the slope of the road. “We are looking at powertrain control, auxiliary load management and other ways this technology can be applied,” said M r. Rotz. “Today auxiliary loads are hard mounted to the engine, meaning they operate whenever the engine runs. They are not being optimized.”

Roundup...

Order intake of €10.1 billion in 2008 broke company records, according to Valeo. Former CEO Thierry Morin attributed these new orders to Valeo’s 10 ppm quality level and to the industry’s need for technology such as stop-start to improve fuel economy and reduce emissions, as well as safety and convenience products such as blind spot detection, lane departure warning and parking assist.

**The Company Profile... Mentor Graphics**

**Background**

Mentor Graphics was founded in 1981 by a small group of entrepreneurs from the Oregon-based test and measurement device manufacturer, Tektronix. Thomas Bruggere, who led the group, served as Mentor Graphics' chairman and CEO until 1994. Mentor Graphics debuted its first product, a CAE workstation, in 1982. The company showed its first profit in 1984 and launched an IPO that same year.

Mentor Graphics' chairman and CEO, Bruggere, who led the group, served as vice manufacturer, Tektronix. Thomas Bruggere, who led the group, served as mentor Graphics' chairman and CEO until 1994. Mentor Graphics debuted its first product, a CAE workstation, in 1982. The company showed its first profit in 1984 and launched an IPO that same year.

**Mentor's Automotive Market**

When you consider all the Mentor Graphics products used by automotive customers—design tools for electrical systems and harnesses, for printed circuit board design, tools for networks, mechatronics and embedded software development—the company's served automotive market is difficult to evaluate precisely. According to the company's best estimate, its served automotive market is worth hundreds of millions of dollars.

**Electrical System and Harness Design Tools Needed**

Given their exposure to electrical wiring design requirements, Mentor Graphics executives are in a good position to observe industry trends. One trend worth noting is that the greater use of data buses has stopped harnesses from growing, but they still aren't getting any smaller. "The number of cut leads [wire pieces] in each vehicle has been stable for about a decade," noted Martin O'Brien, general manager of the Integrated Electrical Systems division. "Everybody is fighting a losing battle with the size of the wiring harness. Every time they find some technology that reduces wiring, it frees up automotive electrical distribution systems designers and manufacturers. Beyond the $43 million worth of business it did directly with carmakers and their suppliers in FY 2009, Mentor Graphics sold $137 million worth of products to the top 14 automotive semiconductor companies.

**Mentor Graphics Total Revenue and Net Margin, by Year**

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>FY 2008*</th>
<th>FY 2009*</th>
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<tr>
<td>$ thousands</td>
<td>775,668</td>
<td>710,956</td>
<td>713,401</td>
<td>802,839</td>
<td>879,732</td>
<td>789,100</td>
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Net Margin (Loss)

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>FY 2008*</th>
<th>FY 2009*</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ thousands</td>
<td>1.2%</td>
<td>(2.9%)</td>
<td>0.8%</td>
<td>3.4%</td>
<td>3.3%</td>
</tr>
</tbody>
</table>

*In 2007 Mentor Graphics switched from calendar years to fiscal years that end on January 31 of the named year. The transition year FY 2008 has 13 months.

**Mentor Graphics Revenue by Segment**

<table>
<thead>
<tr>
<th>Segment</th>
<th>FY 2009 Sales: $789.1 million</th>
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<tbody>
<tr>
<td>Silicon</td>
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</tr>
<tr>
<td>IC Design to Silicon</td>
<td>35%</td>
</tr>
<tr>
<td>IC Design to System</td>
<td>20%</td>
</tr>
<tr>
<td>New &amp; Emerging Products</td>
<td>10%</td>
</tr>
<tr>
<td>Scalable Verification</td>
<td>25%</td>
</tr>
<tr>
<td>Services &amp; Other</td>
<td>10%</td>
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**Mentor Graphics Automotive (OEMs and Suppliers) Revenue by Year**

<table>
<thead>
<tr>
<th>Year</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>FY 2008*</th>
<th>FY 2009*</th>
</tr>
</thead>
<tbody>
<tr>
<td>$ thousands</td>
<td>33,715</td>
<td>39,983</td>
<td>44,513</td>
<td>34,306</td>
<td>44,229</td>
<td>42,989</td>
</tr>
</tbody>
</table>

*In 2007 Mentor Graphics switched from calendar years to fiscal years that end on January 31 of the named year. The transition year FY 2008 has 13 months.

**Summary**

Mentor Graphics makes electronics products faster and more cost effectively. The company markets its products and services worldwide, primarily to large companies in the military/aerospace, communications, computer, consumer electronics, semiconductor, networking, multimedia and transportation industries. Mentor Graphics' tools, available on UNIX, Windows and Linux platforms, are used to create printed circuit boards, integrated circuits, field-programmable gate arrays, embedded software and wire harness systems.

Mentor Graphics, to stake out a position strong and competent commercial vendor, choose from. Here is an opportunity for a number of options their customers can configuration complexity as they increase the electrical content as well as greater con-

suppliers are faced with a growing level of according to Mr. O'Brien. "Carmakers and design tools used by the auto industry," opening with electrical system and harness tools from outside vendors. "Now it's hap-

complexity demanded design automation as the third wave of commercial EDA tools. The first wave came with IC design as ICs became so complicated that tools as ICs became so complicated that device manufacturers stopped using home-grown solutions in favor of commercial tools developed by specialists. The second wave came when printed circuit board complexity demanded design automation tools from outside vendors. "Now it's hap-

Mentor Graphics' stock is traded on the NASDAQ under the symbol MENT

Source: BigCharts.com

by most of the world's top wiring harness makers, including Yazaki, Delphi and Lear.

CHS covers not only electrical system design, but also electrical analysis, systems integration/wiring design and harness engineering. With its powerful data management capabilities, the tool suite can be used for vehicle configuration management, workflow control and as a way to compare different design approaches.

Mr. O'Brien explained: "What CHS does is take all of the logical inputs (the signals that transfer around the car, what goes where), merges them with an understanding of the three-dimensional shape of the car and all the routing paths, merges in the design rules, and at the press of a button, places all the compo-

ments into the vehicle, interconnects everything, and converts it into wiring, automatically. If the design rules are right, the wiring will be right."

CHS consists of three basic, core tools: a tool for capturing the logical systems, a tool for creating the wiring design at the vehicle platform level and a tool for creating the wiring harnesses. Users can add modules that do special things, for example FM EA (failure mode and effects analysis), or costing, or sneak circuit analysis. Another module can generate wiring diagrams. "Some companies want diagrams that they can hold in their hands. Other companies don't ever want to see a wiring diagram," noted Mr. O'Brien.

continued on following page
Benefits Delivered by CHS

According to Nick Smith, director of marketing for the Integrated Electrical Systems division, there are two major benefits to using CHS. “The first comes from our data model, where the data is matured throughout the design process from vehicle connectivity capture right through to design and manufacture of the wiring harness. It’s a seamless data flow where change management is strongly supported and where integration with adjacent domains such as 3D M C A D is made easy.

“The second major benefit is that CHS applies the concept of design synthesis to the electrical system. That means the engineer can work at a higher level of abstraction by inputting connectivity and the set of design rules, and allowing the computer to algorithmically synthesize the wiring that would otherwise be drawn by hand. That is a huge breakthrough in terms of productivity,” he said.

According to Mentor, the combined effect of those two benefits is a very efficient design process, with a lot of support for worldwide operations, workflow control, and high quality designs that can be simulated and analyzed.

And because CHS tools allow data to flow from one tool to the next, it is no longer necessary for each entity involved in delivering the finished harnesses and ECU's to enter data into their own systems. “As you go from the original car concept all the way through to manufacturing, you may have crossed the boundaries of 50 companies. If you use a system where they don’t have to reenter data, you eliminate a huge source of error,” added Mr. O’Brien.

Expanding CHS Capability

Since first bringing CHS to market in 2003, Mentor has put about 500 man years into improving the product line. “In five years’ time there will probably have been a total of 1,500 man years invested in it because we keep expanding its capability,” noted Mr. O’Brien.

In March 2009, Mentor Graphics released the latest extension to the CHS product lineup. Capital Architect is one of many extensions that have been developed since 2003. By assessing the cost and weight of various approaches, Capital Architect helps electrical system designers decide the best way to organize the vehicle’s electrical system, for example, whether it is better to have a small number of large centralized ECUs or a greater number of smaller ECUs distributed throughout the vehicle, or whether the best location for the battery is in the trunk or the engine compartment.

In 2004 Mentor Graphics purchased First Earth, a small Welsh firm with a tool that Mentor evolved and integrated into the CHS suite, and now calls Capital Analysis. Capital Analysis facilitates early design understanding, debugging and validation via an integrated electrical simulation environment, thus raising design quality and compressing the development cycle. Mentor Graphics’ customers pay for CHS licenses according to the number of seats, the number of engineers working on a platform. CHS is comprised of a number of modules; engineers buy whatever modules are applicable to their job functions.

Major Automotive-Related Acquisitions

- 2000 Harness Software: Wire harness design and engineering tools
- 2004 First Earth: Electrical system simulation and analysis tools
- 2005 Volcano: Software development tools
- 2008 Flomerics: Thermal analysis tools

There is potential for other similar acquisitions by Mentor Graphics. Possible targets might be companies doing EMI simulation or fiber optic interconnects, or companies doing 3D harness views. Companies with these sorts of complementary tools might also become part of an ecosystem that could work with data from CHS.

Printed Circuit Board Design Tools

Mentor Graphics has been in the printed circuit board (PCB) design tools business since 1985, when it released Board Station, a tool that is still sold today to automotive customers. PCB design accounts for nearly one-third of Mentor’s automotive revenues, and according to the company, it has a 41% share of the worldwide market for PCB layout tools.

As electronics complexity in the automotive industry has gradually caught up with that of industries such as military and aerospace, automotive customers are increasingly drawn to Mentor Graphics’ next-generation design tool, Expedition Enterprise. Released eight years ago, Expedition Enterprise is especially helpful to companies designing boards for high-speed ICs or boards that require high density interconnects and micro-vias, or where RF circuits are mixed in with other technologies, such as in telematics boxes, collision avoidance or back-up warning systems. Unlike Board Station, Expedition Enterprise can be integrated with Mentor’s Xtreme PCB technology, which supports multiple designers working on a single circuit board at the same time.

New technology acquired by Mentor Graphics with its purchase of Flomerics in 2008 provides thermal analysis at both the PCB level as well as the total enclosure.
which can contribute to improved system reliability.

Of special interest to its automotive customers, in September 2008 Mentor Graphics announced a new tool that makes it much easier for mechanical engineers working on ECU packaging to collaborate with the electrical engineers handling the PCB. “Let’s say the mechanical guy decides he needs to shrink the PCB housing,” explained John Isaac, business development manager for Mentor’s system design division. “With our ECAD-MCAD Collaboration tool, he can propose the change and communicate that electronically to the PCB designer, who would have the opportunity to see a 3D version of the proposal and pull that change into his ECAD tool to test it and see what the effect would be. Electronic negotiation can proceed until a mutual agreement is reached, at which point the respective databases are updated.”

**Software Development Tools**

While most of Mentor Graphics’ automotive business comes from hardware design tools, namely the CHS tools suite, and from PCB design tools, the company has also been investing in software development tools.

In 2005, Mentor purchased Volcano Communications Technologies, with its product line of network design tools, embedded software, and test and validation tools. Volcano products deal with the three major automotive networks: CAN, LIN, and Freescale. Mentor Graphics has been selling two tools from Volcano: Volcano Network Architect (VNA) and Volcano Target Package (VTP).

Serge Leef, general manager of Mentor Graphics’ System Level Engineering division, explained some of the advantages provided by Volcano tools. “VNA uses a top-down methodology to first develop the logical architecture. You can declare all the ECUs, declare the messages that go with each of them, declare message properties and then have the tool automatically generate the network, not the topology but the middleware that ties everything together.”

“VTP is a corresponding middleware package of embedded software that can be used without having used the Volcano architecture tool, but it is more useful when VNA is used, because it generates layers of embedded software that glue the whole distributed system together.”

Volcano’s long list of customers includes: Audi, BMW, Daimler, Volkswagen, Volvo, JLR, A ston Martin and the Chinese carmaker SAIC (Shanghai Auto motive Industries Corporation).

**Mentor Graphics Announces New Autosar Design Tool**

Before it was acquired by Mentor Graphics, Volcano was a premium member of Autosar, actively participating in the development of the standard.

“The reason we got involved with Volcano was Autosar,” pointed out M. Leef. “Without standards there wasn’t much value a vendor like us could contribute to this market. Our intent after acquiring Volcano was to create a comprehensive set of Autosar offerings. Volcano always had a great reputation so it gave Mentor Graphics credibility in the automotive software space.”

On April 20, 2009, Mentor Graphics announced the availability of Volcano Systems Architect (VSA), which helps engineers make cost-optimized architectural decisions at the front end of the design process for distributed systems based on FlexRay, CAN, and LIN.

With VSA, engineers can declare ECUs and map software components onto ECUs. It uses Autosar paradigms, Autosar data models and timing models to create a comprehensive design environment. The tool does analysis as well. For example it will let the designer know if a particular ECU is overloaded and whether some functions need to be moved to another ECU. It also provides information about signal latency. “Other vendors are offering Autosar tools, but no one has a solution as comprehensive as VSA,” asserted M. Leef.

Mentor’s investment in its Autosar tools is substantial, considering the company is leveraging investments in EDA technology it has made over the past 20 years. There are approximately 60 people in the Automotive Network Design business unit (within the System Level Engineering division), most of whom have been working on Autosar tools.

Mentor Graphics has been developing the Autosar tools in cooperation with a European carmaker, and expects that between three and six customers will purchase the new tool before mid-summer.

In three to five years, the company expects its Vehicle Networking division products will deliver $50 million in annual sales—including the Autosar tools, the Volcano product family and embedded software, and some other products.
Consumer Reports’ Reliability Survey

A mericans considering new or used car purchases have for decades turned to Consumer Reports’ Annual Auto Issue for unbiased information to help them make informed buying decisions. In each April issue, the magazine publishes its findings on vehicle reliability based on survey respondents’ reports of problems with their vehicles. The results pertain to problems that were considered serious because of cost, failure, safety or downtime.

The Hansen Report takes a closer look at reliability results in the categories of electrical, power equipment and audio. Also included under the audio heading are navigation, video screens and communications systems. We think it is important to see how the major carmakers’ reliability records compare in the categories where automotive electrical/electronics suppliers play a major role.

Historically, in our rankings, the Japanese carmakers have held the top spots, and they did so again with their 2008 vehicles, notably Honda. Toyota, however, earned a worse than average rating in audio for its high volume Camry, which brought Toyota down to eighth place in the audio rankings. Toyota ranked third in electrical and fourth in power equipment.

Chrysler’s Town and Country and Dodge Grand Caravan minivans both scored much worse than average for power equipment and audio systems, which contributed to Chrysler’s last place rank in both those categories. A worse than average score in the survey does not mean unreliable, Consumer Reports stresses, only that the vehicle had more reported problems than the average; the actual number of problems can still be very low.

To determine our rankings for 2008 vehicles, we assigned a numerical value to Consumer Reports’ relative reliability scores, which the magazine illustrates with red and black filled or partially filled circles. We weighted our assigned value with U.S. sales for each model, using sales figures published in Automotive News or provided by the carmakers.

The results are displayed graphically below. The carmaker with the fewest reported problems is listed first in each of the graphs.

Problem Ratings for MY 2008
Vehicle Electrical Systems

<table>
<thead>
<tr>
<th>Carmaker</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mazda</td>
<td>1.08</td>
</tr>
<tr>
<td>Honda</td>
<td>1.07</td>
</tr>
<tr>
<td>Toyota</td>
<td>1.06</td>
</tr>
<tr>
<td>Nissan</td>
<td>1.04</td>
</tr>
<tr>
<td>Hyundai</td>
<td>1.03</td>
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<tr>
<td>GM</td>
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<td>Ford</td>
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<td>BMW</td>
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<tr>
<td>Chrysler</td>
<td>1.00</td>
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<tr>
<td>Mercedes</td>
<td>1.00</td>
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<tr>
<td>VW</td>
<td>1.00</td>
</tr>
</tbody>
</table>

Includes alternator, starter, battery cables, engine harness, coil, ignition switch, electronic ignition, distributor or rotor, spark plugs and wires, sensors or module.

Problem Ratings for MY 2008
Vehicle Power Equipment

<table>
<thead>
<tr>
<th>Carmaker</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mazda</td>
<td>1.08</td>
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<tr>
<td>Honda</td>
<td>1.07</td>
</tr>
<tr>
<td>Toyota</td>
<td>1.06</td>
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<tr>
<td>Nissan</td>
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<tr>
<td>Hyundai</td>
<td>1.03</td>
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<td>Mercedes</td>
<td>1.00</td>
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<tr>
<td>Chrysler</td>
<td>1.00</td>
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</tbody>
</table>

Includes cruise control, heated/cooled seats, body control module, keyless entry, wiper motor or washer, tire pressure monitor, interior/exterior lights, horn, gauges, 12V power plug, alarm/security, backup camera/sensors.

Problem Ratings for MY 2008
Vehicle Audio Equipment

<table>
<thead>
<tr>
<th>Carmaker</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Honda</td>
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<tr>
<td>Hyundai</td>
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<tr>
<td>Ford</td>
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<tr>
<td>Chrysler</td>
<td>1.01</td>
</tr>
</tbody>
</table>

Includes navigation system, radio, speaker, CD or DVD player and changer, cassette player, antenna, satellite radio, video screen, communication system.

Sourcing...

Technology, Renesas, Infineon Technologies and ST Microelectronics. Well aware of the strategic importance of IGBTs to hybrid and electric vehicles, Toyota developed its own IGBTs and makes them in house. Toyota developed low-loss, highly rugged 600V-200A-class planar IGBTs in 1997 and trench IGBTs in 2001. The company has been working on next-generation IGBTs.

Infineon makes IGBTs for industrial applications and automotive ignitions and will soon go into mass production on IGBTs and modules for HEVs. “You can’t use industrial IGBTs in this application,” said Alfonso Grzegaczek, director of power innovation for Infineon. “You need a different type of module, one with very high quality and a lower-cost position.” According to Infineon, IGBTs, IGBT packaging, plus some power diodes, account for 78% of the cost of the extra semiconductors required to make a hybrid vehicle.

Infineon has several projects in the works with European, American and Chinese customers, but none with Japanese customers. “We have no access in Japan; Japan is more or less closed to us,” noted Dr. Graf.

STMicroelectronics, which produces 400V IGBTs for electronic ignition systems, is currently in the qualification phase at some tier-one suppliers for 600V and 1,200V IGBTs, not only for hybrid and electric vehicles applications, but also for piezo-fuel injectors.

Two years ago STMicroelectronics agreed to provide Freescale with IGBT technology as part of a major agreement to exchange and jointly develop a number of technologies, but Freescale has not yet made the investment necessary to bring IGBTs to market. Freescale got out of the discrete power semiconductor business in 1999 when it sold its component business to ON Semiconductor.

Traction Motors

“Traction motors in hybrid and electric vehicles are limited by the available permanent magnet material, and the situation with traction motors is nearly identical to the problem with inverters. There is a limited number of companies that have invested to industrialize the permanent magnet material in high volume,” said Ford’s Mr. M. Markey. “That means designing the motor with optimal gaps and optimal noise, vibration and harshness characteristics, and producing it efficiently and precisely. A nother issue is sourcing the permanent magnet material, most of which comes from China.”

Traction motors are so important that General Motors designs almost all of its own. “These are very different motors than you would find in an industrial application,” said GM’s M. Nitz. “These are parts that have to live a very long time in a very tough environment where space is very limited. So we go to great lengths to get the most power density possible from our designs.”

Continued from page 1