Despite Slow Uptake, OSEK OS Going Global

It’s been more than ten years since BMW, Bosch, Daimler-Benz, Opel, Siemens A utomotive, and Volkswagen began a joint development project called OSEK. OSEK, an abbreviation for the German “Offene Systeme und deren Schnittstellen für die Elektronik im Kraftfahrzeug,” or in English, “Open Systems and the Corresponding Interfaces for Automotive Electronics,” is a set of standard specifications that support the portability and reusability of software applications.

With an OSEK operating system (OS), vehicle control software can run on a number of different microprocessors, on different vehicle platforms and even on vehicles made by different carmakers. An OSEK OS should save carmakers money on ECUs (electronic control units) and vehicle control system development costs.

While OSEK standards are not yet broadly used by the majority of carmakers around the world, OSEK is definitely progressing. BMW uses an OSEK OS in some chassis controls in its 7 series and in chassis, powertrain and body controls in the recently-introduced 5 series.

Mercedes employs the OSEK operating system on about 50% of vehicle ECUs in the E class and plans to use the OSEK OS in 50% to 90% of the ECUs on each new platform as it is redesigned.

Volkswagen uses an OSEK OS in roughly 30% of all ECUs in its new Golf, just introduced this fall.

OSEK has gained limited acceptance outside Europe as well. General Motors started using an OSEK-compatible OS from WindRiver in its Northstar engine in MY 2000, and now GM says is has roughly 30% of all ECUs in its new Golf, just introduced this fall.

Under GM’s OSEK operating system, thousands of software applications run in different ECUs on the same vehicle. All of us have to adapt to a number of functionalities to put in a car. Today, for every new functionality we add a new box, which increases the number of ECUs,” he said. That leads to a number of carmakers.

**Key Benefits of AUTOSAR**

- Easy reuse of software
- Greater design flexibility
- Simplified integration
- Reduction of software costs
- Tool support
- Suppliers will be able to sell similar product versions across platforms and to a number of carmakers.
- A particular software function can be run in different ECUs on the same vehicle.
- Supports redundancy, for example for safety critical systems.

AUTOSAR Open System Architecture Partnership to Go Public

On September 25, 2003, at the 11th VDI International Congress “Electronic Systems for Vehicles,” in Baden-Baden, Germany, a new software development consortium consisting of BMW, Daimler-Chrysler, Volkswagen Group, Continental Teves, Siemens VDO Autootive and Bosch plans to announce AUTOSAR to the public, in an effort to win international participation. AUTOSAR, for Automotive Open System Architecture, will define a standard, open, non-proprietary software infrastructure on which proprietary vehicle control systems— for body, chassis and powertrain functions—can be built. AUTOSAR will make feasible a new age in automotive electronics when software will account for a major portion of the vehicle’s value to consumers.

**Reduce Complexity and Costs**

AUTOSAR is another example of the international leadership provided by the three German carmakers DaimlerChrysler, BMW and the VW Group, responsible for Audi and the Phaeton luxury car. Because of the market they serve, a market hungry for new high-tech features and willing to pay dearly for them, these carmakers design vehicles that are fully loaded with electronics, which require dozens of ECUs (electronic control units), multiple networks and more and more software. With each vehicle redesign, complexity and development costs rise geometrically. As a result, German carmakers face engineering challenges well before other carmakers—challenges they believe can be answered through more standardization and cooperation.

Among the German-initiated electronics standards already in production vehicles are LIN, CAN and MOST communications networks and the OSEK operating system, all of which are spreading to other carmakers around the world. In a few more years we will start to see the FlexRay protocol for safety-critical systems in use in production vehicles. German leadership has been a boon to such suppliers as Bosch, Siemens VDO , Continental and Harman International’s Becker division (which developed D2B and MOST), who are often pressed to develop new technology well before other suppliers.

With AUTOSAR standards in place, proprietary functional software components from a variety of suppliers could more easily be run on different ECUs regardless of the particular carmaker or vehicle, reducing the total number of ECUs required. Stephan Wolfsried, Daimler-Chrysler vice president for passenger cars, E/E and chassis, elaborated, “We have always struggled with the cost, struggled with the partitioning of functions, with the number of ECUs. All of us have to reduce the number of ECUs.”

VW Group’s top electrical engineer, Karl Thomas Neumann, agreed. “You have a number of functionalities to put into a car. Today, for every new functionality we add a new box, which increases the number of ECUs,” he said. That leads
“fully embraced OSEK for future generations.” GM will use OSEK in a body controller and plans to apply it to chassis controls as well.

We have heard reports about some other key players showing interest in OSEK. For example, Japanese carmakers including Toyota, as well as some suppliers including Denso, regularly attend ISO working group meetings on OSEK in Europe. One working group member told us he believes that Toyota and Nissan will eventually adopt OSEK. A nother industry insider told us that Toyota is working on an OSEK-compliant powertrain controller. We have heard unconfirmed reports that Lear and Ford are developing a smart junction box based on the OSEK OS, and that Yazaki is working with Chrysler to develop an OSEK-based keyless entry system. Now in final editing, the ISO working group is very close to finishing its OSEK specifications.

Despite the time it has taken for OSEK to come this far, we believe—based on the important commitments to OSEK made by several carmakers—that OSEK now has enough momentum to carry it forward. A s other carmakers add more features and are forced to confront the problems that come with software complexity, they too will explore—and eventually adopt—OSEK standard software. A succinct endorsement of OSEK was offered by Pierre Malaterre, vehicle systems electronics manager for PSA Peugeot Citroën, who declared, “We use OSEK because with it we save time and money and improve quality.”

**Major OSEK Experience by Carmaker**

**BMW:** The OSEK operating system is used now on some chassis ECUs on the 7 series and is widely used in ECUs on the 5 series currently in market launch. Other BMW models will also employ an OSEK OS in powertrain, chassis and body control systems.

**DaimlerChrysler:** Starting in 2002, the OSEK OS was used on more than 50% of all ECUs in the new Mercedes E class. The OS is primarily employed on body controllers and to a lesser degree on chassis controllers, followed by powertrain. Next out is the new A class, which will have the OSEK OS on more than 50% of its ECUs. The new S class, which could hit production in 2006, will use OSEK on 90% of the vehicle’s ECUs. The 2001 C class was the first to use the OSEK operating system on a limited number of ECUs. In North America, Chrysler engineers are considering OSEK.

**General Motors:** GM first employed an OSEK operating system in its 2000 Northstar powertrain controller. Since then GM has been converting all its powertrain controllers to OSEK, according to Dennis Bogden, top control engineer for GM Powertrain North America. Further, GM plans to use OSEK in a new body controller by 2007 or 2008 and also in chassis controllers.

**PSA Peugeot Citroën:** The OSEK operating system and OSEK network management software were employed in the body control system on the Peugeot 607 in 2000. Eventually all the carmaker’s vehicles will use OSEK software.

**Volkswagen Group:** VW has employed the OSEK operating system on the powertrain controller and a number of body controllers totaling about 30% of the ECUs in the 2004 Golf.

### Benefits and Obstacles to Using OSEK

**Benefits**

- With basic microcontroller software handled according to OSEK specifications by outside commercial specialists, carmakers can focus on what they do best, which is vehicle systems engineering. Suppliers will keep OSEK standards maintained and up-to-date.
- As a sufficient number of carmakers use OSEK operating systems, the market for OSEK-compatible microprocessors and application software will improve, leading to higher volumes and lower prices for vehicle control systems.
- OSEK functional software can be reused on different vehicle platforms.
- Because OSEK parts are tested by a number of different carmakers and suppliers, OSEK-compliant vehicle control systems should be higher in quality and more robust than proprietary, single-carmaker systems.
- OSEK software can be compliance tested according to OSEK standards.
- Vendors will provide a selection of OSEK development tools.

**Obstacles**

- In some cases carmakers must wait years for an ECU makeover before the OSEK operating system can be incorporated.
- While there are no OSEK royalties, carmakers must pay a price for each OSEK operating system purchased from a supplier.
- Some carmakers have found it difficult to justify an OSEK operating system if it requires considerably more computing power and memory than an in-house system.
- Some carmakers have already invested funds to develop proprietary operating systems. Using OSEK makes that work obsolete.
- Adapting control systems to OSEK requires a significant engineering investment.

### The Hansen Report on Automotive Electronics

© 2003 Paul Hansen Associates, 150 Pinehurst Rd., Portsmouth, NH 03870, USA; Telephone: 603-431-5859. Fax: 603-431-5791. E-mail: info@hansenreport.com. All rights reserved. Materials may not be reproduced in any form without written permission. The Hansen Report on Automotive Electronics is published 10 times a year, monthly; July/August and December/January are combined issues. The annual subscription rate is $677 (North America), $717 (elsewhere). Back issues are available for $45 each; see our online index at www.hansenreport.com. Paul Hansen Associates is a strategy and market research firm consulting to the electronics industry. Publisher/Editor Paul Hansen Managing Editor Brianne Wolfe Circulation Manager
to more interfaces, more complexity and more problems to solve. Complexity is even an issue on the VW Golf, which is not a luxury vehicle. Dr. Neumann explained, “The new 2004 Golf has up to 35 ECUs, the old Golf had 15 to 18 ECUs. So will the next generation have 70? Absolutely not. The next Golf will have less than 35. To stop this ‘one function, one ECU’ [situation] we have to move forward to AUTOSAR.” Dr. Neumann runs Volkswagen’s E/E department and also directs the VW Group electronics competence center, which supports all VW brands including Audi.

AUTOSAR members will develop the AUTOSAR runtime environment (RTE) onto which proprietary software functions can be applied as long as each software component includes the standard AUTOSAR interface. Other basic software will be part of the AUTOSAR infrastructure, for example, transfer layers for different communications protocols such as CAN, LIN, FlexRay or MOST, network management software and diagnostic protocols. The AUTOSAR structure will be flexible, permitting the use of a number of operating systems including OSEK, QNX, VxWorks and Windos CE. AUTOSAR will support hardware independence, in other words, applications could run on a variety of microcontroller platforms. (See figure in column two.)

### Three-Tier Membership Structure

- **Core Partners** make significant technical contributions and provide organizational and administrative management. New core partners will have equal rights as the founding core partners. Core partners share equally in the cost of development, which could run upwards of €100,000 ($111,717) per year for each partner, plus contributed engineers.
- **Premium Members** make technical contributions, can lead or participate in working groups and win access to all current information. Membership fee: about €15,000 ($16,757) per year, plus contributed engineers.
- **Associate Members** have access to publicly available information. Cost: about €7,500 ($8,379) per year.

### OSEK Doesn’t Go Far Enough

Some of the benefits of using AUTOSAR are similar to the benefits of using an OSEK standard operating system. The difference is that with AUTOSAR, it will be much less costly to take advantage of OSEK benefits. OSEK did not go far enough, according to Dr. Neumann: “If new software comes and you run it on the OSEK OS and you want to port it to another microcontroller, it’s much easier when everything is based on OSEK. But it’s not the whole story, ... AUTOSAR provides the missing pieces.”

BMW’s top electrical engineer, Hans-Georg Frischkorn, explained further: “OSEK is at the basic level of one control unit. AUTOSAR looks not at the individual control unit, but rather at the total architecture of the vehicle. More comprehensive, it looks at the networking interrelationships of all the ECUs in the car.”

### International Participation Wanted

Now that the AUTOSAR concept has crystallized, the German founders are looking for international participation. Currently there are only one or two openings left for core partners. Core partners establish the budget and manage the development process. The founders are looking for carmakers or top-tier suppliers willing and able to make major contributions to the development of the technology. They want a company that has proven itself worthy in similar consortia. They also want to work with carmakers who are committed to AUTOSAR, and who have adopted similar network standards. General Motors would fit that bill, given its participation in the FlexRay consortium and given the high priority it places on new technology these days. When GM joined the FlexRay consortium in 2002, its status as the world’s largest carmaker immediately gave FlexRay the bonafides it needed to attract other carmakers and suppliers. Toyota would lend to AUTOSAR similar bonafides, but there are concerns about the carmaker’s lack of commitment so far to German network standards. However, a well placed Toyota engineering manager says the carmaker started to use CAN and LIN in some production vehicles and has approached the MOST Cooperation to establish a special study team to test the MOST physical layer. While there is some concern about giving up any competitive advantage to Toyota, that concern does not apply to GM and Ford because DaimlerChrysler’s Chrysler division would also benefit from AUTOSAR’s broad adoption in North America. “We would welcome Ford or GM; we don’t want a different standard in the U.S.,” explained Mercedes’ Stephan Wolfsried.
The Hansen Report on Automotive Electronics, Portsmouth, NH USA  www.hansenreport.com

Page 4, September 2003

The Company Profile...  Pioneer Corp.

**Background**

Pioneer’s founder, Nozomu Matsumoto, established a company known as Fukuin Denki in 1947 to make loudspeakers. In 1961 the company name was changed to Pioneer Electronic Corporation, and today Pioneer is a world leader in digital audio and audio-visual entertainment products for the car and home. Describing itself as an “entertainment creating company,” Pioneer aims to “move the heart and touch the soul.”

Pioneer is listed on the New York Stock Exchange under the ticker symbol PIO, on Euronext Amsterdam, the Tokyo Stock Exchange and the Osaka Securities Exchange. As of March 31, 2003, the company’s balance sheet showed good liquidity: Current assets were ¥415,982 million ($3.4 billion) vs. current liabilities of ¥206,530 million ($1.7 billion), for a current ratio of 2.0. In the last four years, Pioneer has raised its investment in R&D significantly, from 5.4% of sales in fiscal 1999 to 6.4% of sales in fiscal 2003.

**Car Electronics Strategy**

Of Pioneer’s four business segments—Home Electronics, Car Electronics, Patent Licensing and Other (computer peripherals, factory automation systems, A/V software)—Car Electronics was the most profitable in the last fiscal year, contributing 63.2% of operating income. Over the past few years, however, the Car Electronics segment’s sales have been nearly flat, growing since FY 1999 at just 1.9% per year. But despite a worldwide slump in consumer spending over the past year, Pioneer’s Car Electronics sales were up 9.1% in FY 2003, mostly as a result of strong sales of HDD (hard disk drive) and DVD navigation in Japan, plus a steady demand for CD tuners and CD players in North America.

In the U.S. aftermarket, Pioneer intends to maintain its current market position in two core product categories: single-play CD radio head units and car speakers. Pioneer believes it owns roughly 25% of the CD head-unit aftermarket.

With mobile video and navigation markets growing, Michael Townsen, vice president of marketing for Pioneer Mobile Entertainment, expects to be able to grow this part of the business—from 8% of Pioneer’s total U.S. aftermarket sales in FY 2003 to 13% in FY 2004 and to at least 15% to 20% in the following two years. Pioneer’s mobile video business includes rear-seat entertainment and front-seat information and entertainment. Pioneer claims a 25% share of the U.S. mobile video aftermarket.

The company is focusing its global aftermarket development efforts on mobile audio/video and navigation and is working to increase sales of its products that...
combine those functions in a single unit. Among Pioneer’s new products, those that show the greatest promise in terms of future sales, according to the company, are new models of HDD and DVD navigation, AirNavi telematics systems, introduced in Japan in 2002, and DVD-based rear-seat entertainment with sound. The new products will be launched first in Japan, then in North America and Europe, and later in China. Pioneer expects the Chinese market for mobile electronics to accelerate beginning in 2006.

More OEM Business Wanted

Pioneer has seen its North American OEM business grow 22% annually over the last three years, and the company expects that growth to continue. While globally just 30% of its Car Electronics shipments are sent to OEM customers, Pioneer says it will increase the percentage of OEM sales to 40% in the next five years.

In the States, about 40% of shipments already go to OEM customers, according to Steve Moerner, president and CEO of the North American OEM Group, known as Pioneer Automotive Electronics Sales. DVD players and audio/video systems equipped with DVD players stand out among Pioneer’s most appealing North American OEM products. “Our DVDs are robust and their performance attributes are best-in-class,” said Mr. Moerner. The DVD mechanisms’ compact size (just 20 mm high), vibration resistance and quiet operation make them well-suited to automotive applications, plus Pioneer supports a variety of DVD formats such as DVD-ROM, DVD-Audio and DVD-R/ DVD-RW.

In March 2003, Pioneer was awarded Visteon’s first annual Global VIP award, recognizing Pioneer as the top supplier among the 2,500 firms Visteon deals with. Despite annually selling a lot of CD mechanisms to Visteon, Pioneer has been competing directly with Visteon to become one of Ford’s top four or five suppliers of multimedia entertainment and information products. Pioneer has dedicated itself to winning more Ford business and has performed very well with some early applications on the Ford Ranger, among other programs. Ford appreciates Pioneer’s premium brand image and likes the company’s playback mechanisms, especially its experience with hard drive mechanisms in Japan. While Pioneer competes best with its premium products, it may have a hard time winning Ford business that is more cost sensitive.

Given Pioneer’s dedication to Ford, the carmaker’s recent decision to delay some new audio and entertainment programs could mean less Ford business than Pioneer expected. Nevertheless, Mr. Moerner told us, “For every program that may have been postponed, we have had offsetting new program opportunities outside of those delays.”

Audio

Pioneer first introduced component car stereo in 1975, followed in 1984 by the world’s first car CD player, and today Pioneer has the largest global market share of automotive CD receivers. Pioneer plans to maintain its market position in car audio by targeting new markets in Central and South America and Asia and by continuing to upgrade its audio product line with new features and functions, for example, MP3 compatibility, state-of-the-art displays and digital radio.

Among the first aftermarket suppliers of XM Satellite Radio receivers, Pioneer has shipped between 200,000 and 300,000 XM receivers since August 2001. Pioneer’s XM tuner, which fits into a 7-inch by 4-inch by 0.5-inch box, is usually mounted somewhere behind the instrument panel. The receiver can be added to any XM-ready Pioneer CD player. The suggested retail price for the tuner is $200; an XM antenna retails for $80. Pioneer sells XM Satellite Radio receivers directly to Ford. The Hansen Report on Automotive Electronics, Portsmouth, NH USA www.hansenreport.com
Honda and Toyota for dealer installation. Along with Pioneer, Sony and Alpine were also involved early in XM Satellite Radio development. Other suppliers have followed, including Delphi Delco, which began shipping a popular portable XM receiver called SKYFi in the fall of 2002. A cording to Pioneer, Delphi is now the number-one XM Radio supplier; Pioneer is number two. At this time, Pioneer has no plans to produce radios capable of receiving Sirius Satellite Radio transmissions.

A cording to a recent article in The Wall Street Journal, DVD-A audio hasn't caught on in the United States. Unlike CDs, which play back two separate channels of music, DVD-A audio plays six different channels of music—left, right and center speakers for the front, plus left, right and subwoofer in the back. Together they produce surround sound similar to what is available in home theater systems. Citing data from Nielsen SoundScan, the WSJ article noted that only 309,000 DVD-A audio disks were sold in 2002, compared with 681 million compact disks. Despite surround sound's slow take rate, Pioneer says it is working on a couple of North American OEM programs that are destined for production.

N a vigation

Pioneer says it was first to market a GPS-based car navigation system, in 1990. Thirteen years later, Pioneer tops all other makers in the global navigation aftermarket and ranks fourth among Japanese suppliers in the global OEM market, after Aisin AW, Denso and HCX (Hitachi, Clarion and Xanavi). Pioneer is expecting continued strong sales from navigation products, one of the company's major businesses in terms of both sales and profits. Pioneer sold 300,000 navigation units worldwide in 2002.

In the States, the market for navigation grew 30% in the first half of 2003, and Pioneer expects the market to continue growing rapidly over the next several years. The U.S. market is expanding now, Pioneer says, because today's navigation systems offer improved route-guidance features, better map images and the capacity to store more points of interest. Navigation has become easier to use with a combination of speech-recognition features and touch-panel displays. A nd, according to Pioneer, 90% of Americans are now aware of navigation, due in part to carmakers advertising navigation features as a product differentiator.

Pioneer reports it has garnered a 31% share of the U.S. navigation aftermarket. A cording to the Consumer Electronics Association, about 22,000 navigation units were sold in the United States in 2002. In the U.S., Pioneer's navigation systems range in price from about $2,000 to as much as $3,300, depending on features. A cording to Pioneer, the price of navigation is gradually coming down, but rather than follow that trend ever downward, the company prefers to add value to its navigation products to make them more attractive to consumers and carmakers. “Our mission is to create a product that has high value features that reach beyond pure navigation, for example, integrating navigation with an entertainment system,” explained Mr. Townsen.

Such features include HDD storage for both navigation data and audio (music) files, MD, DVD or CD players, 5.1 channel surround-sound audio systems that can read DVD audio, Dolby Digital, DTS and Dolby Prologic II audio programming. Other features include touch-screen motorized displays, command speech recognition, TV and dual-zone systems, where front-seat passengers can use navigation while rear-seat passengers watch a video. Pioneer has been among the world leaders in bringing HDD versions of navigation to the market. In 2001, in Japan, Pioneer brought out a new HDD navigation system with all functions housed in a 2-DIN package. For the Japanese market, Pioneer employs HDD memory to store both map data for navigation and audio source material. In North America, HDD is used only in audio applications—CDs played on the audio system can be recorded onto the HDD. HDDs have quicker access times than CDs or DVDs, and they can store more data, up to 20
T he Company Profile Continued

gigabytes (GB) on the latest version, compared with 8.5 GB on a DVD. Over time, Pioneer says, the HDD system storage capacity will increase, the physical size will shrink and the price will decrease.

Telematics
Like so many other industry players, Pioneer is still waiting for the communications technology and “killer app” that will lift telematics out of the doldrums. In Japan in 2002, Pioneer introduced AirNavi telematics service as an add-on to its Carrozzeria HDD navigation system. AirNavi uses a built-in CDMA 1x wireless communications module that connects to a cellular phone network to automatically or manually update the map data stored aboard the vehicle, a feature Pioneer hopes might be a killer app. Whenever the central server updates map data for an area within 40 square kilometers of your home, AirNavi automatically updates your system and any preset routes programmed in your unit. Map data is provided by Increment P Corporation, a wholly-owned Pioneer subsidiary. High-end HDD navigation systems retail for about ¥300,000 ($2,487); the monthly service fee for AirNavi is ¥1,980 ($16), which covers a variety of content downloads, map updates and communications fees. Pioneer does not release the number of AirNavi subscribers. Even though telematics has been slow to take off in the U.S. and even in Japan, Pioneer believes that China will eventually become a lucrative market for telematics.

For the Japanese market, Pioneer uses a speech recognition engine it developed in house, but for overseas markets the company buys speech software from ScanSoft of Peabody, Massachusetts. In 2001, ScanSoft acquired the speech recognition technology of Lernout & Hauspie, and in 2003 completed the acquisition of Philips’ speech processing business as well as SpeechWorks International. Thus far, Pioneer has used only limited-vocabulary speech recognition systems for simple commands. It does not yet offer high-vocabulary, speaker-independent, continuous speech recognition systems suitable for destination entry.

Rear-Seat Entertainment
A ccording to data from the Consumer Electronics Association, the U.S. mobile video aftermarket totaled about $450 million in 2002. In recent years, rear-seat passenger entertainment systems have been the hottest-selling automotive aftermarket electronics products in the U.S., although lately Pioneer’s mobile video sales have been slowing as market prices decline. Michael Townsen commented: “[In the overall market] stand-alone back-seat monitor sales are up just 3.6% in the first half of 2003; overhead consoles, which include both the monitor and playback mechanism, are down 11.7%. The actual selling price for stand-alone back-seat monitors is down over 15% to just $385. Overhead consoles are also down—they’re selling for $606.”

Part of that price erosion comes from the fact that customers don’t generally want to spend a lot for electronics that only the kids will use. Given its reputation for premium products, Pioneer would rather focus on the front seat and system integration, where many car owners will pay a premium price. “That is where Pioneer products really excel,” declared Mr. Townsen, “at the high end.”

A Pioneer spokesperson in Japan was optimistic about the market for rear-seat entertainment products in Japan, where Pioneer offers a combination DVD navigation and rear-seat entertainment system. A according to the company, the dual-use system accounts for 20% of Pioneer’s DVD navigation sales.

On May 1, 2003, Pioneer launched two mobile multimedia packages in the U.S. to entertain rear passengers by means of DVD video players and a choice of two types of 6.5-inch monitors. Both packages include the AVH-P6500DVD in-dash DVD player featuring touch-panel control and dual zone capability, which allows simultaneous playback of DVD movies or CDs for rear passengers and AM, FM or XM radio for the front passengers. Key features of Pioneer’s new rear-seat products include high quality monitors and easy installation, particularly the AVD-W 6200 quick-release, 6.5-inch LCD wide-screen rear-seat monitor. The P6500DVD is a high-resolution 16:9 aspect-ratio display with five selectable viewing modes, anti-glare coated screen, auto dimmer, built-in speaker and dual A/V inputs. The monitor comes with a flexible quick installation bracket that fits most detachable headrests and is designed to be installed with no significant modification to the vehicle.

Organic Electro-Luminescent (OEL) Displays
Pioneer was the first company to put organic EL displays into production in car stereos and in cell phones. In 1999, Pioneer fitted three aftermarket car stereo head units with OEL displays. Today Pioneer claims to be the only company that mass-produces OEL displays for mobile applications—over 350,000 are used annually in the U.S. in aftermarket single-play CD head units. Liquid crystal displays (LCDs) are still by far the most popular displays used in automotive applications today. Unlike LCDs, which require back lighting, OELs emit their own light. OELs are brighter, can be seen from wider viewing angles, have superior gray tones, thinner profiles and a wider temperature operating range. Further, pixels have a fast response rate of 2 μ seconds, compared with 20 or 30 μ seconds for LCDs. Future applications of OELs could include multifunction displays, electronic mirrors and dashboard instrumentation.◆
New Intertech Report on Power Management

Power Management in Today’s and Future Automotive Systems 2003-2010, provides readers with a deep understanding of the pros and cons of 42-volt electrical systems, concluding that the transition to 42 volts can be put off at least until the end of this decade. The report advises:

- **Improving Collaboration with Suppliers.** The paper promotes the standardization of a core architecture based on basic functions, exclusive of proprietary innovations, for use by different carmakers and suppliers.
- **AUTOSAR Development Core Partners.**

<table>
<thead>
<tr>
<th>AUTOSAR Development Core Partners</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMW</td>
</tr>
<tr>
<td>Bosch</td>
</tr>
<tr>
<td>Continental Teves</td>
</tr>
<tr>
<td>DaimlerChrysler</td>
</tr>
</tbody>
</table>

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

Key Dates for AUTOSAR

- **October 2002** Development began
- **July 21, 2003** Development agreement signed by founding core members
- **Sept. 25, 2003** First public announcement at VDI, Baden-Baden, Germany
- **2006** Completion of development, all AUTOSAR specs frozen

A U T O S A R’s development won’t be complete at least until 2006, and it will take at least another six years before carmakers will be able to apply the AUTOSAR architecture to a new vehicle platform with redesigned ECUs. We base our adoption forecast for AUTOSAR on the OSEK experience. The OSEK operating system was first announced in 1993, and today only a handful of the world’s carmakers have adopted OSEK on production vehicles, and only on some applications—although more carmakers now say they are seriously committed to the OSEK operating system. In the future, many plan to install OSEK on most body, chassis and powertrain ECUs. (Please see the OSEK article on page one.)

For more information on AUTOSAR, contact BMW’s Harald Heinecke by email: harald.heinecke@bmw.de or by telephone: 49-89-382-42881. A fter September 24 more detailed information can be found at www.autosar.org.◆

This helpful 324-page report was written by SA E Fellow, Randy Frank, and by John West, a noted British automotive electrical systems expert. The price is $2,995. For more information, contact Gerald Giordano, Intertech Corp., Portland, Maine; telephone 1-207-781-9603 or email gggiordano@intertechusa.com.◆

Average Power Demands of Loads as Percent of Total Load

- **Motors, 36%**
- **Lamps, 13%**
- **Solenoids, 11%**
- **Electronics, 4%**
- **Heaters, 27%**
- **Other, 9%**

Problem caused by indiscriminate additions of loads to the vehicle, many have started to question the reality of the transition to 42 volts.

The report also looks at power distribution control:

- **Power distribution control has been implemented by automakers in the form of energy/power management to improve battery charge/balance and provide load shedding under critical conditions in some vehicles. With power distribution control, non-essential loads can be turned off during maximum or excessive power conditions to avoid improper operation of critical systems such as electrical power steering or the anti-lock brake system.**

- **Methods of limiting the power and energy demands of future vehicles are discussed in detail.**