Driver Distraction Issue Threatens Telematics Market

A worried NHTSA official, speaking anonymously about cognitive distraction, was emphatic: “Tell all the people that read your newsletter that this could be the big cloud on their horizon. They shouldn’t minimize it. They should pay lots and lots of attention to the safety aspects of new telematics features.” That National Highway Traffic Safety Administration official did not want to be quoted by name, but the deputy administrator of NHTSA, Rosalyn Millman, went on record last July with her concerns: “Drivers should not talk on the phone or use electronics devices while their vehicles are in motion. ... Hands-free devices will not solve the distraction problem.”

While those comments from NHTSA will not slow down the potential multi-billion-dollar U.S. telematics industry, they should give pause to the telematics and the automotive industries alike. Some in the telematics industry will voluntarily agree to restrictions on using telematics devices while driving, probably in the hope of keeping governments from imposing more stringent mandates. Verizon, the largest cellular phone provider in the United States, broke ranks with other wireless companies and supported legislation in Illinois that would forbid the use of hand-held cellular phones while driving. Verizon instead favors hands-free devices, according to the Wall Street Journal. Nevertheless, as Ms. Millman suggests, NHTSA is considering evidence that hands-free phones are just as dangerous as hand-held phones.

Other countries are not waiting to issue wireless technology mandates. A according to a publication by NCSL (National Conference of State Legislatures), “Cell

Carmakers Unable to Deliver Full Potential of Auto Electronics

The theme for Convergence 2000, “Automotive Electronics, Delivering Technology’s Promise” inspired the following article.

While electronics has gone a long way toward making vehicles safer, more environmentally friendly, more comfortable and fun to drive, carmakers have not yet come close to realizing electronics’ full potential in the vehicle. The gap between the promise of automotive electronics and its actual application must be closed by the carmakers themselves.

Suppliers are in a position to do only so much. Optimizing electrical and electronics applications involves the architecture of the entire vehicle, by which we mean real top-down engineering, where the electrical and electronics systems are among the first things considered, not the last. The importance of the carmaker is evidenced by electrical-distribution system maker Yazaki, which makes wiring harnesses and connectors for numerous carmakers whose vehicles have varying degrees of electrical and electronics reliability—the same supplier, but very different results.

Electrical engineers who have worked for carmakers say there are three major problems limiting electronics development: (1) Top management doesn’t really understand electronics and its promise; (2) Therefore, carmaker organizations and boards are not set up to implement electronics in ways that will allow fundamental and beneficial changes in vehicle design; and (3) Here there are not enough electrical engineers at carmakers to get the job done. Simply put, carmakers are not providing the resources and support to bring about the full potential of electronics. One top electrical engineer believes it will be five to ten years before carmakers realize how important electronics is to the vehicle and place electrical engineers on their management boards.

Turn to Delivering, page 8

The Promise of Auto Electronics: Unrealized Potential

- Worldwide, one million people are killed each year in vehicle crashes. Electronics devices that address lane-change crashes, rear-end crashes, roadway-departure crashes and drowsy-driver-related crashes would save hundreds of thousands of lives each year. Obstacle detection systems that help avoid crashes even in fog and heavy snow are an example.

- The transition to 42-volt power supplies will lead to better fuel economy and lower emissions; it will provide sufficient power for numerous new electronics features.

- Better powertrain efficiencies: Electronics could control all functions currently run by belt-driven motors.

- With the electrification and integration of all vehicle control systems, not only would costs be reduced, but controls throughout the vehicle would be optimized: engine and transmission controls, electric steering, electric braking and electric suspension. Once electromechanical valve timing is deployed, around 2005, electronics will heavily factor into the control of every aspect of the engine—spark, air intake, fuel injection and exhaust—for the ultimate in performance and energy efficiency while minimizing emissions.

- If the auto electronics industry were better organized around standards—giving suppliers a crack at marketing the same product to all carmakers—more suppliers would be interested in serving the industry. The result: appealing, up-to-date electronics features brought to market much faster at surprisingly affordable prices, comparable to consumer electronics today. Infotainment systems that keep drivers informed and productive while driving safely and motorists entertained are but one example.

- Low-speed multiplexing will improve reliability and flexibility as it cuts down on wiring.

- Better price-earnings multiples for automotive stocks
More Research Needed

The industry knows there are a lot of drivers out there making calls. There were 103 million wireless subscribers as of October 1, 2000, and 70% of wireless calls are made from vehicles, according to General Motors. A NHTSA survey found 44% of drivers carry phones with them in the vehicle, 7% have access to email and 3% can receive faxes.

While the annual growth rate of motor-vehicle deaths in the United States has declined very slightly, minus .6%, during that period. But in Japan, after hand-held cell phone restrictions were imposed November 1, 1999, as part of an amendment to the Road Traffic Act, the number of accidents and fatalities associated with cell phones declined dramatically, according to consultant Norio Komoda. (Please see tables on page 3.)

There is also evidence that hands-free devices do not add as much to safety as one might assume. In 1997, a study published in the New England Journal of Medicine found that hands-free units offered no safety advantage over hand-held units. In another study on hands-free devices, even the driver listening to email being read was found to be mentally distracting enough to cause an accident.

A top NHTSA psychologist responsible for researching driver distraction told us: “We really don’t know the safety consequences of the various in-vehicle architectures. Without more data, we can’t do the cost-benefit analysis that’s needed.” NHTSA, part of the U.S. Department of Transportation, will spend about $2 million researching the topic; preliminary results could be ready by Spring 2001.

Restrictions Would Take 3 to 4 Years

Even with reliable data, given how the legal process generally unfolds in such cases, the federal government probably would not issue mandates for at least three or four years. To date, public protest against cell phones is focused mainly at the state and local level, but with enough pressure, it will move to the federal level. Matt Sundeen, a transportation policy specialist for NCSL, has looked at cell phone legislation. “Since 1995, 37 states have considered bills, and on top of that there are upwards of 300 local jurisdictions considering measures on cell phones and driving. … Any time now, you will see a state pass something and that will be the beginning of the process. You are also starting to see the federal government take public comment on the issue, an important step in the process.”

Just when and to what degree NHTSA and governments get restrictive depends continued on following page

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**1999 Worldwide Automotive Semiconductor Market by Supplier**

<table>
<thead>
<tr>
<th>Supplier</th>
<th>1999 Total Worldwide Market: $10.2 Billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motorola SPS</td>
<td>14.6%</td>
</tr>
<tr>
<td>STM</td>
<td>6.7%</td>
</tr>
<tr>
<td>NEC</td>
<td>6.6%</td>
</tr>
<tr>
<td>Intel</td>
<td>3.2%</td>
</tr>
<tr>
<td>Hitachi</td>
<td>4.2%</td>
</tr>
<tr>
<td>Toshiba</td>
<td>6.5%</td>
</tr>
<tr>
<td>Infineon</td>
<td>6.0%</td>
</tr>
<tr>
<td>Philips</td>
<td>5.4%</td>
</tr>
<tr>
<td>Bosch</td>
<td>4.3%</td>
</tr>
<tr>
<td>Others</td>
<td>37.9%</td>
</tr>
</tbody>
</table>


**Convenience Motors Driving Growth in Automotive Motors**

<table>
<thead>
<tr>
<th>Total Motors Per Vehicle</th>
<th>133</th>
</tr>
</thead>
<tbody>
<tr>
<td>Convenience</td>
<td>25</td>
</tr>
<tr>
<td>Safety/Advanced</td>
<td>27</td>
</tr>
<tr>
<td>Basic</td>
<td>47</td>
</tr>
</tbody>
</table>

**The Hansen Report on Automotive Electronics**

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Senior Editor Heather Parker
Managing Editor/ Brienne Wolfe
Circulation Manager

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Distracted... Continued from page 2

Why are U.S. Fatalities Down and Cell Phone Use Up?

Motor-Vehicle Deaths in the U.S.
1995 to 1999 Annual Growth: -.6%

<table>
<thead>
<tr>
<th>Year</th>
<th>Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>41,817</td>
</tr>
<tr>
<td>1996</td>
<td>42,013</td>
</tr>
<tr>
<td>1997</td>
<td>42,065</td>
</tr>
<tr>
<td>1998</td>
<td>41,471</td>
</tr>
<tr>
<td>1999</td>
<td>40,800</td>
</tr>
</tbody>
</table>

Data: National Safety Council

U.S. Wireless Subscribers in Millions
1995 to 1999 Annual Growth: 26.3%

<table>
<thead>
<tr>
<th>Year</th>
<th>Subscribers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>40,800</td>
</tr>
<tr>
<td>1996</td>
<td>55.3</td>
</tr>
<tr>
<td>1997</td>
<td>38.2</td>
</tr>
<tr>
<td>1998</td>
<td>27.0</td>
</tr>
<tr>
<td>1999</td>
<td>19.2</td>
</tr>
<tr>
<td>2000</td>
<td>12.0</td>
</tr>
</tbody>
</table>

Data: CTIA (As of 10/01/00)

Why Did Accidents and Fatalities in Japan Go Down Dramatically with Restrictions on Hand-Held Cell Phones?

<table>
<thead>
<tr>
<th>Prior to Restriction</th>
<th>After Restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accidents with Injuries</td>
<td>2297</td>
</tr>
<tr>
<td>Fatalities</td>
<td>25</td>
</tr>
</tbody>
</table>

Traffic Accidents Related to Cell Phones After Restriction

<table>
<thead>
<tr>
<th>Year</th>
<th>Injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>41,471</td>
</tr>
</tbody>
</table>

Data: The National Police Agency, Japan, provided by Norio Komada Consulting Services on Intelligent Transportation Systems, Information Technology and Automotive Control Systems, Nagoya, Japan

What Should Be Done

The following are some suggestions which could help alleviate concerns about driver distraction.

- Suppliers of new telematics products should support their product offerings with "human-factors" expertise that authoritatively addresses safety implications.
- Carmakers should take control of all telematics products that affect safety and offer an integrated car-centric approach that delivers communications and information to the driver only when he can safely handle the distraction. Since portable products with small screens and difficult ergonomics are theoretically not as safe to use while driving, carmakers should offer safer on-board systems or components that complement portable products.
- If the automotive industry could agree to standards like those being developed by A M I C (A utomotive M ultimedia C ollaboration), carmakers will have more control of the driver interface to telematics and communications equipment.
- The automotive industry needs to develop standards for speech, as well as visual and manual interfaces to the driver.
- Research is needed that analyzes the causal effects on safety, both positive and negative, of various telematics products and services to compare telematics distractions with other distractions, like reading a paper map or eating a Big M ac or referring to a spay between kids in the back seat.
- After such research is completed, the telematics industry should conduct educational campaigns to teach drivers how to safely use their products and services. Had carmakers done that with A BS, drivers in emergency situations would have known not to pump the brakes, but rather to stand hard on them. If the public had been educated, A BS-equipped vehicles would have had a better safety record than vehicles without A BS—rather than the other way around.

W hat's Been Done So Far

The first of several research reports that indicated an association between mental distractions and the risk of crashes was published in February 1997 by the New England Journal of Medicine. It concluded that the risk of collision when using a cell phone was four times higher than the risk when a cell phone was not being used, and that hands-free units offered no safety advantage over hand-held units. Yet the 1997 study's authors cautioned against using their conclusions to restrict the use of cellular phones, since that would also reduce the safety benefits. Witness the thousands of life-saving cell phone calls that are made each year from vehicles to emergency 911 dispatchers.

Given the potential for injury and loss of life caused by distractions—by some accounts, 25% of all accidents, albeit not by cell phones alone—one would think that by now the telematics and automotive industries in the United States would have done more to respond. If governments issue mandates, results can be both positive (fewer accidents), and negative (industry growth would slow and drivers would find themselves with fewer options). Here's what the industry has done so far:

ITS America last May set up the Liability Task Force consisting of 27 members, most from government, academia, consulting companies and trade associations. There is one representative from Chrysler, who is an attorney, and suppliers Navigation Technologies and Panasonic have one representative each. The task force was to have its first meeting by the end of September 2000, and if it commissions a study, results will not be released for at least a year.

C A M P (C rash A voidance M etrics Partnership) was set up in 1995 by F ord and G M. C A M P has been looking at how drivers respond to A C C systems, and it is now trying to put together a three-year project with Toyota and N issan to study driver workload issues. A budget for the project has not yet been established.

A lliance of A utomobile M anufacturers plans to look at its members' practices regarding telematics design and come up with voluntary guidelines, after which a review by experts in the areas of telematics, academia and safety will determine if more research is needed. A A M members are B M W Group, Daimler-Chrysler, Fiat, Ford, General M otors, Isuzu, M azda, M isubishi M otors, N issan, Porsche, Toyota, Volkswagen and Volvo.
The Company Profile...

**Johnson Controls Inc.**

**Corporate Headquarters:** 5757 N. Green Bay Avenue, P.O. Box 591, Milwaukee, WI 53201 USA; telephone: 414-524-1200; www.johnsoncontrols.com

**1999 Sales:** $16,139.4 million

**Operating Margin:** 5.3%

**R&D:** 2.1%

**Top customers:** DaimlerChrysler, with 16% of total JCI sales; Ford, 13%; GM, 13%

**Employees:** 95,000 (FY-end 1999), of whom 68,300 were hourly and 26,700 were salaried

Note: Johnson Controls' 1999 fiscal year ended September 30, 1999.

**Background**

Johnson Controls began as a manufacturer of controls for building environments in 1885. The company began to diversify into the automotive industry through acquisitions and internal means after 1978. Today, automotive products account for 75% of sales.

The Automotive Systems Group assembles and/or manufactures batteries, seating and interior systems in 275 locations worldwide and delivers interior systems for approximately 23 million MY 2000 vehicles. The company has more than 1.5 million square feet in four Automotive Systems Group technology centers in the United States, Germany and Japan. At the technical centers, 5,000 employees are involved in engineering, design, R&D, prototyping, product testing, sales, marketing and administration.

A utomotive sales for the first nine months of fiscal 2000 were $9.0 billion, up 9% over the first nine months of 1999. Despite softening vehicle production in Europe and the United States, strong demand for batteries, seating and interior systems—especially in North America—accounted for 75% of the increase. Johnson Controls is involved more than ever in electronics as electrical and electronics content in seat and interior systems grows, particularly as carmakers slowly turn over development, parts procurement and modular assemblies to specialists such as JCI.

Over the last three years, approximately 55% of automotive sales went to DaimlerChrysler, Ford or GM. Of this business, 68% was domestic and 25% was European. JCI sees further opportunities in Europe, where carmakers still build 25% of seats in-house. JCI Automotive Systems Group has been largely excluded from the Japanese domestic market, focusing almost entirely on North American and Western European customers.

Far more than other OEM suppliers, JCI has shown a predilection for branding its products. Probably the best known of its current generation electronics product names is HomeLink Universal Transceiver, a built-in remote device that opens garage doors and controls home security systems. Other JCI brand names include PathPoint (digital compass), AutoVision (rear-seat entertainment system), TravelNote (electronic memo recorder) and PSI (tire pressure monitor).

**Major Acquisitions**

In July 2000, JCI purchased Nissan Group seat supplier, Ikeda Bussan Co. Ltd. (Tokyo Japan), seen as an entrée into Nissan in Japan. The price for Ikeda Bussan was ¥10.7 billion ($102 million) in cash, and the assumption of ¥9.1 billion ($86 million) in debt. Ikeda’s 1999 sales were ¥130 billion ($1.2 billion). JCI and Ikeda have worked together since 1986 and today operate two joint ventures that supply seats to Nissan, one in the States...
and the other in the United Kingdom. Ikeda has about 4,200 employees, one-half of whom work outside of Japan. JCI would like to sell its complete product line to Nissan and expand to other Japanese carmakers. Development of the Japanese market is likely to take a decade or more.

Purchased for about $1.3 billion in 1996, Prince Holding Corporation (Holland, Michigan) was a supplier of automotive interior components and systems, including overhead systems/door consoles, door panels, floor consoles, visors, armrests and some niche electronics. Before the purchase, JCI had little electronics capability. At the time of the purchase, Prince had 4,470 employees and about $850 million in sales. The electronics Prince marketed included Home-Link Universal Transceivers, electronic compasses and trip computers, now JCI's top selling electronics products.

In July 1998, JCI purchased Becker Group, (Sterling Heights, Michigan) a major supplier of interior systems, for approximately $548 million, plus the assumption of $372 million in debt. Johnson Controls sold those Becker Group businesses it did not consider core; their sale brought in about $212 million.

**The Aim: Market Leadership in Auto Interior Electronics**

Recently, JCI reorganized some of its major product areas into worldwide business units: Cockpit Systems, Door-Panel Systems, Overhead Systems, Seat Systems, Integrated Interiors and Electronics Integration. While each new BU has its own P&L for sales and expenses, including EBIT (earnings before income taxes), these P&Ls are secondary to the company's customer business unit P&Ls. In North America, JCI has customer business units for Ford, GM, DaimlerChrysler, Toyota and Honda. Jim Geschke is JCI vice president and general manager of electronics integration, responsible for engineering, sales, marketing, manufacturing, quality and purchasing of all electronics that sell separately or are integrated with other JCI products. An electrical engineer, Mr. Geschke joined JCI from Prince Corporation when Prince was acquired.

**Distinctions Claimed by JCI**

- 53 consecutive years of sales increases
- Nine consecutive years of increased income
- 24 consecutive years of increased dividends
- Industry Week Magazine's "World's 100 Best Managed Companies" for five consecutive years
- Supplier to the world's top 10 automakers
- Global leader in automotive seating and interiors
- Largest automotive battery supplier in North and South America
- Introduced the world's first automotive compass in 1984

"About a year ago, we [at JCI] significantly expanded our vision for electronics," Mr. Geschke told us. "Historically, our electronics had been focused on high-value niche electronics—things that the car could operate without—like the Home-Link Universal Transceiver. We were successful with that and had a good reputation in the market for bringing creative new features to OEMs. ... Increasingly, customers became comfortable with our electronics capability, and they began asking us for more. Our vision now includes everything in the interior. We aim for market leadership in automotive interior electronics. ... To execute our vision to be a leader in interior electronics, we had a number of choices: We could organically grow significantly, vertically integrate everywhere, invest hundreds of millions of dollars and hire thousands of engineers, or we could use our significant core design and development capability (150, or so, electrical engineers) and start leveraging outside partners."

**Peer Partners: Electronics Alliances**

Rather than develop electronics technology and manufacturing solely in-house, Johnson Controls has chosen to rely on strategic relationships with a number of key electronics and electrical part suppliers, known as Peer Partners. These alliances are loose arrangements that permit JCI's Peer Partners to work outside the alliance, that is, with JCI's competitors. Together, JCI and its partners will create features that integrate electronics and electrical parts into JCI's overhead systems, door panels, seats, floor systems and cockpit/instrument panels.

The company aims to leverage its strengths, while minimizing investments in new technology and manufacturing assets. According to JCI, it will not simply add a markup to its partners' efforts but will add value by applying its strengths: developing outstanding new product ideas, seamlessly integrating electronics and trim, and continuing "human-factors" engineering, which ensures a safe interface between the driver and the electronics.

While JCI has chosen to remain less vertically integrated, some of its competitors have chosen more vertical integration. For example, Delphi manufactures its own electronics (Delco Electronics) and wiring harnesses (Packard Electric). Interior- and seat-manufacturer Lear has its own in-house wiring harnesses and body controller businesses, since it acquired United Technologies Automotive last year. Relying on outside suppliers means lower fixed costs, so JCI reasons it will more easily weather economic downturns while maintaining access to new electronics technology.

In the next year or so, JCI will add more Peer Partners; JCI's partners so far include:

- **Jabil Circuit** (St. Petersburg, Florida), a longstanding partner of Johnson Controls, produces all of the electronic assemblies that JCI sells, including HomeLink. Jabil Circuit will also work more with JCI on designing electronic circuit boards.

- **Gentex** (Zeeland, Michigan) is a manufacturer of rear- and side-view electrochromic, automatic-dimming mirrors. JCI's HomeLink remote garage-door opener and JCI's electronic compass can be integrated into Gentex' automatic-dimming rearview mirrors. Gentex has an exclusive license to integrate HomeLink transceivers into its mirrors.

- **Yazaki North America** (Canton, Michigan) will work with JCI to integrate wiring into the interior assemblies. JCI offers to its customers. With headquarters in Susono, Japan, Yazaki is one of the world's top suppliers of electrical distribution systems. Yazaki and JCI have worked jointly on 42-volt architectures that include JCI interior components and battery and

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continued on following page
Johnson Controls Inc.

Yazaki wiring and power conversion electronics.

- **Tokai Rika** (Aichi, Japan), a Toyota Group supplier of switches, keys and locks and remote keyless entry systems, provides a smart switch for JCI’s i-Seating program. Tokai Rika has been working on other input devices, for example, speech recognition and a touchpad point-and-click device.

- **Microchip Technology** (Chandler, Arizona) is a manufacturer of PIC micro RISC microcontrollers, which serve 8- and 16-bit embedded control applications, and the company specializes in programmable memory, like the security code-hopping technology used in JCI’s universal garage door openers.

- **Nokia** (Helsinki, Finland) will work with JCI to integrate wireless technology into vehicle interiors. Nokia, a major global mobile-phone maker, was among the five companies who founded the Bluetooth consortium. Any product equipped with a Bluetooth transceiver can wirelessly connect to any other Bluetooth-equipped product.

- **Royal Philips Electronics** (Amsterdam, the Netherlands) supplies the flat-panel LCD monitors and video players installed in JCI’s rear-seat entertainment system, AutoVision. The company is working with JCI to integrate other consumer electronics into interiors.

- **SAGEM** (Paris, France) is a European supplier of instrumentation, electronic control units, ignitions and emission controls. JCI will work with SAGEM on cockpit electronics and instrument clusters.

**Batteries**

JCI makes original equipment batteries for Ford, Chrysler, Nissan and Toyota; replacement batteries for A utoZone, Costco, Interstate and W al-M art; plus, the company makes the Diehard line of batteries for Sears. The replacement battery market accounted for approximately 85% of battery sales in 1999. Batteries accounted for about $1 billion in sales in 1999, roughly 36 million batteries sold for about $25 each.

Since its purchase of Prince, JCI has been exploring ways to add value to batteries through electronics. While few batteries today have electronics content, manufacturers increasingly will package electronics integrally with the battery, as with the Diehard A nti-T heft battery (see below), or package electronics in a separate control unit for the battery. For instance, if future luxury vehicles come with a high-power battery for cranking and a high-energy battery to cover all other loads, electronics will be needed to keep track of the state-of-charge and state-of-health of these two batteries. Electronics will provide the same function for batteries of dual-voltage systems when carmakers add 36-volt batteries (for 42-volt systems) to today’s 14-volt systems. The transition to 42-volt systems in light vehicles will take a couple of decades to complete, starting in 2002 with feature-loaded luxury vehicles and with niche applications, like the energy-saving 42-volt integrated starter alternator. Eventually, as the demand for current grows in the typical vehicle, 36-volt batteries will be common in all vehicles.

- **New 36-Volt Batteries**: Johnson Controls will soon have two lead-acid, 36-volt battery lines, which can be applied to 42-volt applications. One is the Inspira, the other, Optima, comes from Gylling Optima Batteries A B (Danderyd, Sweden). JCI announced its acquisition of Optima for $62 million in August 2000; the purchase is expected to be completed at the end of November 2000.

Because both these batteries use spiral-wound plates that are thinner and have more surface area than conventional lead-acid batteries, both lines are capable of putting out more power for quick starts.

While still spirally wound, Optima’s plates are closer in size to the plates in conventional batteries, so Optima can provide greater energy than Inspira. Energy is needed to supply key off-loads for long periods and to supply other onboard electrical loads beyond the capability of the alternator. “Inspira batteries, available in 2.4, 4.5 and 6.5 amp-hour sizes, supply modest amounts of energy,” explained Jim Gracyalny, sales director advanced battery systems. “But Inspira can put out more power than Optima, so Inspira batteries are well suited for stop/start vehicles that must reliably crank even at –30 degrees C. Our Optima battery is a good solution for some of the initial 42-volt architectures that will use belt-driven alternators, instead of integrated starter alternators, and require less power for cranking.”

Until mid-2001, JCI is the exclusive licensee of Inspira technology from Bolder Technologies (Golden, Colorado). Optima batteries are manufactured in Aurora, Colorado.

- **Sears Diehard A nti-T heft Battery**: In January 2000, Johnson Controls began shipping to Sears retail outlets an anti-theft battery equipped with RF receiver, high-current electromechanical switch and computer chip. When leaving the vehicle, the driver presses a key fob associated with the battery; it sends a rolling code to the battery that cuts current for ignition. To start the engine, the driver must press the fob a second time. Electronics in the battery also monitor the battery’s state of health, for instance, if headlights are left on, the battery automatically turns itself off when dangerously low of sufficient charge to start the engine. Once installed in the vehicle, the battery learns how much energy it needs to start that vehicle by keeping track of the vehicle’s start profile. Sears has 24 months exclusive marketing rights to the anti-theft battery.

**Major Electronics Products**

- **HomeLink**: JCI’s biggest-selling electronic product is the HomeLink Universal Transceiver, a wireless electronics device that remotely activates gates, garage doors, home security systems and lighting. By the
Promising New Electronics Products

AutoVision: JCI's first-generation rear-seat entertainment system consists of a portable videocassette player and 6.4-inch LCD TV monitor, with headphone and video game jacks; the monitor pulls down from the headliner. M r. G.eschke told us: “Rear-seat entertainment systems are pretty hot right now. It’s a feature that anybody who has ever gone on long trips with kids can relate to,” By 2003, sales of AutoVision could potentially eclipse all other electronics products that have come before.” That’s partly because AutoVision units sell for several hundred dollars each, considerably more for each unit than JCI’s earlier electronics products.

JCI will sell over 100,000 AutoVision systems in FY 2001. A u t o V i s i o n is now available as a factory-installed option on the 2001 Ford Windstar, M ercury Villager, N issan Quest and Ford Econoline, and second-generation systems are destined for several factory-installed applications in M Y 2002. T h e M Y 2002 system will use a D V D player integrated into a 7-inch, 16x9 aspect ratio LCD display in the headliner; that will simplify wiring. By 2003 or 2004, JCI plans to have a portable version of its D V D unit.

Integrated Seats: JCI will begin shipping seats that include some controllers, motors and heaters. In M Y 2001, G M will use JCI seats that have seat-position controllers packaged under the seats. Planning more deeply embedded seat integration, Johnson Controls has introduced its i-Seating concept, which integrates controller logic into the seat’s switches and integrates controller relays into the motors. M otors can be connected to the control bus and to power by simply connecting to a motor that already is connected to the bus. M r. G. eschke explained, “T hat will let the carmaker easily add new features to seats at the time of refresh without having to throw away the wiring harness.”

Door Module Assemblies: O x ford and Johnson Controls have been working together since 1999 to develop complete door module assemblies, including the painted exterior door and interior trim integrated with motors, window and locking mechanisms, switches, wiring and speakers. O x ford’s expertise is the metal exterior, JCI’s the interior.

PSI Tire-Pressure Monitoring: A ccording to JCI and S A E, improperly inflated tires cause about 260,000 accidents in the U. S. each year. JCI’s tire-pressure monitor, called PSI, uses four or five, if the spare is monitored, low-mass pressure sensors mounted on the inner wheel rim and connected to the valve stem. T he tire’s pressure reading is sent via R F to a receiver; the system indicates loss of tire pressure with an audible signal or an alert message on a visual display. T he receiver can be a separate, dedicated receiver or JCI’s HomeLink III Universal Transceiver. Soon available to carmakers, the company will target the aftermarket, a first for a JCI electronics product. A dealer would be able to install the wheel-rim sensors, and the display has been integrated with a battery into a manually-dimmed, prismatic mirror for the aftermarket. T he company expected deployment on several M Y 2001 luxury vehicles but delayed deployment to M Y 2002.

Travelnote Phone Connection Via Bluetooth: Because JCI’s R F system (see above description) has a microphone built into the interior of the cabin, the addition of a Bluetooth transceiver chip could enable hands-free cell phone operation. S upported by hundreds of companies, Bluetooth is an emerging worldwide standard forlinking electronics devices to each other without wires. I f carmakers choose to do so, Bluetooth-enabled cell phones could also be connected to the vehicle’s display for access to the Internet. In production by 2002, JCI hopes to be first to market with Bluetooth hands-free cell phone capability.
Too Few EEs

Dr. Peter Thoma, BMW’s top electrical engineer until September 15, when somewhat frustrated, he left BMW to join German semiconductor manufacturer ELMOS, told us recently: “Electronics is exploding ... and so much [at BMW] was exciting—new powertrain controls, 42-volt systems, infotainment safety, integration of all vehicle controls, networking. ... Still it was impossible at BMW to get enough resources to do all that needed to be done.” At ELMOS, Dr. Thoma will sit on the management board, and will have responsibility for sales and engineering of automotive semiconductors.

At BMW, Dr. Thoma needed another 400 to 500 electrical engineers over the next three years but was not permitted to go out and hire them. “The reason for so few EEs is that there is a legacy of mechanical engineers, and too many are still onboard today,” explained Dr. Thoma. “At BMW you either have to convert a mechanical engineer to an electrical engineer or you have to wait for a mechanical engineer to retire.”

Heinz Leiber, who was Mercedes’ top electrical engineer until he left several years ago, sympathizes with Dr. Thoma. Not long ago, Mr. Leiber compared engineering headcounts with his peers at BMW and Volkswagen, and concluded that all three carmakers had fewer electrical engineers than you would expect considering the value of electronics in the typical auto. While at the time he checked, 15% to 20% of the vehicle comprised electrical or electronics parts, only 10% of engineers at Mercedes were electrical engineers, fewer at VW and BMW. A according to BMW’s Dr. Thoma, the percentage of the vehicle’s value that is electrical or electronics is currently 35% at BMW. It’s definitely a gap: Only 6% to 7% of the 6,000 total engineers are EEs. Those low percentages also exist in the United States. At DaimlerChrysler Auburn Hills, only about 10% of engineers are electrical engineers, says Denny Florence a top electrical engineer at Chrysler, who took early retirement last year.

Electronics Isn’t Core Technology at Carmakers Worldwide

“At the old Chrysler,” revealed Denny Florence, “electronics wasn’t considered a core function: Body was core, powertrain was core, styling was core but not electronics.” The same situation exists in Germany, according to Heinz Leiber. “None of the German carmakers see electric/electronics as a core competence. I know this because everywhere top management comes from classic mechanics, not electronics.” The situation is similar in Germany and the United States, according to the top electronics engineer we spoke with, the result is a lack of understanding. There’s no hope of [them] ever understanding.

A t ELMOS, Dr. Thoma will sit on the management board, and will have responsibility for sales and engineering of automotive semiconductors. The Hansen Report on Automotive Electronics, Rye NH USA www.hansenreport.com

Important Study on 42-Volt Power

By 2009, 1.5 million vehicles will have 42-volt alternators installed—accounting for only about 2% of the world’s new vehicles. A new study by Paul H. Hansen, 42-Volt Power: A New Opportunity to Redefine the Vehicle, deals with two trends that are driving the industry to a higher voltage: demand for more electrical power aboard the vehicle and the need for more fuel-efficient vehicles that pollute less. Jim Gracyalny, sales director, advanced battery systems, for Johnson Controls Inc., told us: “I have avidly read your study ... and passed it along to our management. They were impressed with the conciseness and broad range of things you hit on.”

In 2002, carmakers worldwide will start limited production of vehicles with integrated starter alternators. These early ISAs will supply 3 to 6 kilowatts at peak power, plenty for increased electrical loads. ISAs will come to play a major role in energy conservation and a cleaner environment by facilitating these new applications.

◆ Stop-start saves fuel as the engine is turned off at stops and the ISA instantly restarts the vehicle when the gas pedal is depressed.

◆ Boost-assist saves fuel because carmakers can use smaller internal-combustion engines run more often at open throttle. The ISA’s that supply 6 kW and higher can provide acceleration boost from a stopped position.

◆ Low-emission starting: ISA’s will help reduce pollution by keeping the engine from stalling, while retarding ignition timing. That helps to hotter exhaust gases, which quickly heat the catalytic converter to light-off temperature, and that in turn reduces cold-start emissions.

◆ Regenerative braking: Several years will pass before affordable 36-volt batteries are capable of capturing regenerative braking energy.

To order this study for $397, or for more information, please call 603-431-5859 or visit www.hansenreport.com.

Delivering...

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