boostermagazine

APRIL 2006

COMMERCIAL VEHICLE BOOSTING

Pushing The Technology Envelope

Honeywell

On Track

- With emissions standards tightening and converging, Honeywell is leveraging its commercial vehicle experience in the U.S. to meet the challenges OEMs face in Europe and Asia.

- Coming up with boosting solutions beyond the current horizon… that's the challenge for Honeywell's Innovations and New Concepts Group. This innovative spirit is symptomatic of the company's commitment to engineering support that's delivering competitive advantage to its worldwide auto customers.

- Computer simulation is helping to map the intricacies of bearing system dynamics... and dramatically cutting development times as a result.

- Turbodiesel take-up in the U.S. looks set to rise dramatically over the next 5–10 years as OEMs catch the public mood for passenger cars that are more environmentally-friendly, more fuel-efficient and still fun-to-drive.

- High octane hot rods are revving up… but for drag racing teams with ambitions of glory, Honeywell's Garrett® turbo is definitely the must-have accessory of the season.

- Audi has gone 'diesel' with its new R10 racecar for 2006. The new Garrett®-boosted Audi R10 TDI achieved the first ever victory of a turbodiesel powered sportscar in Sebring (U.S.)… now attention is focusing on Le Mans in June.

Imprint: Honeywell Booster Magazine
Chief editor: Michelle Dumétier, + 33 (0)1 55 46 22 21
michelle.dumetier@honeywell.com
Assistant editor: Chen Yao
Copywriting: Phil Colley, Harvest PR, UK
Photos: Alain Ernoult, Audi, Bosch, Daimler Chrysler, Ford, Getty Images, Honeywell, Jay Canter, José Luis Salcido Montijo, Kenworth, Kurt Dahlstrom, Peterbilt, Peter Figen, Scania, Tony Perez, Volkswagen
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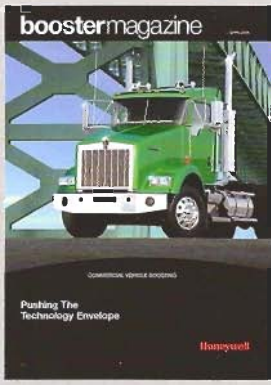
Listening and Learning



COVER:
Kenworth T800 truck boosted by Honeywell's Garrett® turbocharger

Dear Readers,

It gives me great pleasure to welcome you to this latest issue of Booster magazine, which focuses on Honeywell's technology capabilities and the support we are providing to our commercial vehicle (CV) customers.

Against a backdrop of ever more stringent emissions regulations worldwide, our goal is to provide innovative boosting solutions that enable our customers to meet their goals. Examples can be found in a number of stories in this magazine – from our broad portfolio of CV technologies like AVNT™ and Series Turbo to our use of sophisticated computer simulation to shave off important product development time.

As I spend time with our customers throughout the world, it becomes increasingly clear that such advances cannot be achieved in isolation. Our partnerships are the foundations upon which we build our business and through which we share our successes.

Together we work toward common goals... and increasingly these objectives cross continents. As emissions standards continue to tighten and to converge in every region, we seek to provide both the technologies and the capabilities to meet these global challenges.

These are exciting times for Honeywell, and our commitment to success on behalf of our customers is demonstrated in every activity we pursue, from commercial vehicles and passenger cars to hot rods and rally cars. Whether it's for the race track, open road or city streets, we are determined to provide turbo technologies that deliver performance, durability and reliability.

I hope that you enjoy reading this latest edition of our Booster magazine. Thank you for your continued support.

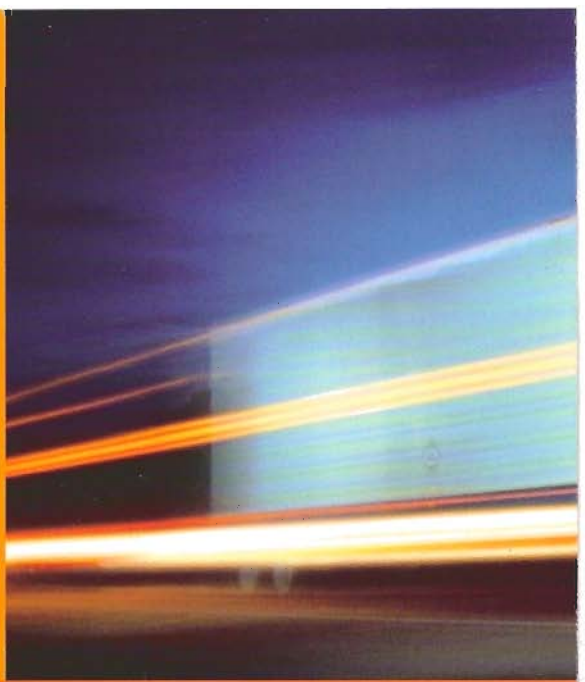
Adriane M. Brown

Adriane Brown
President and CEO
Honeywell Transportation Systems

Going Glo

Shauna Finnie,
Director of Commercial Vehicle Product Line

Honeywell Turbo Technologies is embarking on a major expansion of its commercial vehicle program, leveraging expertise gained in the U.S. across Europe and Asia. Shauna Finnie, Director of Commercial Vehicle Product Line, outlines the company's plans.



What are the major trends in the commercial vehicle industry and how is Honeywell responding?

There are some significant changes underway in the commercial vehicle industry. More than ever, the CV business is becoming global in nature, notably as a result of the consolidation taking place among CV engine and chassis OEMs. This worldwide perspective opens up significant opportunities both for OEMs and for companies such as Honeywell, who can leverage technological solutions through a worldwide capability.

How would you assess the key market drivers for the commercial vehicle business?

Although Europe, the U.S. and Japan require varying technologies to meet their respective emissions targets, the standards for all three regions are in fact converging to near zero NO_x and zero particulates by around 2010. It is our role to help OEMs meet these stringent standards by helping them to develop next generation engines that comply with the incoming legislation. In addition, we are seeing China continue to grow, driven by the rapid expansion of its road transportation infrastructure as a result of its growing economy. In India, strong export market and the increasingly sophisticated customer base are fueling future growth and technology upgrades.

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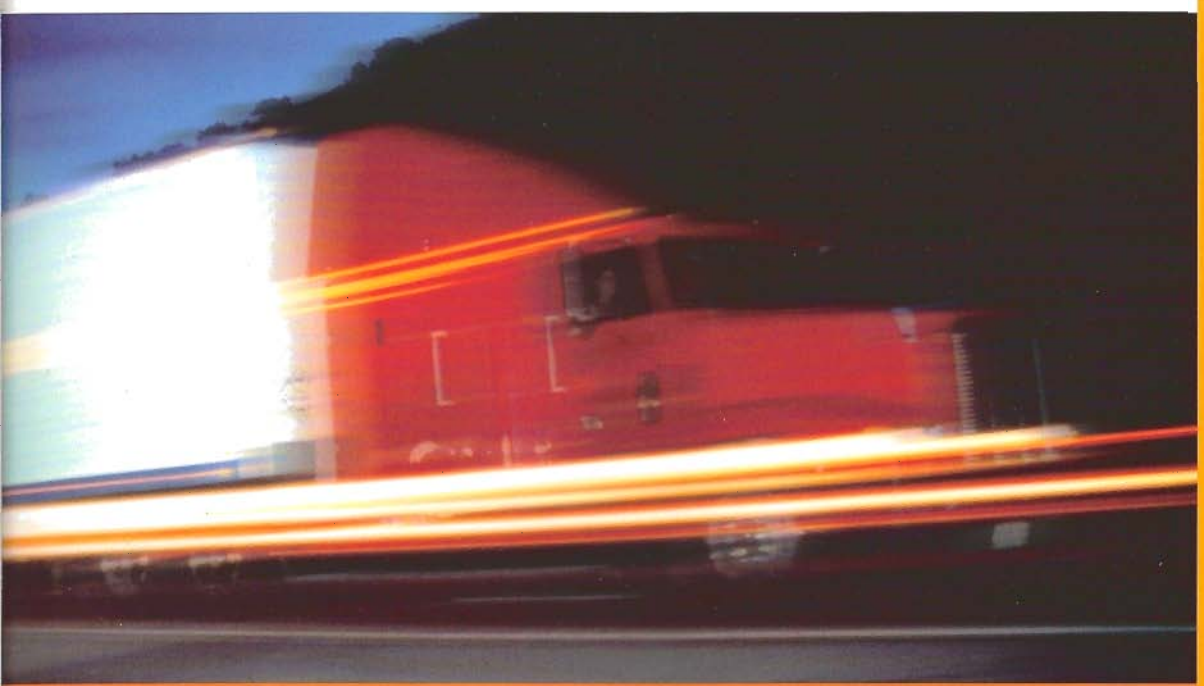


What are Honeywell's plans for developing commercial vehicle turbo technologies?

There are some very exciting developments underway. For example in Japan, where emissions are controlled within the airstream with minimum after-treatments, we are working on very advanced turbo solutions with OEMs. We continue to lead the way in variable nozzle technology, but we are also working on some significant innovations on the compressor side. Add to this our advances in sensors and controls and in materials technology, including the use of ball bearings, and it's clear that we have a very strong technology portfolio for different applications on a global basis.

How does Honeywell's global strength add value to regional customers?

Our global infrastructure enables us to align ourselves closely with the requirements of customers in every region and add value to their businesses, particularly through the strength of our application engineering teams and the flexibility that comes from our worldwide manufacturing footprint.

Worldwide Truck Production at a Glance

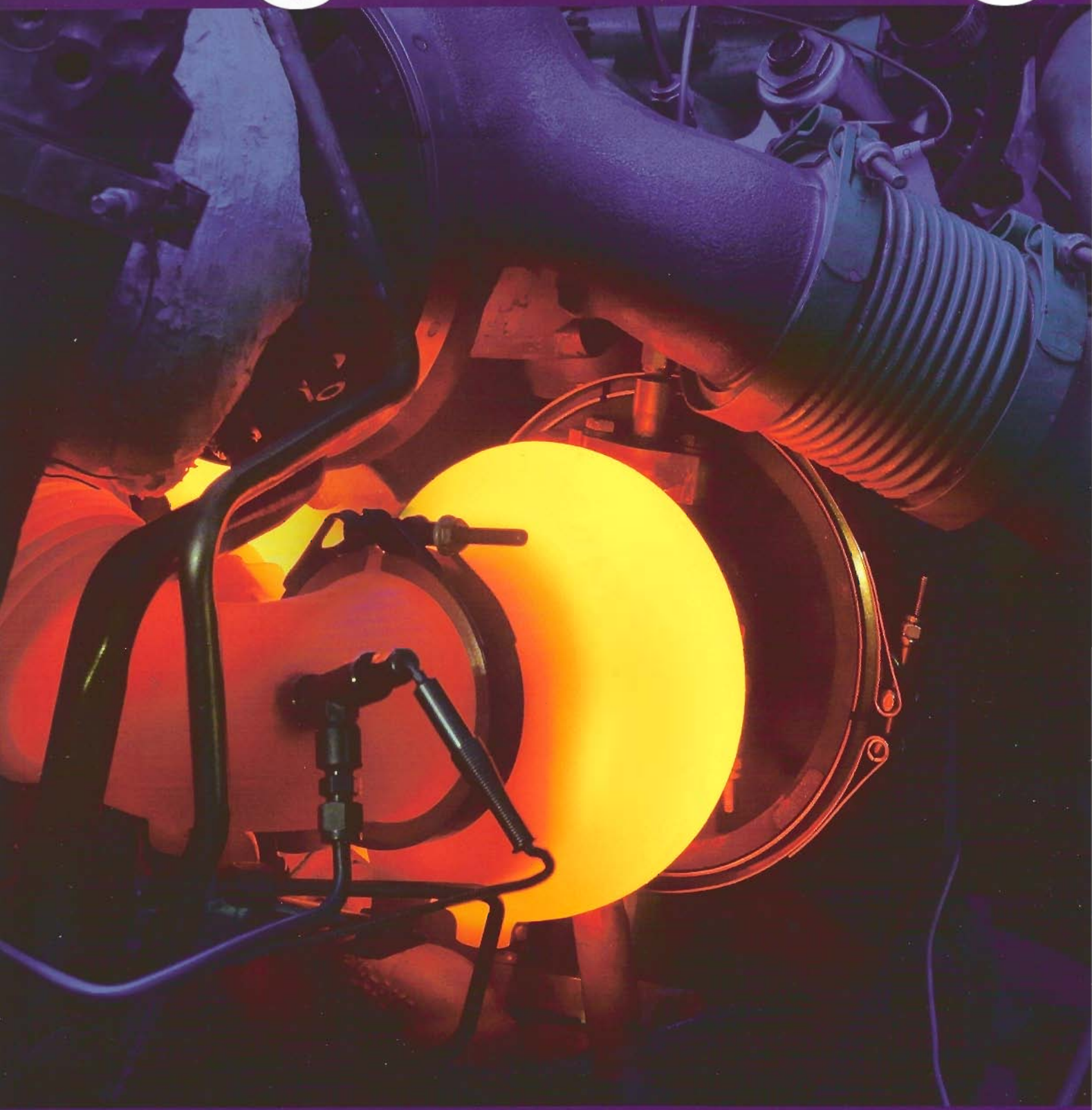
In the U.S. last year, close to 700,000 trucks were manufactured, representing a 20 percent increase over 2004. While class 8 trucks, accounting for more than one third of total truck production, grew by 24 percent year over year, it is class 3 light trucks that witnessed the biggest increase – by 56 percent over 2004.

In Europe, the total production volume of 686,000 in 2005 closely tracked the U.S. level. Heavy trucks over 15 tons clearly dominated, representing 68 percent of total production, followed by medium trucks (6–15 tons) at 21 percent.

In Asia, the most populous continent, over two million trucks were produced in 2005. Light trucks (below 6 tons) were much favored, representing more than half of the total truck production, while medium trucks had picked up in production, growing by 3 percent over 2004.

Sources:
ACT Publications and Global Insight

Engineering



the Future

Honeywell Turbo Technologies' engineering services span the globe. Wherever customers are located, the aim is to provide a seamless pathway that begins with turbo concept and product development and leads to program application and launch.

This investment is creating the ability to compress time through process integration and responsive customer interaction... helping OEMs to reduce lead times to meet ever-tightening emissions standards. Below is a snapshot of the five core engineering groups who support Honeywell's worldwide commercial vehicle business.

Innovation and New Concepts Group

It's described as 'horizon-free' thinking... and it's a vital skill for a key group of Honeywell engineers who focus on challenging the conventional and redefining the future through technology.

The Innovation and New Concepts Group was set up in 2003 with a mission to develop viable concepts that anticipate the future engine boosting requirements of OEMs.

A team of eight forward-thinking engineers focuses on creating one invention every month – on formulating new concepts and systems innovations that will help customers meet their emissions requirements.

Small incremental gains are not for this group... they deal in fundamental change, developing new architecture that will expand the operating envelope of the turbocharger. It's an approach that has already spawned new technologies benefiting from enhanced compressor wheel functionality.

"In a future that could be characterized by many new types of combustion – homogeneous charge compression ignition, partially pre-mixed charge compression, low temperature combustion – we need to find new solutions for air systems' requirements, as well as helping to manage after-treatment technologies."

Steve Arnold

Director, Innovation and New Concepts

Product Engineering

When the heat is on to deliver solutions for commercial vehicle emissions control... Honeywell Turbo's CV Product Engineering is always up for the challenge.

Under the direction of Wayne Waszkiewicz, Director of Product Engineering for Commercial Vehicles, the group turns validated design concepts into proven, scaleable products that are robust, durable and reliable. The engineers at Product Engineering work to deliver high performance, cost-effective technologies that can create competitive advantage in line with the specific market conditions faced by customers.

It is a task that is becoming increasingly complex, not just as a result of pushing the parameters of turbo performance through advanced materials, design innovations and electronic controls and sensors but because of the increased requirements for engine management systems integration.

"Our customers face significant emissions reduction challenges on a constant basis. We focus 100 percent on helping them meet their program goals, delivering increasingly complex turbo technologies against the background of pressure for shorter lead-times."

Wayne Waszkiewicz

Director, Product Engineering for Commercial Vehicles

Engineering the Future

People Make

Core Technologies

In many ways, the Honeywell Core Technologies group creates the heartbeat of the company's turbochargers. Specialist engineers around the world leverage expertise in aerodynamics, rotordynamics, materials engineering and mechanical analysis to help develop advanced turbocharging systems for both passenger cars and commercial vehicles. Sophisticated predictive modeling using advanced finite element analysis techniques and the best software solutions all serve to support a 'right the first time' approach to program delivery.

Core Technologies' engineers not only give front line support to colleagues in Product Engineering and Application Engineering, they also engage actively in customer research programs that produce advanced modeling and simulation capability, for example for predicting shaft motion stability in a turbo spinning up to 300,000 rpm.

"At Core Technologies, we strive to excel through concentrating on those fields common across our products and customer applications. For example, in bearing systems, our state-of-the-art simulation capability has enabled us to reduce product development cycle times by up to 70 percent – which is a tremendous benefit for customers."

Dennis Thoren

Director, Core Technologies

Engineering Services

Engineering Services provides global support to all the other engineering functions through its design office expertise, its prototype shops, laboratories and post-test analysis services.

With regional centers in France, China and the U.S., the group's hundreds of engineers and technicians run the gas stands and engine test cells that provide vital information on turbo performance, bearing qualification and shaft motion.

They also produce around 2,500 commercial vehicle turbo prototypes each year – in addition to the many thousands for passenger cars – and add real value to customers through detailed post-test analysis of turbo performance.

"The global nature of our support for customers means that we not only deliver real value-adding information, we can also maximize synergies with other Honeywell engineering groups to align customer requirements with our activities and thereby reduce cycle times."

Heiman Jan Perdijk

Director, Engineering Services

the Difference

Application Engineering

Speed of response, customer focus and attention to detail are the hallmarks of Honeywell's worldwide team of application engineers, who are fully integrated into customer teams, making them the primary conduit through which interactive communication with customers takes place.

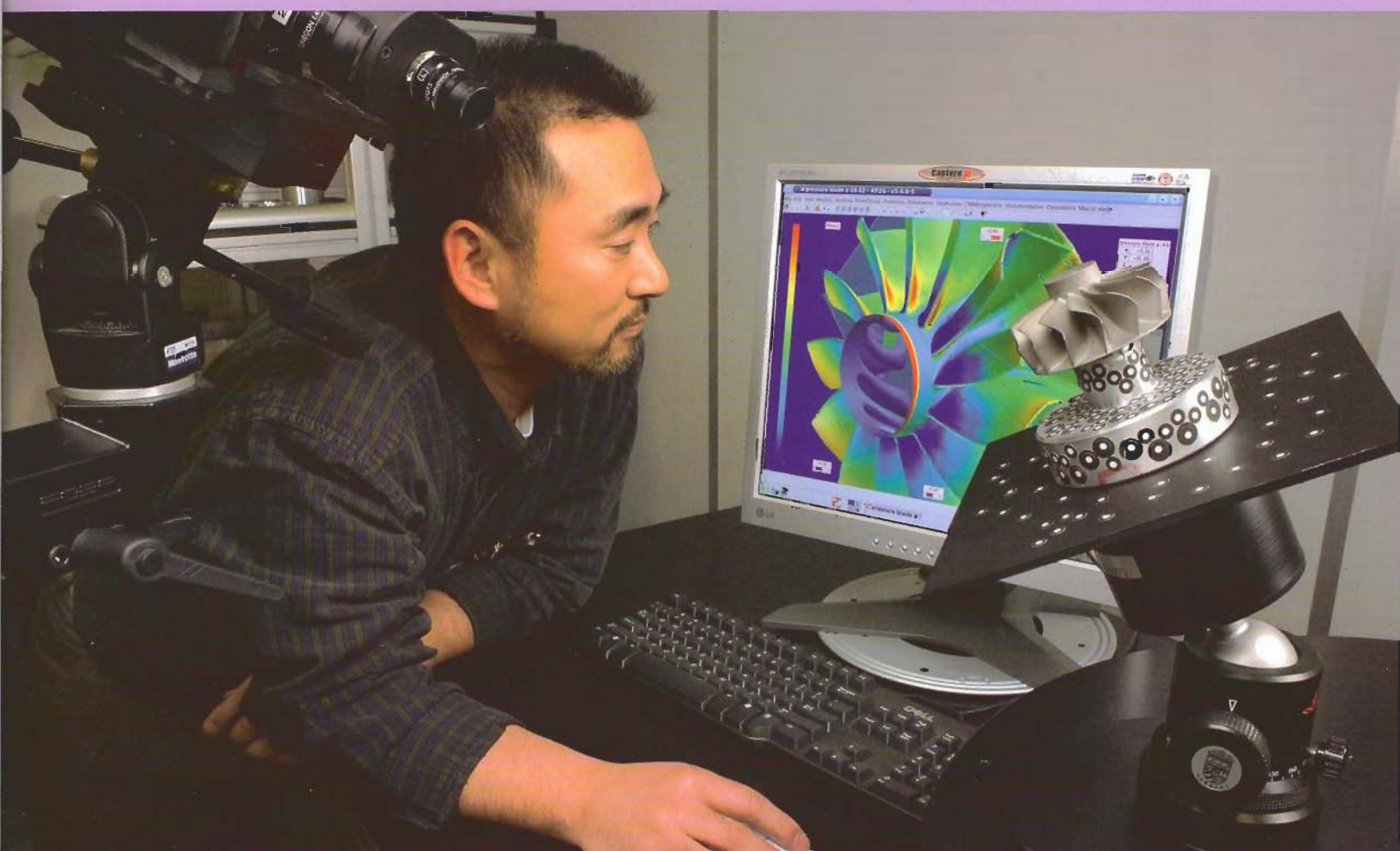
Honeywell offers customers a very strong technology roadmap, but technology is only one leg of the stool – application engineers at Honeywell also have the entire Honeywell engineering resource at their disposal and a track record of building strong partnerships with people who live and breathe engines and turbochargers.

Indeed, many of Honeywell's strong relationships with commercial vehicle customers in the U.S. look set to transfer to Europe as the company begins to ramp up commercial vehicle activity.

"The Honeywell expertise and experience in commercial vehicle are very strong. What really makes the difference is our ability to leverage global resources in meeting the regional requirements of our customers."

Ken Watkin

Director of Application Engineering, Europe



PARTNERSHIP PROGRAMS BOOST PERFORMANCE
NEW TECHNOLOGIES FOR NEW CHALLENGES

Accelerating Tec

nology

Tougher emissions regulations, greater fuel efficiency requirements and better performance on the road... the demands facing commercial vehicle manufacturers have never been greater. Honeywell is helping OEMs to meet this challenge through partnership programs that not only span the globe but also reflect regional market conditions: support for customers rooted in value-adding service and leading-edge technology. In this issue of Booster, we are pleased to present Honeywell's commercial vehicle technology portfolio.

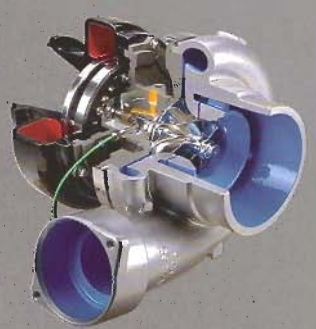
Variable Geometry Turbine Technologies

AVNT™ Turbo

It started as a concept in Honeywell's Innovation Group, but today the Garrett® AVNT™ turbocharger is proving its worth in more than one million commercial vehicle applications. This variable geometry turbocharger features a unique vane design that delivers benchmark efficiency throughout the flow range. Integrated electronically-controlled actuation and position feedback eliminate the need for additional actuation and control devices. At nominal to high engine speeds, Honeywell's Garrett® AVNT™ delivers a reduced engine outlet pressure, resulting in higher power. At low engine speeds, it provides quicker acceleration, allows more torque to be generated and reduces fuel consumption and emissions while improving braking power. The AVNT™ is ideally suited to light trucks with power output in the 200 hp–400 hp range.

Double Axle VNT™ Turbo

Favored among medium and heavy-duty truck and bus applications, Honeywell's Garrett® Double Axle VNT™ uses 12–19 turbine nozzle vanes supported by twin axles. Double Axle VNT™ provides quicker transient response, promotes greatly enhanced engine braking, and is a key component in driving Exhaust Gas Recirculation. The durable nozzle assembly is capable of handling turbine inlet pressure exceeding 5 bar under engine-braking conditions. The nozzle vanes are positioned via a Rotary Electronic Actuator (REA) with a position sensing or a high-pressure pneumatic actuator. Boreless titanium compressor wheels and speed sensors allow for high pressure ratio operation and sophisticated control. This technology is ideally suited to engine displacements ranging from 4l to 14l.



Extra Large Turbos

Going beyond traditional on-highway vehicles, Honeywell's extra large turbochargers are specifically designed for engine displacements from 20l to 100l for such off-highway applications as marine, railway and electric power generation.

With over 30 years of experience with applications of this magnitude, Honeywell has released a new series of upgraded GTB57-70 turbochargers based on the proven GT60 and GT70 designs.

The upgraded GTB products were designed to take Honeywell's large turbo products to the next level. With durable titanium compressor wheels and improved aerodynamics, they provide superior overall turbo efficiency and compressor pressure ratios in excess of 5.0:1. They play an indispensable role in helping engine manufacturers meet the latest off-highway emissions requirements with improved engine performance and reliability.

Accelerating Technolgy

Innovation Drives

High Pressure Ratio Technologies

Series Turbo

It is a technology that literally compounds the benefits of turbo-charging for commercial vehicle OEMs. Dual-stage series turbo-charging draws fresh air into the first stage compressor, where its pressure is raised about 2 to 2.5 times.

This pressurized air is then drawn into the second stage compressor, where it is further raised by another 2 to 2.5 times. Both compressors operate at peak efficiency, while the lower pressure ratios for each stage translate into lower rotating speeds, resulting in improved reliability. Dual-stage series turbocharging significantly improves engine thermal efficiency, leading to lower fuel consumption and a reduction in the formation of NO_x during combustion.

Titanium Compressors

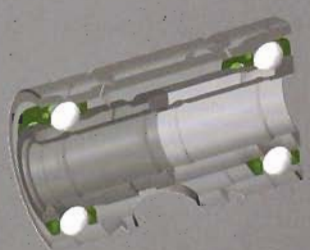
Honeywell is exploiting proven materials technology to deliver next generation turbo solutions for customers. Turbocharger compressor wheels need to withstand high operating temperatures and high stress loads. To optimize performance, Honeywell is now manufacturing compressor wheels from titanium, a material that exhibits impressive strength-to-weight ratio. Titanium compressors, first introduced in the early 1990's for high pressure ratio applications, have proven to provide a dramatic increase in both fatigue life and temperature capability, offering more than 15 times the life span of cast aluminum wheels in the most challenging applications. They have demonstrated significant performance advantages on series turbocharger applications and for highly cyclical applications such as city buses and mining trucks.

Perfomance

Performance Enhancing Features

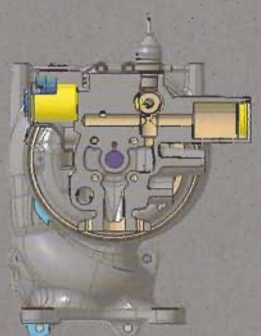
Ball Bearing

Ball bearing technology adds a performance edge to Honeywell's CV turbo portfolio. Honeywell's ball bearing "cartridge" technology brings together a pair of angular contact ball bearings onto a common outer race. In one elegant, holistic assembly, the cartridge eliminates the need to have both radial and axial bearings, as has been the case for the commonly-used journal bearings. This provides a significant reduction in friction by replacing a sliding action with a rolling mechanism, resulting in a faster response during the rev-up of the engine. Capable of handling all kinds of loads, ball bearing technology is ideally suited to demanding applications.



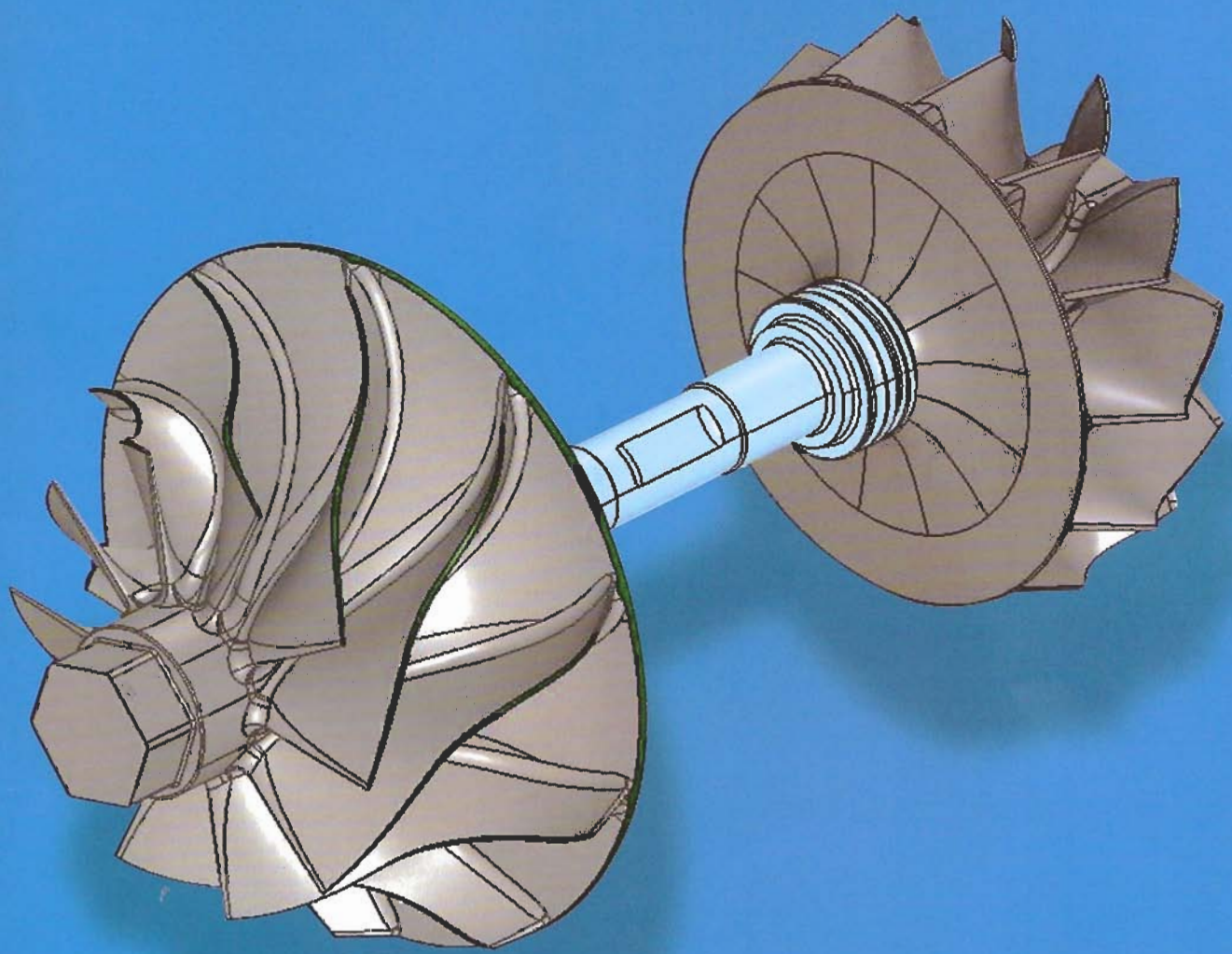
Actuation and Sensors

How to expand the engine boosting operating envelope? That's a central challenge for Honeywell engineers and part of the answer lies in ever-more sophisticated speed and position sensors. Honeywell speed sensors enable engine makers to increase power density by reducing the margins on turbocharger speed limits. Work is currently underway on performance upgrades to the AVNT™ integrated actuation system and to Rotary Electronic Actuators for applications both in North America and in Europe.



NEW COMPUTER SIMULATION CUTS LEAD TIMES
FASTER, MORE PRECISE PRODUCT DEVELOPMENT

A Revolution in Bearing Systems Design



Honeywell engineers are developing the bearing systems of the future by mapping the dynamic characteristics of journal bearings, shaft and wheels through every fraction of a rotation.

This is a daunting task, considering that turbos can spin up to 300,000 rpm. But investment in state-of-the-art simulation technology is yielding immediate benefits.

Partnering with a renowned American university, Honeywell unveiled in 2004 a new simulation tool which is a transient, non-linear, time marching program that accurately predicts shaft motion.

"Previously we used a 'cut-and-try' process, which was laborious and time-consuming," said Dennis Thoren, Director of Core Technologies at Honeywell Turbo Technologies.

"With this new tool, our engineers can study the motion in more detail – gaining a physical understanding of what happens when a bearing system becomes unstable. This new understanding dramatically shortens development times and leads to better and faster design solutions for our customers."

This latest tool enables engineers to identify factors such as oil supply temperature, pressure and viscosity, which can cause problems for the turbocharger, and to gain a better understanding of system responses for noise and vibration.

The benefits to customers are significant. In 2005, Honeywell engineers were able to evaluate more than 50 different bearing systems in just six weeks for titanium compressor wheels. In comparison, only one to two configurations would have been possible in the same timeframe without the benefit of computer simulation.

The net gain is the ability of Honeywell to integrate bearing system design much more effectively into the overall engine system. Complementing the commercial vehicle capability, Honeywell recently announced the successful development of shaft motion prediction code for passenger car bearing systems.

Leading Through Partnership

Gary Powers, Air Systems Manager at Caterpillar Lafayette Engine Center, gives his feedback on the advantages created by the new simulation technology.

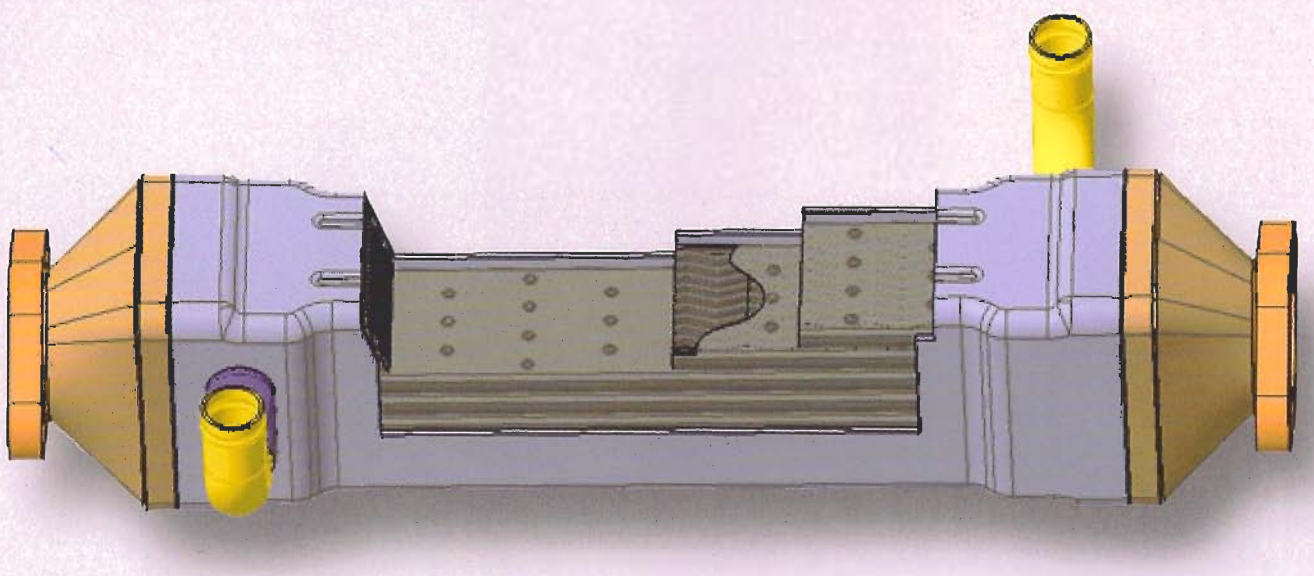
"Diesel engine development times are being compressed to save money and to get product to market ahead of the competition.

The inability to predict shaft motion when using fully floating hydrodynamic bearings has been especially frustrating. The cut-and-try approach is extremely time consuming, resource intensive and at the end of the day you never feel like you have an optimum solution... I have been very encouraged by the rapid advancement in the ability to model free floating bearings using the new simulation tool. This tool has already allowed us to focus on the design parameters that have the most influence on the system so we can drastically reduce the development cycle.

As we use this tool to further understand the bearing systems I hope we can reduce the shaft motion enough to allow for reduced wheel clearances for performance gains or to relax the very tight tolerances in today's systems to reduce costs."

SUPERIOR PERFORMANCE AND FLEXIBILITY
LOWER EMISSIONS, BETTER PACKAGING

Fast Technology for EGR Coolers



Emission standards are accelerating the need for technological advance... so it's good to know that at Honeywell it's happening 'FAST.'

FAST, or Finned Axial Shell and Tube, is at the heart of a new EGR (Exhaust Gas Recirculation) cooler that leverages Honeywell's experience with Shell-and-Tube technology to create a more sophisticated type of heat exchanger.

At the core of the FAST design lies a brand new concept of turbulated tube and fin assembly. Combining Computational Fluid Dynamic analysis with state-of-the-art manufacturing process, Honeywell engineers have come up with an optimized shape for the tubes, which creates turbulence on the coolant and exhaust gas flows.

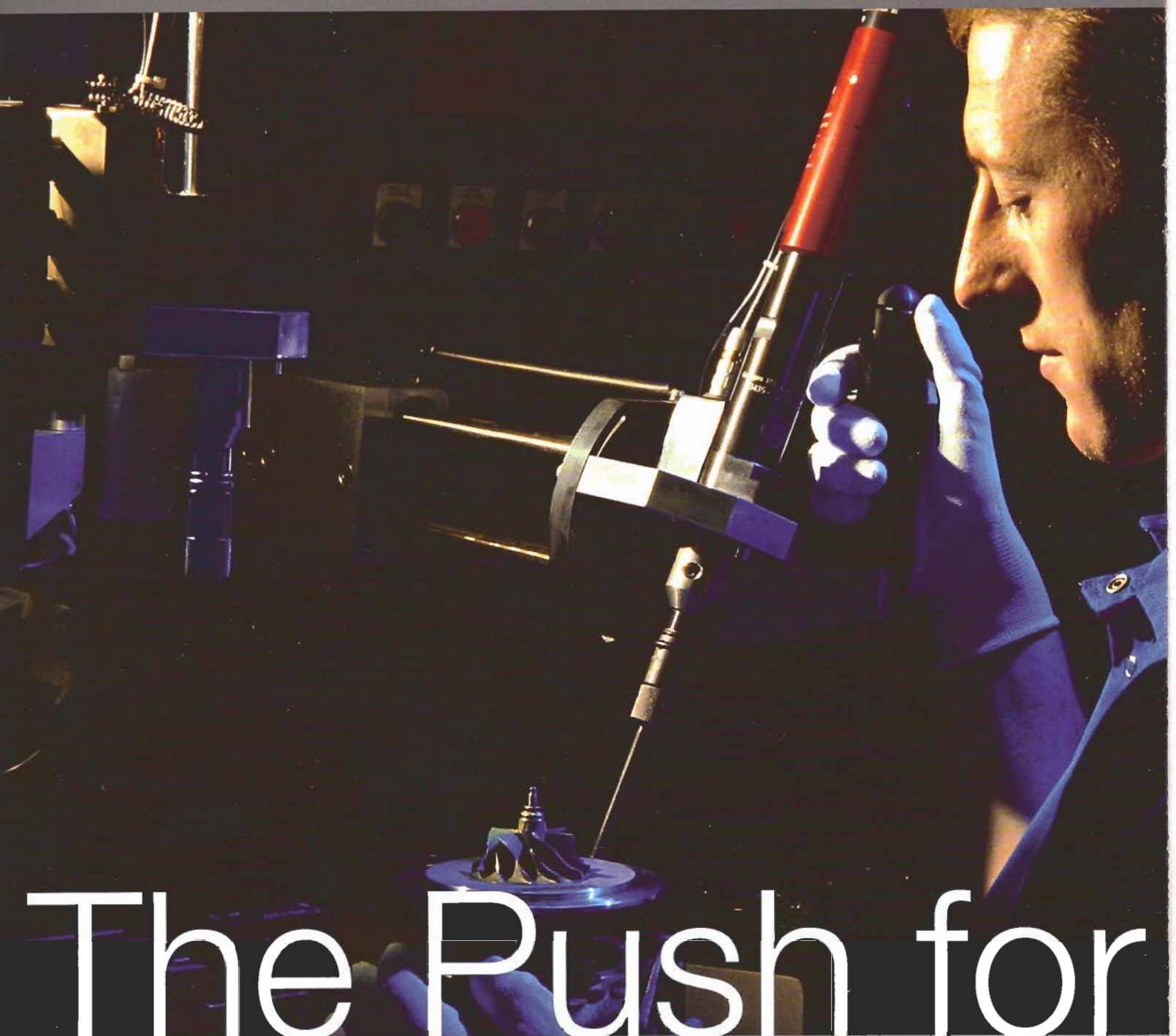
This results in increased heat transfer efficiency between exhaust gas and the coolant.

Using leading-edge simulation programs and prototype testing, Honeywell engineers have succeeded in delivering 15 percent superior performance over a similarly sized Shell-and-Tube cooler. At the same time, the new technology provides superior resistance against performance deterioration due to fouling, the number one issue faced by coolers. Its deceptively simple construction is based on tube assembly stacking and headering operations, coupled with the use of standard components. As a result, the new EGR cooler can be produced on a single brazing operation, thereby reducing assembling time and improving quality. Its versatile design also allows a number of possible packaging solutions.

The FAST technology is ready for a wide range of applications, from small 1.4l diesel passenger vehicle engines to on and off-highway commercial vehicles.

Honeywell Thermal Products Enable Lower Emissions

Honeywell makes heat exchangers for passenger cars and commercial vehicles, working with most of the major vehicle and engine manufacturers in the United States, Europe and Asia. From primary Shell-and-Tube coolers to the Second Surface FAST, Honeywell thermal offerings include exhaust gas coolers, bypass EGR valves and pre-charge air coolers. With thermal engineers located in the U.S. and in Europe working side by side with their turbo counterparts, Honeywell is in a unique position to provide innovative heat exchangers that offer optimized solutions for both performance and emission reductions. Currently, Honeywell thermal engineers are developing such innovative technologies as foam heat exchangers, high-temperature, fouling-resistance coatings, and electronically actuated valves.



The Push for Quality

Honeywell Turbo Technologies is accelarating the quality push that started in July 2004 to ensure that quality and reliability – like technology – become a business differentiator.

As Randall Hoeflein, Vice President of Quality, explains: "Our goal is to support our customers through defect-free products that are robust throughout their life cycle. These are the standards that we set ourselves and we are committed to driving excellence into our processes to get there."

Quality has become part of the genetic makeup of everyone who works at Honeywell Turbo Technologies – from engineers to plant employees, no matter whether they are located in Europe, America or Asia.

Here, Quality Assurance Managers from three top-performing plants give their personal perspectives on how quality is driving performance.

Perfecting Processes:
Nicolae Gligor,
Quality Assurance Manager,
Bucharest

"A place for everything... and everything in its place.

"At Bucharest, we have perfected a system in which everything – from the tiniest screw to the largest CV turbocharger – has its designated location.

"As a result of the 'Clean Plant' initiative, quality problems resulting from dirty particulates are greatly minimized. The process-driven layout sharply reduced the chance for error. The employees are happier and more productive.

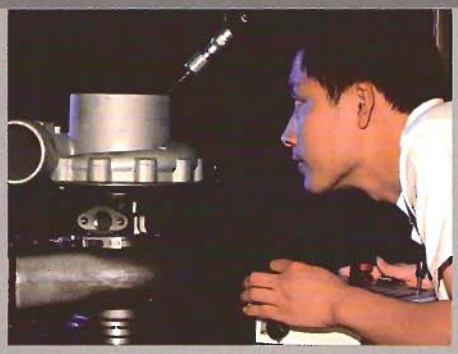
"Quality is the daily agenda. Each shift begins with a 10-minute open discussion on quality related issues. Quality is also everyone's agenda. Each employee went through 70 hours of training last year. Quality is ingrained in our culture."

Performance through People:
Eric Martinez,
Quality Assurance Manager,
Mexicali Thermal Plant

"At Honeywell Turbo's thermal plant in Mexicali, Mexico, we define our performance through a simple statement: 'I won't make, receive or pass on any defects.'

"Our rigorous approach to quality was defined almost two years ago when we organized the plant into ten product-line teams. Extensive training helped to channel our quality toolbox – and as a result we all became committed to the concept of 'poke yoke,' the Japanese term for 'mistake-proof.'

"Then we implemented a stringent certification process for each team... one customer PPM meant immediate de-certification. The results are very impressive. In fact there was not a single reject for the Aluminum Team in over nine months."



Positive Prevention:
George Zheng,
Quality Assurance Manager,
Shanghai

"At Shanghai, we are working hard to ensure that the root causes of quality issues are eliminated before they impact on products.

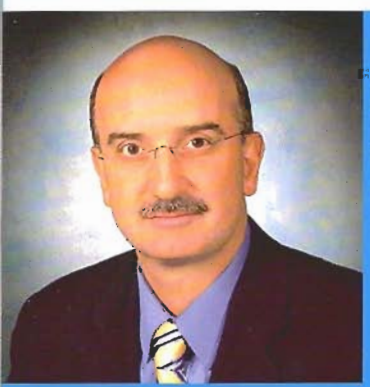
"This means that quality control is going upstream – as a result quality is no longer the sole concern of a specific function, but a shared responsibility for all.

"For example, maintenance technicians are no longer content just keeping machines clean. After consulting with manufacturing engineers, they have come up with detailed maintenance steps for all equipments to ensure error-free performance.

"There is no doubt that we possess world-class processes and tools, but it is only through the involvement of every employee that the full benefits are realized. Our people now see themselves as the first line of defense."

Clean Diesel Passenger Vehicles

Ready for the U.S. Market



John Moulton,
President
Powertrain Division
Robert Bosch Corporation

There has never been a time when automakers, suppliers and consumers have been more focused on pursuing environmentally friendly, fuel efficient passenger vehicles. Clean diesel passenger vehicles promise better fuel economy, reduced emissions and increased performance, all while utilizing existing infrastructure with proven technology.

In Western Europe, registrations of turbocharged diesel passenger vehicles have grown to more than 50 percent of the market. The U.S. market, on the other hand, is only beginning to embrace clean diesel technology. But we see a great potential for clean diesel vehicles here. Bosch's current powertrain forecasts project a 15 percent market share for diesel in the U.S. by 2015, compared with about 3 percent today.

There are many reasons for this forecast. Consumers are beginning to understand the tremendous benefits of turbocharged diesel passenger vehicles, including an increase in fuel economy by approximately 30 percent when compared to gasoline vehicles and a 50 percent increase in torque, resulting in a fun-to-drive experience.

The U.S. government has also recognized the benefits the country will realize if diesel market share continues to increase. In fact, last year's Energy Bill offers incentives to U.S. consumers who purchase vehicles that offer better than average fuel economy – including clean diesels.

Today's diesel passenger vehicles are recognized as clean for other reasons aside from offering significant reductions in greenhouse gas emissions. Since 1990, exhaust emissions have decreased by approximately 90 percent, resulting in diesel engines that are environmentally sound for today's vehicle market. Ultimately, the future growth of diesels in the U.S. is dependent upon meeting the upcoming emissions regulations known as Tier 2 Bin 5. We feel it is possible to meet these standards with today's technology.

New injection systems are capable of 2,000 bar injection pressure and use piezo electric controlled solenoids providing very fast switching time and improved precision injection quality control. This improved response results in more precise control of injection and combustion events, leading to engine applications that are optimized for low engine emissions and greater overall performance.

Additionally, the introduction of ultra-low sulfur diesel fuel will be a key enabler moving forward. The reduced sulfur content of the fuel provides the means for aftertreatment systems to operate at peak performance, resulting in the greatest possible emissions reduction to be achieved – turning clean diesel passenger vehicles into "ultra-clean" diesel passenger vehicles.

Today's clean diesel passenger vehicles meet the needs of the U.S. market. The benefits are real. The time for diesel is now.

The latest generation of Bosch common rail technology

The Clean Diesel Car for all 50 States in the U.S.

Currently, Mercedes-Benz E320 CDI is the only turbodiesel car in the luxury segment sold in the U.S. However, it is not available in the two biggest markets – California and New York, where stricter emissions rules apply.

But the wait is almost over. According to media reports, during the Detroit Auto Show in January 2006, DaimlerChrysler announced that it would introduce its Mercedes-Benz E320 Bluetec for sale in the U.S. this fall. The E-Class sedan is powered by the cleanest-burning diesel engine in the world – clean enough to qualify the car for sale in all 50 states in the U.S.

The E320 Bluetec delivers 211 horsepower and 540 Nm of torque. Its 24-valve, direct injection V6 engine is fitted with piezo-electric injectors and Honeywell's high-performing Garrett® VNT™ turbocharger.

In the Fast Lane

It's a record that might seem to speak for itself... but not even the 47 race wins and the hatful of records tells the full story behind Honeywell's success in the U.S. drag racing in 2005.

Honeywell's Garrett® turbochargers are now first choice for around 70 percent of teams participating in NDRA and NHRA Sport Compact Series – but what sets the company apart is not just the performance of its ball bearing turbos, it's the 24/7 commitment of its race team engineers.

"Everyone in the Honeywell team is a car person – we've got petrol in our blood," says Tracie Parker, Marketing Manager for Honeywell Turbo's Aftermarket business in the U.S.

In the 2006 season, Honeywell will be supporting 16 racers, including the Garrett® GT Hot Rod car, of which Honeywell is the title sponsor, plus a further 35 both directly and through its Aftermarket distributor network.

"Word-of-mouth is very important in the race community. They know that we've never experienced a ball bearing turbo failure in competitive racing, which is why the Garrett® turbo is now overwhelmingly the turbo of choice.

"We assign an engineer to each race team to help them make hardware choices but also to assist in making everything work together – the wastegate, the blow-off valve, the drop across the intercooler, how to handle compressor surge issues... in short it's commitment that goes way beyond the turbo installation."

It was this commitment that delivered stunning results in 2005, culminating in Ron Lummus taking the NHRA Sport Compact Series championship boosted by the Garrett® GT45R ball bearing turbo with the largest points advantage in any pro class. He is the holder of three of four records in both the NHRA Sport Compact Series and the NDRA.

"Ron's fantastic performance capped a brilliant year for Garrett®-boosted race teams," said Tracie. "Now we're ready to do it all over again."

NHRA Sport Compact Series Champion Ron Lummus

Winning Lines

"Whether it's my 1300 hp street driven Toyota Supra or my 1800 hp Toyota Solara racecar, there's only one turbo that I'll use and that's Honeywell's Garrett® turbo. Sure, I've tried others in the past but that's the past. If you want to win, there's only one choice...the Garrett® turbo."

Matt Scranton
Ride Revolution Pro-RWD Racer

"We can always count on Garrett® turbos' cutting edge power and reliability in competition. We would not have won a 2005 NHRA Pro-FWD championship without the Garrett® turbos!"

Ed Bergenholtz
2005 NHRA Pro-FWD Champion

"I love high horsepower cars, but not at the expense of reliability. Honeywell's Garrett® turbos allow me to have both the high horsepower and the confidence that I won't have any problems."

Stephan Papadakis
AEM / Driver FX Pro-RWD Racer

STUNNING RESULTS FOR AUDI R10 AT SEBRING (U.S.)
RACE TEAMS SET SIGHTS ON SUCCESS

Revving up for a New S

There's turbocharged anticipation at the start of a new racing season, with Honeywell turbo technology in pole position to boost race teams across the winning line at circuits all around the globe.

Le Mans Series: New Diesel Entry from Audi

Excitement is building in the pit lane over Audi's new diesel entry for the Le Mans Series. The Audi R10, with Honeywell as a technical sponsor, was unveiled to the U.S. audience at the Los Angeles Auto Show and the Garrett® turbocharged car has already put a scare in the competition by blazing to the fastest lap times at the official "Winter Test" of the American Le Mans Series at Sebring, Florida.

On March 18, 2006, the Audi R10, with its new 5.5-liter, V12 turbodiesel engine featuring Honeywell's twin Garrett® turbochargers, rocked the racing world by winning the 12-hour race at Sebring (U.S.), achieving the first ever victory of a diesel powered sportscar in the history of American Le Mans Series.

In addition, a pair of Champion Racing Audi R8s will be running in selected ALMS events, and there's significant interest in the full-season tilt by fellow LMP1-class competitors Dyson Racing. Both teams are sporting brand new 3.6-liter twin-turbo V8s.

In the European Le Mans Series, look out for Le Mans 24-hour hopefuls Synergy Racing and Protran in the LMP1 class, and LMP2 competitors RML, Belmondo, Alfacompetition and Barazi.

World Rally Championship: Continued Success

Led by Sebastien Loeb's dominating championship run in 2005 – with a remarkable 10 wins in 16 WRC events – Garrett®-boosted entrants in this prestigious series claimed 13 event wins in all. Francois Duval added another win for Citroën, while veteran Marcus Grönholm and his Garrett®-boosted Peugeot 307 recorded a pair of wins.

The outlook for 2006 is just as bright for Honeywell's Garrett®-boosted race cars, which also include Mitsubishi Lancers, the Ford Focus and the Skoda Fabia.

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Champ Cars: "Power to Pass"

In the open-wheel racing ranks, all competitors in the Champ Car World Series will again sport Garrett® turbochargers in their final season of the current V8 engine rules package.

For the third year, the series' unique "power-to-pass" rule gives drivers a limited duration of added turbo boost pressure to use at their discretion. Two-time defending-champion Sebastien Bourdais hopes to carry his Newman-Haas Racing team to another Vanderbilt Cup-winning performance this season.

In 2007, the power-to-pass boost increase, provided by Garrett® turbo, will give drivers an even greater power advantage under the new engine rules.

FIA Cross Country: Dual-stage Turbo Racing

Coming off a second consecutive podium finish at January's renewal of the Paris-Dakar Rally, the Volkswagen Touareg program has its sights set on this elite desert racing series that competes primarily in Africa and Asia. The 2.5 liter Touareg two-stage turbodiesel uses Honeywell's Garrett® TR30R for the primary stage.

Media Talk

As oil prices creep up, and as diesel shrugs off its dirty image, the clean diesel technology pioneered in Europe is receiving renewed interest in the U.S. and Japan. In America, hybrid cars are expected to trail far behind diesel by 2012.

"...experts predict that by 2012 Americans will be buying roughly twice as many diesels as hybrids."
"Forget hybrids, America; diesels will provide economy, performance" Detroit News, October 26, 2005

detnews.com

"When one is paying the equivalent of six dollars a gallon for gas, fuel-efficient diesel makes sense, no matter how much money one spends on a car."
"Diesel does it" Motor Trend, December 1, 2005

MOTOR TREND

"Despite diesel cars' lack of popularity in Japan, DaimlerChrysler AG is looking to make inroads with diesels here."
"DaimlerChrysler looks to sell car buyers on diesel engines" Japan Times, December 29, 2005

The World's Window on Japan
The Japan Times ONLINE

"I am pretty sure that in five to ten years the percentage of diesel-powered vehicles in private use will be higher than that of hybrids,"
Dieter Zetsche, DaimlerChrysler Chief Executive quoted in the Reuters article "DaimlerChrysler CEO sees diesel on rise in U.S." February 1, 2006

REUTERS

"The Environmental Protection Agency estimates that if one-third of cars and light trucks, such as SUVs and minivans, had diesel engines, it would save the equivalent of U.S. oil imports from Saudi Arabia."
"Diesel: using oil to cut oil use" CNN, February 13, 2006

CNN