BorgWarner
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TurboNews

The customer magazine of BorgWarner Turbo Systems

Agility Class

Mercedes presents A 45 AMG with the world's most powerful four-cylinder turbo Page 06

Editorial

Dear readers,

In the past, the Passenger Vehicle and Commercial Vehicle segments at BorgWarner Turbo Systems have operated largely independently of one another as separate organizations. Since the start of the year, however, they are now working to the motto of "One Turbo". By bundling its activities in the turbo business, BorgWarner is keen to use synergies to become both more effective and faster – while continuing to meet the various requirements of vehicle manufacturers in the passenger vehicle and commercial vehicle markets optimally on a local and global basis. In this edition of TurboNews, we chatted with Frederic Lissalde (President and General Manager BorgWarner Turbo Systems) about how this is to be achieved and what the new structure will mean for BorgWarner customers.

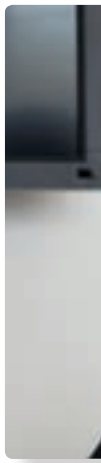
The individual locations of Turbo Systems are also getting themselves ready to provide discerning customers with optimum local support in a globalized market. For example, the Polish facility in Rzeszów now has a modern Technical Center, while the location in China has successfully launched series production operations for the globally deployed engines from Volkswagen and Ford – and in Brazil a completely new facility with growth potential has been established in Itatiba. You can learn more about this in our location articles.

This edition's customer projects section is dedicated to sports vehicles. With the Mercedes A45 AMG, Porsche 911 Turbo, Peugeot RCZ R and Hyundai Veloster, we present not one but four new vehicles which seek to demonstrate that exceptional driving pleasure and economy are definitely not mutually exclusive.

We hope you have fun reading the many exciting articles in this new edition of TurboNews.

Günter Krämer
Marketing Director
BorgWarner Turbo Systems

Content



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Editing and coordination
Günter Krämer, Global Marketing,
BorgWarner Turbo Systems

Authors
Ana Carolina M. Lyrio de Almeida,
Joe Mnich, Nathan Wang, Ray Zhang

Photographs
BorgWarner, Dr. Oliver Brunke, Fotolia,
M.Wichert/Messe Muenchen GmbH,
Mercedes-Benz, Kia, Hyundai, Peugeot,
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Efficiency wins

A premium brand praises a premium supplier: At the BMW Supplier Innovation Awards 2013, BMW's management team presented BorgWarner Turbo Systems with the much coveted trophy in the "Efficient Dynamics" category.

With this award, BMW honored the development of the innovative turbocharging system for the 3-stage turbocharged six-cylinder turbodiesel, an economical yet powerful new addition to BMW's "M Performance" range of engines (please also refer to TurboNews 1-2012). The diesel engine, which has been named "TwinPower", generates an incredible 545 lb-ft (740 Nm) of torque from its 183 cubic inch (3.0 liter) displacement, while delivering impressive standard fuel consumption of 44 mpg US (37 mpg UK). It is the world's first diesel engine to be equipped with the new R3S 3-stage turbocharging system.

At the awards ceremony, Klaus Draeger, Director of Purchasing and Supplier Network at BMW, emphasized: "We are keen to further expand and strengthen our leading position as innovators. Maintaining close cooperation with our suppliers is extremely important for us in this regard. Our goal with this awards ceremony is not only to honor excellent service, but also provide our suppliers with an incentive to achieve an outstanding competitive position within the BMW Group through innovation."

Bradford powers Jaguar Land Rover

Bradford, Great Britain

BorgWarner has been producing turbocharging systems for commercial vehicles in Bradford (Great Britain) for almost 35 years. With construction of a new development and production center, the facility is now set to extend its product portfolio to include turbochargers for passenger vehicles. The site will supply the latest turbocharging technology for the new range of four-cylinder diesel engines from Jaguar Land Rover (JLR), which are set to be launched in 2015.

The new development center will cover the fields of application engineering, design, simulation, tests, validation and metallurgy - thereby strengthening the facility's existing technological expertise. As it will guarantee sustainable employment and generate economic growth in the area, its construction will be supported by the British Government Regional Growth Fund.

BorgWarner is also keen to extend its existing cooperation with the nearby University of Huddersfield, which has been in place since 2011, by introducing a new master's degree in engineering that will focus on exhaust gas turbocharging. The postgraduate degree program will offer young engineers the opportunity to specialize in pioneering drive technology. However, the goal is also to establish knowledge transfer as a way of researching and improving the materials used in turbocharger casings.

Turbo Systems remains on growth course

BorgWarner Turbo Systems is expanding worldwide. The company is targeting annual growth in the double-digit percentage range and hiring around 100 new employees per year in its Engineering division alone. In particular, the HQ of the turbocharger specialist in Kirchheimbolanden (Germany) is being extended. Indeed, a new office building was recently added at this location. The new building, which offers space for around 200 workplaces, has been home to Global Headquarter and employees from the Engineering and Purchasing divisions since the start of 2013.

Hour of glory at the Daimler Supplier Awards 2012

In mid-March, Dr. Dieter Zetsche, CEO at Daimler AG and Head of Mercedes Benz Cars, welcomed more than 450 high-ranking representatives from the company's most important suppliers to the Mercedes Benz Center in Stuttgart. The occasion was the presentation of the Daimler Supplier Awards 2012 to 16 suppliers for their exceptional services.

During the "Night of Masterpieces", as the evening was called, BorgWarner Turbo Systems was also presented with an award for its excellent work within the scope of various engine development projects. These revolved around the turbocharging system for the M275 twelve-cylinder BiTurbo gasoline engine (Mercedes S-Class), the turbos for the M177 and M178 models, which are constructed by Mercedes' in-house tuner AMG and also used in the SLS supercar, and the turbocharger for the M133 engine, whose 355 bhp (265 kW) output makes it the most powerful four-cylinder engine in the world. Other honorable mentions went to projects for development of the four-cylinder OM651 two-stage turbocharged passenger vehicle diesel engine, as well as the three-cylinder OM660 turbodiesel that is, for example, used in the Smart.

"You are not only our most important suppliers, but also our most important supporters," added Dieter Zetsche, praising the representatives from the companies receiving the awards. With the annual Daimler Supplier Awards, Daimler honors those suppliers that have gone the extra mile with regard to technology, quality, costs and delivery reliability.

Frédéric Lissalde, President and General Manager BorgWarner Turbo Systems and Wolfgang Schneider, Plant Manager Kircheimbolanden, Germany

Agility Class

Mercedes models carrying the famous AMG badge have been delivering breathtaking driving performance for almost 50 years. The incredible power and fantastic sound offered by the eight-cylinder and twelve-cylinder models of the Mercedes' in-house tuning expert are truly legendary. For the first time ever, the company is now offering a compact class model with four-cylinder engine in the form of the A 45 AMG. Although the engine in the tuned A-Class may only have four cylinders, it uses a BorgWarner twin scroll turbocharger to deliver impressive power.

People in their early 30s to mid 40s, who are successful in business, independent, individual and sophisticated – this is the target market for the A 45 AMG. This very special A-Class, trimmed to deliver maximum performance, spectacularly rounds off the lower end of AMG's model range. The aim is for this vehicle to make an important contribution to increasing the company's sales from 20,000 vehicles to more than 30,000 vehicles by its 50th birthday in 2017. To achieve this ambitious goal, the developers at AMG have given their latest creation a large number of technical refinements.

World's most powerful four-cylinder turbo

As is the case with all AMG models, the engine represents the heart of this vehicle. It should therefore come as no surprise that AMG has created the most powerful serial production four-cylinder turbocharged engine in the world. With total displacement of just 122 cubic inches (2 liters), the unit is capable of generating just over 350 bhp (265 kW) and maximum torque of 331 lb-ft (450 Nm). This corresponds to an incredible power output of almost 180 bhp (133 kW) per liter, which is higher than even the most powerful sports cars. Yet despite the massive power on tap, the AMG turbocharged engine also impresses with standard consumption of 41 mpg US (34 mpg UK) – an exemplary value in its segment. In addition to this, it excels through its particularly low exhaust emissions and already complies with the Euro 6 standard, which is set to be introduced in 2015.

To get so much power and also efficiency out of the four-cylinder unit, the engineers at AMG upgraded the most powerful engine in Mercedes' BlueDIRECT range with the latest technology. The exhaust gas turbocharging system employed here represents a particular highlight. BorgWarner Turbo Systems provides a twin scroll turbocharger for the engine that is capable of delivering maximum boost pressure of 1.8 bar. The turbocharging system uses exhaust back pressure, exhaust gas temperature and exhaust

Exclusive design, explosive performance: Although the A 45 AMG has immense power under the hood, this is well hidden by its reserved, yet still sporty appearance.

pulses intelligently to spontaneously build up high boost pressure. This means that massive torque is already available at low revs, which makes a significant contribution to increasing dynamic performance and driving pleasure. As if this were not enough, the twin scroll technology also enables excellent fuel consumption and impressive exhaust emissions figures.

The engine and turbocharger are cooled using a high performance cooling system. Building on components that are also used in Mercedes' SLS AMG supercar, an additional low-temperature circuit is used for air-water intercooling. This allows the highly-compressed charge air to be cooled very effectively, which thereby optimizes the unit's power delivery.

Hand-made

The new turbocharged engine is built by hand on an exclusive assembly line at the Mercedes-Benz Motorenwerk MDC Power facility in Kölleda (Germany), where all BlueDIRECT four-cylinder engines for the A-Class and B-Class are manufactured. As is the case with all AMG drives, the engine is assembled entirely by hand in line with the AMG philosophy of "one man, one engine". This means that the entire engine is fitted by one expert, whose signature is then also included on the engine badge.

Development of the high-performance engine for the A 45 AMG marks another milestone in the collaboration between Mercedes AMG and BorgWarner Turbo Systems. The new drive is an excellent example of how turbocharging can be used to meet the toughest requirements in terms of dynamic driving performance, while also complying with environmentally friendly fuel consumption and emissions figures.

Interview with Frédéric Lissalde, President and General Manager of BorgWarner Turbo Systems

"Our goal is to be the preferred partner for auto manufacturers throughout the world."

The Passenger Vehicle and Commercial Vehicle segments of BorgWarner Turbo Systems have operated largely independently of one another for some time. However, the leadership teams of the two have been brought together under one roof since May of this year, working to the maxim of "One Turbo". We spoke with Frédéric Lissalde, who explained the background behind the decision and gave an outlook of what customers can expect from this new "One Turbo" group.

Mr. Lissalde, what challenges does BorgWarner currently face in the turbocharger business?

In the powertrain sector, everything revolves around reducing exhaust emissions and fuel consumption (CO_2). As we are already starting from a very high technological level today, improving the efficiency of our turbochargers even further is a real challenge. However, providing our customers with the best turbocharger technologies in the world is one of our primary objectives.They also expect us to launch flawlessly, offer first-class quality, best possible service and cost competitiveness.

Another challenge is our growth. In the last 18 months alone, we have significantly extended five of our locations to ensure that our production capacities can keep up with the pronounced increase in customer demand. But none of this would even be possible without the right people. We therefore need to develop, retain and recruit the best talents across the globe for BorgWarner, and ensure that they stay with us long term. In addition, we bring more than 100 engineers on board every year.

How are your markets in Europe, Americas and Asia currently developing?

The European passenger vehicle market is very mature. Turbochargers have already been in use for a long time here, and almost 100% of diesel vehicles today leave the factory with a turbo fitted. Here the market growth is mainly driven by the higher penetration of turbocharging on gasoline engines. In the US and China, the market for turbocharging systems is growing significantly more dynamically, but from a lower base. Here turbochargers for gasoline engines are the main growth drivers. I am actually amazed by the development displayed by our Chinese facilities. In terms of turbochargers for commercial vehicles, the global market is more saturated or let me say follows the general market dynamic due to the already high turbocharger usage. Yet we still see growth opportunities in emerging markets and with smaller engines in the off-highway segment due to stricter exhaust emissions legislation, which is leading to increased use of turbochargers. Overall, we are operating in a very attractive market segment and benefitting from an excellent technological and market position.

What were the reasons behind the unification of Turbo Systems' Passenger Vehicle and Commercial Vehicle segments to create "One-Turbo"?

The idea behind One Turbo is to run our turbocharger business with a single management team. With this step, we are combining our forces in all areas that are crucial to the success of our business. For example, we cooperate in development programs for improving transient response, such as TiAl turbine wheels or ball bearings, and engage in general collaboration to improve the efficiency of turbochargers. We also work together in Purchasing and Materials Development, as well as on our manufacturing strategy, of course. This allows us to significantly increase the leverage effect of our efforts.

But are the various requirements of passenger and commercial vehicle customers also taken into account here?

We serve three segments, Passenger Car, Commercial Vehicle and Aftermarket, which is something we clearly cannot afford to lose sight of. We have a good hold on this and focus our efforts keenly on each of these three seg-

"A clean, energy-efficient world – that's BorgWarner's new vision."

Frédéric Lissalde had been working in the auto industry 25 years starting with Valeo SA and ZF in various jobs including program management, engineering, operations and sales before he joined BorgWarner in 1998 as a sales manager in Transmission Systems. Since then, he was the plant manager in Tulle, Vice President of Global Sales for Transmission Systems, Vice President and General Manager Dualtronic and Clutch Systems, Vice President and General Manager Turbo Systems Passenger Car and now President and General Manager Turbo Systems.

"We are today among the most respected automotive suppliers in the world."

ments as a way of ensuring that the specific requirements of our customers are always taken into account. Parts of the back office look after all three segments, but our customer interface is tailored to their specific needs.

How is the unification progressing and what advantages does One Turbo offer customers?

We are already finding key synergies in our Engineering departments, ensuring that the best staff in the world work together to develop new technologies and further improve the efficiency of our turbochargers. We are also working hard on our manufacturing standards and manufacturing quality as a way of optimizing our manufacturing excellence.

Besides this, One Turbo allows our various facilities to be used far more flexibly, so we can produce products required by local customers. In Great Britain, for example, we have only ever produced turbochargers for commercial vehicles in the past, but are now also set to produce turbocharger systems for Jaguar Land Rover – i.e. passenger vehicles. We will also manufacture commercial vehicle turbochargers at locations which have previously only manufactured passenger vehicle turbochargers. This allows us to be close to our customer base and leverage our global manufacturing footprint for the benefit of our customers.

Where do you see the particular strengths of BorgWarner Turbo Systems?

Our employees represent BorgWarner's greatest strength. We have outstanding employees. These are the most important key to our success and our future. I get a strong sense of entrepreneurship here at Borgwarner. Our employees have the ambition to lead our product leadership mission and offer first-class customer service as well as manufacturing excellence.

Another strength is our manufacturing footprint – which is one of the best in the world. We have dedicated development and production sites close to our customers at 10 locations in all important markets around the world. Finally, I am convinced that our operating model "Local Accountability, Global Strength" gives us a competitive edge and distinguishes us in the market.

Let us return to the topic of employees. How do you ensure that you always have enough highly qualified experts?

BorgWarner is a fantastic employer. This is something we try to make clear to young engineers. We also operate in an attractive growth market. The powertrain sector is the area in which manufacturers will need to and also want to invest in future to improve the efficiency and environmental friendliness of their vehicles. And this fits well to a clean, energy-efficient world, BorgWarner's new vision. We are recognized as one of the most successful automotive suppliers worldwide in the powertrain sector.

Aside from this, we are also a global business unit with around 6,500 employees, who enjoy excellent international career opportunities. Our top management is a good example of this. We are a US company with a British CEO and BU presidents from Germany, France, Great Britain and the US. The Turbo Leadership team is also made up of American, Danish, Belgian, German, Dutch and French employees. I am looking forward to even more diversity at each level of our company.

We provide our employees with targeted support for their personal development. We encourage and require entrepreneurial thinking and give our employees the opportunity to show what they can do. Thanks to "One Turbo", employees can now also move between the Passenger Vehicle and Commercial Vehicle segments more easily than in the past.

What are your plans and goals for the near future?

We are targeting annual double-digit percentage growth. Profitable growth of this magnitude is essential if you want to be successful as a supplier, particularly in the automotive sector. We have excellent opportunities in this regard. The total passenger vehicle turbocharger market is around 27 million units this year and is likely to increase to around 44 million units within the next five years. For the Commercial Vehicle segment, the market will grow from 6.5 million to 9 million turbochargers in the same period. So about 20 million more turbochargers per year in 5 years! This is for us to grab!

However, this requires having the most competitive products in terms of technology and efficiency. In the passenger vehicle segment, we are therefore working intensively on further improving the efficiency of our turbochargers, offering the latest mixed-flow turbine wheels and driving forward issues such as TiAL turbine wheels, ball bearings and electrical turbocharging. Efficiency and emissions are also the key topics in the commercial vehicle sector. The operators of commercial vehicle fleets are increasingly demanding vehicles that consume less fuel. Downsizing therefore has a part of play here, as the demand for smaller engines is on the rise. The merger of our Passenger Vehicle and Commercial Vehicle divisions will make it much easier for us to develop intelligent and efficient small turbocharging systems for modern commercial and off-highway vehicles with small engines.

"With One Turbo, we can make far more efficient use of our worldwide locations and engineering skills."

Overall, our top priority is to be the preferred partner of vehicle manufacturers worldwide. We have excellent opportunities here – also with regard to our competitors. In our history, we have produced over 110 million turbochargers and are still learning new things every day. We have the world's top-performing portfolio of turbochargers, which we use to seamlessly cover the whole spectrum of applications, from the passenger vehicle and commercial vehicle engine markets, through the off-highway sector, all the way up to large marine applications. With our manufacturing footprint, we also secure proximity to our customers and offer specific expertise in the various market segments for which we produce.

What are you particularly proud of at BorgWarner?

I have worked in four different business units since 1998 and have experienced how BorgWarner has managed to quadruple its sales revenues in this time. The company has adopted an ever clearer structure over the years, while also creating plenty of space for entrepreneurial decisions and allowing managers to assume a high degree of responsibility in the individual business units. I also think it is great how BorgWarner has fought to assume a leading position in the powertrain sector through excellent products and innovative technologies. We now rank among the most respected and admired automotive suppliers in the world. We also repeatedly receive Supplier Awards (please refer to the news and the article on page 24), which are a very special expression of our performance.

You come from France, but have already worked for BorgWarner in many different countries. To what extent has this changed you?

Over the last 25 years, I have lived and worked in five different countries. Although I am still very conscious of my French roots, I obviously see the world with different eyes than most of my countrymen. I now actually think and dream in English most of the time, which sometimes worries me, but I suppose this is just a natural part of me. I thoroughly enjoy my job and still learn new things every day. To be successful in the global business, I believe that it is important to have experienced and understood different cultures, working methods and ways of thinking. Of course, there are always going to be cultural differences from location to location in a global company. The key here is to be aware and understand these differences, so that their respective strengths can be integrated for the benefit of everyone. The mistake is to judge cultures.

Your position comes with a great deal of responsibility. How do you relax and rejuvenate yourself?

I make sure that I set aside enough time for myself and also try to spend most weekends with my family. I find the best way to relax is by going jogging or playing tennis with friends or with my son. I also love to travel with my family, visit European cities and take extended holidays anywhere in the world.

Mr. Lissalde, thank you for taking the time to talk to me today.

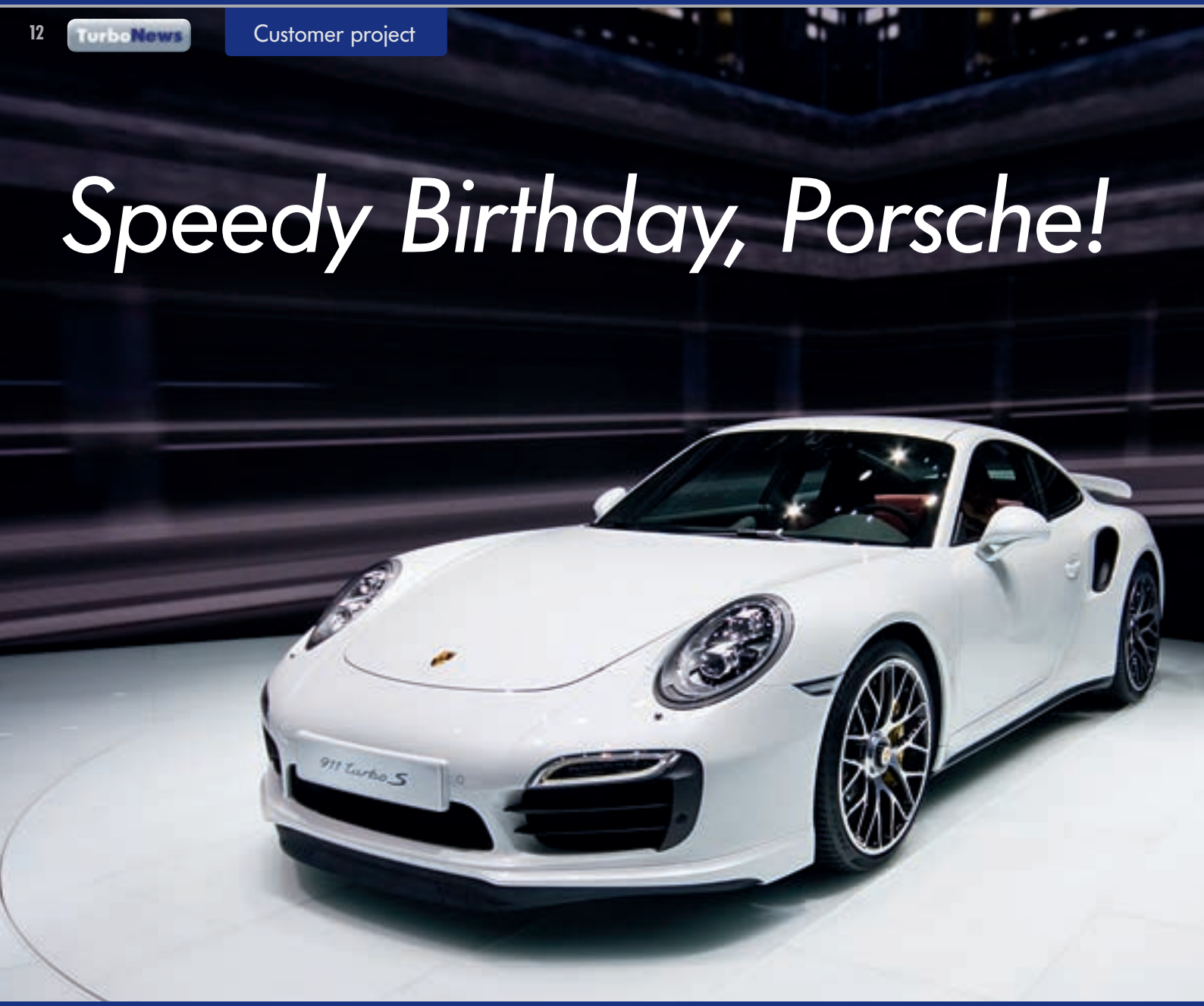
Local Accountability, Global Strength – what does it mean?

The BorgWarner operating model combines the strengths of flexible decentralized sites with the advantages of a large global organization. It is a proven concept for profitable growth.

Local Accountability stands for:
Strengthening the performance of local sites
- Responsibility for the results
- Decisions are made closer to the customer and the market
- High flexibility of the individual sites
- Focus on innovation and new ideas for local market requirements
- Guarantees a lean organization
- Geared towards product leadership

Global Strength stands for:
Creating synergies and improving global performance to support the sites
- Introduction of global tools, efficient processes, and product standards
- Company-wide implementation of best practices
- Geared towards the global requirements of the turbocharger business

Speedy Birthday, Porsche!



To mark the 50th birthday of its legendary 911, sports car manufacturer Porsche has given its fans a very special gift: a brand new version of the 911 Turbo. This new super sports car not only impresses through its dynamic design, but also its drive, which is sure to put a smile on the face of all refined sports car lovers as soon as they start the engine. The massive power offered by the new Porsche engine is thanks in no small part to its two exhaust gas turbochargers, which are supplied by BorgWarner.

It was already clear at its premiere in 1963 that the 911 was a driving machine with truly breathtaking dynamic performance. However, the new 911 Turbo models now boast more power than ever before – while also offering significantly improved comfort and day-to-day convenience than their ancestor. A 231 cubic inch (3.8 liter) 6-cylinder bi-turbo boxer engine represents the heart of the new 911 Turbo. And in keeping with tradition, the engine is mounted at the rear of the vehicle. With direct fuel injection, variable turbine geometry turbochargers, an expansion intake manifold for improved efficiency, VarioCam Plus variable camshaft control system, a special thermal management system, an on-board energy recuperation system and automatic start-stop, the developers have incorporated a large number of innovative technologies, not only to boost power, but also to improve fuel economy and reduce CO_2 emissions.

Optimum efficiency thanks to variable turbos

As is the case with all previous Porsche 911 Turbo models, BorgWarner Turbo Systems provides the turbo-

Photo: Dr. Oliver Brunke

A new take on a classic design: The 911 Turbo bears the features of its ancestor from 1963 – yet still manages to look striking and modern thanks to its intelligent styling.

charging systems for this new vehicle. Two water-cooled BV50 turbochargers with variable turbine geometry are connected in parallel in the 231 cubic inch (3.8 liter) bi-turbo boxer engine. Although they were already used in the vehicle's predecessor, the two turbochargers have been further refined and modified to handle the stricter requirements. Among other things, the VTG control system has been matched ever more precisely to the conditions of the gasoline engine – with the result of significantly improved power output, torque and fuel economy. The response of the turbocharged engine has also been improved. As the only turbocharger manufacturer with gasoline engine VTG turbochargers in serial deployment, BorgWarner can draw on a tremendous pool of experience and offer customers a further alternative for gasoline engine turbocharging applications.

Driving pleasure with environmental bonus

The new unit is available with two different power outputs. In the 911 Turbo, it produces 525 hp (383 kW) and offers maximum torque of 486 lb-ft (660 Nm), which is available to the driver in the wide band between 1,950 and 5,000 rpm. The overboost function of the optional Sport Chrono Package allows this already massive torque to be increased even further to 523 lb-ft (710 Nm) for a short period. The new 911 Turbo S generates 552 hp (412 kW). Its maximum torque of 516 lb-ft (700 Nm) is available at all times, but can also be increased to an incredible 553 lb-ft (750 Nm) using the overboost function available in the standard Sport Chrono Package. The acceleration offered by the new 911 Turbo S is equally impressive, as it completes the sprint from 0 to 62 mph in just 3.1 seconds and goes on to a top speed of 197 mph. The fact that this kind of driving pleasure does not come at the cost of the environment makes it all the more pleasing. Despite its amazing performance, the Porsche bi-turbo engine achieves an average of 24 mpg US (29 mpg UK) and already complies with the Euro 6 emissions standard, which is to come into effect for all vehicles with gasoline engine from September 2015.

Development of the turbocharger system for the 911 Turbo marks another milestone in the longstanding collaboration between Porsche and BorgWarner. For the developers at the turbocharger specialist, each Porsche project also represents a new challenge, in which the boundaries of the possible are gradually being extended.

Ready for business: Two BorgWarner BV50 turbochargers provide the Porsche 911 Turbo S with up to 553 lb-ft (750 Nm) of torque.

CHINA

Growth engine

China has become the world's most important vehicle market – and still holds massive growth potential. According to a study conducted by PwC, vehicle production is set to almost double by 2017. BorgWarner Turbo Systems operates a modern site in China to ensure optimum supply of innovative engine components for local vehicle manufacturers. Work recently began at this location on producing turbochargers for several of the most important engines from Volkswagen and Ford as well as many of the Chinese car makers.

Whether the Skoda Octavia, Rapid, Yeti or Superb or the VW models Golf, Bora, Jetta, Polo and Lavida, the latter of which was developed in China specifically for the local market – the Volkswagen Group is catering to all wishes and requirements in the Chinese market with its broad range of successful models. One thing that all of these models have in common is a modern drive unit, the 85 cubic inch (1.4 liter) TSI gasoline engine, which is now also produced in China. As it successfully combines dynamic performance with excellent consumption and emissions values, this engine is also very popular in Europe.

High production volume for VW

The turbocharger that BorgWarner provides for the engine has also been manufactured locally by the turbocharger specialist since May of this year. The planned production volume is for several hundred thousand units per year. Before the start of production, the team in Ningbo first had to overcome several challenges – for which they were supported by Turbo Systems in Kirchheimbolanden (Germany). The turbine and the waste gate of the K03 turbocharger were given an optimized design and various design modifications had to be made during the extremely short development period of just 22 months. Despite all the challenges being faced, the facility in Ningbo was able to commence production to the complete satisfaction of Volkswagen and even managed to set up the first cold test beds in China (please also refer to TurboNews 1/2012 for further details on this), which are now used to test every single turbocharger before delivery to the customer.

Local manufacturing for Ford

BorgWarner has also been producing K03 turbochargers in China for Ford's local engine manufacturing operations since the end of 2012. The turbocharging systems form part of the 122 cubic inch (2.0 liter) EcoBoost engines, which are used in Ford's Mondeo and Kuga models. In Europe, the engine has already been in production since 2010, since which time it has proven extremely popular. It has now also become a massive hit in the Chinese market thanks to its impressive 236 lb-ft (320 Nm) of torque and low fuel consumption. The schedule for completion of the Ford project was extremely ambitious. For the first time ever, the team in Ningbo had to integrate a system for electron beam welding at the location and only had very limited resources available for validation. Yet despite this, production was up and running on schedule for the Ford components to the full satisfaction of the customer. The successful launch of this project has now paved the way for further start-ups in the coming months.

Ningbo survives its baptism of fire

With its turbocharger production operations and the Ningbo Engineering Center, which was opened in China in 2011, BorgWarner is now in a position to provide first-class support for the local engine manufacturing operations of its customers in China. The Ningbo facility has proven to be an extremely successful location within BorgWarner's global manufacturing network, as underlined by the launch of serial production operations for Volkswagen and Ford. Turbo Systems won the tender for business in China due to its impressive across-the-board performance – not only in terms of support, technology and production, but also quality and price.

Rzeszów facility gets new Technical Center

Poland power

It was almost exactly four years ago that BorgWarner Turbo Systems opened a turbocharger manufacturing facility in the Polish town of Rzeszów. Since this time, the facility has enjoyed continuous further development in the up-and-coming Aviation Valley economic area. In July 2013, the site was extended with construction of the ultra-modern Rzeszów Technical Center (RTC).

Photos: Jaroslaw Kierat

BorgWarner was already considering establishing an engineering group on campus when it founded the facility in Poland. In fact, this was one of the key reasons why this location was selected. In the so-called Aviation Valley, the automotive supplier can exploit synergy effects of other service providers in the region, access a comprehensive pool of qualified experts and benefit from the favorable position near the Rzesów-Jasionka airport.

Designed for growth

After the economic crisis subsided, the idea of establishing a Technical Center was therefore re-examined in 2010, and a concept was drafted for an office building that also offered enough space for future extensions, as well as a generously dimensioned hall for testing. One of the main objectives was to fully integrate the test bench engineering systems into the building itself. The extension of the existing facility is also to be financially supported by the EU, as it will create new jobs for highly-qualified experts.

Construction work on the new Technical Center began in July 2012 with the ambitious goal of starting work in the RTC by mid-2013. Construction was synchronized with the new factory for BorgWarner Drivetrain Systems and Morsetec, which was also to be built on the same campus, to be able to profit from synergy effects during the construction process.

The new 3-floor office building of the RTC offers space for around 120 workplaces, as well as generously dimensioned training and meeting rooms. The testing hall has six chambers, which will be home to two engine test benches, three combustion chamber test benches and offer enough space for a further test bench. It will also include a mechanical workshop capable of constructing prototypes, a vehicle workshop for two vehicles, as well as six more universal laboratory rooms. Added to this is the evaluation workshop, a fully equipped materials laboratory, an assembly workshop and a measuring room.

Close cooperation with Germany

The employees of the RTC have been hired in a progressive process and been given intensive training since 2010. Great emphasis has been placed on establishing excellent collaboration with the colleagues from Kirchheimbolanden here. Indeed, every new employee of the RTC first spends a certain time working at Turbo Systems in Germany. At the moment, there are around 50 specialists already working on current projects. Since its official opening on September 26, 2013, the Rzeszów Technical Center is ready to provide European customers with qualified support for complex and demanding development projects.

The 59,000 square foot (5,500 square meter) facility in Rzeszów employs more than 100 people and is capable of producing up to 500,000 turbochargers per year for European auto manufacturers. The facility's first customer was Fiat Powertrain Polska, for whom BorgWarner had previously produced components at its Hungarian facility in Oroszlány. Today, Ford ranks among the largest customers. With the new Rzeszów Technical Center, the facility is expanding its expertise to include turbocharger development and testing. Its primary focus here is on applied developments, although it also offers general services such as testing, design and materials analysis.

Build big!

Boasting an exhibition area of over 6 million square feet (570,000 square meters), as well as some 530,000 visitors and 3,420 exhibitors, bauma 2013 broke all records as the world's largest ever trade fair in terms of floor space. Although this was the first time that BorgWarner had attended the world's most important fair for construction machines, building materials machinery and mining technology, the company immediately impressed the international audience with its innovative products.

Despite the fact that so many people are still talking about the crisis, the construction sector is currently booming in many countries. As such, manufacturers of construction machinery were pleased to see the new record set for the total number of visitors at this year's event in Munich and delighted to return home with their order books full. On BorgWarner's stand, the Turbo Systems, BERU Systems, Thermal Systems, Emissions Systems, MorseTec and Transmission Systems business units all presented their products and services under a single banner with the latest drive technologies for construction vehicles.

Illustrious international audience

To be able to present its broad range of products in a visually appealing way, the American supplier welcomed guests to its large, two-storey stand with a total area of 1,230 square feet (114 square meters) that housed meeting rooms upstairs. The numerous visitors to the stand included both vehicle/engine manufacturers and many customers from the aftermarket sector. BorgWarner's bauma team was particularly impressed by the internationality and high level of visitors to the stand.

Major interest in robust turbocharging technology

In terms of turbocharging technology, visitors from the sector were primarily interested in the BV turbochargers

Großes Photo: © Margarethe Wichert / Messe Muenchen GmbH

The BorgWarner business units Turbo Systems, BERU Systems, Thermal Systems, Emissions Systems, MorseTec und Transmission Systems presented their products on a large, two-storey stand at the bauma.

with variable turbine geometry (VTG) and the two-stage regulated R2S booster system with electrical actuator. Although robustness, resilience and reliability are clearly key criteria in the construction machinery sector due to the demands placed on the technology, fuel consumption and emissions values are two topics that are also becoming increasingly important to vehicle manufacturers thanks to ever stricter legislation. The VTG and R2S systems from BorgWarner excel in this regard, as well as through their durability when operated in harsh environments.

After seven days at the exhibition, the BorgWarner team was able to draw extremely positive conclusions. In personal discussions held on the stand, staff were able to establish promising contacts with manufacturers and set up several new projects. BorgWarner has therefore already committed to exhibiting its products and services at the next bauma fair in 2016.

Sporting performance, Korean style

When it comes to compact sports vehicles, most people looking to buy a new car first think of the powerful models produced by European manufacturers. However, two new players from Korea in the form of the Hyundai Veloster Turbo and the Kia cee´d GT are starting to win over more and more customers with their performance, design, equipment levels and quality.

The K03 Twin Scroll turbocharger from BorgWarner combines impressive performance with moderate consumption.

When it premiered in 2011, the Hyundai Veloster caused quite a stir with its completely new vehicle concept. Since this time, the compact sports coupé with its revolutionary 1+2-door concept has proven increasingly popular. In Germany, for example, the Korean coupe now enjoys an impressive 3.5% market share among sports cars – having doubled the number of new registrations in 2012 compared to the previous year.

Turbo power

Given this success, Hyundai is now keen to win over new customers who attach particular significance to design, individuality and driving pleasure to the brand with its new top of the range engine, which has been available since the start of 2013. The company, which is now the world's fifth largest vehicle manufacturer, has reworked its familiar 1.6 GDI engine and combined it with a turbocharging system to increase the output of the direct injection gasoline engine by more than 30% to 188 hp (137 kW). BorgWarner developed a specially modified version of its K03 turbocharger with Twin Scroll technology for the new engine. With this turbocharger concept, the exhaust gases that drive the turbine wheel flow through two separate channels. This allows the Twin Scroll turbocharger to avoid pressure fluctuations, while also increasing energy

Powerful design, powerful drive: The Hyundai Veloster Turbo generates an impressive 188 hp thanks to its Twin Scroll turbocharger.

Improved styling on the outside, more powerful on the inside: The new 1.6 GDI turbocharged engine provides pure driving pleasure in the Kia cee´d GT.

efficiency and improving response at low revs.

This improved dynamic performance is immediately apparent to drivers. The Veloster Turbo offers impressive pick-up and completes the sprint from 0-62 mph in just 8.4 seconds, going on to reach a top speed of 133 mph (214 kph). The powerful torque of 195 lb-ft (265 Nm) is available from 1,500 to 4,500 rpm - an unusually wide rev band for a compact gasoline engine. The turbocharged drive also offers impressive average consumption of 34 mpg US (41 mpg UK), which is extremely economical in light of the performance on offer.

The Kia cee´d also gets a welcome boost

Since the summer of 2013, the new Turbo GDI has also been available as the most powerful engine in the Kia cee´d and Pro cee´d. With the GT versions, the Hyundai subsidiary brand is adding two sports cars to its popular compact class models as a way of competing with the more established brands. In the Kia cee´d GT and Pro cee´d GT, the turbocharged GDI engine generates 204 hp (150 kW) and maximum torque of 195 lb-ft (265 Nm). The two Korean vehicles also complete the sprint from 0-62 mph in just 7.7 seconds and go on to achieve a top speed of 143 mph (230 kph). Their fuel consumption is also impressive at 31 mpg US (38 mpg UK).

Long-standing partnership

The 1.6 GDI turbocharged engine is not the first development project in which Hyundai Kia has collaborated with BorgWarner Turbo Systems. In fact, the turbocharger specialist is already supplying for example turbochargers with variable turbine geometry for the Hyundai ix35 and Kia Sportage models, as well as regulated two-stage turbocharging systems (R2S®) for the 360 cubic inch (5.9 liter) inline six-cylinder diesel engine, which is used in several of Hyundai‘s commercial vehicles.

R for red, R for racing: The new Peugeot RCZ R.

Peugeot RCZ R achieves peak output with BorgWarner turbocharger

King of the Lions

Driving force: A BorgWarner K04 Twin-scroll turbocharger generates 243 lb-ft (330 Nm) of torque from a displacement or just 98 cubic inches (1.6 liters).

Peugeot first presented its RCZ – a thoroughbred sports coupé – at the Frankfurt Motor Show (IAA) in 2009. Since this time, the powerful vehicle has been winning over more and more fans of the brand with the lion. In Germany, it quickly assumed the top position among the most popular imported sports cars right after its launch. This was reason enough for Peugeot to thoroughly revise its crowd-puller in 2013 with an innovative turbocharged engine as a way of winning over even more fans.

The RCZ R, the top model in the range, celebrated its world premiere at this year's Frankfurt Motor Show (IAA). Generating just over 270 hp (199 kW), the new RCZ R is the most powerful series production vehicle Peugeot has ever built. Under the hood sits a 98 cubic inch (1.6 liter) direct injection gasoline engine that generates its power using a BorgWarner Turbo Systems K04 Twin-scroll turbocharger. With a power output of around 170 hp (125 kW) per liter of displacement, the turbocharged unit ranks among the most powerful passenger vehicle engines in the world.

Explosive power delivery

To squeeze this incredible power output and maximum torque of 243 lb-ft (330 Nm) from a serial production engine with a displacement of just 98 cubic inches (1.6 liters) – which is also designed to handle racing applications – the engineers had to find sophisticated technical solutions and adopt features from the world of motor-racing. They also had to revise and even completely redesign specific parts to combine the racing characteristics of the engine with the robustness necessary for a serial production unit. The team of developers at BorgWarner also had to overcome several challenges in this regard – to contribute to the success of this ambitious development project with a pioneering turbocharging system. The Twin-scroll turbocharger employed was developed specifically for this engine, catering to the intended application parameters and offering the necessary performance. In connection with a completely redesigned racing exhaust manifold made from steel, the unit can handle higher operating temperatures.

Impressive fuel economy

The performance data and agility of the RCZ R are also the result of numerous testing and fine tuning procedures on the race track – in particular with the test drivers from Peugeot Sport behind the wheel. All of the time and effort invested has produced a driving experience that is sure to impress even the most discerning customers. The new turbocharged engine catapults the 2+2-seater RCZ R from 0 to 62 mph in under six seconds and allows the vehicle to reach a top speed of 155 mph. This incredible performance becomes even more impressive in light of the vehicle's average fuel consumption of 37 mpg US (44 mpg UK) and the fact that it already fulfills the criteria of the future Euro 6 emissions standard.

Turbo goes to school (reloaded)

Physics is fun! Pupils from schools in the Donnersberg district (Germany) were able to discover this for themselves back in 2012 at BorgWarner Turbo Systems within the scope of the "Turbo goes to school" project. Based on the excellent feedback received from the first competition, the company Engineering GmbH in Kirchheimbolanden once again called on young people to slip into the role of vehicle designers this year.

Those taking part in the competition were tasked with working in a small team to develop a prototype vehicle that could cover the greatest possible distance without any on-board drive systems when released from a ramp. The main objective here was not only to pass the practical driving test, but also to present the vehicle's concept and provide a detailed cost breakdown in a theoretical section.

Pupils demonstrate ambition and creativity

A total of 14 teams, made up of around 60 pupils from the region's high schools, faced the challenge at the end of June. When the day of competition finally arrived, the young vehicle designers were still working feverishly on optimizing their vehicles and getting everything ready for the competition.

The design created by Lea Zielonka, Inga Grössle and Jonathan Müller from the Nordpfalzgymnasium school, which sent an impressive eight teams to the event, proved a particularly clever solution. In an exciting competition, this intelligent design managed to fend off even the most sophisticated competitors. Combined with their impressive performance in the theoretical section, the three pupils were therefore awarded the prize money of € 250 each, which they were encouraged to invest in driving lessons. Parents, relatives, as well as other pupils and teachers from the schools cheered their teams on and created a great atmosphere at the Kirchheimbolanden facility.

"Events like 'Turbo goes to school' give us an opportunity to get young people excited about engineering and provide them with interesting insights into what a career in this sector can offer," was the summary of Arno Schwarz, project manager and Vice President Manufacturing Strategy of BorgWarner Turbo Systems.

Lea Zielonka, Inga Grössle and Jonathan Müller from the Nordpfalzgymnasium school were delighted to receive prize money of € 250 each, which they were encouraged to invest in driving lessons.

Fit for growth

BRAZIL

In April 2013, BorgWarner opened an ultra-modern new facility in Brazil. The new location in Itatiba replaces the previous production site in Campinas and is set to reinforce the company's position as the leading provider of powertrain technologies in the growing South American vehicle market.

The previous site in Campinas had enjoyed massive growth over the course of the last decade, but unfortunately no longer offered any further capacity for expansion. The management team at BorgWarner therefore decided to build a new facility in Itatiba – approximately 50 miles northwest of São Paulo and just under 20 miles from the former site in Campinas. The automotive supplier invested almost € 24 million (approximately $31.3 million US) in development and construction of the new site.

With around 20,000 square meters (215,200 square feet), the productive area of the new facility for turbochargers, Visco fans, fan drives, camshaft drive systems and components for reducing emissions is twice the size of the former production site in Campinas. BorgWarner also used the space offered by the new site to incorporate a development center with four engine test benches and an area for prototype construction. These new facilities will allow the company to drive forward development of its innovative powertrain technologies even more powerfully in South America, offer new solutions to local vehicle manufacturers even faster and cater to local customer requirements more effectively.

Smooth transition

The new building was constructed in just 18 months, which is an amazing achievement, given the size of the undertaking. The BorgWarner project team also succeeded in relocating from the Campinas site to the new facility in Itatiba without any interruptions to running operations – either in terms of production or customer service.

The fact that the relocation went so smoothly and effectively was largely thanks to the intensive preparations. One key aspect in this regard is that the HR department informed the workforce of the upcoming changes well ahead of time and also made sure that everyone had the opportunity to get a good feel for the new facility before moving in. This strategy clearly paid off. The employees were full of praise for the lighter and more generously dimensioned workplaces – and all specialists also relocated to Itatiba. Although the total number of employees – currently 485 – did not increase, BorgWarner still expects to generate greater revenue at the new facility and is planning to hire more staff in the mid-term.

Environmentally friendly location

At the new facility, BorgWarner is capable of manufacturing 500,000 turbochargers annually right from the start. The total site area of 100,000 square meters (24 acres) also offers sufficient scope for future extensions. In addition to this, the location complies with the strictest safety and environmental standards. In fact, every effort is being made to have the site qualify for LEED certification (Leadership in Energy and Environmental Design) for "green buildings".

Itatiba lies in the federal state of São Paulo. In 2010, the town had a total of around 100,000 inhabitants. Its proximity to regions enjoying rapid economic growth makes it an attractive site for international companies. The name "Itatiba" comes from the Tupi-Guarani language and means "many rocks". Due to its rocky landscape, Itatiba has often also been called "princess of the hill".

Innovation to the power of three

Automotive News PACE AWARD

One project, three awards, three turbochargers – this is a concise summary of the results of the latest cooperation between BMW and BorgWarner Turbo Systems. For the development of a three-stage turbocharging system, BorgWarner not only won the BMW Supplier Innovation Award (see the "News" section in this edition), but also the Automotive News PACE and PACE Innovation Partnership Award 2013.

The much coveted trophy was awarded mid-April in Detroit by a combined presentation party from Automotive News, corporate consultancy Ernst & Young and Transportation Research Center Inc. Recognized throughout the world as a symbol of exceptional performance, the PACE Award is presented each year to automotive suppliers that have demonstrated great success in the fields of innovation, technological progress or business development.

World's first diesel engine with R3S

BorgWarner received the award for its development of the world's first three-stage R3S turbocharging system for a diesel engine. The unit in question is used with the new 183 cubic inch (3 liter) six-cylinder turbodiesel in BMW's exclusive M Performance vehicle models. This is currently the most powerful six-cylinder diesel engine in the world and combines the impressive performance of a V8 engine with the fuel economy of an inline six-cylinder unit. The R3S system from BorgWarner consists of two small high-pressure turbochargers with variable turbine geometry that are connected in series with a larger low-pressure turbo. The first high-pressure turbocharger generates pressure from very low revs just above idling speed, while the low-pressure turbocharger kicks in as the engine speed increases. At high speeds, the second high-pressure system then provides additional boost pressure. Precise control of the exhaust gas stream and fresh air supply ensures that the performance on offer always matches the respective driving situation.

Multiple awards

With seven PACE Awards, four PACE Innovation Partnership Awards and one PACE Environmental Award, BorgWarner has ranked among the most successful participants in the history of this international competition since 2005. This year alone, three innovations submitted by the automotive supplier made it to the finals.

Arno Schwarz from BWTS with a representative of the PACE Awards

From left to right: Tom Grissom (BWTS), James Verrier (CEO BW), Arno Schwarz (BWTS), Gerald Bauer (BMW), Mart Verschoor (BWTS), Rob Meilinger (BW Emissions), Erika Nielsen (BW), Scott Gallett (BW)