DuPont press conference
Pre-K 2007 in Prague

DuPont Engineering Polymers' vision 2010

Speech of

Timothy P. McCann

Vice President Sales & Marketing, DuPont Engineering Polymers

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EP-PreK-2007-01

I would like to address you in the universal language of science and innovation – and more importantly about putting science and innovation to work to create sustainable solutions that are essential to a better, safer, healthier life for people everywhere. And what better place to address you than from Prague. The Czech Republic – as many of you know – has a heritage rich in art, literature – but more relevant to us today, in science.

Investment in research and development here is among the fastest growing in the European Union, according to Eurostat data. And while it may not be at the absolute level of the developed EU countries like Germany, Finland and Sweden, that percentage of growth crystallizes a major trend you'll hear more about today - Emerging country growth and increased living standards. But before I talk about the trends that are fuelling our growth and developments worldwide, I would like to share a little about our company since we were last together in 2004.

DuPont is a $30 billion dollar science company with science and innovation at the heart of everything we do. The results of our science touch many aspects of everyday life – products and technologies that provide better personal protection for people, safer buildings and vehicles. We also work toward lighter and more fuel efficient vehicles, energy-saving building products, clearer, more vibrant displays on televisions and computer screens as well as improving the quality and productivity of crops.

We present solutions through these five platforms – Agriculture & Nutrition; Coatings & Color Technologies; Electronic & Communication Technologies; Safety & Protection; and Performance Materials. The work done by most of the folks you will meet today is captured in the Performance Materials Platform, which includes Engineering Polymers, Packaging and Industrial Products, DuPont Performance Elastomers and Teijin Films.

In 2005, DuPont Dow Elastomers evolved into DuPont Performance Elastomers, a wholly owned subsidiary of DuPont, and brought high-performance products such as Viton® back into the portfolio we use to help customers turn design concepts into products. Together the Performance Materials Platform delivers almost one-quarter of the corporate revenue, so you can imagine that there is a great deal of energy and support for these businesses. The major markets we serve include automotive, industrial segments and consumer markets such as sporting goods, consumer electronics and health care, which you will hear more about in the sessions.

Since the last pre-K press briefing, our revenues have grown nearly 22 percent to $6.9 billion in 2006. That's not been easy growth, though: Think about the changes since last we were together in terms of sharp increases and fluctuations in raw material costs, market dislocation, global competition and global pricing strategies, mergers, consolidations, bankruptcies, knock-offs and counterfeits, over-capacity and under-capacity.

It's pretty difficult to concentrate on what it truly takes to win in business. Some plastics companies, facing the wave of global industry consolidation and commodity pressure, reacted by cutting back value added services. Others backed out of certain business, shut their doors – or they are exiting the business through a corporate strategy.

For us to continue to grow in this increasingly challenging, dynamic environment, we feel we must travel the route of innovation – delivering solutions through one of the broadest portfolios of products in the engineering polymers industry today. And it's critical we travel that route with our customers.

For the balance of my time, I would like to share how we are uniquely positioned today and into 2010 to help our customers Give Shape to Smarter Ideas, both in terms of delivering a broad-base of high-performance products from a global network and in terms of supporting new product developments from an experienced global base of design and processing experts.

Our glocal network

Today, the Engineering Polymers network of application development, research and manufacturing centers looks like this. Customers can access the global network to meet their local need – a strategy that is referred to as "glocal." As an example, we are the only nylon producer with nylon polymer and compounding manufacturing plants in all main regions of the world. We're driving a strategy to make all of our products in the regions where they're sold. Making product where it's sold helps to improve response time, decrease cost and improve quality. The facilities you see on this slide are designed to provide support for research, application & market development, material manufacturing, training, technology transfer and licensing of DuPont technologies for global markets.

When we were last together in 2004 we had just started up our PBT Joint Venture in Germany and our first ever HTN continuous polymerization unit in Richmond, Virginia – both large scale, low cost polymerization units that today produce relevant, essential polymer products. Since then DuPont Engineering Polymers has invested more than $200 million to expand our capabilities and our global reach. More than half of our growth is in Asia Pacific, and about two thirds is happening in emerging or developing economies.

A few of the new facilities since 2004:

- New compounding capability for resins in Shanghai and Bangkok;
- A new design centre and testing facility in India,
- An R&D centre in Shanghai, and
- Automotive centre in Nagoya, Japan.

We also recently announced two new manufacturing sites in Singapore: one to provide our second Zytel® HTN continuous polymerization line; the other a manufacturing center for Vespel® parts and shapes. Corporately in Eastern Europe we will launch an automotive office in St. Petersburg soon and have established one for all DuPont businesses in Alma-Aty, Kazakhstan. Alain Barronier, DuPont Engineering Polymers Director Sales & Marketing in Europe, will also share more about what's happening in Europe, which today provides one third of our sales volume

But I would like to share with you today that we plan to invest another $200 million in global growth over the next three years, the majority of which will be focused on capacity increases that follow from our successful new technology centres in Shanghai and Japan.

Our Innovation Banner

The ability to grow and invest in this "glocal" strategy is a direct result of a successful business. As I mentioned earlier, innovation and the ability to help customers go from art to part – quickly and cost-effectively – sets us apart in the crowded, fiercely competitive plastics supplier marketplace. Strategically, we support our customers by working with them early in the development cycle so that they can get to market faster, with better products, more cost effectively.

We illustrate our role through this application development triangle. This non-linear process includes up-front cooperative design innovation, blends in processing support and innovation and also includes material innovation. Let me share how that works.

In the automotive industry, where styling is a significant differentiator, headlamps can be designed to add personality. Until recently, design was somewhat limited by materials and cost. Our global lighting team, working closely with customers in the value chain, found a solution that involved new materials, collaborative design solutions and new processing techniques that today have led to applications on more than 8 million vehicles worldwide.

Customers benefit through significantly reduced costs, consumers benefit through improved design features. You hear more about this and a number of stories of successful programs today, but I would like to take just a few moments to highlight the trends driving innovative, new ideas that turn into successful new materials, and new development opportunities for our customers.

Consumers in many markets are showing their support for sustainable products at the cash register. Recent studies show that more than half of all Americans are inclined to purchase "green" products, though the question of "how much more will they pay?" remains unanswered. At the same time dozens of retailers – growing every day - are differentiating themselves beyond price and convenience with sustainable products and practices. While young, the leading indicators say sustainability is a means of differentiating. Our customers know this and they are looking for materials and technologies that help take them there.

To borrow words from our chairman Chad Holiday, we believe what's good for business must also be good for the environment and for people everywhere in the world. We recently announced our intent to expand business offerings addressing safety, environment, energy and climate challenges in the global marketplace. Today we will slice through those goals and share with you some of the specific trends driving new products, technologies that promise to help us in Engineering Polymers and our customers reach footprint reduction and business growth goals.

Sustainability

- Renewably sourced materials
- Fuel economy, reduced automotive emissions, lightweighting
- Automotive safety - Pedestrian safety requirements
- Improved product performance
- Human connectivity

Renewably sourced materials

Nandan Rao, Vice President of Research and Development for Performance Materials, will describe the science behind a much-requested new offering that includes renewably sourced materials, and in the workshops you'll hear how we are working with customers in targeted development programs to ensure the first adoptions of this new polymer family deliver not only environmental benefits, but performance benefits as well.

Fuel economy, reduced automotive emissions, lightweighting
While there is some debate on the number, vehicle use emissions are often blamed for up to 75% of CO2 releases globally. At DuPont there are dozens of programs in place to greatly reduce CO2 emissions – including developing advanced bio-fuels. What we want to do today is focus on a few Sustainable Mobility solutions relevant to us here in the performance materials business.

As the auto industry strives to find Sustainable Mobility solutions, you will see today that we are working in focused areas to improve barrier technology that significantly reduces permeation and on material enhancements that meet the challenges of aggressive alternative fuels. Reducing weight improves gas mileage, which also reduces emissions – 25 kilograms means a one percent increase in fuel economy – critical to automotive engineers challenged to provide additional content without adding to vehicle weight.

Weight reduction is obviously great news for plastics; and we actively work with our automotive customers to reduce weight and improve performance. Nandan Rao will talk in a few minutes about nanocomposites and how they are poised to offer a step change in structural performance to replace heavy, structural metal components and systems.

Automotive safety - Pedestrian safety requirements
Delivering safety-systems solutions in the automotive industry requires precision engineering – reliability is paramount – and this demanding environment has long been an area of expertise for DuPont … from developing Butacite® for laminated automotive windshields and SentryGlas® for sunroofs and side windows, to optimizing the flexibility characteristics of Hytrel® thermoplastic polyester for airbag doors, and tapping the mechanical reliability of Delrin® acetal for automotive safety belts.

What we want to talk about later today are new developments that help our customers improve pedestrian safety. In the EU alone, about 8000 pedestrians and cyclists are killed and about 300,000 are injured every year. We must use our innovation capabilities to be a force working to reduce the number of these tragedies.

Improved product performance
Improving product performance is critical for many of our customers fighting to stand out in a crowded marketplace. This trend exhibits itself in automotive through extended warranties, improved customer satisfaction ratings. In the consumer products markets it reveals itself by differentiating higher-end items. In industrial products, we see this trend emerge as the desire for equipment that doesn't require continual maintenance and inspection. Since 2004 we've launched more than 115 new products to improve overall product performance; and you'll hear more today.

Human Connectivity.
Last on my short list of trends – you should see my REAL list – is the flattening of the world and the human connectivity trend. If you are among the statistical norm, you have a cell phone, blackberry-type product and a laptop with wireless connection. Some studies show that consumers in developed countries have reached their saturation with being accessible, but people in emerging countries are driving demand for devices that continue to flatten and connect our world. That translates to billions of mobile phones, laptops, handhelds – and it translates to billions of connectors, housings, displays, etc.

While we provide material solutions for cell phones, laptops and handhelds, the trends to make them smaller, lighter, more aesthetically pleasing and recyclable will drive the need for higher temperature materials, halogen free materials and multi-functional materials – those that provide strength and beauty. You will hear more of those stories as well today.

I talked, perhaps too much, about market trends but I want to emphasize that high-performance materials, experienced design and development experts linked globally can Give Shape to Smarter Ideas – today and into 2010. Nandan Rao, Vice President of Research and Development for Performance Materials will describe how our research and development group translates these trends into market realities. Nandan, please take us further along the path that biology, chemistry and physics is taking to "Shape our Future …"

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Shaping the Future of Plastics: New Technology Platforms

Nandan Rao
Technology Director for DuPont Performance Materials

EP-PreK-2007-02

In the short time available, it is my sincere pleasure to provide an overview of several exciting, new technology platforms in the DuPont pipeline. I expect these technologies to become valuable tools that help deliver innovative solutions to our customers well into the future.

I'm going to highlight two important focus areas where DuPont is developing new technology platforms – the drive for metals replacement in response to escalating natural gas and energy costs and sustainable solutions that respond to environmental issues such as global warming. In both of these areas our current industry practices are not sustainable and we face discontinuity that requires innovation. DuPont is addressing this with new technology platforms that will be coming to market in the period between now and the next time we meet at the K-Show.

I'd like to start with the drive for energy conservation. As you see in the graph at the bottom left, the cost of oil and natural gas have been rising exponentially. In the automotive market, this has resulted in a drive for improved fuel economy and weight reduction. The drive to replace metals is not limited to automotive though. Lighter weight, higher performance materials are desired in many high performance markets including electronics. DuPont technology solutions in development include polymers with high temperature resistance, superstructural capabilities and thermal conductivity.

DuPont and others are working to push the properties of polymer composites further in the direction of metals. Our most recent steps involve a superstructural family using a combination of high-performance polyamides and glass or carbon fiber reinforcement to provide levels of stiffness and strength not achieved before.

High strength structural materials have been made possible with elevated concentrations of standard short glass fibers that required innovations in compounding technologies. High loadings of short glass in a high modulus matrix such as DuPont™ Zytel® HTN gives outstanding performance. Such composites are used in applications where performance at high temperatures and high dimensional stability are critical, such as in tool housings, motor coil bobbins etc.

Thermoplastics reinforced with long glass fibers move us further up the metals replacement curve for applications where light weight and high strength are critical. We work with customers to evaluate their needs for polymer composites with structural properties closer to metal while retaining the design flexibility and economic advantages of thermoplastics.

Here are some of the innovative new technologies we are exploring in our search for superstructural materials. The photos show a microscopic view of long-fiber reinforced and also a fabric composite. We are making progress in each of these areas on this list but I'd like to highlight the last item, thermoplastic nanocomposites, which is a technology with especially high potential.

This slide shows from bottom left to upper right the progress thermoplastics are making toward the properties of metal. In yellow are the first generation short glass fiber reinforced conventional polymers. In red are long glass fiber reinforced types in the same polymers. You see the improvement in the tensile modulus or stiffness but the improvement is only in this one dimension.

Our efforts have been aimed at improving performance in both dimensions. This is achieved by changing the polymer matrix to high performance polyamides which yield a step change in both thermal stability and strength. Further improvements will come from metal/plastic hybrids, fabric reinforced thermoplastic composites and long carbon fiber reinforcement. There is considerable R&D underway in the latter fields and you can expect new product and process innovations over the next 3 years suitable for metal replacement in structural parts such as car seats and reinforcing beams. These innovations will result in significant weight reduction opportunities.

Since our announcement last summer of DuPont's proprietary nanocomposite technology we have made significant progress in our understanding of the properties attainable as we reduce the particle size of reinforcing materials to produce order of magnitude greater interfacial area. Significant improvements in crystallization, rheological, mechanical and permeability properties can be achieved for improved processing, better structural performance, higher heat deflection temperatures, better electrical insulation and improved barrier to gas permeation. Our research is focused on a range of polymer matrices including polyester and polyamides.

The photo is a TEM microscopy of PET with 3 wt% nanomaterial. It shows the well-defined nano-fiber morphology of the DuPont nanomaterial in the PET. The chart at left shows that at any given temperature, nano-reinforced PET has improved modulus to a maximum of 140 degrees Celsius. The implication of this is that one can reduce the amount of glass reinforcement. One can also obtain improved surface properties. Nanocomposites provide a means to achieving equivalent properties at lower glass loadings which opens the way for reducing the weight of parts with comparable properties while providing other attributes, such as improvements in surface appearance.

Now let me turn our attention to thermal conductivity in plastics. Plastics are of course insulators of heat. The trend towards devices operating at higher voltages and miniaturization of components requires more efficient heat removal than plastics have been capable of in the past to replace metals. An example is that conventional automotive head lamps are moving to LED arrays to reduce energy demand. This design change will require improved heat removal.
This chart summarizes the progress that's been made and helps illustrate the challenges in balancing improved thermal conductivity with the need to retain moldability and low cost.

On the left we show the highest range of thermal conductivity that's been achieved labelled box 1. In the last three years, within and outside DuPont, electrical conductivity has improved from 3 W/mK to approaching 50 W/mK. This was achieved via specific mixing of high filler content, addition of molding aid agents and use of carbon fiber with other fillers. These formulations provide high stiffness at an acceptable cost level, but have poor moldability. Improving moldability and balancing the tradeoff vs electrical properties is where R&D is focused.

The second group shown in the Electrically Insulative column illustrates the highest range of performance that's been achieved. This has been via BN coated graphite, Cu particles coated with glass and BN powder and coupling agents. On the plus side these technologies achieve electrical insulation with high thermal conductivity. However, they are expensive technologies to get that performance and again have poor moldability.

The group labeled number 3 highlights electrically insulative performance that is achieved via filler concentrations in block copolymer or ceramic particle technologies. You can see that we do get electrical insulation along with thermal conductivity, but the level of thermal conductivity is not sufficient to meet emerging needs. My overall point with this data is to emphasize the difficulty in obtaining **all** the desired properties in a single approach.

I'd like to turn my attention now to the drivers for sustainable solutions and DuPont's Technology focus. If you look at the chart on the upper left of this slide, it's obvious that we should be concerned about global warming and the rise in greenhouse gasses in the atmosphere. Earlier this year the prestigious international organization, Intergovernmental Panel on Climate Change made an announcement that global warming is definitely linked to human activity.

DuPont has responded Corporately by announcing our 2015 sustainability goals as Tim mentioned earlier. Corporately the company is pursuing biofuels and a variety of sustainable solutions. In our business, we have focused on the need to develop polymers from sustainable resources.

I would like to spend a few minutes providing an overview of the biorefinery concept and how it enables sugar-based intermediates taking advantage of cellulosic conversion.

Here we have a schematic of the biorefinery concept that shows the process flow for corn grain and corn stover. It's pretty obvious what corn kernels are. Corn stover is all the cellulosic material from the plant that remains after the grain is harvested. I've illustrated corn here because this is the US direction, but the same concept applies to other sugar sources that might be used in other parts of the world.

Of these two approaches, corn grain is the initial sugar source being utilized. It has the benefit of high productivity in the conversion process. However there are many value-adding uses for the grain and supply is not unlimited. You can see the process steps from the production of starch to fermentation that leads to the output of value added chemicals such as PDO.

Conversely, corn stover is mostly going unutilized today – essentially going to waste. On the right side of this slide you can see that the process steps for processing corn stover to hexose sugars and that it also yields value-added product. There also is the additional benefit of energy output, seen in this illustration as electricity through steam generation, thus making maximum use of plant products that ultimately derive their energy from the sun.

DuPont is working closely with the US Government and select partners to create and efficient biorefinery. Because of their high sugar content, cellulosic materials offer an abundant, renewable source that today is going totally to waste. This chart shows that the useful sugars in corn stover, glucan and xylan are about 58%. In 2008, DuPont is expected to participate in the construction and operation of a pilot cellulosic biorefinery to ethanol. With the growing demand for sugars for industrial intermediates and biofuels, cellulosic conversion is an essential step in a biorefinery concept.

Let's look at how much energy is saved in biorefinery process compared to a conventional petrochemical process. We completed a full life cycle assessment (LCA) for propanediol, an intermediate for DuPont™ Sorona®. First we see the refinery flow for Bio-PDO™ from corn.

Now on the right we show the same process for PDO from fossil fuel sources. They have different inputs but the same value added products coming out the final process steps – one is biologically derived.

We believe the biological process can fully compete with the petrochemical route to PDO. It also has the advantage of reducing depletable resource consumption and reducing our environmental footprint. The production of Bio-PDO takes 40% less energy than its petrochemical-based counterpart saving the equivalent of 13.5 million gallons of petroleum for 100MM pounds per year of production.

The processing facility we constructed with Tate & Lyle to make Bio-PDO is already operational and will have its grand opening ceremony in June. Bio is a reality!

I've shared with you the technology DuPont is developing to bring forward products based on renewable materials and that the plant to make commercial scale Bio-PDO is fully operational. This chart shows the array of offerings DuPont is developing based on Bio-PDO including DuPont™ Sorona® polymer and DuPont™ Hytrel® made with nondepletable resources. We now will be able to offer our customers the benefits of renewably sourced materials, reduced dependence on petrochemical sourcing and a positive impact on the environmental life cycle of their products at competitive prices.

In closing I'd like to go back to where we started this talk. Tim spoke about macro trends impacting thermoplastic materials markets. I've tried to provide an overview of the transformational technology platforms DuPont is developing in response to these trends. DuPont is committed to sustainable growth and to continuing to develop and bring to market innovative new offerings that benefit our customers and everyone in our value chains. In 2006, 34% of our sales were from products introduced in the last five years, so you can see that we are paying off our commitment with value-added new offerings.

Next, I'd like now to introduce Alain Baronnier, European sales and marketing director for DuPont Engineering Polymers, who will speak about our new developments in the important European market.

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DuPont press conference
Pre-K 2007 in Prague

Committed to growth in Europe

Speech of

Alain Baronnier

European sales and marketing director for DuPont Engineering Polymers

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EP-PreK-2007-03

Good morning ladies and gentlemen. For those who I have not met, I am Alain Baronnier, European sales and marketing director for DuPont Engineering Polymers. I am based at the company's European headquarters in Geneva, Switzerland. My career at DuPont to date stretches over 22 years, spent in the company's engineering polymers, five years at the beginning of my career and since July 2002, electronics, PET films and packaging and industrial polymers businesses. My previous role, based in Shanghai, China, was that of global business marketing manager for DuPont Engineering Polymers' High Temperature Solutions, part of our business offering for customer innovation.

Based on my current responsibilities, my presentation will focus on DuPont Engineering Polymers in Europe. I am pleased to say that the strong figures previously shown for our global activities are also reflected in Europe, which contributes approximately a third to the global revenue of about 3 billion dollars. Hence 2006 was a good one for EP in Europe, both in terms of volume and revenue, where we saw revenue for EP in Europe grow by around 10 percent. If we measure EP's contribution to DuPont's overall revenue in Europe, our business is the largest and accounts for about 12 percent. Hence Europe remains very important to our business, despite our industry's trend of moving to the Far East, and Engineering Polymers is a key player in DuPont's overall European presence.

As you have already heard, a key factor in achieving current and future growth, has been our strict implementation of the "glocal" (global + local= glocal) approach in our European operations. Our network of sales offices is present in all the principle countries of Europe, Middle East and Africa, all other areas are covered by our established and qualified distribution network partners.

We have manufacturing facilities in across Europe able to polymerize and compound products to global standards and meet local demand. World-class application development and processing expertise is headed by our European Technical Center in Meyrin, Geneva – which I am delighted to say, has been recently appointed a Global Center of Excellence for extrusion technology, something you will hear more about in our workshops this afternoon.

On the application front, the ETC in Meyrin leads, for example, developments in air induction applications, such as blow-molded airducts, or lighting applications such as headlamp bezels. Of the development work that goes on there, more than 40% is dedicated to countries outside of Europe. The ETC is part of an integrated network of technical centers – in the USA, China, Japan, Korea, Switzerland, and soon India –providing not only global reach but each assuming global leadership on specific applications and technologies.

Before our venue for today's press conference leads me to speak about our strategy for partnering growth in eastern and central Europe, I would first like to emphasize the ongoing significance of the western region. Currently around 80 percent of our business remains located in western Europe, evidence of its crucial role in our future prosperity. A wide range of developments are for example taking place in Western Europe in the areas of automotive – we estimate that about 2/3 of all the major global innovations in plastics like AIM`s or rocker covers were made here (and the big part of which is based in Germany). Other examples of global lead are winter sports with core design and development activities in France, Austria and Switzerland. Italy is playing a key role in appliance, electrical or medical device industries and many other areas where sophisticated industrial design and high quality are key to commercial success.

For these countries and market segments we will continue to provide industry-leading and differentiated products, which combined to our processing/design/application development support, will enable our partners to be cost competitive and innovative. Here it is critical to have development expert teams in place to drive innovation and create growth opportunities. Thus the work carried out in Western Europe is essential in creating the growth there, as well as in providing opportunities to be captured in the "emerging markets".

I would now like to address our approach for managing growth in Central and Eastern Europe. Our EP growth in these areas is moving at three or four times the rate of established markets such as Western Europe. Today, the growth is driven not only by foreign companies, but also by national companies. Both types benefit from increases in export and for the last years from significant local demand as well. By adopting a 'glocal' approach, we have been able to support our global Engineering Polymers customers 'locally' – in other words, as they have established operations in this part of the world. At the same time we have also

created new opportunities to grow with our customers in these new markets through innovative application development using our joint design, processing and material expertise.

Since the 1990s, we have helped existing customers of DuPont Engineering Polymers in Western Europe, Japan and North America to move into new regional manufacturing markets, principally by enabling the smooth transition of their business to these countries and maintaining the same high level of material and technical expertise they have come to expect from DuPont. At the same time we will look to work with local industry leaders, many of whom we are quite familiar with through our early engagement in the region. In all key countries of the emerging markets, we have established teams of DuPont Engineering Polymers marketing specialists, supported by dedicated distributors. In smaller markets, our distributors provide similar services to DuPont depending on customer needs; from local ware-housing, through application development work, to processing help.

Our local sales and development specialists in this region work closely with their DuPont Engineering Polymers colleagues throughout the world when it comes to both global account management and global technology transfer / application development.
This means, for our customers in Central and Eastern Europe, and beyond, from the start-up of their operations to full operation of their factories and the commercialization of their products, that DuPont Engineering Polymers is there to assist them in growing their businesses.

To illustrate my point, I would like to take a few minutes to describe EP growth in the Czech Republic and Slovakia. Our revenue in these two countries has increased by a factor of five over the last seven years, much of which is driven by their booming automotive industries: Between them Skoda, an alliance of Toyota, Peugeot and Citroen, and Hyundai produce over a million cars per year in the Czech Republic – a slightly lower number in Slovakia with a different constellation of OEMs – but between them combined their output constitutes 12 percent of west European car production. A considerable market, reflected in the number of Tier 1 suppliers also present in these countries, to whom we can offer our material solutions.

An example of which is our close partnership with Visteon’s Autopal Lighting Technical Center, based approximately 300 kilometers east of Prague, which has seen Autopal using Crastin PBT® for a range of headlight bezels commercialized on the Ford Focus and Fiesta, the Citroen Berlingo and Skoda Octavia. Beyond the excellent properties of Crastin® for this application, the customer cited the superb technical support provided by colleagues at our Czech offices as a reason for its choice of material.

Growth in other countries of Central & Eastern Europe includes the burgeoning appliance industry in Turkey – which has one of the fastest growing plastics processing industries in the world, with an increasing trend in exports thanks to its geographical location on the crossroads of Europe and Asia. A recent example of close cooperation between my colleagues in Istanbul and Arçelik, the internationally-recognized producer of household appliances and components, has seen the use of Zytel® HTN PPA in a new coffee machine as an alternative to aluminium or copper. The local provision of material design and processing support by DuPont was again a factor in this project's success.

To summarize the recipe for our success in the emerging markets such as those in Central and Eastern Europe, I would say that businesses based in these countries want committed partners who support them with the very latest technologies, and who are there for the long haul. That is something that DuPont Engineering Polymers has been able to respond to. In the eyes of our customers and other business partners, the commitment of DuPont Engineering Polymers to the emerging markets is now firmly established. The reward for our company has been substantial business annual growth of around 20 percent. We would like to take this opportunity to thank our partners in Central & Eastern Europe, and areas beyond, for this growth, and we look forward to many years of continued success together.

Before I conclude my presentation, may I briefly address a topical issue that effects us wherever we are in Europe, and ties in with our own sustainability goals: REACH - the Registration, Evaluation and Authorization of CHemicals in the European Union is the first major legislation worldwide to require the comprehensive registration and evaluation of chemical substances, and will enter into force tomorrow, on 1 June 2007. The goal of this regulation is to improve protection of human health and the environment. This intent is consistent with DuPont Product Stewardship programs and is aligned with our own internal evaluations to ensure the safety of our products. We are committed to meeting the requirements of REACH in full co-operation with our customers and suppliers.

Indeed, we have been actively preparing for REACH implementation since October 2003. Our view is that it is part of a growing global regulatory trend for the sustainable development, production and use of chemicals. DuPont is relying on a long tradition of regulatory compliance excellence and leadership in product stewardship to set the stage for our approach to REACH. DuPont businesses like EP are working on REACH and incorporating its thinking into all aspects of their activities. We believe excellence and leadership in REACH compliance will be not only an expectation, but a business advantage for our customers.

So to conclude and summarize our strategy for Europe: DuPont Engineering Polymers will continue to grow both in Western, Central and Eastern Europe and all others parts of the EMEA region by:

- providing industry-leading, sustainable and differentiated products, which combined to our processing/design/application development support, enable our customers to be cost competitive and innovative.
- maintaining our strong design and developmental support in all industries, with an emphasis on those projects where high performance materials are key to success;
- strengthening our local presence through adding adequate resources, in order to capture the new opportunities presented in the emerging markets - often created by our development work in the established markets;
- extending the range of technical capabilities provided to our customers through investing in the European Technical Centre and our global Technical and R&D network.

Based on these pillars and the active collaboration with our growing customers, we are confident about our ability to increase our EMEA business by more than 25% at the 2010 horizon.

It is at this point in our program that we will break out into smaller workshop sessions, whereby you will be able to hear more detailed information on three core areas of the DuPont Engineering Polymers offering, aspects of which have been touched on in this morning's presentations. This will include

- developments in our automotive offering in this region and beyond,
- the expansion of our extrusion capabilities in Meyrin and our application development competencies.
- and marketing efforts to open up fresh applications in areas such as healthcare, food-processing and the oil and gas industry.

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Engineering Polymers for the Automotive Industry: Turning Visions into Reality

Workshop Summary

Klaus Bender

Market Development Manager, Automotive Industry, DuPont Engineering Polymers

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EP-PreK-2007-04

Prague, 31 May 2007 - The overall drivers for development in the automotive industry have changed little in the last decade. Cars should be made safer and more comfortable, and they should get lighter, or at least not heavier, and their environmental impact should be reduced. Changes are to be found in the detail. DuPont Engineering Polymers with its strongly application-oriented palette of products is helping the industry to attain across-the-board objectives as well as highly specific ones.

Minimised Emissions from Motor…

The automotive industry is advancing towards the ideal 'zero emissions' car. The rate of progress is determined partly by its own environmental awareness, partly by ever stricter global mandatory requirements, and partly by customer expectations. The EURO 5 exhaust-gas standards will come into force in 2008/09, substantially reducing the already low limits for NOx, particles, CO and hydrocarbons still further. Improvements in mixture preparation and combustion through better design have made great progress, but seem to have reached a certain saturation point. More radical steps, such as hybrid drives, the use of bio-fuels or the selective post-treatment of exhaust gases are assuming greater importance. There is a trend to substantially smaller cubic-capacity motors, which have lower fuel consumption but need to be supercharged to achieve the required performance.

All these steps mean more severe demands on the plastic materials used. Alternative fuels, concentrated blow-by gases in mechanical separators as well as the ammonia solution used for treating exhaust gases have a highly aggressive effect on seals and moulded parts. The extremely limited space under the bonnet and the use of exhaust

gas recirculation systems, turbo- and mechanical charging systems and self-cleaning particle filters increase the operating temperatures around the motor to levels where conventional engineering polymers often capitulate.

DuPont™ Zytel® HTN polyphthalamide (PPA) meets the majority of these challenges. This polymer, which has a continuous operating temperature of up to 220 °C, bridges the gap between the high thermal and chemical resistance of conventional high-performance plastics such as polyether sulphone (PES) or polysulphone (PSU) and the more economical nylon 6 and 66 types. Zytel® HTN types optimised for specific applications as well as new extrudable 66 nylon types with improved thermal resistance are in development. They will allow air-conduit parts exposed to high temperatures to be produced by blow-moulding; they may even be candidates for metal and rubber replacement in the hot regions between the supercharger and the supercharged-air cooler.

… from Fuel Systems …

The alcohols, ethers or methyl-ester-based components of bio-fuels (bio-diesel and ethanol) attack sealing materials and plastics parts, leading to their degradation and ultimately to their failure. DuPont has developed Delrin® 560HD, a special acetal for such applications. It can also be used in contact with hot diesel fuel and has been successfully incorporated in fuel supply units.

DuPont has tackled the challenges in sealing applications with new Viton® fluoroelastomers, which withstand aggressive media and respect or even exceed mandatory volatile emission limits. These di- and terpolymers with significantly improved processing characteristics are designed for highly economical production of sealing elements. Recently developed types such as Viton® GBLT-S combine very good resistance to fuels and liquid media with low permeability and good low-temperature characteristics and very good processability. Viton® GF-S combines high chemical resistance with low compression set and should be considered for use as high-performance fuel hose lining.

… and from Interiors

When the smell of newness has gone from a car’s interior, passenger compartment materials must not generate other unpleasant smells. Conventional acetals (POM) may in certain unfavourable circumstances become disagreeably noticeable by releasing formaldehyde. DuPont™ Delrin® 100PE, 300PE and 500PE are new POM types in which such emissions have been reduced substantially (by about 90 %). Typical applications for this new generation of POM types are gears for drives and actuators, window-lift systems, door-lock housings, safety-belt guides and pre-load devices, as well as knobs and push-buttons.

Weight Saving

The number of components in a car which serve to reduce environmental impact and improve safety and comfort continues to grow. But the space to hold them is not increasing, and adding weight is not an option. Hence designers and engineers are compelled to integrate more functionalities into individual components and/or to reduce their size and weight without compromising reliability. While maximising functionalities is a speciality of thermoplastics, weight reduction calls either for plastics with substantially improved mechanical properties, or for hybrid construction methods combining thermoplastics and metals into a single unity which can then be used for structural parts.

DuPont's 'superstructural' resins offer a possible way to reduce wall thickness while maintaining load-carrying capacity. With these resins, the combination of PA and PPA types with good flow characteristics and 40 % or 60 % long-glass-fibre (LGF) reinforcement (about 12 mm) result in especially high stiffness, strength combined with good impact resistance. For structural parts, high-performance Zytel® HTN51LG50 based on PPA and Zytel® 75LG50 HSL based on PA-66 should be considered.

Where short fibres do not provide sufficient stability, for example in back-rests, a combination with carefully placed continuous filaments can provide a solution. In this area, as with thermoplastic/metal hybrids, DuPont is developing new materials and the appropriate technologies. Apart from seating, applications in the steering column, suspension and structural parts in the motor are mooted.

More Protection, Greater Safety

Greater safety for pedestrians is a theme of current importance. Apart from changes such as a steeper angle for the bonnet, new design concepts employing soft plastics can open new perspectives. There are many possible starting points, from front bumper and radiator grille, headlights, mudguards and bonnet, and the beauty cover immediately under the bonnet. New design ideas are under discussion for bumpers, to replace polypropylene foam, which is generally used today, with a product that stays flexible even under freezing conditions. DuPont is participating actively in the optimisation of bumper systems. Promising results are coming from tests with an extruded profile of DuPont™ Hytrel® thermoplastic elastomer with an integrated impact sensor system extending over the whole width of the bumper. Co-extrudates of Hytrel® in the front part and stiffer, stronger thermoplastics in the rear part of the bumper could also offer cost-saving solutions.

More Sensors for Comprehensive Data Capture

A growing number of sensors in and around the car help to increase safety, protection and comfort. They are in the passenger compartment as well as at every imaginable location of the drive-train and bodywork. They have, of course, to be as small as possible, and they have also to be capable of withstanding aggressive media, a broad range of temperatures and possibly hard impacts. Depending on their task, such sensors and their electronics are either placed in housings or they are encapsulated by overmoulding.

The LGF-reinforced thermoplastics as well as thermally stabilised and hydrolysis-resistant nylons, some with increased glass-reinforcement content, offer many different possibilities for housings, saving weight and space through a substantial reduction of wall thickness. Hermetically sealed housings can be made by welding the covers in place, whereas conventional processes can damage the electronics inside through high accelerations (vibrations). The workaround is through laser-welding, an innovative, gentle process, in which parts are not exposed to abrupt movements or to high thermal stresses. DuPont has expanded its range of engineering plastics with the addition of types available in laser-absorbent and laser-transparent versions; the first is suitable for making housings, the second for covers. These types still offer their regular properties.

The encapsulation of components for automotive electricals and electronics makes further miniaturisation possible. For these applications and for connectors DuPont offers ‘wire-friendly’ thermoplastics with very good dielectric properties. They are dimensionally stable and can be processed by gentle methods so that delicate electronic circuits are not damaged during encapsulation and through temperature variations. They also release virtually no corrosive off-gases (no outgassing). Examples of such resins are to be found in the range of low-warpage nylon 612 types, in DuPont™ Crastin® and DuPont™ Rynite® thermoplastic polyesters and in the inherently flame-resistant DuPont™ Zenite® LCPs.

Engineering Plastics Remain Key Materials

Stricter exhaust gas standards, more severe requirements in active and passive vehicle safety, limited raw materials resources, a rapidly growing number of electrical and electronic components in cars, and the demand for weight reduction—all these factors will continue to determine the future of automotive design. This in turn will require materials with specially adapted property profiles. Here, engineering plastics offer some of the broadest capabilities, and their significance will continue to grow. DuPont has anticipated these trends and is working with its specialists on a global basis on the application-oriented development of new plastics materials.

The plastics content of cars in the 1970s was about 5 %. Today it lies over15 %; realistic estimates point to 20 % plastics content in five years’ time. With innovative thinking and the market-oriented conversion of projects in close co-operation with OEMs and systems suppliers, DuPont will contribute substantially to the sustained use of plastics in automotive engineering and thereby to reaching this figure.

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All charts and illustrations from the posters used during the workshops may be requested as individual, hi-definition jpeg files in local language. Please either contact us directly during the event, or contact your local press office on your return from Prague.

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Rocker cover of Minlon® with a high degree of functionality

This image can be downloaded as a hi-resolution file at:
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EP-PreK-2007-05

Photo: DuPont

The rocker cover of DuPont™ Minlon®, developed by systems supplier MAHLE for the six-cylinder VVT petrol engines from BMW, measures approximately 700mm by 330mm. Its highly-integrated functionality makes it a cost-effective alternative to those made of metal.

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Rocker cover of Minlon® with a high degree of functionality

Prague, 31 May 2007 - - The systems supplier MAHLE has tailor-made a multifunctional rocker cover for the six-cylinder petrol engines with variable valve timing (VVT) from BMW. A mineral-filled and glass-fiber reinforced grade of DuPont™ Minlon® nylon-66 provides the large cover, measuring approximately 700 mm long by 330 mm wide, with the required amount of stiffness, strength, low-warpage and dimensional stability at a temperature range of between –40 °C and, sporadically, 150 °C. Further reasons for the selection of Minlon® were its good weldability, enabling the cost-effective and secure attachment of additional components, and excellent surface properties, which means that the partially-visible cover can be used in unpainted form.

In addition to the rocker cover's basic roles of providing a cover and secure seal to protect the valve control system, even when the vehicle is at an extreme tangent, MAHLE has been able to integrate blow-by-gas management into its design. Further roles include noise optimization, incorporation of sensor technology and the six pencil coils, as well as the secure positioning of the flange-mounted servo-motor for adjusting the variable valve timing.

Minlon® is inherently suited to such tasks, as it combines very good mechanical properties with high rates of attenuation, both in terms of the acoustical and mechanical vibrations that occur in the vicinity of the servo-motor's fixing. Working together with finite element specialists from DuPont, MAHLE was able to optimize the design in those parts primarily affected, and thus achieve the desired acoustic and mechanical properties with minimal material volume. Despite its large size, the cover only weighs just less than 3.8 kilograms.

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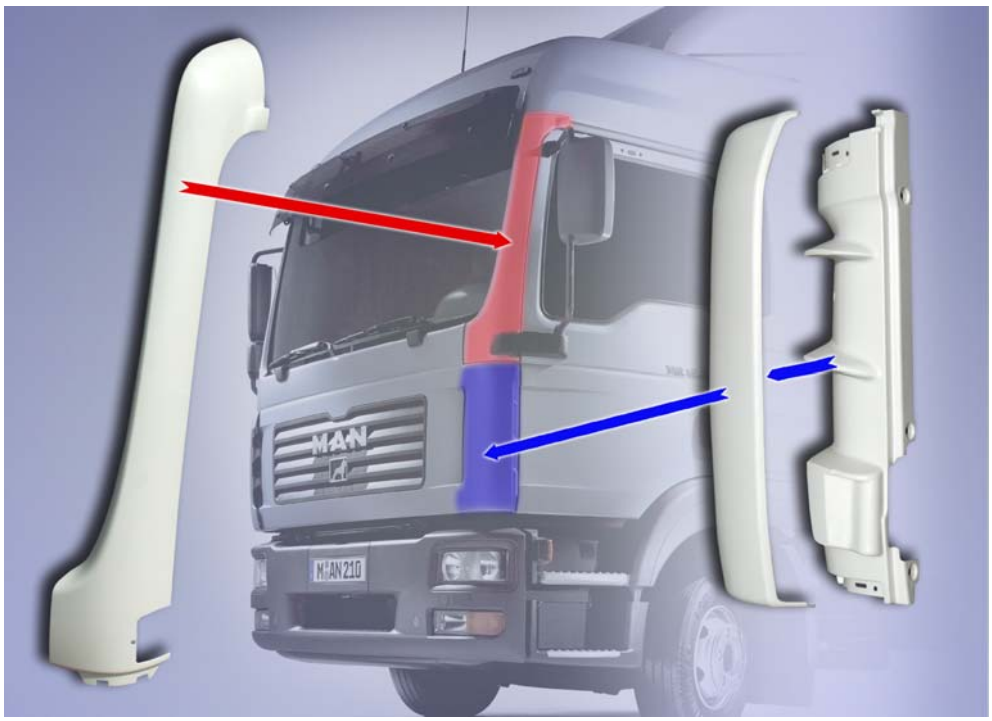
EP-PreK-2007-05

Note to the editor:
This press release is based on information provided by:
MAHLE International GmbH, Pragstraße 26 - 46, D-70376 Stuttgart
Contact: Corinna Krampe
Telephone: +49 (0) 7 11/5 01-20487, E-Mail: corinna.krampe@mahle.com

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Truck body-panels made of DuPont™ Crastin® reduce costs and weight



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EP-PreK-2007-06

Photo: DuPont

The upper A-pillar trim (red), wind deflector and lower A-pillar trim (blue) of the TG range of heavy-duty trucks from MAN are all made from DuPont™ Crastin®. It represents the first serial adoption of a glass-fibre reinforced thermoplastic for the class-A exterior body-panels of a truck.

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Truck body-panels made of DuPont™ Crastin® reduce costs and weight

Prague, 31 May 2007. The truck manufacturer MAN-Nutzfahrzeuge AG has taking its own route in the selection of materials for the A-pillar trim of its TG-range of heavy-duty trucks. Three components (the upper A-pillar trim, the lower A-pillar trim and the wind deflector) are now injection-moulded parts made from glass-reinforced DuPont™ Crastin® PBT (polybutylenterephthalate). It represents the first serial adoption of a glass-fibre reinforced thermoplastic for the class-A exterior body-panels of a truck. The adoption of Crastin® has facilitated a reduction in unit costs of approximately 45 percent versus standard components produced as sheet moulded compounds. Moreover, the overall weight of the three components was reduced by around 32 percent, representing a weight-saving of around 2.4 kg per vehicle.

During the five-year development process, MAN tested a number of thermoplastic, glass-fibre-reinforced materials, including those which are typically used for the exterior trim such as PA6, PBT/PET, PC-ASA, PBT-ASA and PBT-ABS. The specific combination of properties offered by Crastin® – in terms of heat resistance, dimensional stability, good surface-finish and processing performance – were decisive in its selection. The material's high flow means that the large body panels – in some cases up to 1.35 metres long – can be produced in a single operation, and with short cycle times, on standard injection-moulding machinery.

"Considerable demands are placed on the material, in terms of heat resistance and expansion behaviour, during inline-coating of the body-panels. Temperatures within the paint shop can reach up to 150 °C," explains Hartmut Häberle, development manager for driver cabin exteriors at MAN Nutzfahrzeuge. "The excellent surface finish of Crastin® helps produce Class-A surfaces, which meet the high standards that MAN sets for all of its trucks. DuPont provided support during the material selection process and production planning. They also developed a conductive primer especially for this application."

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MAN Nutzfahrzeuge AG, with headquarters in Munich (Germany), is the largest company in the MAN Group and one of the leading international suppliers of trucks and transport solutions. During its business year 2006, the company, which employs around 34,000 people and sold 80,000 trucks as well as over 7,300 buses and bus-chassis, achieved a turnover of 8.7 million Euros.

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EP-PreK-2007-06

Note to the editor
This press release is based on information provided by:

MAN Nutzfahrzeuge AG, Dachauer Straße 667,
D- 80995 München, Deutschland
Contact: Hartmut Häberle
Telephone: +49 (89) 1580-4749
E-Mail: Hartmut.Haeberle@de.man-mn.com

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Large truck air duct blow-molded in DuPont™ Zytel® nylon

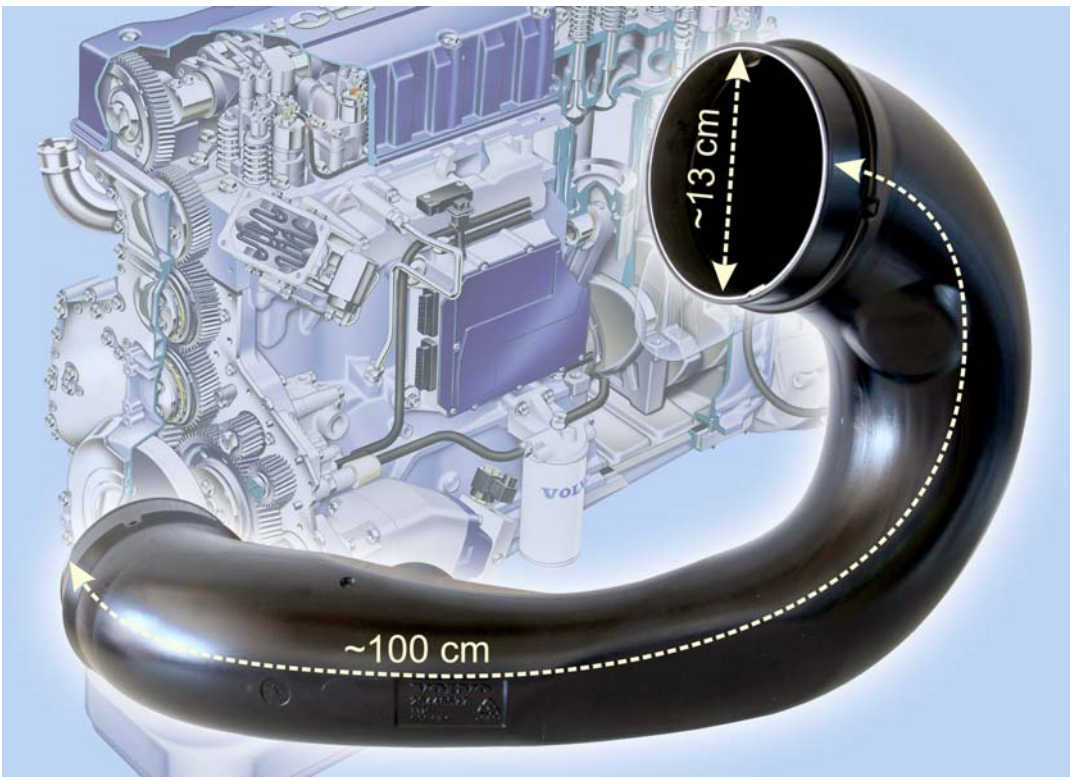

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Photo: DuPont

The approximately one meter long, blow-molded air duct – installed between the air filter and the turbocharger – is used to transport clean air to the engines of specific trucks within the Volvo range.

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Large truck air duct blow-molded in DuPont™ Zytel® nylon

Prague, 31 May 2007. A 3-dimensional blow-molded air duct, used on Volvo trucks with a 12-liter engine, is currently being produced by TI Automotive in Norway using an unreinforced, toughened and heat-stabilized grade of DuPont™ Zytel® nylon. The duct, which weighs just over two kilograms, is one of the largest blow-molded parts that DuPont is aware of. Parison manipulation, an advanced blow molding technology which produces scrapless parts, was adopted by TI Automotive for the curved duct's manufacture to enhance mechanical performance and achieve the part's complex geometry.

The intermediate duct is used to transport clean air from the air filter to the turbocharger. It is thus exposed to temperatures of around 140ºC and needs to contend with pressure ranges of between 1.2 and 2 bar charge pressure, as well as exhibiting resistance to oil, blow-by gases and fuel. Moreover, parts for truck engines are required to achieve extended lifetime requirements of 10,000 hours. Looking to replace metal for the duct's manufacture, thus reducing its overall weight by approximately 50 percent, TI Automotive proposed that Zytel® nylon be used to fulfill material requirements.

Demanding processing conditions were also a factor in material selection: the complex shape of the large, curved duct, approximately 1 meter long and with a diameter of 13 centimeters and varying wall thicknesses of between 4 and 2.55 millimeters, requires the use of an engineering polymer with a good flow characteristics and low shrinkage. The "parison manipulation" process was used for its manufacture, a technique which is a development of conventional blow moulding, whereby the extruded parison is "manipulated" by a combination of robots and moving mould segments in order to make it conform to the 3-dimensional mould cavity. This method produces scrapless parts, i.e. with no pinch weld on the finished part itself, to improve mechanical performance in critical stressed areas.

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EP-PreK-2007-07

This press release is based on information provided by:
TI Automotive – Fuel Systems, Postuttak, 2206 Kongsvinger
Tel: +47 (0)6282 4400 , Fax: +47 (0)6282 1411
E-mail: KAurbakken@no.tiauto.com, www.tiauto.com

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Safety-enhanced adaptive headlamp system from Valeo uses DuPont™ Zytel® HTN

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EP-PreK-2007-08

Photo: DuPont

The housing for the adaptive Xenon headlamps, with bending light technology, developed by Valeo for a number of vehicles, is made of a particularly heat-resistant and dimensionally-stable grade of DuPont™ Zytel® HTN.

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Safety-enhanced adaptive headlamp system from Valeo uses DuPont™ Zytel® HTN

Prague, 31 May 2007. Valeo, the world leading manufacturer of automotive lighting products, uses DuPont™ Zytel® HTN PPA for its Xenon Dynamic Bending Light (DBL), which is, among others available in vehicles such as the Citroen C4 or the VW Passat. This adaptive headlamp system optimizes illumination of road curves at night-time for enhanced road safety and driver comfort. The housing for each headlamp unit is molded from a glass-reinforced and heat-stabilized grade of Zytel® HTN PPA, selected for its resistance to both high temperatures and humidity while displaying the excellent dimensional stability required for this application.

The adaptive headlamp system developed by Valeo consists of a Bi-Function-Xenon elliptic projector headlamp, together with an electronic actuator and electronic control unit. Controlled by a microcontroller linked to the vehicle's data network, the system operates the swiveling of the Bi-Function Xenon lamp by up to 15º more than the standard "straight-ahead" position. Designed for medium- to high-speed driving in both high and low beam mode, the system doubles the driver's visibility distance in road curves, and maximizes his forward visibility. Moreover, the significant increase in night-time illumination minimizes driver stress and fatigue in road curves and at intersections, improving driving comfort in all weathers and road conditions.

A cost-effective alternative to metal, a glass-reinforced and heat-stabilized grade of DuPont™ Zytel® HTN PPA was used to create the headlamp housing because it offers high stiffness even at temperatures of around 150ºC, and hydrolysis resistance at 130-150 ºC for 95% RH. The material displays low outgassing, good creep and fatigue resistance, combined with relatively low moisture absorption and excellent assembly flexibility with regards to the integration of snap-fits and rivets.

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EP-PreK-2007-08

Valeo Contact Person for Press:
Claire Vidal-Pilo, Tel : +33 (0)140 552126
claire.vidal-pilo@valeo.com, www.valeo.com

DuPont press conference
Pre-K 2007 in Prague

DuPont's broad-based strength in Industrial & Consumer (InCon)

Workshop Summary

Stewart Daykin

Market Development and Technology Manager Europe at DuPont Engineering Polymers

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EP-PreK-2007-09

DuPont's broad-based strength in InCon

Prague, May 2007. One of the strengths of DuPont Engineering Polymers is the broad range of industries and applications – apart from its traditional automotive stronghold – in which its products are used worldwide. DuPont already offers a number of high-performance polymers that are successfully applied in the areas of electrical/electronics, industrial, consumer and healthcare applications, as detailed below. This range of applications, categorized under the term InCon (Industrial and Consumer) by DuPont, constitutes well over 40 percent of its business in Europe.

A differentiated approach to Electrical and Electronics
DuPont categorizes the E&E market in three segments – 'signal', 'building' and 'machines' – and adapts its resources accordingly. In the predominantly globalized market for signal-carrying components, previous regional differences in specification and performance requirements have now been replaced by world-wide requirements, with global players looking to standardize production. DuPont looks to meet these global standards with specific solutions: an example is our recent introduction of a new halogen-free grade of DuPont™ Zytel® HTN, a 30 percent glass-reinforced PPA with a V-0 UL94 flammability classification which fits well with emerging recycling programs for discarded electronic products.

For building electrics there remains vast potential for the replacement of thermoset resins with multifunctional molded parts of high-performance engineering thermoplastics. Associated benefits include manufacturing cost reductions through shorter cycle times, greater design freedom and reduced

environmental impact. New materials from DuPont, compliant with new, stringent electrical testing requirements, include Zytel® FR82G33V1, which is based on a PA66/PA6 copolymer with 33 percent glass-fiber reinforcement. This grade is a response by DuPont to the 2005 National Electrical Code (US), the requirements of which include a 100 kA (kiloampere) short-circuit rating at 480 Vac (volts, alternating current) per UL489 – a test which electrical housing parts made of most flame-retardant thermoplastic resins would fail. Indeed, increasingly stringent industry requirements are benefiting from the performance properties and functionality offered by engineering polymers. DuPont considers growing functional requirements as a clear growth driver, which will lead to greater penetration of this expanding market space.

The third category, that of 'machines', includes coil-form based electrical components, for which DuPont already offers a wide range of insulating materials. These comprise thermoplastic materials, films, wire enamels and aramid papers, which are integrated in pre-tested systems meeting IEC/UL (UL 1446) requirements. DuPont's engineering polymers DuPont™ Crastin® PBT, DuPont™ Rynite® PET, DuPont™ Thermx® PCT, DuPont™ Zenite® LCP, DuPont™ Zytel® PA and DuPont™ Zytel® HTN PPA in standard or flame-resistant versions, are used for insulation systems to match the application and the thermal class of the electrical equipment. These thermoplastic materials offer a combination of stiffness, toughness, flame-resistance, high heat-deflection temperature and dimensional stability. Good mould-flow characteristics make them suitable for injection-moulding thin-walled parts for mounting on PCBs.

Metal-detectable Delrin® for conveyors

In industrial applications, Delrin® acetal resin – offering a combination of strength, stiffness, hardness, dimensional stability, toughness, resistance to fatigue, solvents and abrasion, low wear and low friction – has long been used for conveyor segments in many industries. Food conveyors, on the other hand, must meet an additional requirement: they must be made of materials that are detectable by metal-detectors. To overcome this hurdle, DuPont recently developed DuPont™ Delrin® 400MTD, which contains a proprietary filler detectable by industry-standard metal-detection equipment. This new grade enables DuPont to broaden its business with the food-processing industry, which is keen to profit from the advantages of plastic conveyors as they need less lubrication, consume less energy, make less noise and last longer, thanks to their low-wear qualities. First commercial applications of this new grade can be found in Italy, Spain and the UK. With design engineers in other industries also demanding traceability and detectability, DuPont expects this offering to find a use in diverse applications, including, for example, those where digestion needs to be considered such as in drug and nutrition handling, toys and clothing fasteners.

The bakeware opportunity
Another up-and-coming use for DuPont engineering polymers is also in food processing. Zytel® HTN PPA and Zenite® LCP liquid-crystal polymer, with their outstanding heat resistance, dimensional stability and European and FDA food compliance, are gaining acceptance as alternatives to metal for bakeware in the baking industry. Baking forms of these materials have consistent release performance over time, so there is no need to coat or grease tins; bakers save energy costs through shorter heating times and/or lower temperatures; polymeric bakeware cannot corrode; and lighter bakeware means easier handling. In the meantime, DuPont has prepared relevant data on baking performance which will help potential users, based on their own baking conditions, predict the endurance performance of polymer-molded tins versus those made from metal. According to research carried out by DuPont, the baking industry in Europe now uses some seven million metal baking tins, thus replacing a percentage of these represents a considerable market opportunity.

New grades for water management
For water management applications, DuPont has developed new grades such as DuPont™ Zytel® 70G30HSR3, a nylon offering excellent performance in terms of hydrolysis- and oxidation-resistance in hot-water-contact applications, which passes WRAS (Water Regulations Advisory Service Scheme) and ACS (Attestation de Conformite Sanitaire) standards. A further new grade for tough, hot-water environments is represented by Zytel® HTN FG52G35HSLR, which passes new KTW (Kunststoffe und Trinkwasser) standards by providing outstanding performance in relation to hydrolysis resistance and oxidation under high stress conditions. Both candidates constitute an alternative to metal in hanging wall boilers water manifolds and fittings, where more costly brass alloy is commonly used today.

Material solutions for the growing oil and gas industry
DuPont Engineering Polymers has developed a range of special resins for the burgeoning oil and gas industries to be found in Russia and the Nordic countries, marketed under the Pipelon® brand. They include Pipelon® 401, for use as an extruded wear-tape layer in composite pipe systems, and Pipelon® HT, a higher-performance resin for more demanding applications, including offshore umbilicals and other high-temperature oil pipes. Meanwhile Pipelon® PLR is a masterbatch additive to polyolefins which reduces hydrocarbon permeation in oil and gas pipes. Independent trials have shown that the addition of only 10 percent of this high-performance resin reduces methane permeation by a factor of more than six.

Consumer applications: comfort, performance and safety with aesthetic appeal
Among principle drivers for the adoption of DuPont polymers in recent sporting applications have been the enhanced combination of comfort, performance and safety. From ski-bindings to motorcycle boots, the properties of materials such as Delrin® acetal resin, Hytrel® thermoplastic polyester elastomer or Zytel® nylon contribute to body protection and increased user comfort over a range of temperatures and in the harshest conditions.

Meanwhile DuPont continues to focus its technical resources on combining the functionality of its materials with aesthetic appeal, either through painting, plating or sublimation techniques. One such example is the business' development of its new 'selective plating' technology. Using platable and non-platable resins in a two-component molding process, customers can precisely determine which area of the surface of an injection-molded part is galvanized and which is not. Samples have already been made to demonstrate the technology, using specific pairs of polymers using different grades of platable Zytel® nylon and Minlon® mineral reinforced nylon and non-platable resins such as TPEs for a soft-touch effect, ionomer-based resins for a transparent effect or ethylene copolymers for a soft-grip effect.

Engineering polymers for sophisticated medical devices

For the healthcare industry, DuPont Engineering Polymers recently launched a program to support manufacturers of non-implantable medical apparatus, such as drug-delivery devices, diagnostics and surgical/hospital equipment and even prosthetic devices. Of particular interest to DuPont are the continuing trends in self-medication and formulation advances in inhalable drugs. Theses trends are leading to increasingly complex devices, where both precise and controlled delivery are required, while the consumer values a compact, easy-to-use and stylish device. To accommodate all these needs, without compromising reliability, designers are looking to miniaturize mechanical components such as counters, gears, levers, axles, actuators etc., resulting in higher demands being placed on each of them. The use of engineering polymers from DuPont helps the designer reduce wall-thickness, integrate more functions into each part and to minimize creep. The latter is of particular relevance to components which are exposed to a continuous load over the duration of their shelf-life.

To conclude, DuPont will continue to penetrate the InCon sector with new applications, developed in close cooperation with the OEMs, designers and manufacturers of engineered components, where the opportunity for metal replacement can represent savings in weight, overall number of parts and total cost of manufacturing. At the same time, investment is being made in development and marketing efforts to open up fresh, high-growth applications in industries which are new to DuPont, such as food-processing and the oil and gas industry. Finally, development work is ongoing for new and innovative means of improving utilization of alternative energy, and reducing the company's ecological footprint. Thus Engineering Polymers has developed a strategy aimed at achieving an ambitious growth target of more than three times GDP for the business' non-automotive activities.

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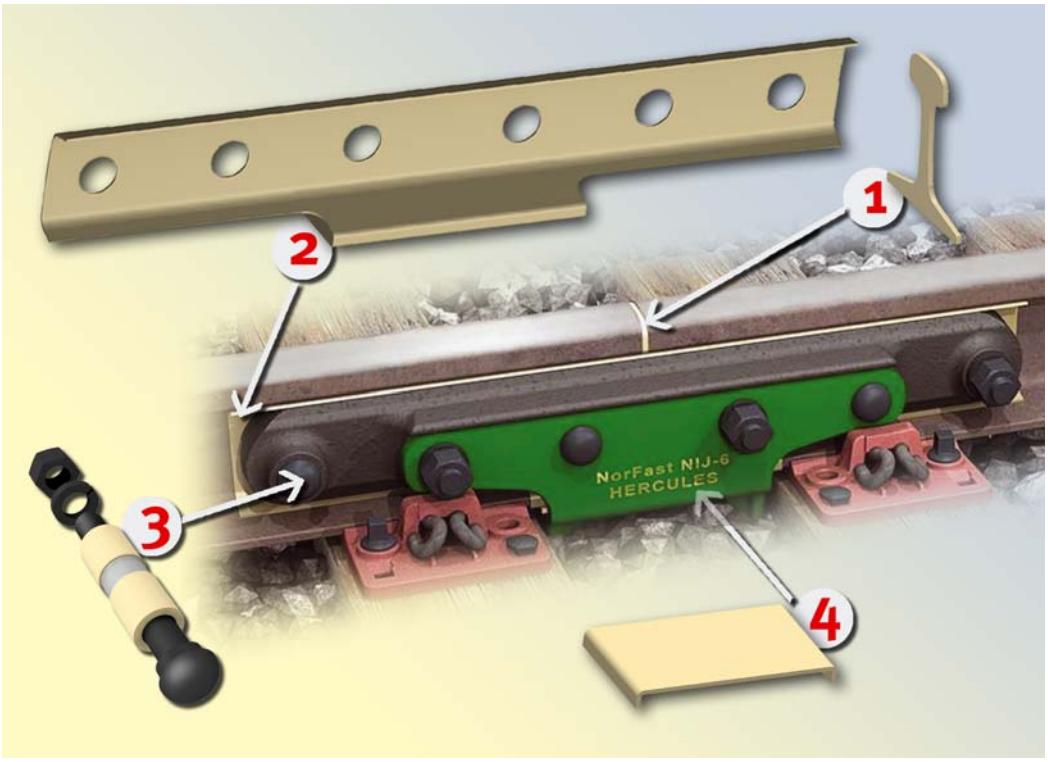
Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

DuPont™ Hytrel® provides reliable signal protection in railroads



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EP-PreK-2007-10

Photo: DuPont

The NIJ-6 “Hercules” consists of seven principle parts, four of which are made from DuPont™ Hytrel® thermoplastic polyester elastomer (cream-colored): (1) for the insulating end post between the two adjacent rails; (2) as a liner between the bar and the rails; (3) in the patented thimble design that isolates and strengthens the six fixing bolts;(4) and as an insulating pad between the rail and integral saddle.

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

DuPont™ Hytrel® provides reliable signal protection in railroads

Prague, 31 May 2007. A new and innovative insulated joint (IJ) from Canadian company NorFast Inc., currently being tested in the US and Canada, is helping to enhance railroad signal reliability. The modular kit doubles the operational lifetime of the rail joint, reduces stress within the joint and reduces the cost and time required for its installation – performance benefits which are largely attributable to the company's selection of flexible and resilient DuPont™ Hytrel® thermoplastic polyester elastomer for key insulating components.

Insulated joints (IJs) play an essential role in current railroad circuit-based signal systems by dividing the track into short, electrically isolated segments that detect train presence and activate trackside signals. However as a direct result of the deficiencies of the epoxy resin used in current bonded joints, they only have a relatively short lifetime of 12 to 18 months. Thus NorFast has developed the NIJ-6 "Hercules", which uses a particularly flexible and durable grade of Hytrel® with high resistance to creep, impact and fatigue to prevent the bars or bolts used in the joint to make contact with the rails and short out the signal in each block.

As a direct consequence of NorFast's design and choice of materials for the NIJ-6 "Hercules", insulator stress within the joint is reduced by up to 65 percent versus a standard joint. Fatigue testing of the joint at 60,000 pounds (27,000 kilograms) vertical loads for 3 millions cycles has shown no wear or damage to its parts, including those made of Hytrel®. Its simple, in-field installation, which fits any type track and fastener without track modification, saves two welds points in the rail, while its modular construction means that worn components can be replaced quickly and with minimal disruption for a brand new joint. Such is the confidence of NorFast in the longevity of its new system, the company intends to offer a 3-year or 400-million-gross-tons warranty on its continued operation.

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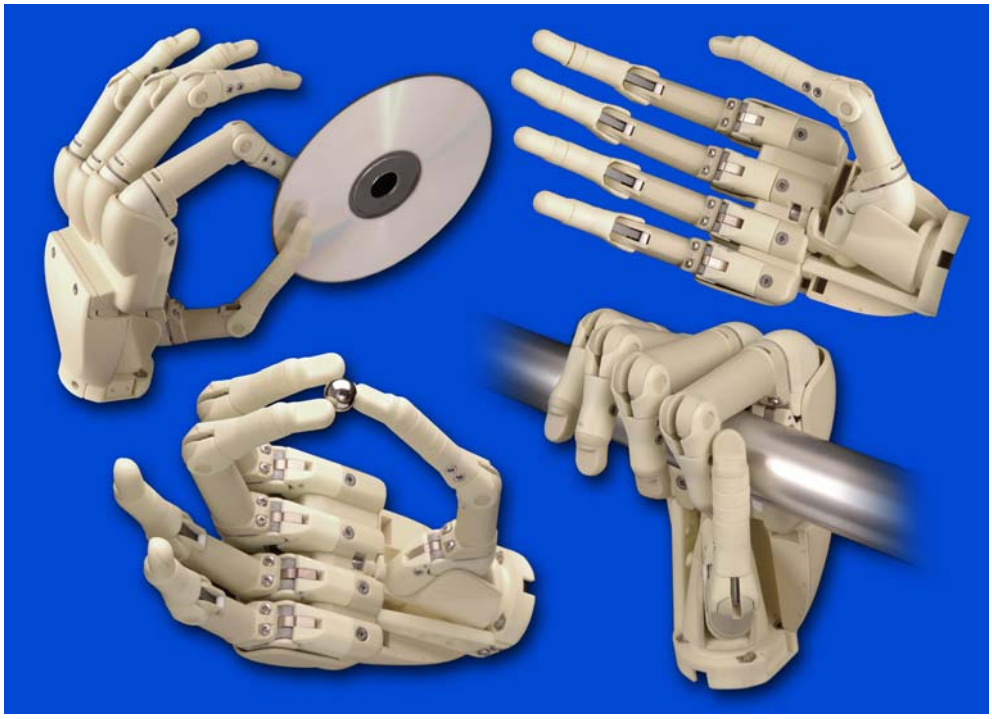
Note to the editor:
This press release is based on information provided by:
Norfast Inc., 2-9446 McLaughlin Rd.,
North Brampton, Ontario, Canada L6X 4H9
Tel.: +1 (905) 454-8687, email: norfast@norfast.com

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Robust and lightweight DuPont™ Zytel® HTN used in ground-breaking prosthetic hand



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EP-PreK-2007-11

Photo: Touch Bionics

The i-LIMB™ Hand is a prosthetic device from Scottish bionic technology company Touch Bionics that replicates the look and feel of the human hand. DuPont™ Zytel® HTN semi-aromatic polyamide is used to protect the sophisticated system of drives and motors within the device by providing extreme impact resistance and dimensional stability without exceeding the required overall weight. Further hi-resolutions images of the i-LIMB Hand can be downloaded from the press office of the Touch Bionics website (www.touchbionics.com).

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Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Robust and lightweight DuPont™ Zytel® HTN used in ground-breaking prosthetic hand

Prague, 31 May 2007. The i-LIMB™ Hand is a prosthetic device from Scottish bionic technology company Touch Bionics that replicates the look and feel of the human hand. Embracing the very latest in mechanical engineering design, Touch Bionics selected a particularly rigid grade of DuPont™ Zytel® HTN semi-aromatic polyamide to produce a device which is lightweight, robust and highly-appealing to both patients and the healthcare professional.

The prosthetic hand has five individually powered digits with fully articulated joints, all helping deliver multiple grip patterns which enhance dexterity and support up to 90 percent of all activities of daily living. Fundamental to Touch Bionics' ability to produce the breakthrough device has been the company's willingness to adopt the latest materials and design techniques – exemplified by its selection of robust and lightweight Zytel® HTN for the device's outer casing – a total of 33 components including the digits and controller housing surface.

As space was limited for the mechanical structure, a very strong and rigid grade of Zytel® HTN was required which actually has a similar elasticity-modulus to a human bone of 15 to 16 Gigapascal (GPa). Further key requirements, such as an extreme impact resistance and an appealing surface finish could also be met.

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EP-PreK-2007-11

This press release is based on information provided by:
Touch Bionics
19a Rutland Square, Edinburgh, Scotland EH1 2BB.
Tel: +44 (0)870 2251930 , Fax: +44 (0) 845 280 5169
Email: phil.newman@touchbionics.com, www.touchbionics.com

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Turkish coffee pot made of Zytel® HTN combines polymer technology with tradition

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EP-PreK-2007-12

Photo: DuPont

The ‘miniTelve’ automated coffee machine (far right) has a single boiling pot consisting of a body moulded in Zytel® HTN high performance polyamide (center) fixed to an aluminum base (left, center) by a ring, also made of Zytel® HTN (left rear) and sealed with a heat- and moisture-resistant rubber (left, front). A two-part PBT handle (center front) is mounted to the body of the pot with a screw.

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Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Turkish coffee pot made of Zytel® HTN combines polymer technology with tradition

Prague, 31 May 2007. A heat-resistant, food-approved grade of DuPont™ Zytel® HTN PPA polyphtalamide is the material of choice for in a modern-day version of the traditional 'cezve', or Turkish coffee pot, made by Arçelik A.Ş of Istanbul Turkey. The pot features in the multi-patented 'miniTelve' coffee machine, launched during the fall of 2006.

The pot, used for heating water and ground coffee, is made from silver-painted DuPont™ Zytel® HTN as an alternative to aluminium or copper. The polymer's ability to retain mechanical properties such as strength, stiffness and toughness when exposed to heat and moisture, as well as its dimensional stability and approval for use in food and drink applications, were key factors in its selection.

"With the benefit of material selection, design and processing support provided by DuPont, as well as our own use of computer-aided engineering tools such as mould-flow and warpage analysis, we were able to produce a boiling pot made principally from Zytel® HTN. It withstands repeated exposure to the heating process used in the coffee machine, involving temperatures of up to 150 degrees C (300 degrees F) for one to three minutes during each cycle depending on the amount of coffee being made, as well as recurring exposure to the boiling water it contains. Moreover, the pot was more durable than aluminium to the bumps and bangs of daily use, meaning it retains its form over time and continues to fit smoothly into the machine," explains Levent Reisoğlu, project leader for the 'miniTelve' at Arçelik.

X X X

EP-PreK-2007-12

Note to the editor:

This press release is based on information from:
Levent H. Reisoğlu
Tel: +90 216 585 8431, Fax: +90 216 423 3045
e-mail: levent.reisoglu@arcelik.com, www.arcelik.com

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Growth-encouraging lighting for greenhouses

Holders made of DuPont™ Zenite® for gas discharge lamps retain properties at over 200 °C

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EP-PreK-2007-13

Photo: DuPont

In the ‘E-Papillon’ greenhouse lights from Lights Interaction, holders made of DuPont™ Zenite® LCP fix the ‘Master Green Power TD’ gas discharge lamp from Philips in place, and do so at temperatures considerably higher than 200° C. In the foreground, a holder is shown in opened (left) and closed (right) position.

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D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Growth-encouraging lighting for greenhouses

Holders made of DuPont™ Zenite® for gas discharge lamps retain properties at over 200 °C

Prague, 31 May 2007. The ‘E-Papillon’ greenhouse lights from Lights Interaction Agro B.V., Geldrop, Netherlands, create the optimum lighting conditions for luxuriant plant growth. They use a 1000-watt-rated gas-discharge lamp, the ‘Master Green Power TD’ from Philips, which can reach temperatures of around 500 °C at its hottest parts. In such cases, the K12x30s-type lamp holders, developed especially for the application by Vossloh-Schwabe of Lüdenscheid, Germany, can become heated to over 200 °C. DuPont™ Zenite® 7145L, an LCP reinforced with 45 percent glass fibres by weight, provides the holders with the required combination of extremely high heat deflection temperature (HDT = 295 °C), thermal ageing resistance (RTI = 240 °C) and potential for cost-effective processing.

Zenite® solidifies at very high temperatures, meaning that a low holding pressure and shorter cooling times are required. Post-processing of the injection-moulded parts is not required. Thus considerable cost advantages can be achieved versus other materials used for similar parts, such as ceramic or thermoset resins. A further benefit of Zenite®: thanks to its excellent thermal resistance there is no outgassing of its constituents, which could otherwise form a coating on the reflector or lamp itself, thus reducing their performance. Hence the long-term efficiency of the light is maintained.

The two-part holder facilitates the safe and simple exchange of lamps. An integrated switch function ensures that the current is reliably interrupted when the socket’s upper-section is slid back. At the same time, retaining clips integrated in the holder release the nickel wire contacts of the lamp, allowing it to be removed with very little effort. Once the lamp is replaced, it is fixed in place by pushing the upper-section forward, the holder is closed and the current circuit is re-created. The lamp then emits exactly the right dosage of light that the plants require for photosynthesis and to prosper.

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Vossloh-Schwabe, with headquarters in Lüdenscheid, Germany, is among the world's largest producers of electro-technical and electronic components for lighting technology and offers a comprehensive range of high-quality electronic and electro-magnetic power-supply units, transformers, ignition boxes, condensers, component for LED lighting technology and lamp holders amongst many other lighting items.

Lights Interaction Agro B.V. is a leading manufacturer of greenhouse lighting with headquarters in Geldrop in the Netherlands. Its product range includes lights with a rating of between 450 and 1000 watts, which offer a high degree of efficiency thanks to their optimised design.

X X X

EP-PreK-2007-13

Note to the editor
This release is based on information provided by

Vossloh-Schwabe Deutschland GmbH
Hohe Steinert 8, 58509 Lüdenscheid, Deutschland
Contact: Christian Gerstberger
Telephone: +49 (0) 23 51 / 101-462
E-Mail: christian.gerstberger@vsl.vossloh-schwabe.com

and

Lights Interaction Agro B.V., De Hooge Akker 2
5661 NG Geldrop, Niederlande
Contact: Ton ten Haaf
Telephone: +31 (0) 40-/2 80 71 19,.
E-Mail: ton@liagro.nl, www.liagro.com

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

New motocross boot uses DuPont™ Hytrel® for protection, performance and comfort

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EP-PreK-2007-14

Photo: Scott

The Genius MX Boot is constructed of injection molded pieces of DuPont™ Hytrel® thermoplastic polyester elastomer and polyurethane. Both materials, characterized by their durability and impact resistance, allow the boot to protect the lower leg and foot to a level unreachable by its leather counterparts.

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Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

New motocross boot uses DuPont™ Hytrel® for protection, performance and comfort

Prague, 31 May 2007. The Genius MX Boot, launched by sports manufacture Scott this spring in the US and Europe, has been developed by Scott to significantly reduce the rate of lower-leg injuries amongst motocross riders. Key to achieving this is the ingenious Scott Pivot System, a hinge system with worldwide patent, which allows the boot to flex while retaining its solid construction. It is made of DuPont™ Hytrel® thermoplastic polyester elastomer, chosen for its excellent fatigue resistance, damping properties and high impact strength over a wide temperature range.

"The hinge's design and use of Hytrel® provides both performance and protection, allowing the necessary foot articulation required by the rider while simultaneously limiting ankle motion. Under excessive loads, such as during jumps or falls, the Hytrel® structure absorbs energy and thereby reduces the amount transmitted through to the rider's foot or leg, discouraging fractures and ligament strains," explains Hervé Maneint, project leader at Scott Sports.

A second, key feature of the Genius MX Boot also benefits from the flexible yet tough properties of the thermoplastic polyester elastomer from DuPont: the hood of the boot, injection-molded in stiff Hytrel® 6356, incorporates a soft over-molded section, combining Hytrel® 7246 with polyurethane, which constitutes Scott's patented Sure-Feel Shifter Pad. The external, copper-colored pad is positioned in the shifting area at the top of the boot and transfers shifter lever pressure through ridges on the interior of the boot, allowing the rider to feel it without compromising protection of the boot. Other elements of the boot are injection-molded from polyurethane.

X X X

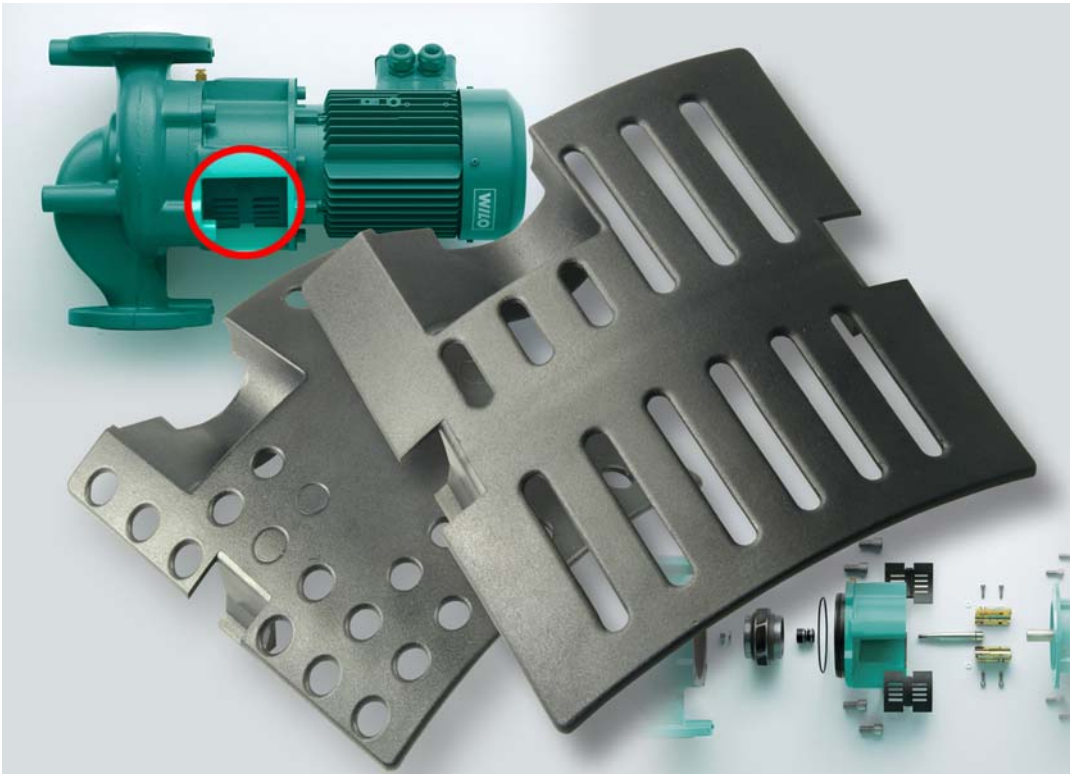
EP-PreK-2007-14

Note to the editor:
This press release is based on information provided by:
Scott Sports SA
Route du Crochet 17, CH-1762 Givisiez, Switzerland
Phone : +41 26 460 1616, E mail : customersupport@scott-sports.com

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Shaft cover made of DuPont™ Zytel® provides cost-efficient safety for HVAC circulating pumps



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EP-PreK-2007-15

Photo: DuPont

Covers, made of heat-stabilized DuPont™ Zytel® nylon resin, are fixed to the pump lanterns of the Wilo-Crono glanded pumps. They prevent accidental contact with the pump-coupling, thus reducing the risk of injury

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Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Shaft cover made of DuPont™ Zytel® provides cost-efficient safety for HVAC circulating pumps

Prague, 31 May 2007. The Wilo-Crono glanded pumps, from Dortmund (Germany)-based pump manufacturer Wilo, are designed for long-term usage in the HVAC installations of industrial facilities, as well as larger-scale private and commercial properties. The service temperature of the medium to be pumped in such heating and cooling systems can range between –20 °C and 140 °C. Accordingly, Wilo selected the temperature - resistant DuPont™ Zytel® 80G14AHS to protect the coupling of the pump lantern, which connects the drive motor to the pump's hydraulics.

"Polymer parts can be more economically manufactured and assembled than those made from perforated metal plates, which are typically used for such applications. Even without coating, they contribute to the aesthetic appeal of our Wilo-Crono pumps," says Detlev Jäkel, project engineer for glanded pumps at Wilo. "The glass-reinforced nylon 66 from DuPont combines excellent strength, elasticity and impact resistance – properties it retains over the long-term, and despite the demanding conditions presented by today's heating and cooling systems. A principle factor in our choice of material, is the option to prise off the protective cover made of Zytel® 80G14AHS for maintenance purposes, and to press it back in without breaking the snap-fittings used to hold the cover securely in place – even after many years of use."

The manufacturer and co-developer of the covers, SMK-Energietechnik of Groß-Umstadt (Germany), worked in close cooperation with Wilo and DuPont on material selection. "We produced the samples which DuPont used for comprehensive mechanical testing – later we optimized tooling and processing," says managing director Dr. Felix Schmitt. "This has helped us achieve very economical cycle times during the production of high-quality, accurately-fitting parts with a homogenous surface structure."

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EP-PreK-2007-15

Note to the editor:
This press release has been prepared with information from:

WILO AG, Nortkirchenstraße 100, D-44263 Dortmund
Contact: Detlev Jäkel
Telephone: +49 (0) 231 4102 7343
E-Mail: detlev.jaekel@wilo.de

And

SMK-Energietechnik GmbH, Hans-Böckler-Straße 35,
D-64823 Groß-Umstadt
Contact: Dr. Felix Schmitt
Telephone: +49 (0) 6078 931912
E-Mail: dr.felix.schmitt@smk-tec.de

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Glass in AEG oven doors held in place by engineering polymers from DuPont

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EP-PreK-2007-16

Photo: DuPont

Covers made of DuPont™ Crastin® PBT or DuPont™ Rynite® PET and pillars made of DuPont™ Zytel® or DuPont™ Zytel® HTN keep the glass in the doors of the 'Competence' range of ovens from AEG-Electrolux firmly in place – even at high cooking temperatures. A clip system is used to detach the upper cover from the door, facilitating removal of the cooled-down glass plates for cleaning purposes.

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

Glass in AEG oven doors held in place by engineering polymers from DuPont

Prague, 31 May 2007. Pillars and covers made of engineering polymers from DuPont hold in place three glass plates, one-behind-the-other, in the 'Cool-Front' doors of the 'Competence' integrated ovens from AEG-Electrolux. Thanks to the high temperature resistance and dimensional stability of the selected thermoplastics, these fittings reliably retain their functional properties regardless of oven temperatures. The cover located at the top of the door is secured to the side pillars with the aid of snap-fittings. Thus the glass plates can be easily removed from their frame, without the use of additional tools, for cleaning when required. According to the oven model, AEG uses DuPont™ Zytel® nylon or DuPont™ Zytel® HTN for the side fittings and DuPont™ Crastin® PBT or DuPont™ Rynite® PET for the covers.

"On the basis of the several years of positive experience we have had with covers made of Rynite® or Crastin®, we were willing to complete the switch from metal to plastics by changing the pillars," explains Erhardt Koitzsch, specialist for moulds & plastic in the development division at AEG-Electrolux, Rothenburg (Germany). "What convinced us were a number of factors such as the very good flow rate of the materials and their correspondingly short cycle times during injection molding; their high elasticity – a prerequisite for the integration of snap-fittings; the low warpage behavior of the component parts; the ability of Zytel® and Zytel® HTN to cope with the demands of fully-automated adhesion to the door frame – and of course the considerably expanded design potential versus their metal equivalents."

Which engineering polymer is ultimately used depends on the individual oven temperature. The greatest requirements, in terms of thermal resistance, are presented by the process of catalytic self-cleaning, during which cooking dirt and debris is burnt off at temperatures of around 500 °C to just leave ashes. For ovens equipped with this option, AEG uses pillars made from the Zytel® HTN polyphthalamide, which is well-suited for long-term exposure to temperatures up to 250 °C, and an upper cover made from Rynite® 520 with 20 wt.% glass-fibers and high surface quality.

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The requirements set by ovens without catalytic self-cleaning can be fulfilled by a combination of the particularly stiff Zytel® 70G30 nylon resin with 30 wt.% glass-fibers for the pillars, and Crastin® polybutylene terephthalate with 15 wt.% glass-fiber reinforcement, which also provides good surface quality, for the cover. All polymers listed meet one fundamental requirement for kitchen equipment: they offer long-term resistance to both cleaning detergents and hot oil and fat.

Koitzsch continues: “DuPont provided efficient assistance in terms of tool design and the processing optimization, through the use of CAD calculations and flow studies, so that production could commence almost without a hitch. The results of the conversion have been convincing in every respect. As a consequence, we have successfully extended the principle of door glass fittings made entirely of plastics, first used on the ‘Competence’ ovens from AEG, to other brands within our group.”

AEG Hausgeräte GmbH is part of the Electrolux Group. At its site in Rothenburg, Germany, approximately 700,000 integrated and free-standing ovens are produced per year, as well as one million cooking modules. Through a dual strategy of increased sales and concentration of the whole group over the last five years, the site has been able to more than double its production volume and has gone on to play an important role in the household equipment segment of Electrolux. Of particular significance to the site was the decision to expand development of high-end equipment, during which process the use of polymers is gaining greater emphasis.

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EP-PreK-2007-16

Note to the editor
This press release is based on information provided by:
AEG Hausgeräte GmbH, Bodelschwinghstraße 1,
D-91541 Rothenburg
Contact: Erhardt Koitzsch
Telephone: ++49 (0) 9861 69 4481
Fax: ++49 (0) 9861 69 49 4481
E-Mail: erhardt.koitzsch@electrolux.de

DuPont press conference
Pre-K 2007 in Prague

Innovations in high-performance engineering polymers

Workshop Summary

Stefan Greulich

Marketing manager EMEA for High Temperature Solutions
at DuPont Engineering Polymers

EP-PreK-2007-17

Prague, 31 May 2007. This section of the technology workshop is used to introduce, in more detail, several new polymer grades which have been recently developed for specific applications. Yet, by merit of their unique combination of properties to achieve improvements in both performance and productivity, their potential for application is considered to be wider ranging.

New **DuPont™ Zytel® HTN PPA (non-V0) corrosion-free resins**, used for electrical circuits and connectors and exposed to high-temperature automotive environments, are the first innovation. Standard polyamide resins contain stabilizers that can escape from the polymer matrix, corroding contacts and electrical circuits. A recently-developed technology from DuPont, available through the new range of Zytel® HTN PPA (non-V0) resins, helps prevent this occurrence of corrosion and thus prolongs the life of electrical devices.

Zytel® HTN has become a material of choice for automotive sensors for a number of reasons. Firstly its higher mechanical properties at elevated temperatures compared to PA6 or PA66 enable greater proximity to the item to be monitored: with a glass transition temperature of up to 135 ºC, and a melting point over 300 ºC, Zytel® HTN can be used continuously at 200 ºC and above. Secondly, a 50 percent lower coefficient of thermal extension and up to 60 percent lower moisture pick-up versus PA66 helps reduce thermo-mechanical stress on encapsulated components, while cohesive failure in butt or overlap joints is attained due to the material's outstanding self-adhesion.

Targeted applications for the new Zytel® HTN resins include sensors (such as wheel-speed sensors, pressure-sensors, transmission-sensors, etc.) and high-voltage cable connectors in electrical and hybrid vehicles. Alternative industry applications include those in the growing renewable energy sector (wind, photovoltaic, etc), marine and kitchen appliances.

DuPont™ Thermx® TE4004 is a new grade targeted initially at high-performing pencil-coil ignition systems. The recent trend in automotive ignition systems is to reduce the diameter of pencil coil to less than 22 millimeters (from 26 millimeters in 1997) and for a higher energy to be delivered by each of the pencil coils (from currently 35-45 mJ up to 65-70 mJ in the future). As a consequence, materials need to meet criteria such as excellent flow to fill thin walls, higher dielectric strength at elevated temperatures to deliver higher power and outstanding adhesion to epoxy to eliminate the potential for electrical failures due to thermomechanical stress.

Thermx® TE4004 is a high-temperature polyester that has been tailored to provide these benefits in ignition applications. A further new grade of Thermx® for ignition systems will be introduced before year end, which will offer enhanced flow characteristics without compromising other, critical properties.

The introduction of **new halogen-free flame V0 grades** is set against the background of increasing demand among manufacturers, particularly of electronic consumer goods, to eliminate materials that contain brominated flame retardants. DuPont has two new high-temperature resins that are halogen-free: DuPont™ Zytel® HTN FR52G30NH and DuPont™ Rynite® RE19041. Both materials are V0 at 0.8mm and have a high CTI of over 500V. The Glow-Wire Ignitability Temperature (GWIT) of Rynite® RE19041 is an impressive 775 ºC. Both grades deliver good processing characteristics and mechanical performance in the final application.

Principle applications for new halogen-free Rynite® are in the areas of office equipment (such as printers), lamp sockets and electronic and electrical components requiring GWIT 775 ºC according to IEC 60335. For halogen-free Zytel® HTN, main applications are in connectors, heavy duty circuit breakers and contactors. In general, all DuPont flame-retardant grades lend themselves to use in environments where electrical currents may cause sparks or ignition. It should also be noted that DuPont™ Zenite® LCP is halogen free and V0 compliant without the addition of any flame retardant.

Subsequent to its addition to the company's LCP portfolio, DuPont has developed **two new remarkable additions to the DuPont™ Zenite® 5000 polymer range**. DuPont™ Zenite® ZE55201 is an ultra-low-warp LCP to maintain flatness in components such as connectors, chip-card holders and large parts in appliances such as oven parts. The ultra-low warp performance of this new grade has been achieved by reducing anisotropic

shrinkage – more than 50 percent reduction of shrinkage in its cross-flow direction. Zenite® ZE55801 is a palladium-doped, glass-reinforced grade of LCP that enables selective chrome-plating of connectors for MID (Molded Intercircuit Devices) if used with a standard grade of Zenite® in a twin-shot molding process. The new grade has close to 10 percent lower density compared to competitive products, resulting in lower part costs, plus good elongation and weld line strength due to the overall characteristics of the Zenite® 5000 polymer series.

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All charts and illustrations from the posters used during the workshops may be requested as individual, hi-definition jpeg files in local language. Please either contact us directly during the event, or contact your local press office on your return from Prague.

Du Pont de Nemours (Deutschland) GmbH
Du Pont Straße 1
D-61343 Bad Homburg
☎ 0 61 72/87-0

Press Information

New multilayer and corrugation line installed at ETC in Geneva

DuPont extends its extrusion capabilities to form new global center of excellence

This image can be downloaded as a hi-resolution file at:
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EP-PreK-2007-18

Photo 1: DuPont

The new multilayer and corrugation extrusion line, installed at DuPont's European Technical Center in Geneva during the first quarter of 2007, includes a multilayer head for the extrusion of tubes with up to three layers, while a corrugator can produce either monolayer or multilayer corrugated tubes.

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Photo 2: DuPont

The new line will help DuPont identify new opportunities in extrusion with its materials in the areas of coolant pipes and degassing tubes, blow-by tubes, servo-brake vacuum tubes, fuel vent tubes, or mandrels to name a few.

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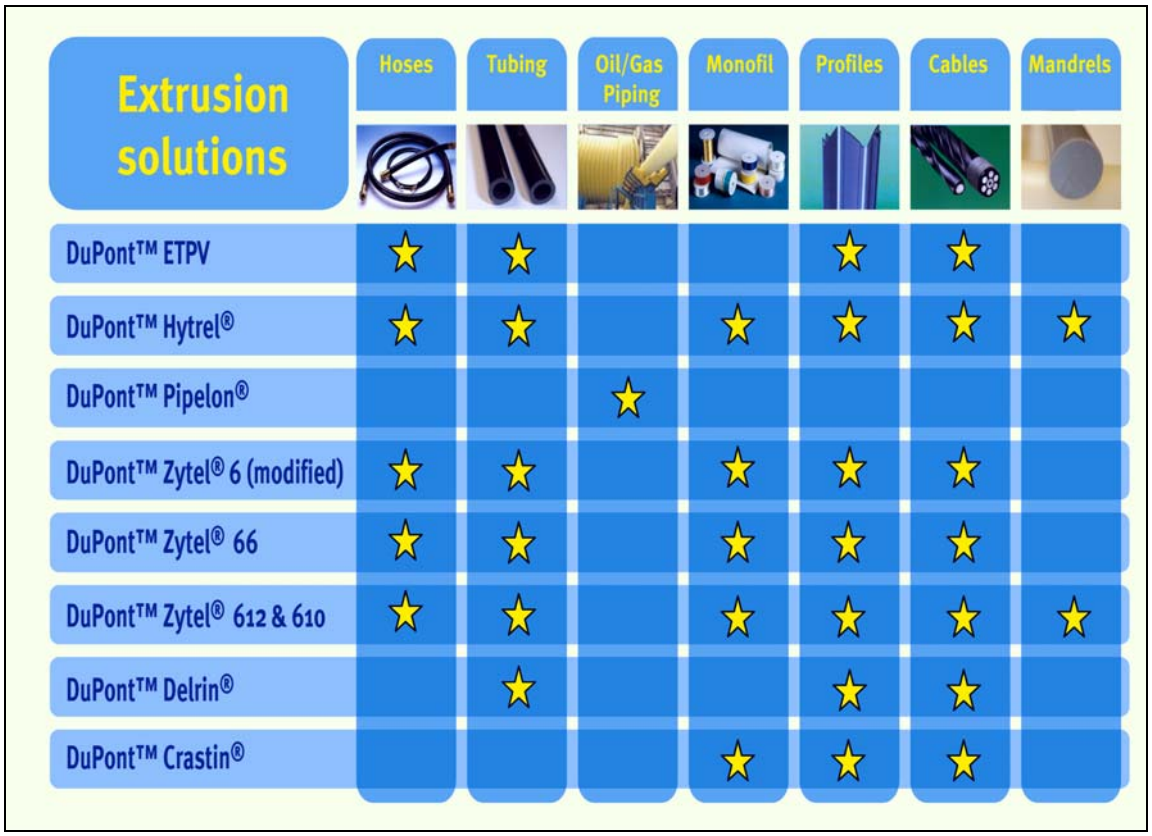

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EP-PreK-2007-18

Photo 3: DuPont

DuPont offers one of the widest material portfolios for extrusion, which includes its range of semi-crystalline thermoplastics (acetals, nylons and polyesters), modified ethylene copolymers and fluoropolymers.

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New multilayer and corrugation line installed at ETC in Geneva

DuPont extends its extrusion capabilities to form new global center of excellence

Prague, 31 May 2007. DuPont has extended the range of extrusion processes available to its customers with the inauguration of a new multilayer and corrugation extrusion line at its European Technical Center (ETC) in Geneva, Switzerland. The adjustable line includes a three-layer crosshead for multilayer tubing applications, while a corrugator in the same line enables the production of flexible, corrugated monolayer or multilayer tubes for piping applications, predominantly for the automotive and industrial sectors. The strategic investment by DuPont marks the company's long-term commitment to extend its material and technical expertise to the growing extrusion sector, whereby the ETC in Geneva will become the DuPont's new global center of excellence for extrusion technology.

To better understand and assess new opportunities in extrusion with its materials, DuPont installed the new multilayer and corrugation extrusion line equipment at the ETC during the first quarter of 2007. Line parameters include a multilayer head for the extrusion of tubes with up to three layers and a diameter of between 4 and 32 millimeters, while a corrugator using a vacuum forming system of up to 0.8 bar, can produce either monolayer or multilayer corrugated tubes with an outside diameter of up to 50 millimeters. Typical line speed for corrugation is 5 to 10 meters per minute. The extrusion of monolayer tubes with an outer diameter of 10 millimeters, and at a speed of 60 meters per minute, is also possible on the same line

New development opportunities for DuPont materials include multilayered extrusion, where different material combinations provide diverse properties for to meet an application's specific requirements, or corrugated sections to meet flexibility requirements for simpler installation and packaging efficiencies. In some cases both multilayered and corrugated extrusions are required. Indeed one prototype application, already developed on the new line, is a part-corrugated, multilayered coolant pipe, extruded in DuPont Zytel® nylon and DuPont™ Bynel® adhesive resin as a cost-effective alternative to rubber. The integration of corrugated sections in the pipe

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facilitates its installation in the tight spaces of the engine compartment, while the outer layer of Zytel® ensures the pipe's mechanical stability and the inner layer of Bynel® reduces its permeability to water-glycol and increases its hot water resistance.

Meeting extruder and end-user demands for material solutions in the area of high-performance extruded products, DuPont already offers one of the widest material portfolios for extrusion, which includes its range of semi-crystalline thermoplastics (acetals, nylons and polyesters), modified ethylene copolymers and fluoropolymers. Much of the technical support in extrusion, provided by DuPont to its customers, comes from the ETC in Meyrin, where a number of processes – including a film and sheeting line, a tubing extrusion line, a wire coating line and a blown-film line – are available for sample runs and compiling performance data. As a result, DuPont's materials are already being used in different tubing, hose, wire & cable and profile applications in the automotive and industrial sectors, where customers benefit from numerous functional and productivity benefits.

Serving as a focal point for DuPont's extended capabilities in extrusion for its range of polymer-based materials across three of its businesses - DuPont Engineering Polymers, DuPont Packaging & Industrial Polymers and DuPont Fluoropolymers – the ETC in Switzerland has been appointed the company's new center of excellence, serving the extrusion needs of customers across the globe. According to Christophe Chervin, European extrusion technology leader at DuPont, "the new line helps us identify new opportunities in extrusion with our materials in the areas of coolant pipes and degassing tubes, blow-by tubes, servo-brake vacuum tubes, fuel vent tubes, or mandrels to name a few. The strategic investment in our capabilities in Geneva reflects our long term commitment to grow in the extrusion sector, to better serve our customers and to accelerate the availability of our offering to the market."

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