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page 13

# High-impact PP breaks new ground in ice cream packaging

6

## PB-1 materials

PB-1 stars in 'sustainability showcase'

10

## Ultrapolymers:

Resins from *Catalloy* process make the difference

basell
Polyolefins

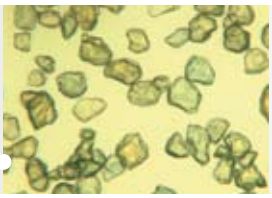
# CONTENTS

## Editorial

Towards sustainability 3

## Focus

*Avant* catalysts: pushing the envelope of polyolefin processability, properties and performance 4



## Developments & Applications

PB-1 stars in 'sustainability showcase' 6
*Metocene* resin is clear winner in Cadbury's new gum packaging 8
*Stretchene* resins set new standards in ISBM 9
*Hostalen* ACP grade breaks new ground in HDPE bottles 9
Ultrapolymers: resins from the *Catalloy* process make the difference 10
Renault Modus fits glass-fibre PP waterbox 12
High-impact PP breaks new ground in ice cream packaging 13
Pipe coatings toughen up with PEX protection 14
PIT opens new horizons for plastics applications 16
Pipes take off in Turkey 17

## Events

Basell @ Chinaplas 07 18
*Purell* resins showcase at CompaMed 18

## News

Australian plant wins sustainability award 19
Basell sponsors Nobel Web game 19
Qatar plant takes world *Spheripol* process capacity to 20 MT 19
Latest *Avant* ZN catalysts now available in China 19
Basell to expand *Spherizone* plant in Italy 19
Basell to acquire Shell refinery 19
*Spheripol* technology for new Venezuela plant 19

# Towards sustainability

Sustainable development – the recognition that social, environmental and economic needs must be met in balance with each other for sustainable outcomes in the long term – was a key theme at a recent Basell workshop on plastics and the environment.

As a global producer of polyolefin materials and a leading developer of polyolefin technologies, Basell is well positioned to contribute to the goals of sustainable development.

In this edition of Basell Dimensions we report on a number of instances where the goals of sustainable development have benefited through effective working relationships between customers and Basell.

For example, on pages 6 & 7, you can read about how Basell's polybutylene-1, a material used in pipe manufacturing, helped to achieve an 80% reduction in energy consumption in the new UK headquarters of Warmafloor.

Reducing the quantity of material needed for an application cuts consumption of raw materials, as well as costs. Examples include the down-gauging potential offered by Basell's new *Stretchene* materials used by customers for injection stretch blow moulding (see page 9) and the tough new *Hostalen* HDPE grades used for bottling household cleaning products (page 9).

Reducing the energy needed to convert materials – either by shortening cycle times, as in the *Hostalen* example above – or by using materials with a lower melt temperature, such as the *Metocene* resins used in Cadbury's new confectionery packaging are all contributing to the progress of sustainable development (page 8).

On the production side, a Basell polypropylene plant in Australia reduced its energy requirements by 85% and won a sustainability award (page 19).

In each of these success stories, sustainable development benefits were achieved in the pursuit of Basell business objectives such as improving productivity and efficiency, as well as affirming the connectivity of environmental, economic and social needs.

As this edition of Basell Dimensions goes to press, Basell is moving closer to the creation of the new global polymers, petrochemicals and refining company that will be known as LyondellBasell Industries when the transaction is completed.

We are very excited about how LyondellBasell Industries will be well set to deliver even greater value to customers through its offering of products and services.

In the meantime I hope you will find the articles in this edition interesting and informative.

Patricia Vangheluwe

Chief Editor, Basell Dimensions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# *Avant* catalysts: pushing the envelope of polyolefin processability, properties and performance

Basell is the world's most experienced and largest producer of polyolefin catalysts. The catalyst division of Basell's Technology Business produces and supplies catalysts for the manufacturing of polypropylene and polyethylene under the *Avant* trademark. Dimensions discussed the catalyst business with three key team members – Jim Seward, vice president, Sales and Marketing; Neil Nadalin, business development manager, and Dick Schoonaard, application and technical support manager.

**How has Basell managed to establish and sustain its leading catalyst position across many polyolefin process technologies?**

**Jim Seward:** I think we start with an advantage because our company's heritage means that the roots of modern polyolefin catalysis are here in Basell. And from the different companies that have combined to build Basell, we've gained a very broad experience in process technologies – both proprietary and third-party – from our plants around the world. We've built on that heritage through the creation and maintenance of both our strong R&D base, which enables us to offer the widest portfolio of catalysts to the industry, and our ability to add value to our customers through close technical cooperation. The proof of Basell's success in doing so is the fact that today around 40 million tonnes of polyolefins are produced worldwide using our *Avant* catalysts in plants employing around 25 different process technologies.

Jim Seward, vice president, Sales and Marketing

**What's the key to building successful customer relationships?**

**Jim Seward:** Catalysts play a vital function in the manufacturing processes for polypropylene and polyethylene production, influencing many factors from final product properties to the ease of operation of the plant. At Basell, we aim to provide *Avant* catalyst solutions that improve our customers' business, regardless of the process technology they operate. We do this through the development of catalysts specifically designed for different production processes or market demands. It's not a "one size fits all approach" – tailoring to meet our customers' needs and, just as importantly, their customers' needs is an essential ingredient in how we do business.

Neil Nadalin, business development manager

**How important is differentiation in the catalyst business?**

**Neil Nadalin:** We have to ensure there's a match between our catalysts and the customer's process technology and product property requirements. Competition is getting tougher and tougher in the commodity end of polyolefins and we believe differentiation will be the key to profitability for many of our customers. For our part, Basell has developed a unique range of *Avant* polyolefin catalyst systems that includes the latest generation of Ziegler-Natta – such as 5$^{th}$ generation diether and succinates – and metallocene catalysts. Our commitment to catalyst research and development and Basell's knowledge of the polyolefins industry gained through being a major producer of both PE and PP are very important to the success of our catalyst business.

**What competitive advantages does Basell's new generation of catalysts offer customers?**

**Neil Nadalin:** A customer using a third-party gas-phase PP process recently switched from an older 4th generation to our 5th generation diether *Avant* catalysts and this catalyst upgrade enabled the customer to achieve significant differentiation in terms of product properties. Additionally the new 5th generation catalyst enabled the customer to improve the production economics as a direct result of the much higher yield of the diether catalyst. Basell is also moving ahead with our 5th generation succinate *Avant* catalysts. The industrialisation of succinate-based products in our own plants clearly indicates the potential for product differentiation in high stiffness applications and mono-modal BOPP (Bi-axially Oriented PP).

**What role does catalyst application and technical support have in Basell?**

**Dick Schoonaard:** The relationships we build with customers, founded on our technical expertise and experience and cemented through trust, are essential to making catalyst trials work and developing long-term relationships. Our Catalyst Application and Technical Support team – or CATS – has to understand the customer's development wishes and be able to position the most suitable catalyst for their needs. We have to build close links with the customer's technical staff. It is also very important for customers to run catalyst trials and we can support them through lab or pilot tests as well as industrial trials. An industrial trial is cost intensive for the customer, requires extra work and effort and may involve a customer interrupting current production to test a catalyst for future business development. In every case, it is important that a trial is well managed, successful and that Basell provides the right level of support, onsite or offsite.

Dick Schoonaard, application and technical support manager

**How many catalyst trials is Basell involved with each year and what is your success rate? The geographical scope must create significant pressures?**

**Dick Schoonaard:** We're currently doing several trials each month and the number keeps growing. Our success rate is close to 90% across all technologies and this performance increases our customers' confidence. We have six people in our CATS team, and the team's geographical spread enables us to support customers and trials anyplace in the world. The team is supported by colleagues from our Research and Development and Technology Services organisations.

**How do you measure success in customer relationships?**

**Dick Schoonaard:** We do customer satisfaction surveys regularly. The surveys have shown that our customers give Basell high marks for being responsive to their needs. When there are issues, we address them quickly and thoroughly. Another important feature of our relationship is confidentiality. Customers need to feel absolutely secure that the integrity of their business will not be compromised. We manage our Catalyst operation as an independent business within Basell and have focused on building a reputation as a catalyst supplier with very high ethical standards.

**How is Basell responding to the challenges of supplying *Avant* catalyst systems on a worldwide basis?**

**Jim Seward:** As the industry grows, we have been positioning ourselves for the future. We increased catalyst production capacity at our Ferrara, Italy, and Ludwigshafen, Germany, sites and in 2006 we expanded our production capability in the United States by acquiring a catalyst manufacturing facility in New Jersey. We've established a global supply chain and we also have a sales, customer service, and technical support infrastructure that enables us to respond to the local needs of customers in every region of the world.

**How does Basell view the future of its catalyst business?**

**Jim Seward:** We recognise that investing in R&D and customer support services and contributing to the continued success of our customers will keep our global *Avant* catalyst business growing. We've worked hard to establish Basell's catalyst technology leadership across the full range of process technologies, and we're determined to maintain it.

**What is a catalyst?**
In simple terms, a catalyst is an external reagent which speeds up a chemical reaction. Chemically, this is achieved by lowering the reaction's activation energy; thereby increasing the reaction rate. In the world of polyolefins, catalysts can be broadly divided into 3 main families: Ziegler-Natta, chromium and metallocene. Yield is one of the most important characteristics of a catalyst and defines how much mass of polymer is produced per mass of catalyst. Modern industrial catalysts can have yields as high as 100,000 kg/kg.

# PB-1 stars in 'sustainability showcase'

Basell's polybutene-1 materials played a key role in maximising energy efficiency and sustainability at Warmafloor's new state-of-the-art UK headquarters.

Warmafloor's new state-of-the-art UK headquarters

Since its establishment 20 years ago, Warmafloor's objectives have been to create underfloor heating and cooling systems that maximise the well-being of a building's occupants while minimising energy consumption and environmental impact.

Warmafloor's installations now include many of the most prestigious organisations and institutions in the UK from the British Museum to the Scottish parliament building.

The piping material of choice for all of these projects was polybutene-1 (PB-1).

**Low environmental impact**

"The data speaks for itself – in addition to its superior flexibility and creep resistance, PB-1 has the lowest environmental impact of any pipe manufacturing material," said Frank Schemm, Basell's customer project manager and PB-1 pipe marketing manager. "Given Warmafloor's environmental priorities, PB-1's performance advantages made it the prime candidate in the company's search for the most sustainable solutions."

Two years ago, growth in Warmafloor's business made it necessary to move to larger headquarters. The company saw this as an opportunity to create a building whose materials and systems would be a showcase for the application of sustainable technologies to the creation of well-being in the workplace.

**High-sustainability technologies**

Among the many high-sustainability technologies incorporated in the new building is a heating and cooling system that uses groundwater in the surrounding terrain as a sink for heat in the summer months and a source of heat in the winter.

During the summer, water flows through 4 kilometres of 50 mm polyethylene 'ground coils' before passing through a heat pump and heat exchanger where it cools the water in the underfloor and ceiling circuits. In the winter the system operates in reverse to provide heating.

With time, the system will become more and more efficient as heat released into the ground during the summer is brought back into the building during the winter.

As well as the heating and cooling systems, the new building contains an impressive range of other energy-saving technologies, including a solar-powered hot water system, high-reflectance glazing and insulated wall cladding. As a result, total energy consumption is barely 20% of that of a conventional building. "Our gas bill for our first January in the offices was just £27," commented Mike Lamb. Warmafloor's chairman and designer of the building.

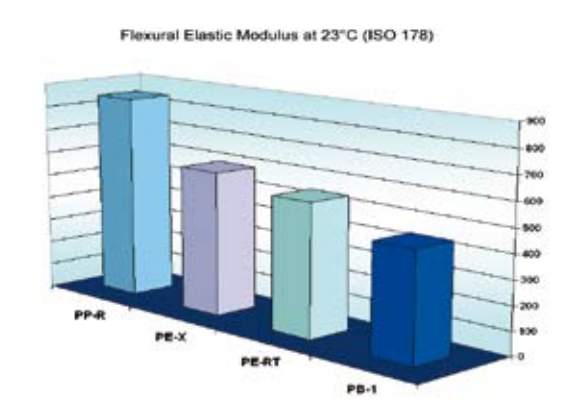
**Water conservation**

Water consumption was another area in which Warmafloor saw the opportunity to maximise the building's environmental efficiency.

## PB-1 – a natural choice

PB-1 has a number of characteristics that make it extremely attractive for use in customer hot and cold water systems and flexible surface heating and cooling.

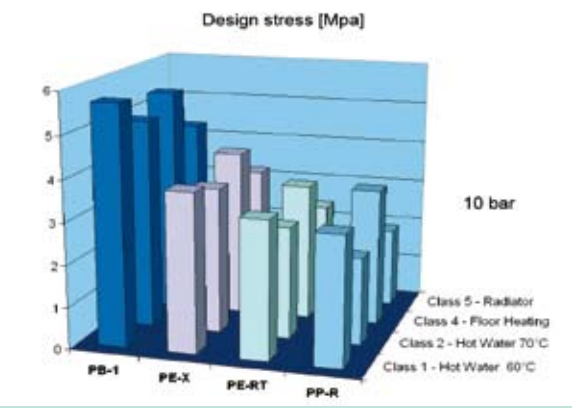
**Flexibility**
The high flexibility of PB-1 (up to twice that of other polyolefin piping materials) makes for easy installation – even at low temperatures. PB-1 piping needs no pre-heating to adapt flexibly to the geometry of the floor area, passing easily around obstacles and making installation quick and safe.




**Creep resistance**
Given the elevated temperatures and mechanical stresses experienced by piping systems, creep resistance over a wide temperature range is a desirable characteristic.

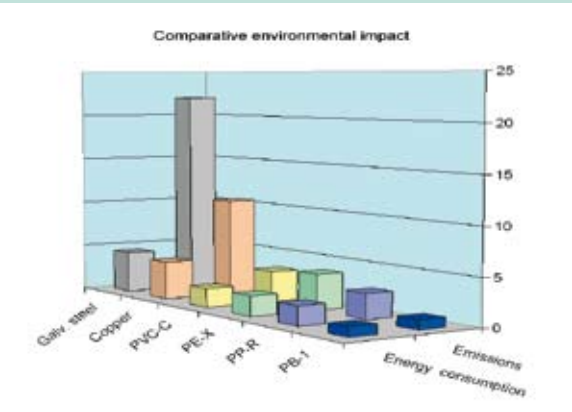
PB-1's creep resistance is intrinsically excellent and it outperforms conventional polyolefins in this respect.

For all application classes listed in ISO 10508, PB-1 offers higher design stress values than alternative materials.




**Environmental impact**
An extensive study carried out in the 1990s by Berlin Technical University compared the energy consumption and soil, water and air emissions involved in the manufacture and installation of six different piping systems.

Measured in this standardised way, the environmental impact of piping systems using plastic materials, and PB-1 in particular, turned out to be far less than that of metal piping. Growing recognition of the importance of sustainability in building design and construction has made PB-1 an increasingly attractive material for piping systems.




Rain runoff from the building roof is channelled into a 12,000-litre underground storage tank for use in flushing toilets and washing company vehicles. Again, polyolefins play an important role – the storage tank is moulded out of PE resin and most of the drinking water systems use PP-R and PB-1 piping.

**Carbon-neutral**
The eco-compatibility of the site extends also to the construction phase. In fact, the site is 'carbon-neutral', because the energy consumed during building construction is offset by the carbon absorbed by more than 200 shrubs and trees which were planted in the surrounding grounds.

The day-to-day energy savings achieved by the building systems also contribute to a significant reduction in 'carbon footprint'. Initial conclusions from the first 9 months of operation suggest that the installed sustainable technologies allow a saving of 8 kg of $CO_2$ per $m^3$ - some 216,000 kg per year for the complete building.

"This project is an excellent example of the effective application of technology to meeting today's most pressing environmental concerns," commented Frank. "The value of PB-1 in this context is being increasingly recognised with double-digit annual growth in this market and we expect the trend to continue for the foreseeable future."

# *Metocene* resin is clear winner in Cadbury's new gum packaging

The exceptional clarity and gloss of Basell's metallocene-catalysed materials proved a key design resource in Cadburys' launch of a new packaging of chewing gum.

"In the increasingly competitive world of confectionary and chewing gum, the visual appeal of packaged products is becoming even more important for brand recognition. The more exciting the design of the packaging is, the more our customers will be recognized at the point of sale."

The packaging is manufactured by plastics converter Millet Marius – a specialist in injection and blow moulding for food packaging, located in Jura, France. Pascal Foucher, their purchasing manager explained the strategy behind the choice of material for Cadbury's new chewing-gum brand "Hollywood Sphere".

**Clarity and stiffness**

"We were looking for a real designer polypropylene that enabled a high level of design freedom as we were asked to combine exceptional clarity and a glossy surface on the one hand, with an increased level of stiffness on the other hand," added Pascal Foucher.

"It was clear that they were looking for a material with a unique combination of properties that *Metocene* resins can specifically offer," said Jean-Pierre Bideau, Basell's customer project manager in the *Metocene* Resins Business Unit for Southern Europe.

"The product we recommended exhibited a clarity similar to that of clarified Ziegler-Natta random copolymer polypropylene, but with the stiffness of a typical homopolymer," he continued. "Our *Metocene* resin provided Millet with outstanding clarity, without sacrificing rigidity."

**High-purity resins**

Other advantages of the *Metocene* resin chosen for this application included the low melting point (20° lower than a conventional polypropylene resin), which allowed significant reduction in cycle times, and the exceptional purity of the materials in terms of volatiles and oligomer. "The low odour and taste properties of this *Metocene* resin make it particularly attractive for food packaging applications," added Jean-Pierre.

**Award nomination**

This new packaging developed by Millet Marius proved to be extremely popular and is now on sale in many countries throughout the world.

The effectiveness and visual appeal of the packaging was recognised by the French Association of Plastics Manufacturers, who nominated it for one of their annual design awards, the "Oscar de l'emballage".

# *Stretchene* resins set new standards in ISBM

Basell's new family of resins specially developed for injection stretch blow-moulding (ISBM) applications offers new opportunities in food and household containers.

"These new resins are a clear alternative to glass and PET in a wide range of bottle and jar applications," said Mike Rogers, Basell's project manager – Innovation and new business.

"*Stretchene* resins represent a significant extension of the standard polypropylene property envelope in the direction of impact strength, rigidity, transparency and impact strength," Rogers continued.

"The resins can be used in customer ISBM applications from food containers to bottles for household chemicals and cosmetics."

**Hot fill**

*Stretchene* resins are designed for high throughput on standard ISBM lines and the high transition temperature of *Stretchene* RP1685 grade makes it a competitive candidate for hot-fill applications.

**High transparency**

High transparency is the special feature of *Stretchene* RP1903 grade, which can be used for customer cosmetic applications where excellent optical properties are required.

The low density (0.9 g/cm$^3$) of *Stretchene* materials reduces packaging weight as well as cutting material costs by allowing more items to be moulded from a kilo of resin.

"We're very excited by the potential of the *Stretchene* resins family," said Rogers. "They represent a groundbreaking development for polypropylene materials in the packaging sector."

# *Hostalen* ACP grade breaks new ground in HDPE bottles

With enhanced stiffness and ESCR, a new grade from Basell's Advanced Cascade Process extends the performance of bottles for household cleaning products.

Household cleaners and chemicals pose a challenge for polymer bottle manufacturers – chemical attack can, over time, weaken the polymer structure, leading to warping or 'panelling' of the bottle walls.

A new *Hostalen* HDPE grade produced using Basell's Advanced Cascade Process (ACP) offers higher stiffness and ESCR (environmental stress-cracking resistance), improving long-term performance and even offering the possibility of downgauging.

Basell tests indicate that *Hostalen* ACP 6031D, the new resin, can enable customers to obtain an ESCR of up to 10% higher than a typical HDPE grade with the same density.

"The ACP process modifies the polymer structure to reach a higher level of stress-cracking resistance and stiffness", said Mike Freudenstein, Basell's product manager for HDPE grades.

"The high stiffness is a key to reduced weight, reduced material consumption and reduced cycle times," observed Alexander Woerz, Basell's application development manager, "all of which are essential to competitiveness and value for processors."

# Ultrapolymers: resins from the *Catalloy* process make the difference

Basell distributor Ultrapolymers makes a significant contribution to the continued success of Basell's resins made with *Catalloy* process.

Combining tactile qualities like softness and flexibility with the toughness and processability of polypropylene, materials from Basell's *Catalloy* process deliver value and performance in an enormous range of applications.

"*Catalloy* process materials are frequently involved in leading-edge applications," said Rainer Schweda, responsible for *Catalloy* process resins global marketing & innovation.

"Making sure that customers get the best out of these products requires the right kind of technical support and Ultrapolymers has been particularly effective at helping its customers get the most value out of our *Catalloy* process resins."

How has Ultrapolymers managed to meet the needs of such a large and evolving customer base?

"Basell's resins from the *Catalloy* process are a key reason why our customers perceive and value us as problem solvers for challenging applications," adds Rainer Konrad, Product Manager for Basell polyolefins at Ultrapolymers Deutschland GmbH.

**Soft material, hard competition**
"When it comes to flexible, soft applications, we have a competitive edge. This continually offers new opportunities for our customers to make existing applications better or more cost-efficient, or both, and also to develop entirely new applications."

**Trust and cooperation**
General Manager Ultrapolymers Deutschland Ludwig Berger explained: "It is enormously important that both our customers and suppliers can rely on us. That is why we lay particular emphasis on continuing, long-term contacts based on mutual trust and open dialogue."

## Resins from the *Catalloy* process at work with Ultrapolymers

**Safety goggles**
(soft earpiece ends)
**by UVEX Arbeitsschutz GmbH**

Injection moulded
in *Adflex* X500F resin

**Fendt tractor**
(seat and backrest
of passenger tractor seat)
**by Sudhoff Technik GmbH**

Injection moulded
in *Softell* TKS 204 D resin

**Functional cap for „MIX-BOY"**
**by J. Buchsteiner GmbH & Co. KG**

Injection moulded
in *Adflex* X500F resin

## Ultrapolymers – a profile

Ultrapolymers Deutschland GmbH is a subsidiary of the Ultrapolymers Group N.V., Lommel/Belgium, which was formed in 2002 and is an international distributor of raw materials for the plastics processing industry, with offices throughout Europe, Turkey and South Africa.

From its headquarters in Augsburg and ancillary sales offices, Ultrapolymers serves a customer base which has more than doubled over the last five years and now comprises over 1,500 customers in Germany, Austria and Switzerland.

Ultrapolymers' customers operate in a wide range of sectors, including automotive engineering, packaging, the electrical/electronics sector, household goods, medical technology, consumer goods and sports and leisure articles.

**Racing ski stick**
(Ski stick plate)
**by K. Brunner GmbH**

Injection moulded
in *Adflex* C200F resin

**Biker boots**
(inner functional parts
of biker boots)
**by B. Frey OHG**
**(Daytona Schuhfabrik)**

Injection moulded
in *Adflex* X500F resin

## *Catalloy* process technology

The *Catalloy* process is an advanced gas-phase technology developed by Basell for the production of in-reactor alloys including polypropylene (copolymer), ethylene-propylene rubber (EPR) and other alpha-olefins.

The products possess an extremely wide range of flexibility from very soft to very rigid materials, together with high resilience.

Materials from the *Catalloy* process are marketed under the trademarks *Adflex, Hifax, Softell* and *Adsyl* and are used as base materials or blending components in key industry segments like building and construction, industrial applications, automotive, consumer goods and packaging.

"We offer a wide Basell polyolefin portfolio, which is constantly being expanded by innovative products and is enhanced by close cooperation between our staff and our customers."

**Technical creativity**
"We have a team of highly qualified employees, who consistently provide their in-depth know-how and technical creativity to customers throughout the development process, with a focus on polyolefins from the initial idea to production start-up."

The range of applications developed so far by Ultrapolymers in collaboration with customers is impressive.
They include:

1. drum liner

2. sport, leisure & toys

3. specialty compounding

4. safety and protection

5. 2-component soft touch applications

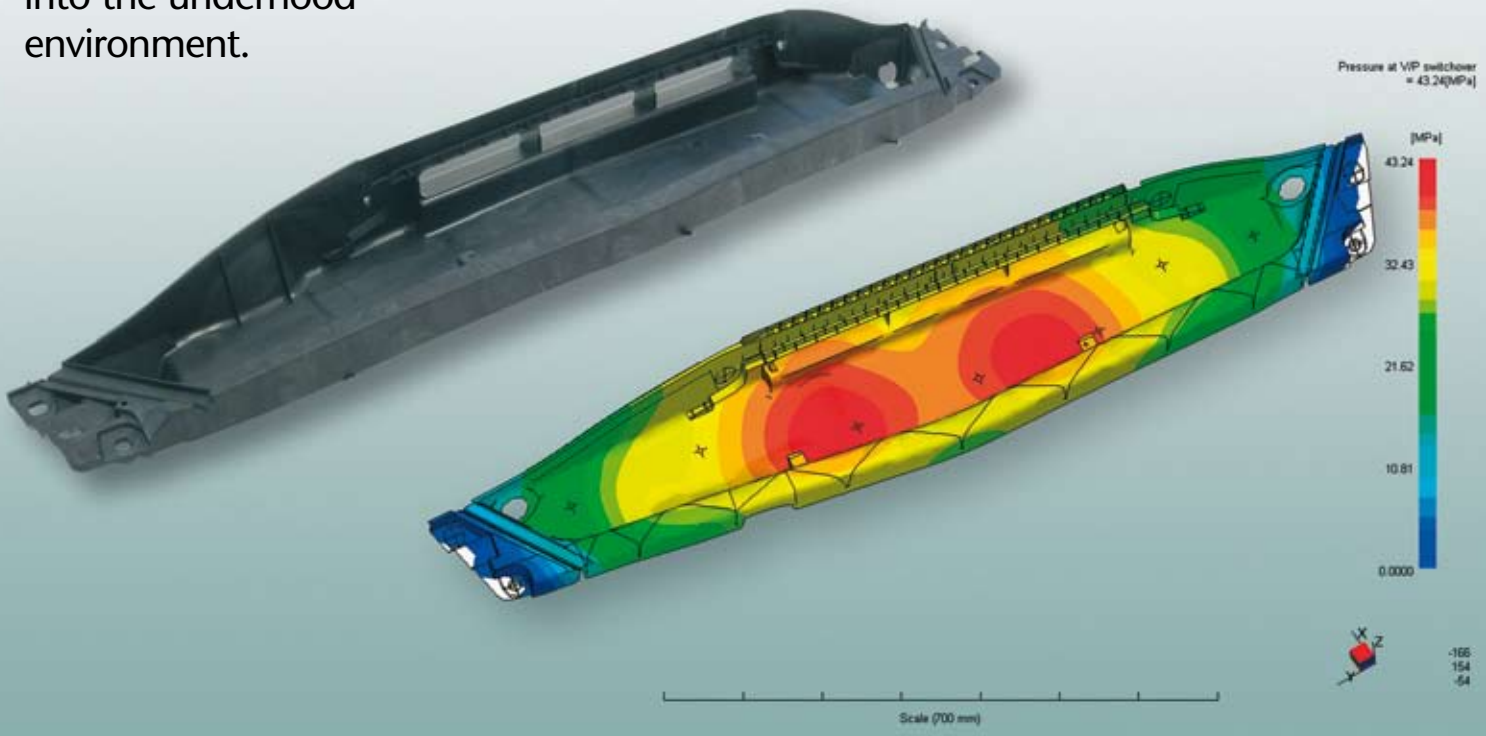
Lars Adler, Basell's Distributor & Agent sales manager Europe for Advanced Polyolefins was enthusiastic about the role played by the distributor: "I am impressed by the continuing ability of Ultrapolymers in finding new applications for our outstanding *Catalloy* process resins."

"Besides a very good understanding of the product, the key to their success is the collaborative way they work with customers to meet their differentiated needs."

"Ultrapolymers has made significant contributions to the growing success of this Basell product group across Europe."

# Renault Modus fits glass-fibre PP waterbox

A new glass-fibre-filled grade continues the penetration of advanced polyolefins into the underhood environment.




"Glass-fibre reinforced polypropylene has proven to be a cost-effective replacement for engineering plastics and even some metals in the automotive underhood environment," said Jean-Philippe Dassaud, Basell's customer project manager. "The waterbox application for the Renault Modus is the latest in a series of customer applications in which new glass-fibre PP grades from Basell are combining performance benefits with cost savings."

The waterbox is a relatively large moulding located below the vehicle's cowl-vent grill to collect run-off water from the windscreen. Dimensional stability and water resistance are key properties, as is resistance to the elevated temperatures found in the engine compartment.

**Material and energy savings**

"The move to GF-PP from glass-fibre reinforced polyamide in this application allowed Mecaplast designers to obtain significant technical advantages. It also simplified the assembly process, thus providing cost savings. The low density of polypropylene with respect to engineering plastics means that manufacturers get more parts per kilo of resin, as well as reducing vehicle weight and fuel consumption."

Polypropylene's superior water-resistance with respect to polyamide was an additional advantage, and assembly time was cut because the associated foam damper element could be fixed to the PP water-box with a simple welding operation.

**Mould compatibility**

"The original tool had been cut for polyamide," explained Jean-Philippe. "So an important consideration for Mecaplast and Renault in moving to the new material was its mould shrinkage behaviour. Basell's CAD/CAE centre carried out a number of simulations to establish that the same mould could be used for the polypropylene material with virtually no modification because the shrinkage behaviour of the two materials is very similar."

Recent underhood applications using advanced polyolefins include the cowl-vent grill on a new vehicle where a component moulded from a filled polypropylene resin replaces not only the grill, but also the supporting beam below it, normally made of mild steel.

"We're convinced that applications like these are just the beginning," said Jean-Philippe. "We're looking forward to working with our customers to develop advanced polyolefins for other demanding underhood applications."

# High-impact PP breaks new ground in ice cream packaging

## Innovative packaging contributed to the success of Wells' Dairy's 'Blue Bunny®' brand on the U.S. market.

Replacing a traditional paperboard tub with a sophisticated high-impact polypropylene (PP) container incorporating in-mould labelling has helped Wells' Dairy's Blue Bunny brand to become U.S.'s fastest growing packaged ice cream in the past year.

"While the ice cream category as a whole has remained flat, consumers have been more willing to try our product because of the innovative packaging," said Lesley Bartholomew, manager, public relations and corporate communications, Wells' Dairy.

**Tough at low temperatures**
The new 56 oz (1.59 kg) packaging is injection moulded from *Pro-fax* EP390S, a 35 melt flow polypropylene resin with high impact strength down to minus 40°C.

**Integrated labelling**
Injection-moulder Airlite Plastics Co. uses a technique known as in-mould labelling to decorate the container at its Omaha, Nebraska plant. A printed PP label is placed in the mould by robotics before the resin is injected. The resulting label cannot be detached in the humid storage conditions used for ice-cream and the intense colours and attractive graphics allowed by this technique, significantly increase the packaging's customer-appeal.

**Hygiene and safety**
The snap-on lid with tamper-evident seal is moulded from the same *Pro-fax* resin. "Wells' Dairy has a patent pending on the design and functionality of the container. The sturdier new package keeps its shape both in and out of the freezer. Its elliptical contour makes it easier to grip and creates less mess when scooping ice cream. So much so, that the company has trademarked the term no more "knucklemuck" because consumers no longer have to worry about getting ice cream on their knuckles when scooping out of the container," Bartholomew said.

But the benefits of the new packaging do not end when the contents have been consumed: "The container is also microwaveable, reusable and 100% recyclable," Bartholomew pointed out.

**Growth potential**
"The availability of this grade opens the door to many new applications for injection moulders and frozen food packagers," said Dave McKeeman, Basell's new business development manager for injection moulding, North America.

"Food marketers want to create more value for their product at the point-of-purchase. These new polypropylene alternatives – coupled with an in-mould label – can help them achieve the differentiation they desire," commented McKeeman.

"Basell is the leader in the industry when it comes to resin because of its ability to meet the required FDA regulations for food contact approval, freezer grade and impact resistance," Bartholomew said.

# Pipe coatings toughen up with PEX protection

Protecting the anti-corrosion coating of steel pipes with a layer of cross-linked polyethylene cuts installation costs and boosts reliability.

The use of polyethylene and polypropylene coatings to protect steel pipes from corrosion is now widely established in many areas from petroleum and gas transportation to water and steam.

Basell's broad portfolio of PP- and PE-based coating systems (see box) now includes an innovative multilayer coating designed to provide a high-level of protection against physical damage, as well as corrosion.

Modern three-layer PP and PE coatings provide excellent long-term protection – but this can be compromised if the coating is mechanically damaged during storage or transportation or, most critically, during backfilling of the pipeline trench – especially if the substrate is rocky or abrasive.

Measures to avoid such damage include backfilling with sand or gravel, instead of the original substrate, or binding the pipeline with 'rock shield' materials after laying. Such solutions, however, can add appreciably to the overall cost of the project.

**Built-in protection**
An alternative approach is to build the mechanical protection into the coating itself. This was the idea behind a new technique developed jointly between Basell and Mülheim Pipe-Coatings GmbH in Germany.

This approach uses a layer of cross-linked polyethylene (PEX) applied on top of a conventional 3-layer polyethylene coating system.

The mechanical properties of PEX are well understood and exploited in plastic pipe applications. Outstanding impact strength (even at low temperatures) and high stress cracking resistance have made PEX the material of choice in many piping application areas. The aim of the project was to harness these qualities in the protection of anticorrosion coatings.

**Building mechanical protection into the pipe coating in this way offers a way to increase the reliability and service life of installations**

**Applying the coating**
The PEX coating consists of a layer of silane-grafted HDPE extruded over the main coating using the same standard extrusion equipment.

Heinz Vogt, Basell's PE product and application development manager, commented: "No additional equipment is required – the PEX layer is applied in the same way as the main coating. Process times are a little longer because the pipe sections must be cooled down more slowly after extrusion to allow the cross-linking reaction to complete."

To assess the effectiveness of the mechanical protection provided, PEX-protected pipe sections were subject to laboratory testing as well as incorporated in an actual pipeline installation.

"The PEX coating showed significantly higher impact resistance than the top coat in standard impact tests," said Heinz. "In simulated penetration and abrasion tests with actual pipeline sections, the PEX protected pipes showed practically no damage to the underlying coating, even from abrasive basalt substrates."

**Field testing**
To assess performance in a real application situation, a kilometre stretch of PEX-protected pipe sections was included in a WINGAS pipeline extension near Erfurt in Germany.

A new tehnique has been developed jointly between Basell and Mülheim Cosatings GmbH using a layer of crosslinked polyethylene (PEX) applied on top of a conventional 3-layer PE coating system

## Basell coating systems worldwide

Basell produces a complete range of PE- and PP-based coating systems which are used in pipeline projects throughout the world.

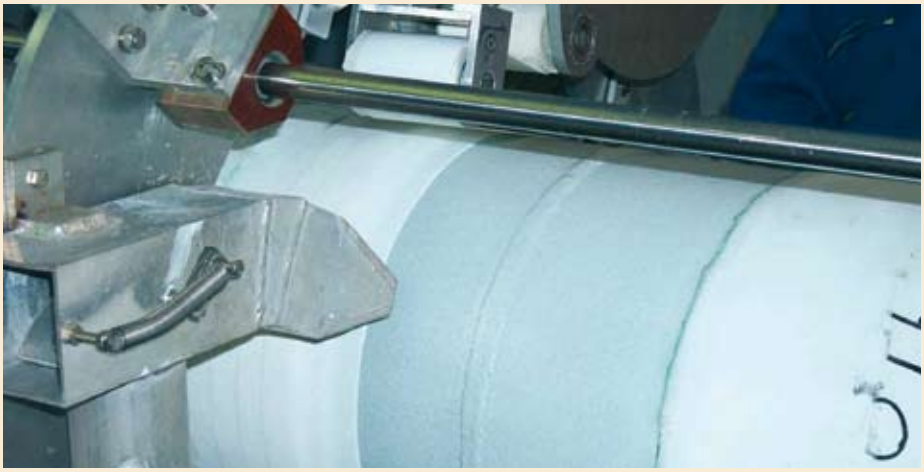
The Basell portfolio includes three main types of systems:

**Three-layer PE coatings**
For corrosion protection of gas and oil pipelines operating at temperatures up to 85°C, Basell supplies coatings consisting of an outer layer of *Lupolen* HDPE resin bonded to an inner layer of FBE epoxy resin via an intermediate layer of *Lucalen* PE resin.

These systems also include the incorporation of PEX layers to provide mechanical protection (see main story on this page).

**Three-layer PP coatings**
For higher operating temperatures up to 140°C, a *Moplen* PP outer layer is bonded to the inner epoxy coating by a layer of *Hifax* PP resin.

**Multi-layer PP coatings**
Insulating properties can be incorporated into the anticorrosion coating by the addition of one or more layers of PP foam below the outer *Moplen* PP coat. These systems are used for deep-water installations where the oil leaving the well-head needs to remain at the proper temperature without compromising the pumping operations.



The pipeline trench was backfilled with the original excavated limestone rock fragments (the other sections of the pipeline were protected with rock-shield materials.)

The pipeline has been in use since the spring of 2006 without any reported problems.

"Building mechanical protection into the pipe coating in this way offers a way to increase the reliability and service life of installations," observed Heinz. "At the same time, it simplifies and lowers the cost of installation by eliminating the need for special backfill materials or additional rock-shield systems."

"Following the successful conclusion of the pilot phase, we expect to be using the approach soon in full-scale projects."

**Patented protection**
"The development of this innovative protection system demonstrates the excellent synergy that exists between different parts of Basell's global organisation," commented Hans Videler, Basell's business manager anti-corrosion coatings. "We have been able to apply our experience in PEX materials developed in other sectors to create an innovative technique that is a powerful differentiator for Basell's portfolio of coating technologies."

# PIT opens new horizons for plastics applications

Plastics Interface Technology – the bonding of a metal foil to a polymer substrate – is a completely new application mode with exceptional cost-performance potential in many applications such as appliances, electronics and automotive.

A new technique recently developed and patented by Basell combines a plastic substrate with high-quality metal foil in a single one-step operation.

The resulting structures have excellent surface qualities and their mechanical and thermal characteristics are far superior to those of the polymer substrate alone. In some applications they can even be used to replace steel or aluminium components at a fraction of the cost and weight of a pure metal solution.

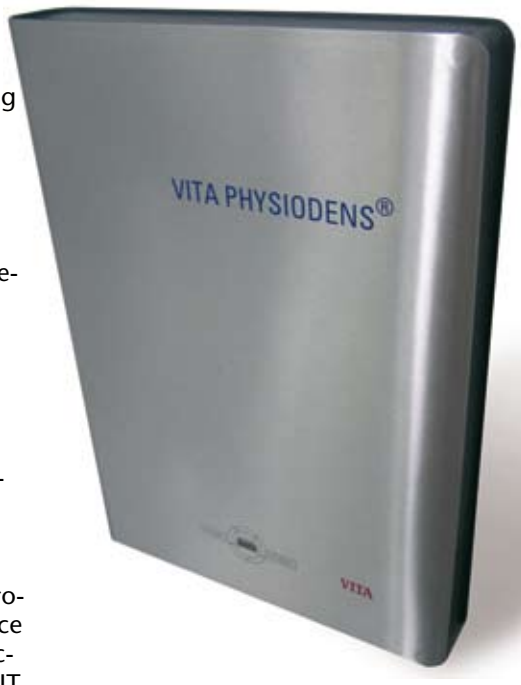
A typical composite uses an aluminium foil pre-coated by the supplier according to Basell's patent(s) nr 6,494,982 and 6,972,153 B2 (and followers), enabling further heat-bonding to polypropylene or even another plastic substrate during a conventional injection moulding process.

**Replacing electroplating**
One obvious area of application for the new composites is in the replacement of electroplated plastic: the surface quality achievable using PIT is comparable or superior to electroplating; reject rates are far lower and the polypropylene resins used represent significant cost savings compared to specialised electroplating plastics.

**Appliances and construction**
Other potential areas include the provision of electromagnetic interference (EMI) shielding in electrical appliances. The high thermal resistance of PIT composites confers excellent flame-retardancy (full compliance with the requirements of flammability classes B1 and B2 - German standard DIN 4102 - or UL94 V-0), making them potentially suitable for use in electrical devices for building and construction, elevators and automotive.

**Long-term performance**
In trials carried out in collaboration with Basell customers, PIT composites have confirmed their toughness and long-term resistance to mechanical and chemical attack, even in demanding applications involving exposure to the hot detergent solutions found in washing machines and dishwashers.

High-temperature resistant part injection-moulded in PA66 with PIT-applied aluminium facing (no delamination after 40 days at >180°C).




„Dentalbox": injection-moulded glass-fibre reinforced polyamide box for dental articles + PIT-processed aluminium sheet decoration.

"We're very excited by the results that these trials have delivered so far," commented Klaus Müller, Basell's PIT-project manager. "PIT composites have the potential to offer unprecedented levels of cost-performance in a wide range of application areas from floor panels, furniture and lamps to automotive interior trim. Using foamed substrates, we can combine superb surface quality with exceptional weight savings."

"We've developed extensive know-how of this new technology and we're looking forward to putting our knowledge to work in helping our customers develop a whole range of innovative new applications."

# Pipes take off in Turkey

Pipe customers in Turkey are served by a new team based in Basell's Istanbul office.

From left to right: Tugba Sekeroglu Demirtas, Serhan Zumrut and Filiz Bardakci

"Turkey's pipe market will offer significant opportunities over the next few years," said Eckhard Kuhnhenne, sales director of Europe pipe & sheet. "Basell is now well-placed to serve this rapidly growing demand."

Healthy expansion in Turkey's economy is driving rapid growth in overall plastics consumption – currently at around 16% per year and expected to grow even more in the coming years.

In the plastic pipe sector, the high rate growth of the residential building sector has generated a strong demand of hot and cold water piping systems (sanitary), especially systems based on PP-R (Polypropylene Random Copolymer). PP-R pipe systems have been used for years in Turkey and became the system of choice for sanitary installations in the country, while PEX materials are used for underfloor heating applications. Many customers are also very active on the international scene with export to Western Europe and the Middle East.

At the same time, Turkey's strategic position between Europe and the energy-rich Middle East has made it the focus of many forthcoming pipeline projects for the transportation of gas, with opportunities for anti-corrosion coatings and HDPE materials. With more than 30 years of expertise in the pipe coating business, Basell is uniquely positioned to continue this success in the pipe coating market.

**Our goal is to be the main supplier of innovative polyolefin materials in Turkey**

In order to meet the demands of this dynamic market, Basell completed the existing pipe and sheet sales organisation with the integration of technical manager Tugba Demirtas in early 2007.

The aim of the new team is to offer pipe customers a single source of supply and technical support for polypropylene and polyethylene pipe and anti-corrosion products.

"We are the first overseas supplier in Turkey with a comprehensive sales and technical organisation specifically dedicated to the pipe market," said Serhan Zumrut, Basell's account manager of pipe & sheet. "We are focusing particularly on the PP market, and we have good logistics in place to supply PP pipe grades from Basell's *Spherizone* unit in Brindisi, Italy. Our goal is to be the main supplier of innovative polyolefin materials (PE, PP and PB-1) in Turkey."

# Basell @ Chinaplas 07

Basell and CSPC once again co-exhibited at the 21st International Exhibition on Plastics and Rubber Industries (Chinaplas 2007) and hosted a customer dinner in the evening of the first show opening day.

Chinaplas 2007, which took place from May 21 through 24 at Guangzhou International Convention and Exhibition Center in Pazhou, Guangzhou, China, attracted 61,621 visitors from 112 countries or regions, according to statistics from the organizers Adsale Exhibition Services Ltd.

Basell also took this opportunity to launch the Chinese version of its website (www.basell.com.cn) at the Fair and attracted quite a few interested visitors to register with our portal on site.

Chinaplas is the largest exhibition of plastics and rubber industry in Asia, gathered 1,580 exhibitors from 36 countries and regions on an exhibition area of 102,000 square meters. A total of 1,200 machines, including injection moulding machines, blow moulding machines, extruders and auxiliary equipments, were displayed at the fairgrounds in addition to in addition to different chemical materials.

# *Purell* resins showcase at CompaMed

## Basell's family of high-purity grades for medical and pharmaceutical applications makes its first appearance at the CompaMed trade event in Düsseldorf.

Since their introduction just over four years ago, Basell's *Purell* family of resins specially formulated for the medical and pharmaceutical sectors (see box) has been widely adopted by customers in medical applications ranging from highly regulated uses (medical vials and clear, radiation-resistant syringes) to devices such as sharps containers and labware.

### The *Purell* family – serving the medical sector

*Purell* grades are drawn from a range of polyolefin families, from PP and PE resins to the latest *Metocene* grades combining high clarity and excellent mechanical properties. The medical grade range also includes *Adflex* and *Softell* supersoft materials.

**Regulatory compliance**
*Purell* grades normally meet the requirements of regulatory bodies in Europe and North America, including compliance with EP and USP standards.

**Sterilisability**
Most *Purell* grades are sterilisable using the normal range of techniques: autoclave, hot steam, Et2O, gamma, e-beam.

**Support**
Basell has introduced a medical protocol for *Purell* grades to support customers in the regulatory process.

The special characteristics of the *Purell* resins range will be on show for the first time at the specialist medical technology event CompaMed, to be held in Düsseldorf in November 2007.

"The *Purell* family now constitutes a key resource for manufacturers in the medical sector," commented Mike Freudenstein, Basell's marketing manager. "*Purell* resins are chosen by customers for many specialized applications because of their high purity, processability and regulatory compliance."

"Visitors come to CompaMed looking for technological solutions for the medical sector and I think we can say that *Purell* resins make a valuable contribution in many customer applications."

Visit Basell's stand at CompaMed, located at 08B/J08.

AUSTRALIA

## Australian plant wins sustainability award

Basell's Geelong polypropylene plant in Australia has won the 2007 Sustainability Award for Chemical Plants for the successful completion of its expansion project in 2006.

The award was presented at the Plastics and Chemicals Industries Association (PACIA) national conference in Sydney. It recognises organisations that have demonstrated progress in sustainability through innovative projects and activities.

The plant was honoured because the project enabled them to achieve an 85% reduction in energy requirements. They also implemented an effective consultation process with the local communities during every phase of the project.

INTERNATIONAL

## Basell sponsors Nobel Web game

Basell is one of the official sponsors of an online educational initiative promoted by the Nobel Foundation.

The game "Heating Plastics", featured on the official web site of the Nobel Foundation, uses an interactive quiz to help raise awareness of the science behind plastics among young children.

The web site also features an introduction to plastics and polymers, which highlights the pioneering, Nobel prize-winning discoveries of Karl Ziegler and Giulio Natta.

QATAR

## Qatar plant takes world *Spheripol* process capacity to 20 MT

The selection of the *Spheripol* process technology for a new plant to be built by Qatar Petroleum brings the total licensed capacity of *Spheripol* PP process plants to 20 million tonnes in 35 countries throughout the world.

The unit, with a capacity of 700 kt/a, will be operated by a joint venture between Qatar Petroleum and Honam Petrochemical of Korea. Start-up is expected in 2011.

CHINA

## Latest *Avant* ZN catalysts now available in China

Basell is to begin supplying polyolefin producers in China with the latest generation of *Avant* ZN catalysts for polypropylene production. The first customer to be served will be leading Chinese polyolefin producer CSPC.

The new catalysts will allow producers to extend the property range of the resins they produce, as well as enhancing product quality and consistency.

ITALY

## Basell to expand *Spherizone* plant in Italy

A new debottlenecking and revamping project for Basell's *Spherizone* process plant in Brindisi, Italy will increase the capacity of the unit by 50 kt to 235 kt per year.

The output of the plant is being increased to meet growing demand for the innovative materials produced by the *Spherizone* process which can produce resins with properties such as clarity, impact resistance, softness and rigidity.

FRANCE

## Basell to acquire Shell refinery

Basell has made an offer to buy the Shell oil refinery and associated infrastructure at the Berre l'Etang petrochemical complex in France.

At the same site Basell currently operates world-scale polypropylene and polyethylene plants, a steam cracker and butadiene extraction unit and is the refinery's largest customer.

The purchase, for an agreed price of $700 million, is subject to staff council consultation and approval from regulatory authorities.

VENEZUELA

## *Spheripol* technology for new Venezuela plant

A new polypropylene plant to be built jointly by Venezuela's state-owned oil company Pequiven and Brasil's Braskem, the South American market leader in thermoplastic resins, will use Basell's *Spheripol* process technology.

The plant, to be located at Jose in Venezuela, will have a capacity of 450 kt per year, and is expected to come on stream in 2009.

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