

Shanghai, Technical Polymers press conference
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With global brands like Rilsan[®], Pebax[®] and Kynar[®], unique products like Rilsan[®] Polyamide 11 and leading capacities in Rilsan[®] polyamide 11 and 12, Arkema's Technical Polymers business unit stands out in the industry by providing its customers with global coverage and superior regional service from production facilities and research centers in Europe, Asia, and the USA.

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***Thermoplastic Elastomer Innovation
Electronics – Sports – Consumer Goods***

**Pebax[®] Rnew: the first engineering thermoplastic elastomer range
made from renewable resources**

Arkema is launching the first complete range of engineering thermoplastic elastomers with a 20 to 90% renewable carbon content.

For the past 60 years, Arkema has been the world leader in Amino 11 chemistry, a unique chemical processed from a vegetable source - castor oil - used to produce Rilsan[®] PA11. This natural vegetable oil is derived from a non-edible and non-GMO crop, and therefore does not compete with food production. The Pebax[®] Rnew range is based on this particular chemistry. The use of Amino 11 chemistry in this new Pebax[®] formulation reduces fossil energy requirements as well as emissions of CO₂, the main greenhouse gas.

The Pebax[®] Rnew family (25D to 72D hardness) made from renewable resources boasts the same outstanding properties as Pebax[®], including light weight, flex fatigue resistance, spring-back and elasticity return. It retains these outstanding features over a wide temperature range.

Pebax[®] Rnew perfectly fits into the product eco-design concept that satisfies the environmental awareness of consumers, while maintaining the existing high performance of Pebax[®].

This new Pebax[®] range will meet the needs of Arkema's customers (e.g. electronics, sports, automotive, etc.) who are looking for high value products, while engaging in environmentally sound manufacture as the material they will use has been processed from vegetable resources.



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Platamid® HX 2656 Rnew: the first 100% biobased Hotmelt Adhesive

Arkema, one of the world leaders in copolyamide Hotmelt Adhesives, introduces Platamid® HX 2656 Rnew, a unique new product fulfilling two major challenges of the adhesive market: lower emissions and sustainable chemistry.

The automotive industry has been working for years to reduce emissions of volatile organic compounds in the passenger compartment, i.e. the evaporation of gases from the materials used for the construction of car interiors (VOCs and fogging). Other markets in Technical Textiles are following this trend.

In line with the Kyoto Protocol, the challenge for the chemical industry as a whole is to provide sustainable chemistry. This is driven primarily by the objective to limit CO2 emissions into the atmosphere. Using renewable resources is one of the key factors in attaining this goal. The raw materials of Platamid® HX 2656 Rnew are derived from vegetable oil feedstock, and thus 100% renewable organic carbon as per ASTM D6866 (Standard Test Methods for determining the Biobased Content of Natural Range Materials Using Radiocarbon and Isotope Ratio Mass Spectrometry Analysis).

Platamid® HX 2656 Rnew is a high performance thermoplastic hotmelt adhesive developed for highly demanding and durable applications. Industrial scale production has been demonstrated successfully. Platamid® HX 2656 can be processed into webbing, netting, film and filament using standard equipment and conditions. Application developments are underway in cooperation with our customers.

Platamid® Hotmelt Adhesives are an excellent solution to highly demanding bonding challenges in a large number of markets, including textile interlining, technical textiles, construction, electronics and automotive.

Platamid® has been used for over 40 years in applications where durability and strength matter.



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Rilsan® Clear, a successful high performance transparent polyamide offering new design opportunities

A year ago, Arkema launched Rilsan® Clear, a new high performance transparent polyamide. Today, Arkema announces two developments opening up new design opportunities.

Rilsan® Clear fulfills genuine market needs by providing greater flexibility and easier processing than existing solutions, creating new opportunities in a number of markets, including sports and leisure.

Rilsan® Clear offers new design possibilities to designers and manufacturers of signature and sports spectacles.

Two new recent developments open up new design opportunities with aesthetic effects:

- Rilsan® Clear is perfectly suited for overmolding onto itself, therefore allowing various colors to be combined.
- Rilsan® Clear and Pebax® offer excellent synergy: the co-injection and overmolding of Rilsan® Clear and Pebax® produce excellent adhesion. Combining transparency with new “feel & touch” effects is now possible.

Transparent in any thickness, Rilsan® Clear offers designers and manufacturers all the benefits of high performance polyamides – light weight, toughness and chemical resistance – to create products that blend comfort and protection with fashion.



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**Thermoplastic Elastomer Innovation
Sports – Consumer Goods**

**Pebax[®] Clear: the new material that combines transparency
with the unique performance of Pebax[®] thermoplastic elastomer**

Pebax[®] Clear, a new range of transparent Pebax[®] materials, combines outstanding transparency with the unique performance of Pebax[®] thermoplastic elastomer.

The performance of Pebax[®] is now well established, and this material is now recognized as the lightest thermoplastic elastomer available, offering exceptional flex fatigue resistance, notched impact resistance, spring-back and elasticity return in all temperature conditions.

Pebax[®] Clear is fully compatible with Arkema's polyamide product range. Pebax[®] Clear is available in two flexural moduli, Pebax[®] Clear 300 and Pebax[®] Clear 400. The easy processing of Pebax[®] Clear using all major technologies opens up a whole new scope of possibilities for products requiring flexibility and high performance in combination with transparency and aesthetics.

Developed 25 years ago by Arkema's researchers and constantly improved upon ever since, Pebax[®] high-tech polymer is the preferred choice of many international plastics equipment manufacturers.



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***Fluoropolymer Innovation
Protective surface coatings***

Arkema's Kynar Aquatec®: the easy-dry coating !

Arkema presents a new waterborne fluoropolymer resin: Kynar Aquatec®. This innovative product offers the durability and performance of traditional Kynar® coatings, whilst drying at ambient temperature.

Developed from Arkema's research, Kynar Aquatec® is an emulsion of a Kynar® PVDF copolymer with an acrylic resin. Kynar Aquatec® coatings are water-based formulations that do not need to be baked - an ambient air-dry is all that is needed. They can be used on a variety of substrates, including PVC, textile, elastomers, etc.

Kynar Aquatec® emulsions are formulated into high-performance paints using formulating guidelines that are similar to those employed for typical acrylic emulsions. In addition, the aqueous nature of the emulsion means that the system is low in volatile organic compounds.

Manufactured with a technology developed from Kynar® coatings, Kynar Aquatec® features the same characteristics and properties as other Kynar® coatings. The ease of processing and the remarkable properties of Kynar Aquatec® are opening up new application possibilities for protective surface coatings



Kynar Aquatec®

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Fluoropolymer Innovation
Metals and polymers materials

Kynar® ADX: innovative PVDF with adhesion performance

After developing a revolutionary patented technology, Arkema is now able to offer commercially a new range of reactive polyvinylidene fluoride (PVDF) polymers and copolymers under the trade name Kynar® ADX series.

This new modified PVDF product range opens numerous application possibilities by allowing Kynar® ADX PVDF to adhere to many materials:

- other performance polymers such as polyamide or polyester,
- functionalised polyolefins (allowing the production of Polyethylene / PVDF coextruded structures),
- metals,
- certain types of rubber.

Initial applications are emerging in such diverse fields as transport fuel lines, battery binders, rubber coatings, and metal coatings.

Kynar® ADX resins retain the same excellent melt and solvent processability as standard Kynar® and Kynar Flex® resins. Kynar® ADX features similar thermal, UV and chemical resistance, high mechanical performance and high permeation barrier properties as the other well-known Kynar® resins.

KYNAR® ADX

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Kynar[®] ADX 111: new adhesive PVDF grade for powder coatings

Arkema has enhanced its Kynar[®] ADX range with Kynar[®] ADX 111, a new grade capable of adhering to metals without the need for an adhesion primer. Kynar[®] ADX 111 offers a cost-effective solution which also makes life easier for processors.

Kynar[®] ADX 111 is the only coating entirely formulated from a fluorinated polymer requiring no adhesion primer. This coating process using Kynar[®] ADX 111 stands out by its straightforward application and its effectiveness: Kynar[®] ADX 111 may be applied by electrostatic dusting or by fluidised bed coating to produce highly adhesive coatings with a small thickness (under 200 microns) on substrates such as steel and aluminum.

In addition to its remarkable adhesive performance, the chemical nature of Kynar[®] ADX 111 also ensures outstanding chemical stability, therefore making it insensitive to corrosion, solvents and the decay caused by most chemicals.

Kynar[®] ADX 111 furthermore exhibits excellent mechanical properties as well as good thermal stability (up to 130°C).

Thanks to its specific characteristics and outstanding properties, the new Kynar[®] ADX 111 is therefore highly suitable both for the external anticorrosion coating of various parts and for the lining of hollow vessels designed to contain chemical agents.

Other technical solutions can also be used:

- In the coextrusion process, the Kynar[®] ADX resin can be combined with most polymers (polyethylene, polyamide, polyester, etc.) to ensure optimum performance synergy, in particular in terms of mechanical, chemical and barrier properties.
- In processes requiring solvents, the Kynar[®] ADX resin dissolves to be used on metals with or without additives, for example as an excellent adhesion primer or as a binder.

KYNAR[®] ADX

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***Polyamide case study
Offshore***

**Arkema's Rilsan[®] 11 at the heart of technological innovation
in deep offshore oil production**

The high performance flexible pipes raising the oil from Dalia, a deep offshore field with outstanding characteristics operated by Total, were designed and manufactured by Technip from Rilsan[®] 11, a material with proven reliability in over 25 years' service in offshore subsea conditions with its superior temperature resistance.

The vast Dalia oilfield, one of the world's largest deep offshore developments, is located 135 km off the Angolan coast, and covers an area in excess of 200 km² at a depth of between 1200 and 1500 m. The development of the field, which has outstanding characteristics, has called upon specific know-how and technological innovation.

The only material to have proved reliable following 25 years' service in offshore oil production, Arkema's Rilsan[®] 11 was chosen by Technip for the manufacture of these risers using the new IPB (integrated production bundle) technology. These 1,650 m long flexible pipes bring up the fluid from the bottom to the production and storage floating unit on the surface. They include for the first time multiple functions for production, activation and safety of offshore production.

The remarkable properties of Rilsan[®] 11, a product derived from a renewable raw material source, guarantee the safe operation of the offshore field in extreme conditions. Rilsan[®] 11 ensures unprecedented levels of performance for submarine pipes: temperature resistance greater by 10°C than for competitive materials, double lifetime in a given environment, and optimized mechanical properties.



With Rilsan[®] and Kynar[®], Arkema is offering a unique and complementary range of high performance products to the offshore industry. Kynar[®] PVDF is used for offshore flexible pipes who need to withstand extreme temperature and pressure conditions.

Arkema's Rilsan[®] 11 is a high performance polyamide derived from a natural vegetal oil. Widely used in the most demanding applications, Rilsan[®] 11 boasts an exceptional combination of strength, chemical and hydrocarbon resistance and thermal stability. It also offers much freedom in terms of design and processing.



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***Polyamide case study
Automotive: fuel lines***

Sanoh selected Arkema's Rilsan[®] PA11 for innovative partially zero emission vehicle (PZEV) multilayer fuel line

Sanoh Industrial Co., Ltd. (Sanoh), the leading Japanese Automotive components manufacturer, has established a new production technology for multi-layer fuel lines and commercializes this environmentally friendly solution for automotive multi-layer fuel lines.

This innovative new multilayer technology exhibits very high barrier properties leading to a significant reduction of the permeation of hydrocarbons, even when the gasoline contains ethanol. Compared to existing multilayer combining polyamide 12 and ETFE, the permeation level is significantly lower as well as the cost.

Thanks to the combination of Arkema's biobased Rilsan[®] PA11 with fuel barrier PPS, these new fuel lines including both conductive and non conductive types, comply with stringent Japanese Automotive standards.

Rilsan[®] PA11 was chosen for its unique chemical resistance (sour gasoline resistance), cold impact resistance, as well as its pressure resistance and durability at high temperature. Global warming and other environmental concerns drive advances in the automotive industry to minimize the environmental impact of today's cars. Governmental regulations such as Californian Legislation or EURO 5 set restrictive limits for fuel and tailpipe emissions and are tightening towards zero emission levels. In order to comply with this stringent legislation, the fuel system is equipped with barrier materials to minimize the diffusion of the fuel through the fuel system. The combination of Rilsan[®] PA11 with fuel barrier material PPS leads to a completely new multilayer construct opening its use in partial zero emission vehicles. In addition, the use of renewable source materials and fuels, such as biobased Rilsan[®] PA11 and biofuels, can significantly reduce greenhouse gas emissions and dependence on fossil fuels. Recently, Rilsan[®] PA11 Biodiesel grade won a European 2006 Bioplastic Award for its impressive compatibility with Biofuels and other aggressive fuels.

Arkema commercializes its patented multilayer fuel line technology under the brandname Rilperm[®] and offers a wide range of cost-effective multilayer structures to meet specific application and regional needs. The website at <http://www.rilperm.com> features a wealth of technical information on Arkema's multilayer product portfolio for the Automotive industry.



Arkema is committed to sustainable development by developing and marketing products for today's generations, and not at the expense of tomorrow's generations. The use of renewable source materials and fuels such as biodiesel and flexfuel combined with the use of biobased Rilsan® PA11 can significantly reduce greenhouse gas emissions.

With global brands like Rilsan®, Pebax®, and Kynar® unique products like Rilsan® biobased PA11, and leading capacities in Rilsan® PA11 and 12, Arkema's Technical Polymers business unit provides its customers with global coverage and superior regional service from production facilities and research sites in Europe, Asia, and the USA.



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