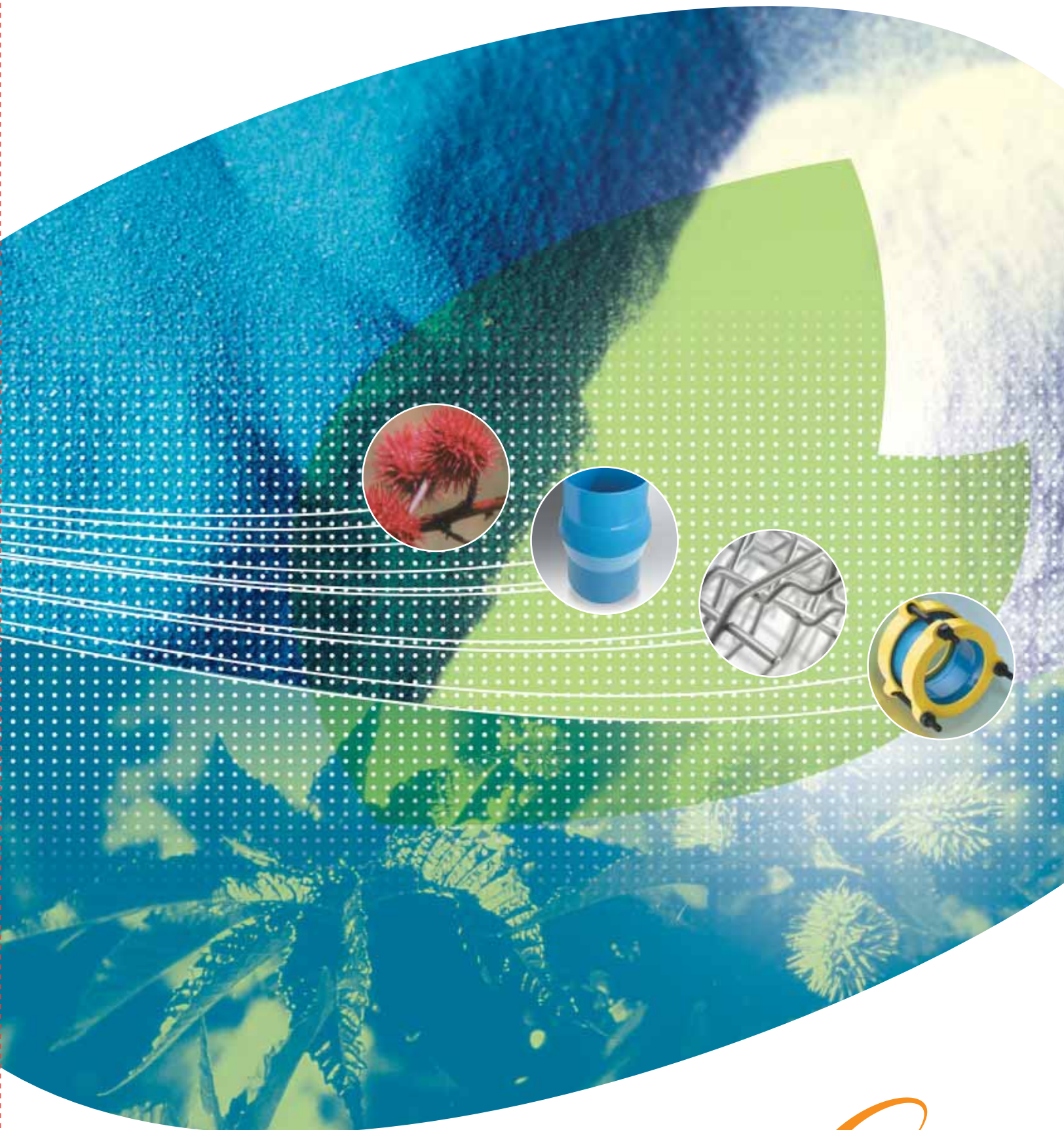




Rilsan®

FINE POWDERS: A DURABLE COATING FOR DURABLE PRODUCTS





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Introduction



Rilsan® Fine Powders is a unique synthetic thermoplastic Polyamide 11 powder product range. It was developed for the first time over fifty years ago to protect metal parts from corrosion. Since then, Rilsan® PA11 coatings have fulfilled the most stringent specifications of the industry thanks to their unique range of properties, in a growing range of applications.

O R I G I N

Rilsan® PA11 is produced from a **renewable raw material of plant origin**, the *Ricinus Communis* (Castor Oil), which grows primarily in tropical countries.

Rilsan® Fine Powders is hence a thermoplastic which is not directly impacted by the variation in crude oil prices.

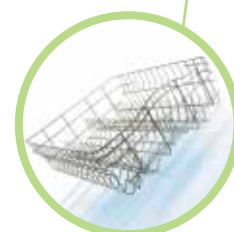
Rilsan® Fine Powders are environmentally sound. They do not release any volatile organic compounds, and their composition is free of any heavy metal based pigments, and of curing agents.

They offer a responsible coating solution that helps safeguard our environment.

A global chemical player, Arkema combines 3 related and integrated business segments: Vinyl Products, Industrial Chemicals, and Performance Products.

Present in over 40 countries with 18,400 employees, Arkema achieves sales of 5.7 billion euros (2005).

With its 6 research centers in France, the United States and Japan, and internationally recognized brands, Arkema holds leadership positions in its principal markets.



Results in a wide variety of applications due to a unique combination of properties

Providing both aesthetic and functional properties, the Rilsan® PA11 coating offers a solution for the most demanding applications. The Rilsan® brand has become the reference around the world for the following industries looking for the ultimate metal protection:



AUTOMOBILE

- Exceptional abrasion resistance
- Thermal and chemical resistance, including inertness to oils
- Flexibility and machining suitability
- Low friction coefficient
- Noise and vibration dampening



Spline shafts

Sliding door and seat rails

Springs, brackets, clips and safety belt fasteners



WIRE ARTICLES

- Very easy processing
- Excellent resistance to alkaline and chlorinated hot water
- Long-term abrasion and wear resistance
- Impact resistance



Dishwasher baskets

Shopping carts

Various cleaning trolleys





FLUID TRANSFER

- High resistance to hydrocarbons and various chemicals
- Anti-corrosion properties
- Smooth surface for optimum flow
- Compliance with the most demanding specifications for contact with drinking water (US, Europe, Japan). List of certified grades
- Very good resistance to wear and cavitation
- Good UV resistance



Pipes and fittings (drinking and waste water treatment plants)
Valves, flanges, couplings
Water/hydrocarbon transportation pipelines, injection tubing



ROLLER INDUSTRY

- Exceptional resistance to wear
- Hardness designed for uniform pressure
- Smooth surface finish and low friction
- High resistance to inks and solvents
- Machining suitability, dimensional stability

Printing rollers
Rollers for textile, pharmaceutical and food industries



FOOD AND HEALTHCARE INDUSTRY

- Unique warm-to-the-touch and smooth surface
- Easy to clean, resistance to chemicals and heat
- Limitation of bacterial growth (Rilsan® Active)

Hospital furniture (beds, wheelchairs, etc.)
Ambulance stretchers
Bathroom fittings
Food processing machinery



CLOTHING, BUILDING, ELECTRICAL AND ELECTRONICS INDUSTRY

- Very easy processing
- Suitability for dyeing with colorants
- Aesthetic color tones
- Electrical insulation (low conductivity)



Undergarment and electrical industry (adjustors, bra wire, clips, etc.)
Construction (nails, screws)





Product range and properties

► RANGE OF POWDERS AND RECOMMENDED PRIMERS

The Rilsan® Fine Powders range has been constantly developing since it was first introduced. These powders are available in many different particle size distributions and formulations to allow application by the standard powder coating methods used today. They are available in a wide variety of colors both by the dry blend and the mass coloration process, which produces a stable finish and superior UV stability. Special grades and color-matched formulations can be developed specifically to suit customer needs.

Various products are currently marketed by Arkema under the following nomenclature:

RILSAN® T

T grades are designed for the fluidized bed dip coating process. A desirable coating thickness in between 250 to 500 µm can be achieved.

RILSAN® ES and RILSAN® ESY

This product range is designed for the electrostatic spraying process using positive, negative or “tribo” guns. Positive polarity is recommended for ES grades. ESY powders are specially formulated with a built-in adhesion promoter to improve adhesion on the substrate, their processing requires no primer.

RILSAN® MC

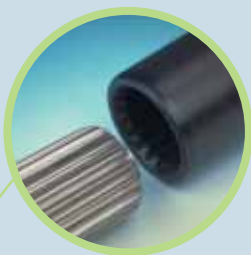
MC grades are specially designed for the coating of small items via the minicoat / maxicoat process, which was originally developed by our company.

RILSAN® D

These powders are used as additive components for paint formulations. Rilsan® D provides excellent scratch and abrasion resistance, and the desired structural effect in a large range of liquid paints.

PRIMGREEN® AND RILPRIM®

High performance primers are marketed under the Primgreen® (water-borne, low VOC) and Rilprim® (solvent-based) brands. These primers have been specially developed to be compatible with Rilsan® Fine Powders, on a variety of metal substrates and at various processing temperatures, to provide optimum anticorrosion properties when combined with Rilsan® PA11 coatings.



PHYSICAL PROPERTIES OF RILSAN® COATINGS



Properties	Standard	Units	Values
Melting temperature	ISO 11357	°C	186
Specific gravity	ISO 1183, at 20 °C	g/cm ³	1.04 to 1.25*
Water absorption at saturation	at 20 °C, 65% RH at 20 °C, 100% RH	%	0.9 to 1.1 1.6 to 1.9
Surface hardness	Shore D, ISO 868	Shore D sec	75 200 to 300
	PersoZ, ISO 1522		
Abrasion resistance	Taber, ASTM D4060 (CS17 grind wheel, 1000 cycles, 1 kg load)	mg	15
Impact resistance	ASTM G14	J	2 to 3
Salt spray resistance	ISO 7253, on scribed primed plates (testing according to WIS 4-52-01)	mm	< 1mm corrosion after 2000 h

* measured on natural and colored products

RESISTANCE OF RILSAN® TO MAIN CHEMICAL PRODUCTS

Rilsan® PA11 features outstanding resistance to oils, hydraulic fluids and fuels, as well as excellent resistance to acids, bases and salts. The chemical resistance of Rilsan® PA11 coatings is reflected both in high dimensional stability under harsh conditions and in the non-degradation of the polymer matrix, making it the ideal material for highly demanding applications.

G = Good

L = Limited (swelling of Rilsan®-suitability depends on specific use and duration)

For specific information, please refer to "Rilsan® Fine Powders - Physical and Chemical Properties".

Performance after 18 months' exposure

Chemical agent	Concentration	Performance		
		20°C	40°C	60°C
Acetone	Pure	G	G	L
Agricultural spray		G	G	
Ammonia	Concentrated solutions	G	G	G
Calcium chloride		G	G	G
Citric acid		G	G	L
Copper sulfate		G	G	G
Fruit juices		G	G	
Gasoil		G	G	G
Glucose		G	G	G
Glycerin	Pure	G	G	L
Greases		G	G	G
Hydrogen		G	G	G
Lactic acid		G	G	G
Mercury		G	G	G
Oils		G	G	G
Ozone	2 ppm, 10 days	G	G	
Paraffin		G	G	
Petrol		G	G	G
Sea water		G	G	G
Sodium carbonate		G	G	L
Sodium chloride	Saturated	G	G	G
Stearine		G	G	G
Sulfur		G	G	
Sulfuric acid	1%	G	L	L

Processing of Rilsan® Fine Powders

Rilsan® PA11 coatings may be applied to all types of metal components, providing these can be raised to the necessary coating temperature without causing any physical change to the metal (distortion) and degradation of its structure.

Processing is quite simple, and consists of depositing a Rilsan® film onto the metal surface needing protection. The type of workpiece to be coated and the final properties required determine the best application technique:

- dipping in a fluidized bed (T powders range);
- electrostatic spraying (ES, ESY powders range);
- dipping in a vibrating bowl (MC powders range);
- other specialized methods, i.e. hot-spraying or flame-spraying.

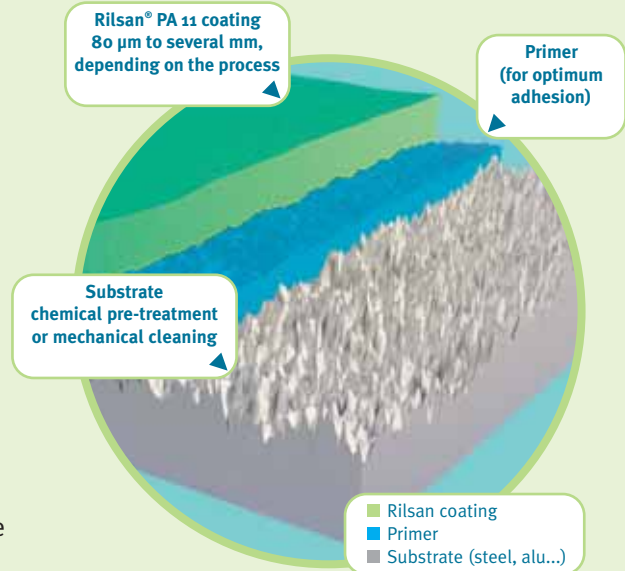
Whatever the coating technology, careful surface preparation is absolutely necessary beforehand if optimum performance has to be achieved with Rilsan® products.

Following this pre-treatment, a primer may be applied to improve the adhesion of Rilsan® onto the surface, and maximize the anticorrosion properties. The use of a primer is particularly recommended when the coated parts are destined for outdoor use and/or severe chemical or thermal environment, or in any demanding applications.

Rilprim® and Primgreen® primers, marketed by Arkema, undergo a full range of quality control tests prior to shipment to our customers. By carefully following our recommendations on surface preparation and primer application*, our customers will obtain the most outstanding and long-lasting properties from Rilsan® coatings.

* For further information on processing characteristics and properties, please refer to our Technical Datasheets or contact our technical support teams for assistance.

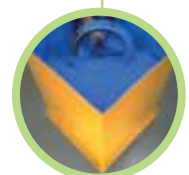
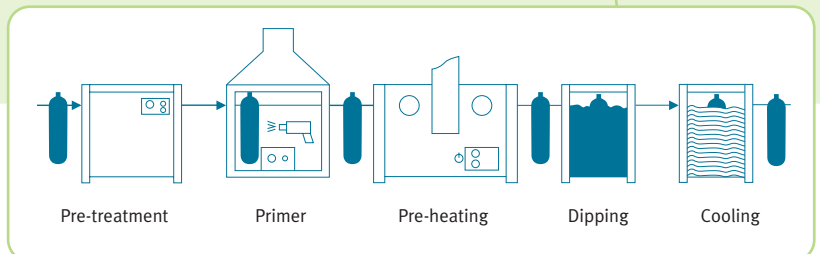
Rilsan® coating system



PRINCIPLE OF THE FLUIDIZED BED DIP COATING PROCESS

Advantages of the process:

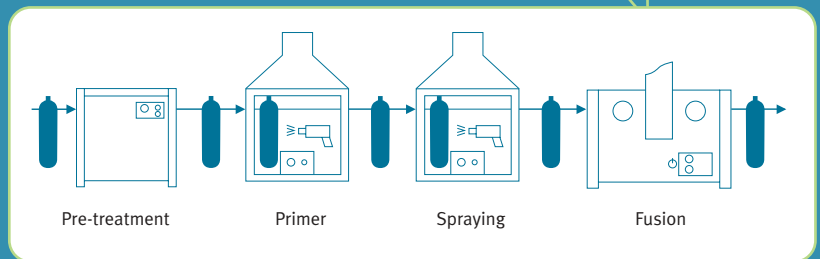
- External and internal coating in one single operation
- Uniform coating thickness achieved, even on parts with complex shapes
- High flexibility in terms of part dimensions
 - Simple production technology
 - Very good productivity
 - Easy process automation
 - Very little powder wastage



PRINCIPLE OF THE ELECTROSTATIC SPRAYING PROCESS

Advantages of the process:

- Good control over powder deposition
 - Partial coating of the article can be achieved
- Lower temperature during shorter time to fuse the coating in the oven compared to the pre-heating step in the fluidized bed coating process*
- No crosslinking risk compared to thermoset materials
- Smaller powder stock required
 - Process may be automated



* Depending on the desired coating thickness and the nature of the metal, the time and / or temperature in the oven may vary. For further information, please refer to the Technical Datasheets on the processing of Rilsan® Fine Powders.

PRINCIPLE OF THE MINICOAT PROCESS

Arkema has developed a process under the name “Minicoat” for the coating of small articles, which can vary from less than 1 cm to approximately 15 cm in overall size. Its principle is similar to the fluidized bed dip coating process: a small pre-heated article is dropped into a Rilsan® vibrating bowl, and the powder immediately melts onto the surface thanks to the residual heat in the article. The surface finish can subsequently be smoothed down using a post-fusion oven.

Advantages of the process:

- Fully automated process
- No need for suspension points during the operation, no jig marks after coating
- Highly uniform thickness
 - Easy control of the final aesthetic appearance (smooth or textured)
 - Outstanding productivity, successful coating of thousands of parts per hour

OTHER SPECIALIZED COATING TECHNIQUES

In addition to the conventional dipping in fluidized bed and electrostatic spraying coating technologies, both widely used throughout the world, Arkema has developed new technologies and adapted product formulations over the last 20 years to provide efficient coating systems for specific applications.

Rilsan® Fine Powders are aptly suited to most other standard processes dedicated to powder coating materials: hot (flock) spraying, rotomolding, pipe lining, flame spraying, etc., to name but a few.

Such processes are particularly adapted to the coating of large or bulky parts (valves, pumps, cylinders), articles with intricate designs (heaters), or large diameter pipes designed for the transportation of highly abrasive slurries, which are too large to be dip-coated.

Depending on the final coating properties required, both the processing conditions and the grades compatible with such technologies should be studied and chosen specifically. Our technical support team will be pleased to assist you further in this regard.





Packaging

Rilsan® Fine Powders are supplied in 20 or 25 kg sealed bags or 850 kg octabins. The bags consist of a multilayer Kraft paper/PE, which ensures mechanical resistance, efficient palletization, and a high barrier to moisture. Every Rilsan® Fine Powders bag carries appropriate labels with all essential data (product name, article code, batch number) for traceability purposes.



Environmental issues

Rilsan® Fine Powders offer many positive features in terms of environmental protection, in line with Arkema's global initiatives on sustainable development.

Produced from Castor Oil, Rilsan® polyamide 11 Fine Powders are made of 100% renewable raw material. Through its ongoing purchase of Castor Oil on the world market, Arkema contributes to the development of several regions (South America, India, South-East Asia, China).

Rilsan® Fine Powders applications afford an unrivaled balance of technical and economic benefits throughout the industrial supply chain down to the end-consumer.

The use of Rilsan® Fine Powders as a coating for dishwasher baskets, for example, combines outstanding resistance to chemicals and long-term corrosion protection, with ease of processing and quick assembly of coated parts, thereby ensuring absolute competitiveness to job-coaters using Rilsan® coatings in the appliance industry.

Arkema's global commercial and technical service

Marketed by Arkema's Technical Polymers Business Unit, Rilsan® Fine Powders boast a global and integrated organization in terms of marketing, technical support, and development network. The Technical Polymers Business Unit will be pleased to assist you at any stage of projects involving the use of Rilsan® Fine Powders (design, industrial development, market launch).

Technical coating centers have been set up in France, Japan and the US to provide first-rate technical assistance to our existing customers. Our technical support teams specializing in high-performance polyamide materials (choosing the right product, processing, application development) can help you develop high-tech solutions, while advising on the various issues that ensure the economic viability of your project.



As a long-standing partner to high-tech industries, we can oversee complex developments involving the end-user and the industrial supply chain (job-coaters and original equipment manufacturers).



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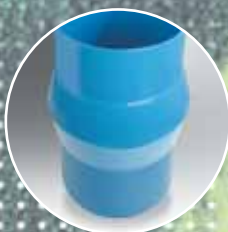
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