

# BIOGAN<sup>®</sup>

A FOCUS ON INNOVATION FOR  
THE PERFORMANCE OF YOUR NETWORKS

Waste and rain water, DN150 and 200



A SAFE PATH FOR WATER



SAINT-GOBAIN



*PAM has been designing, producing and selling a complete range of solutions dedicated to the supply of drinking water, sewerage and evacuation of waste water since 1856.*

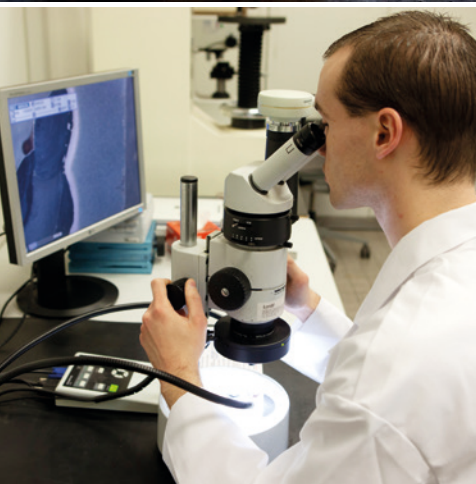
The reputation of PAM in the pipe industry is based on its know-how, the reliability of its products and on the level of service offered to its customers.

PAM is constantly improving its products. Engineers and researchers at its R&D Centre are registering over **50 inventions each year**.

The sales and technical teams at PAM deliver a **local service** as well as support and guidance to operators, design offices and installation companies throughout their projects.



**PAM products have been installed in 110 capital cities, with over 40,000 km of pipes sold worldwide every year.**



# biogan

Sewerage networks represent a long-term investment for local authorities and are subject to severe constraints throughout their service life (type of effluent, environmental constraints, etc.), meaning that a sewerage network must be resistant, watertight and durable.

BIOGAN® is a new pipe system for gravity sewerage which harnesses the best of PAM's technology for the performance and long service of networks.

Besides the traditional qualities of PAM ductile iron systems, BIOGAN® combines the performance of **DUCTAN®** and **BioZinalium®** coatings; already proven in sewerage which are recognised for their remarkable resistance, ensuring the sustainability of the pipes.

Because installation determines performance and sustainability of the network, and that it takes place in often difficult conditions, PAM has developed a **BIOGAN® ring** and a **new gravity standard joint** which contribute to the safety and ease of installation.

Discover the best of technology of PAM in BIOGAN®

## DURABILITY

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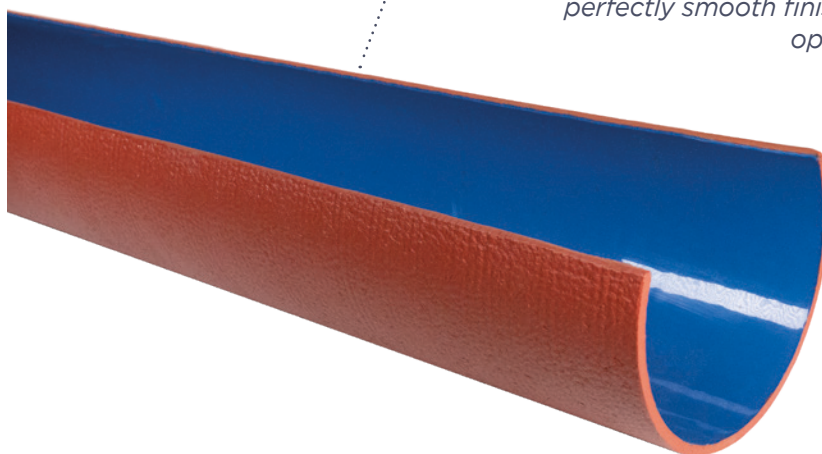
# DURABILITY

## DUCTAN® INTERNAL COATING RESISTANCE TO AGGRESSION

*Sewers carry loaded effluent that may sometimes be travelling at high speed, which causes abrasion. These effluents are of a very variable and evolving nature and quality and can place a significant strain on the pipelines. As such, the resistance of the internal lining is crucial for the durability of the pipeline.*

*The DUCTAN® coating, developed by PAM research, is particularly noted for its chemical resistance and resistance to abrasion.*

*DUCTAN® is a polymer lining that covers the barrel and the socket of the BIOGAN® pipe. Its perfectly smooth finish ensures optimal flow.*



### Resistance to corrosive effluent

Thanks to its DUCTAN® lining, BIOGAN® is capable of resisting acidic effluent **up to pH 4** (test according to paragraph 7.9 of EN 598 standard for ductile iron pipes).

Its reinforced version can withstand extreme conditions, such as septic fermentation (H<sub>2</sub>S) – this version is available on consultation.

### Resistance to abrasion

DUCTAN® withstands abrasion with performances **at least 2 times higher** than the requirements according to the EN 598 standard. That explains why BIOGAN® is also suitable for the evacuation of particularly abrasive water such as rainwater carried at high speed in steep slopes.

### Resistance to indirect impact

Impacts may occur when pipes are being handled or laid. DUCTAN® coating is perfectly adherent, «flexible» and will undergo these impacts without damage.

## → Additional testing



*In addition to the tests specified in EN 598 standard, PAM carries out further assessments on its products to ensure that they will be suitable for use in every situation.*

### Abrasion

The engineers at PAM have designed their own test equipment to reproduce the exact situations that the products may be encountered. Thus, DUCTAN® has been subjected to **the «abrasion loop»** in order to determine its behaviour in the face of loaded fluids travelling at high speeds. This test confirmed that the DUCTAN® lining offers excellent abrasion resistance.



*Abrasion loop at the Technocentre of PAM, in Mairières (Meurthe-et-Moselle, France): tests on the DUCTAN® internal coating.*

### Resistance to temperature

Similarly, PAM has gone beyond the requirements of the applicable standards by testing how DUCTAN® behaves when subjected to accelerated ageing at 50° for 500 hours: the coating retains excellent adhesion.

### Resistance to jet cleaning

PAM has carried out jet cleaning resistance tests not specified in EN 598. These tests demonstrated that the lining can withstand jetting up to 120 bar without sustaining any damage.



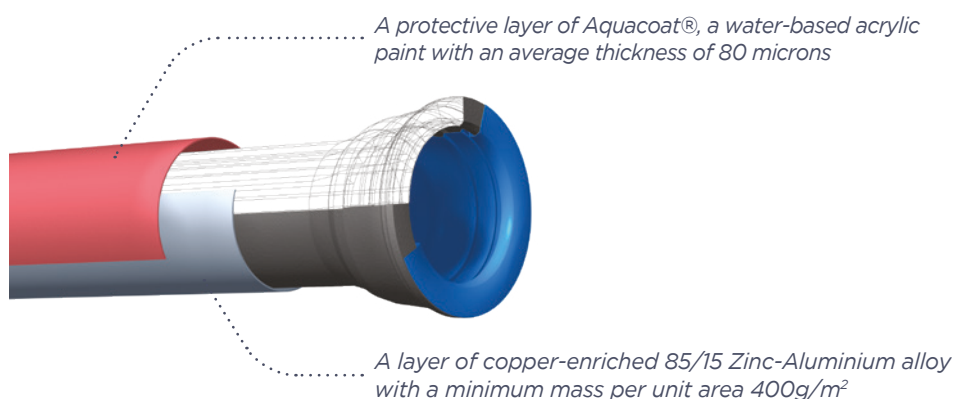
*High pressure cleaning (120 bar)*

# DURABILITY

## BIOZINALIUM® EXTERNAL COATING PROTECTION AGAINST CORROSION

*Pipelines are subjected to the constraints of the environments in which they are buried, including soil and backfill corrosivity. The BioZinalium® coating developed by PAM researchers guarantees perfect protection for the outer surface of the BIOGAN® pipes.*

The BioZinalium® coating comprises 2 layers:



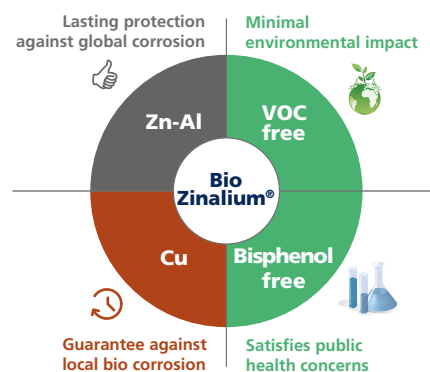
The BioZinalium® coating maintains the «active» properties of the Zinalium® coating when in contact with the soil, meaning that it:

- Formation of a stable and adherent all-round **protective layer** (zinc hydroxides, etc.) that covers the entire surface of the buried pipe
- **Restoration** of the continuity of this protective layer at points where it has sustained limited damage (impact during transportation, scrapes when backfilling, etc.).

The combination of Aluminium and Zinc in the ZnAl (Cu) alloy **strengthens the resistance of the protective layer.**

Enhancing the ZnAl (Cu) alloy with copper allows **the protective layer to be implemented faster** following damage.

**BioZinalium® means a lifetime of the pipeline multiplied by 3 compared to the 200 g/m<sup>2</sup> zinc allowed by the standard.**



→ VOC and Bisphenol-free:  
BioZinalium® is the healthy  
and eco-friendly choice

The Aquacoat® protective layer is VOC-free (volatile organic compounds). VOCs are compounds that have direct and indirect effects on health and the environment (source ADEME). Aquacoat® does not contain bisphenols (neither bisphenol A or BPA nor other bisphenols), chemical compounds considered as endocrine disruptors.

## EXCEPTIONAL MECHANICAL PROPERTIES

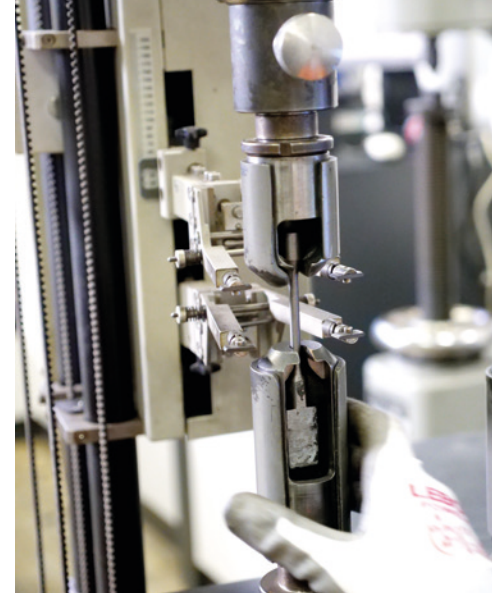
*Buried pipelines need to be capable of supporting high mechanical strains, including earth loading, traffic loading and ground movement... PAM cast-iron pipelines are engineered to withstand such strains with their exceptional mechanical properties.*

The strength and elasticity of PAM ductile cast iron allow pipe systems to absorb unavoidable strains without the risk of pipe breakage or dislocation (earth load, traffic load, etc.), while adapting to changes in the immediate environment..

**Tensile strength :  $R_m \geq 420$  MPa**

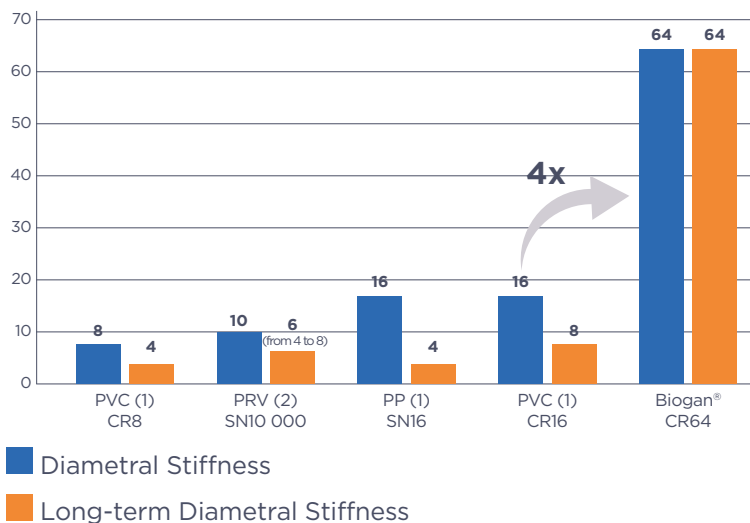
**Proof stress :  $R_e \geq 270$  MPa**

**Elongation after fracture :  $A \geq 10\%$**



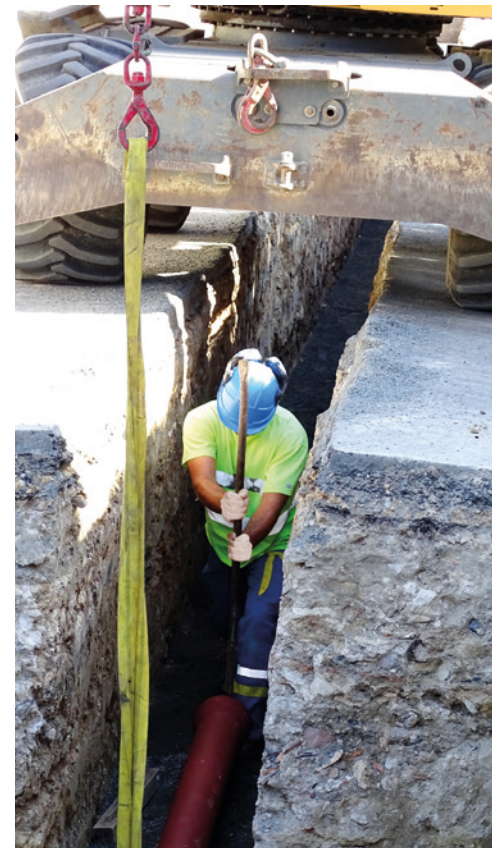
With if **diametral stiffness of 64 kN/m<sup>2</sup>**, BIOGAN® pipes allow simplified laying, low or high cover heights, compacting and backfill limited to what is strictly necessary. In addition, the diametral stiffness of the cast iron remains stable over time.

### Diametral stiffness of pipes and their evolution



(1) : Values based on the French Code of Practice "Fascicule 70 -1" of 2019

(2) : Values based on Technical Approvals



# LEAKTIGHTNESS

## A HIGH-PERFORMANCE GRAVITY STANDARD JOINT

*Leak-tightness is crucial point in sewerage. Sewer needs to consistently offer leaktight performance. Effluent leaks from networks pollute the soil and contaminate the water table, while water seeping into networks can disrupt their performance as well as operations at the wastewater treatment plant. The intrinsic qualities of cast iron combined with high-performance joints guarantee leaktight BIOGAN® pipes.*



BIOGAN® is fitted with a new Nitrile (NBR) gravity standard joint developed by PAM. When used during its operational limits, its tightness performance can withstand the mechanical stresses exerted on the joints over time (shear, deviation, accidental loading).

### Pressure resistance of the BIOGAN® system

	Internal pressure (occasional)	Internal pressure (continuous)	External pressure
Water	2 bar	0.5 bar	1 bar
Air	200 millibar	-	-

The nitrile quality of the BIOGAN® joint allows it to withstand the effluents encountered in sewerage.



# SAFETY AND EASE OF LAYING

The installation process determines the sewerage network's performance and durability, and systems are often laid in difficult conditions, so PAM has pioneered a new joint and ring, which help make installation safer and easier.

## 1 The BIOGAN® ring for safe jointing

The BIOGAN® ring is factory-fitted in the socket. The elastomer ring ensures compliance with the insertion depth, including for pipes that have already been laid. The BIOGAN® ring **ensures a safe jointing**.

The process for accepting a network is extremely strict for gravity sewerage and includes a visual inspection that picks up on any defective joints. The BIOGAN® ring guarantees perfect joints.

## 2 The BIOGAN® joint for easier jointing

With the new Standard gravity joint, the jointing forces are three times lower than with a conventional Standard joint, which makes installation much easier.



## → BONUS

### Network protection plugs

BIOGAN® pipes are fitted with plugs developed and patented by PAM.

- Plugs prevent dirt or harmful substances from entering the pipe - the cleanliness of the network is part of the reception controls.
- Plugs are kept in place until the last stage of the jointing process and prevent sand from being introduced into the joint, thereby reducing the risk of leaks.

### Marking of the theoretical centre of gravity

The theoretical centre of gravity is marked on the pipe (signe ) for easier lifting with a strap.

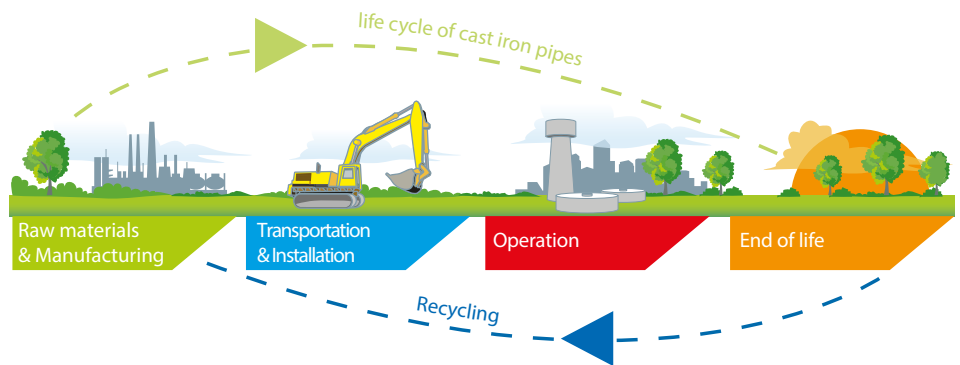


100% recyclable

# SUSTAINABLE DEVELOPMENT

*The public procurement must take into account the requirements of sustainable development. Sustainable development aims to meet the needs of current generations without compromising the ability of future generations to meet their own needs. It is a comprehensive approach including not only environmental, but also economic and social considerations. BIOGAN® satisfies these requirements.*

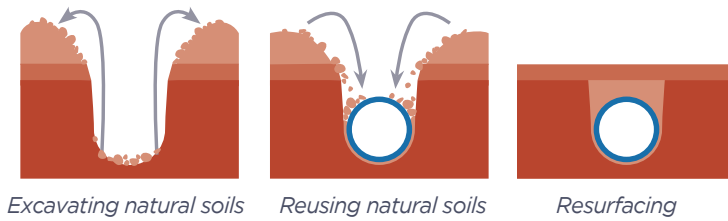
- Ductile cast iron is a noble material that can be fully and indefinitely **recyclable** through existing recycling processes.



- PAM offers solutions whose **durability** is enhanced by specific coatings, such as DUCTAN® and BioZinalium® for BIOGAN®.
- BIOGAN® coatings **do not emit toxic emissions:**
  - The Aquacoat® protective layer of the BioZinalium® external coating is free of VOCs (Volatile Organic Compounds) and does not contain bisphenols.
  - Similarly, the DUCTAN® interior coating is free of bisphenols and VOCs.



- Robust and flexible, BIOGAN® pipes are suitable for **ECOPOSE** laying, with a reduced trench width and the reuse of native backfill. ECOPOSE significantly reduces the amount of raw materials purchased, while lowering transport costs and curbing CO2 emissions.



- The BIOGAN® pipe was designed at the PAM Technocentre in **Maidières** (Meurthe-et-Moselle, France) and is produced in the **Pont-à-Mousson** and **Foug** (Meurthe-et-Moselle, France) plants. These factories are **ISO 14001** certified (standard applied to environmental management systems).



*Technocentre in Maidières*



*Pont-à-Mousson plant*



*Foug plant*



# PRODUCTS



## biogan PIPES

DN	Lu	Ø DE	Ø DI	P	Ø B	e nominale	Mass	Reference without joint	Reference With joint
mm	m	mm	mm	mm	mm	mm	kg/m		
150	6.0	169.7	173.4	100.5	220.8	4.5	15.5	BSB15Q60TDR	BSB15Q60TDR-E05
200	6.0	221.6	225.2	106.5	275.1	4.7	21.7	BSB20Q60TDR	BSB20Q60TDR-E05

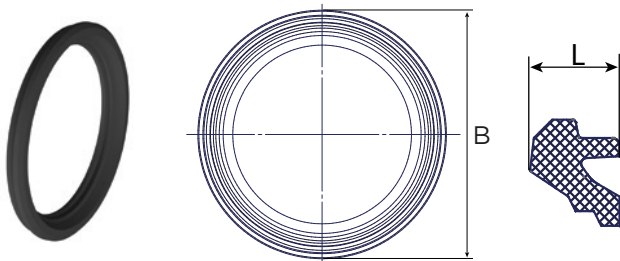
### Légende :

- **DN** : nominal diameter
- **Lu** : laying length, in m
- **e** : thickness according to EN598, in mm
- **ØDE** : external nominal diameter of the barrel according to EN598, in mm
- **ØDI** : internal nominal diameter of the socket, in mm
- **P** : nominal depth of the socket, in mm
- **ØB** : nominal diameter of the socket, in mm
- **Mass** : total mass per meter (including coating and socket), determined with the nominal thickness, in kg/m
- **Reference** : commercial reference PAM

- BIOGAN® ring factory fitted.
- Pipes delivered equipped with plugs.
- Compatible with fittings from the TAG and Integral range.
- Use EXTREM 1 to repair BIOGAN pipe cuts. EXTREM 1 is a ready-to-use paint for quick and easy repair.



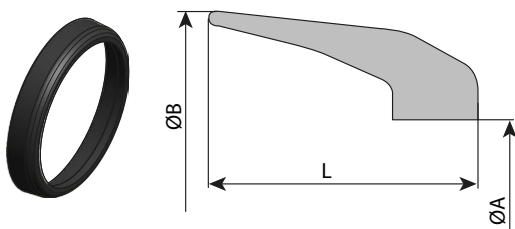
## STANDARD GRAVITY JOINT FOR BIOGAN® PIPES



DN	Joint Ø outside B	Joint width L	Mass	References
<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>kg</i>	
150	206.4	24.4	0.260	JSB15BG
200	260.1	24.4	0.340	JSB20BG

Automatic joint. Tightness is achieved by compressing the elastomer joint ring, obtained at the time of assembly, by simply introducing the spigot into the socket.

## BIOGAN® RING FOR BIOGAN® PIPE



DN	L	Ø A	Ø B	Mass	Reference
<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>mm</i>	<i>kg</i>	
150	37.8	159.2	196.6	0.18	JJB15UB
200	40.2	206.0	244.5	0.21	JJB20UB

Marking: «D» ring RING PAM DN150 EN681.1 WG/70 NBR.  
 Factory fitted ring on the Biogan® pipe, can be ordered separately

# SUMMARY OF CHARACTERISTICS PRODUCTS

Product/part name	Characteristics	Quality standards and marks
<b>BIOGAN® pipe</b>	Ductile iron pipe, 6 m long, with a diametral stiffness of 64 kN/m <sup>2</sup> for gravity sewerage, waste and rain water, in separate and combined systems, equipped with the elements described below	Complies with EN 598 + A1 - August 2009 and ISO 7186 CE and UKCA markings NF and BENOR quality marks
<b>DUCTAN®</b>	Internal lining: ultramarine blue thermoplastic polymer DUCTAN - thickness 300 microns Field of use: pH ≥ 4	Complies with EN 598
<b>BioZinalium®</b>	External coating: a layer of zinc-aluminium alloy enriched with copper Zn85Al15 (Cu), with surface density of 400 g/m <sup>2</sup> covered with a red (RAL 3011) Aquacoat protective layer, without VOC and without Bisphenols. Field of use: soil with a resistivity up to 500 Ohm.cm	Complies with EN 598
<b>Gravity standard joint</b>	Automatic joint in NBR nitrile elastomer *Pressure resistance (with water): 2 bar internal pressure, 1 bar in external pressure *Shear force: 30 times the DN (in Newton)	Complies with EN 598, EN 681.1 type WG, ISO 4633
<b>BIOGAN® ring</b>	NBR nitrile elastomer ring fitted at the back of the socket to respect the insertion depth. Resistant to a jointing force of 20 kN	EN 681.1 type WG



**biogan**

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