



MACCAFERRI POLIMAC®

MACCAFERRI

Engineering a Better Solution

THE
EVOLUTION
OF
POLYMER
COATING



TESTED SOLUTIONS FOR LONG-LASTING, NATURE INCLUSIVE GEOTECHNICAL AND HYDRAULIC WORKS

Date

February 16, 2023

MACCAFERRI



10' *Our response to new challenges:
the PoliMac coating*

20' *The extensive testing and the
proven performance*

10' *The use of PoliMac coated products
and their certified quality*

Q&A Session

Speaker: Paolo Di Pietro

DT Business Unit - Senior Specialist & Know-how Manager

Do you design for the exposure conditions of today or the exposure and working conditions you expect in the future?

In 120 years, what will the exposure conditions be?

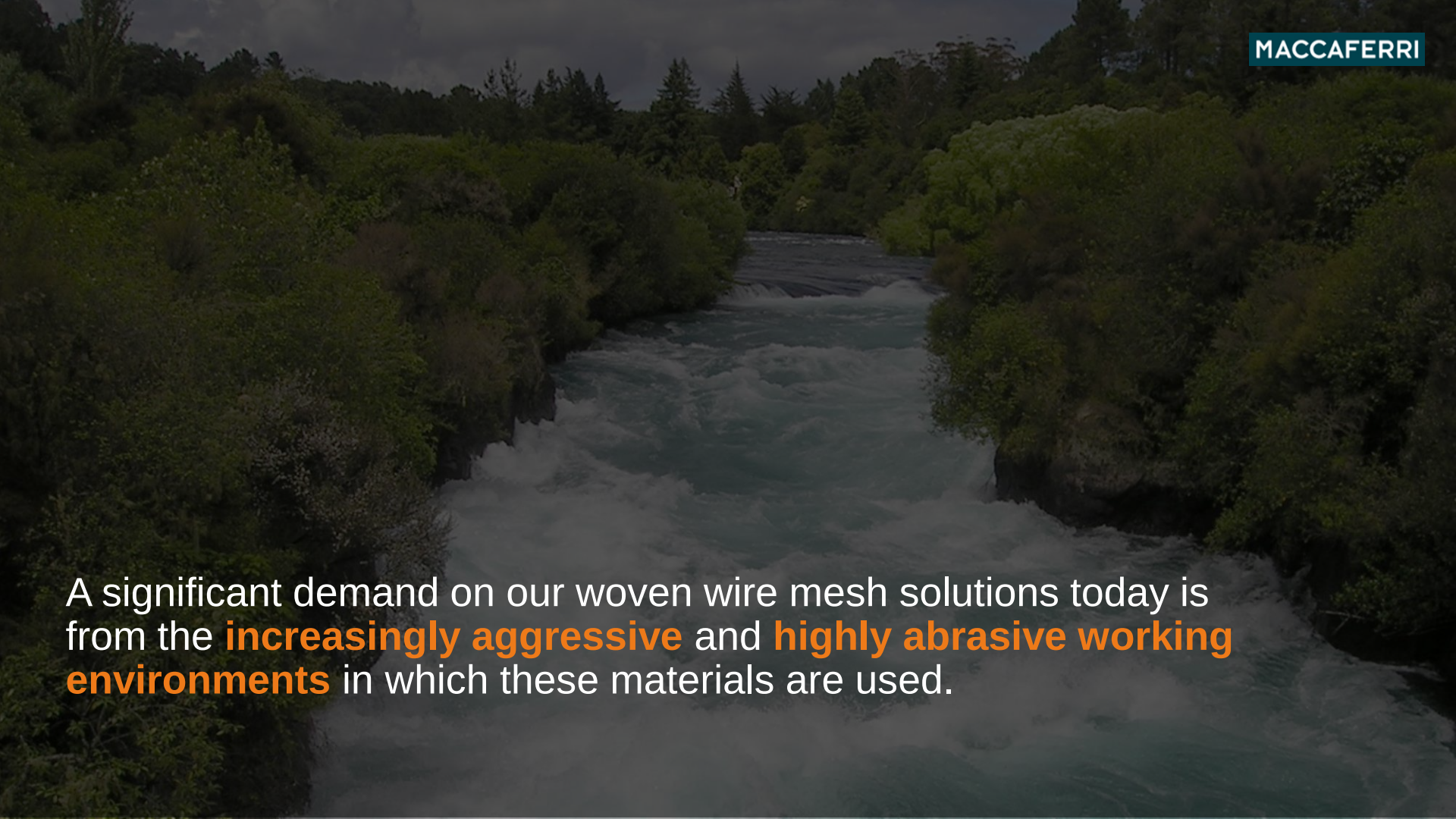
Better than today? Or worse?

Do you consider this uncertainty within your design?

Do you select a product that is more durable to
reduce your risk?

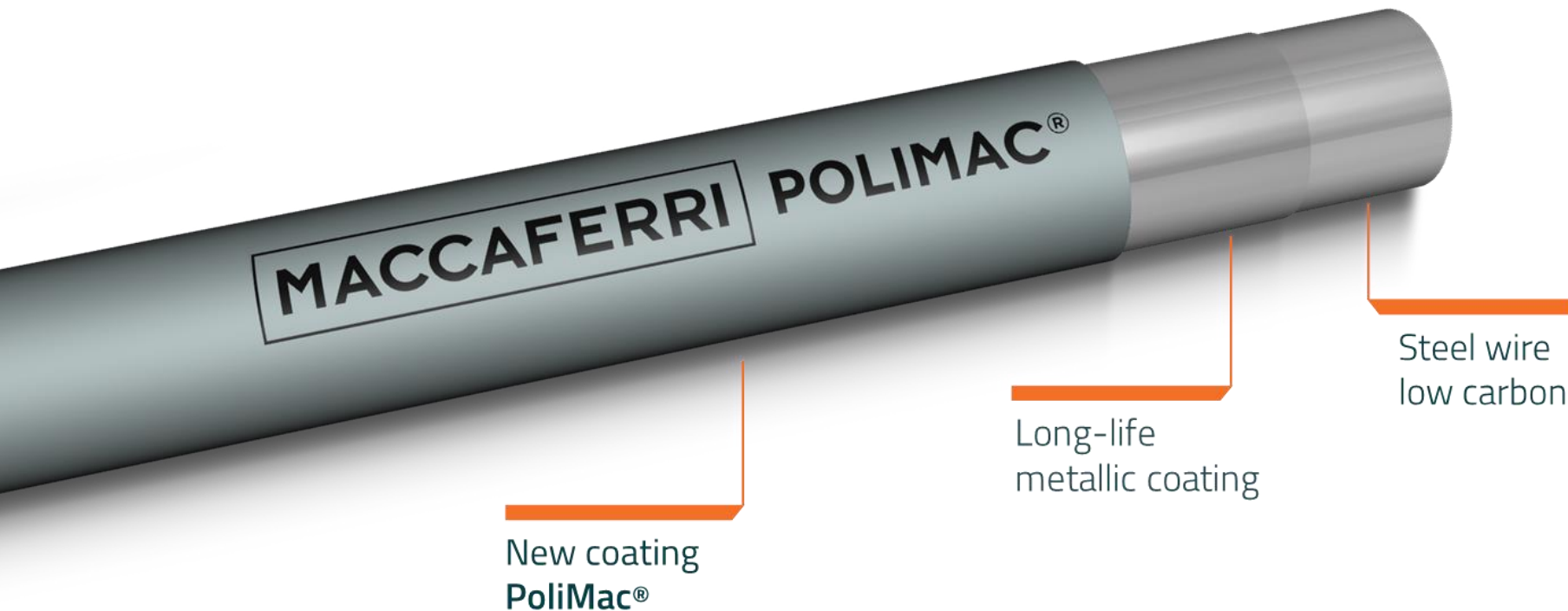
A man in a white lab coat and safety glasses is shown in profile, looking intently at a small, clear, spherical object he is holding with his gloved right hand. The background is a blurred laboratory setting with various pieces of equipment. The overall image has a blue tint.

There is an increasing need for **more robust solutions** to address the worsening climate and operating conditions faced by all structures.



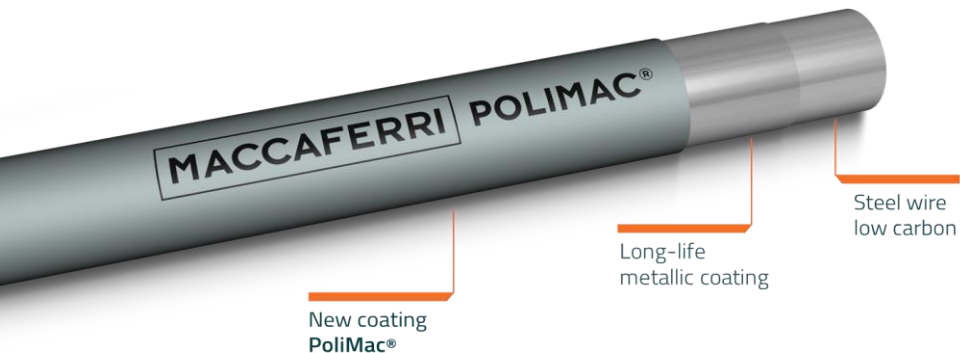
A significant demand on our woven wire mesh solutions today is from the **increasingly aggressive** and **highly abrasive working environments** in which these materials are used.

Our response to these new challenges?



PoliMac®

wire protection for a changing world



The new **PoliMac®** coating for **double twist steel wire products** is a polymeric compound which exhibits high abrasion resistance.

It is capable of **withstanding the most severe conditions** including

- aggressive mechanical and chemical impacts,
- long-term ultraviolet radiation,
- low temperatures.

PoliMac® meets the environmental project requirements;

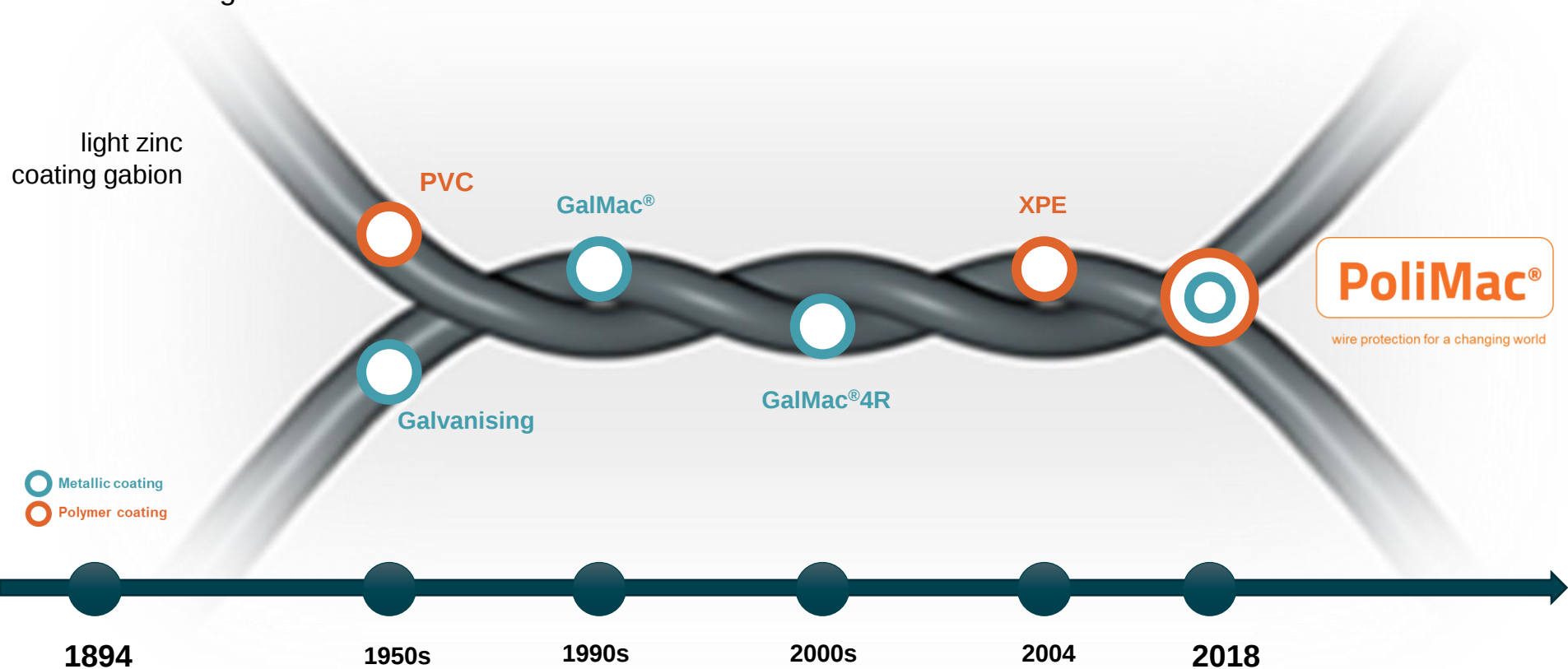
PoliMac® achieves the technical performance required by the construction industry;

PoliMac® maximizes longevity and structural efficiency through increased abrasion and chemical resistance.

HISTORY OF STEEL WIRE COATINGS

MACCAFERRI

Since 1879, our steel wire double twist mesh solutions have **continuously improved**. Better coatings were introduced to meet the evolution of demand in the market.

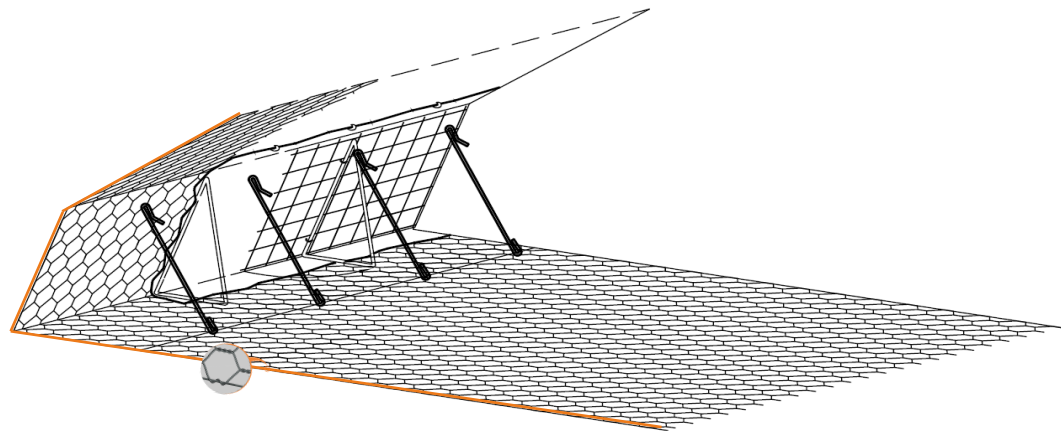


How to identify **PoliMac[®]**?

HOW TO IDENTIFY POLIMAC®?

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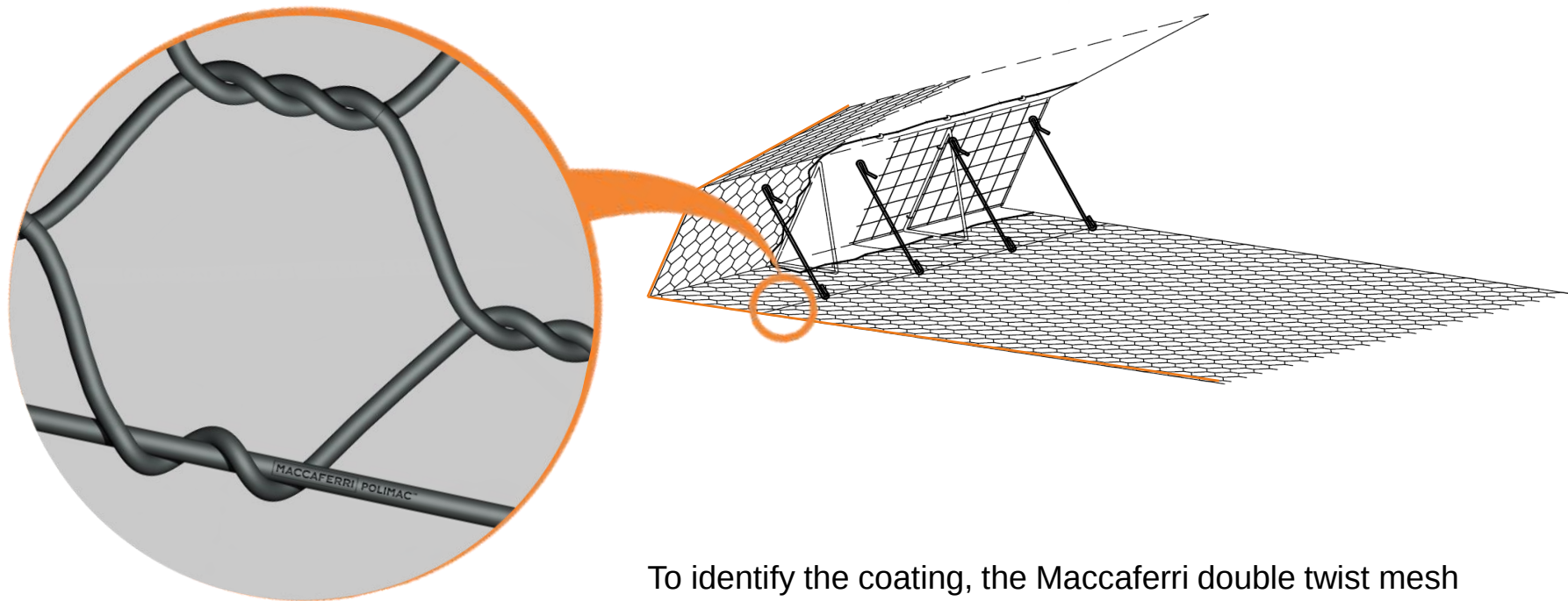
MACCAFERRI POLIMAC®



HOW TO IDENTIFY POLIMAC®?

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MACCAFERRI POLIMAC®



To identify the coating, the Maccaferri double twist mesh solutions will have a selvedge wire with **PoliMac®** printed on it.

Performance testing



MECHANICAL PERFORMANCE

- M ABRASION TEST
ASTM A975-21; EAD 200019-01-0102
- M HARDNESS TEST
ASTM D 2240



ENVIRONMENTAL FRIENDLINESS

- M LECHEATE TEST
EPA 1312
- M ELUATE TEST
M GeoK E: 2016



WEATHERING RESISTANCE

- M LOW TEMPERATURE BRITTLINESS
ASTM D 746
- M UV EXPOSURE
ISO 4892-3; ISO 527-1
- M CORROSION SPREAD TEST
ASTM A975-21



MECHANICAL PERFORMANCE

- M** ABRASION TEST
ASTM A975-21; EAD 200019-01-0102
- M** HARDNESS TEST
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ENVIRONMENTAL FRIENDLINESS

- M** LECHEATE TEST
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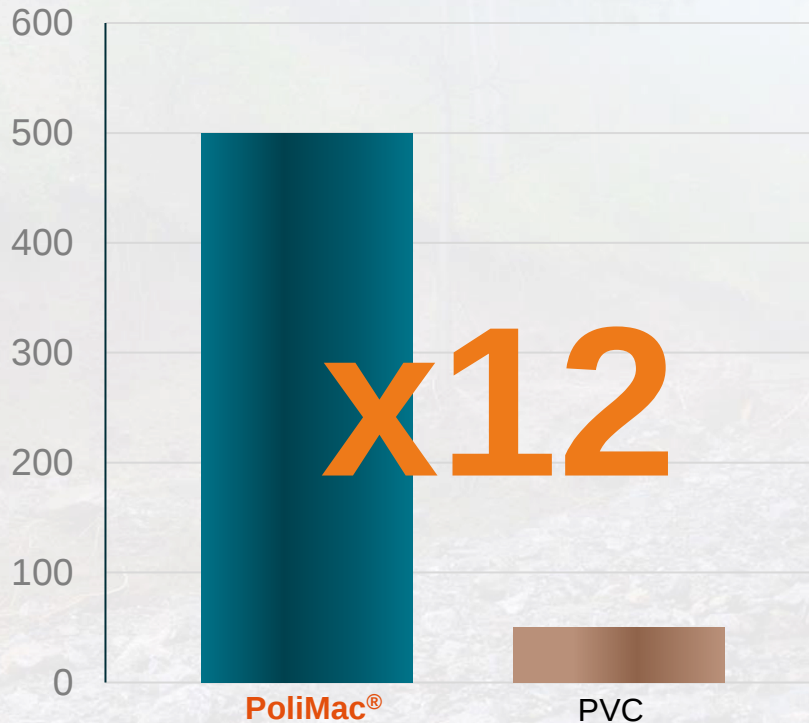
WEATHERING RESISTANCE

- M** LOW TEMPERATURE BRITTLINESS
ASTM D 746
- M** UV EXPOSURE
ISO 4892-3; ISO 527-1
- M** CORROSION SPREAD TEST
ASTM A975-21

ABRASION TEST

ASTM A975-21; EAD 200019-01-0102

Number of cycles at the end of the abrasion test

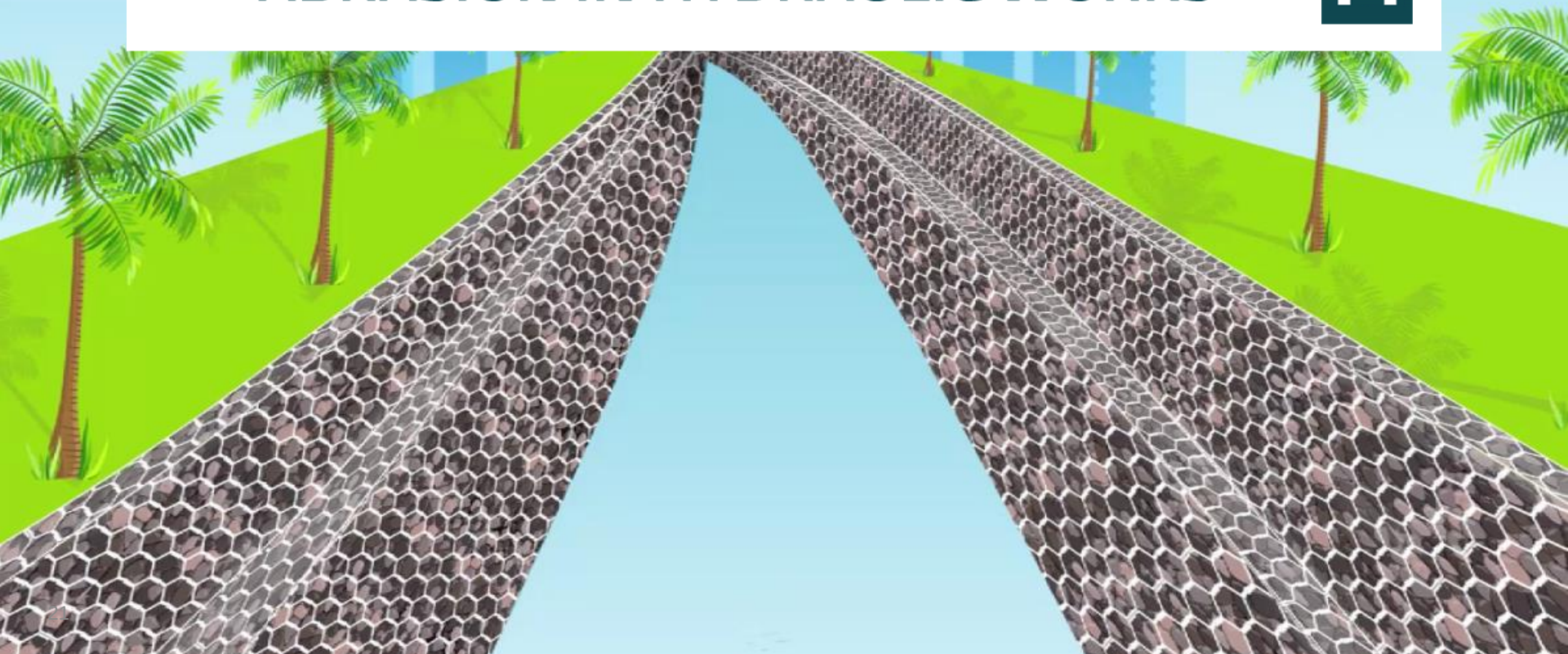


ABRASION TEST ASTM A975-21

- M** The plastic coating is abraded by a **steel point** in contact with the wire.
- M** A pneumatic piston drives the steel point **up and down** the coated wire.
- M** When **complete loss** of the plastic protective coating occurs at a location in the sample, the circuit closes, ending the test

PoliMac® offers 12x better abrasion resistance to abrasion than PVC!

ABRASION IN HYDRAULIC WORKS



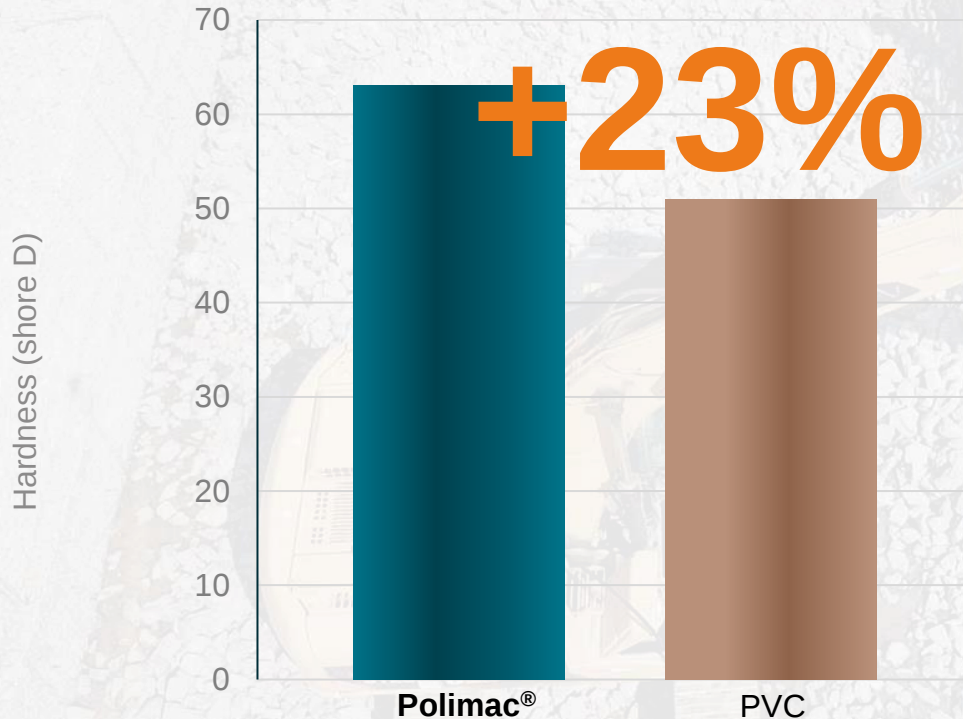
RESISTANCE TO INSTALLATION DAMAGE



HARDNESS TEST ASTM D 2240

“Standard Test Method for Rubber Property - Durometer Hardness”





HARDNESS TEST ASTM D 2240

"Standard Test Method for Rubber Property - Durometer Hardness"

- M** This test procedure consists in measuring the penetration of a specific indenter under specified conditions.
- M** The hardness is inversely related to the penetration, and it is dependent on the elastic modulus and on the viscoelastic behaviour of the material.

PoliMac® is 23% harder than PVC, providing better resistance to impact and to installation damage.



MECHANICAL PERFORMANCE

- M** ABRASION TEST
ASTM A975-21; EAD 200019-01-0102
- M** HARDNESS TEST
ASTM D 2240



ENVIRONMENTAL FRIENDLINESS

- M** LEACHATE TEST
EPA 1312
- M** ELUATE TEST
M GeoK E: 2016



WEATHERING RESISTANCE

- M** LOW TEMPERATURE BRITTLINESS
ASTM D 746
- M** UV EXPOSURE
ISO 4892-3; ISO 527-1
- M** CORROSION SPREAD TEST
ASTM A975-21

PoliMac® is not only suitable for use in most aggressive environments, but it is also **free of heavy metals** and it **does not release polluting substances**, thus making it become part of environment and its fauna.

It is designed to integrate with the environment without any impact on living species.

LEACHATE TEST - EPA 1312

“Synthetic Precipitation Leaching Procedure (SPLP)”

The leachate test is known as Synthetic Precipitation Leaching Procedure (SPLP).

Bureau Veritas Canada tested **PoliMac®** to assess the potential impact of when exposed to freshwater aquatic life. The results proved that there were **no metals or PFAS** present in the SPLP extracts that were **above EU directive**

Also, not present according to short/long-term **Canadian Water Quality Guidelines**, nor according to **U.S. EPA's National Recommended Water Quality** criteria.

LEACHATE TEST - EPA 1312

"Synthetic Precipitation Leaching Procedure (SPLP)"

Test report issued by Bureau Veritas



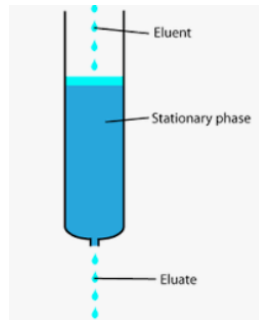
FREE
OF HEAVY
METALS

PFAS
FREE

ELUATE TEST – M GeoK E:2016



In addition of testing **PoliMac®** as PFAS Free polymer with the leachate test, the Eluate test was performed to test the presence of **PCB, CHC, Pesticides, PAH and Heavy Metals** after immersion in water according to **M GeoK E:2016** (German Standards on quality of water table)



ELUATE TEST – M GeoK E:2016

Test report issued by KIWA



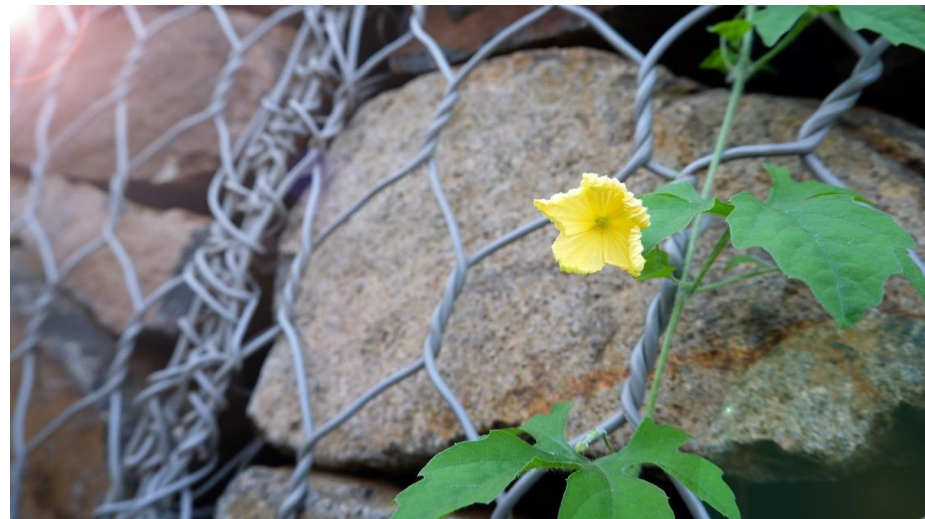
FREE
OF HEAVY
METALS

FREE OF
CHLORINATED
HYDROCARBON

FREE OF
PESTICIDES

FREE OF
POLYCHLORINATED
BIPHENYL

FREE OF POLYCYCLIC
AROMATIC
HYDROCARBONS





MECHANICAL PERFORMANCE

- M ABRASION TEST
ASTM A975-21; EAD 200019-01-0102
- M HARDNESS TEST
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ENVIRONMENTAL FRIENDLINESS

- M LEACHATE TEST
EPA 1312
- M ELUATE TEST
M GeoK E: 2016

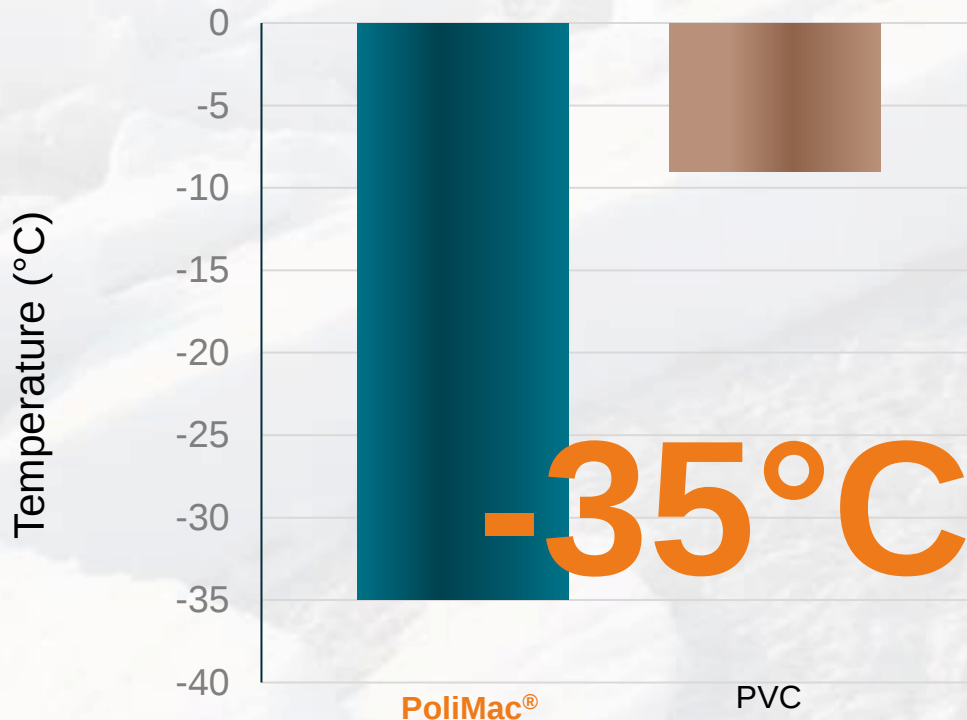


WEATHERING RESISTANCE

- M LOW TEMPERATURE BRITTLINESS
ASTM D 746
- M UV EXPOSURE
ISO 4892-3; ISO 527-1
- M CORROSION SPREAD TEST
ASTM A975-21

LOW TEMPERATURE BRITTLINESS ASTM D 746

“Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact”



LOW TEMPERATURE BRITTLENESS ASTM D 746

“Standard Test Method for Brittleness
Temperature of Plastics and Elastomers by
Impact”

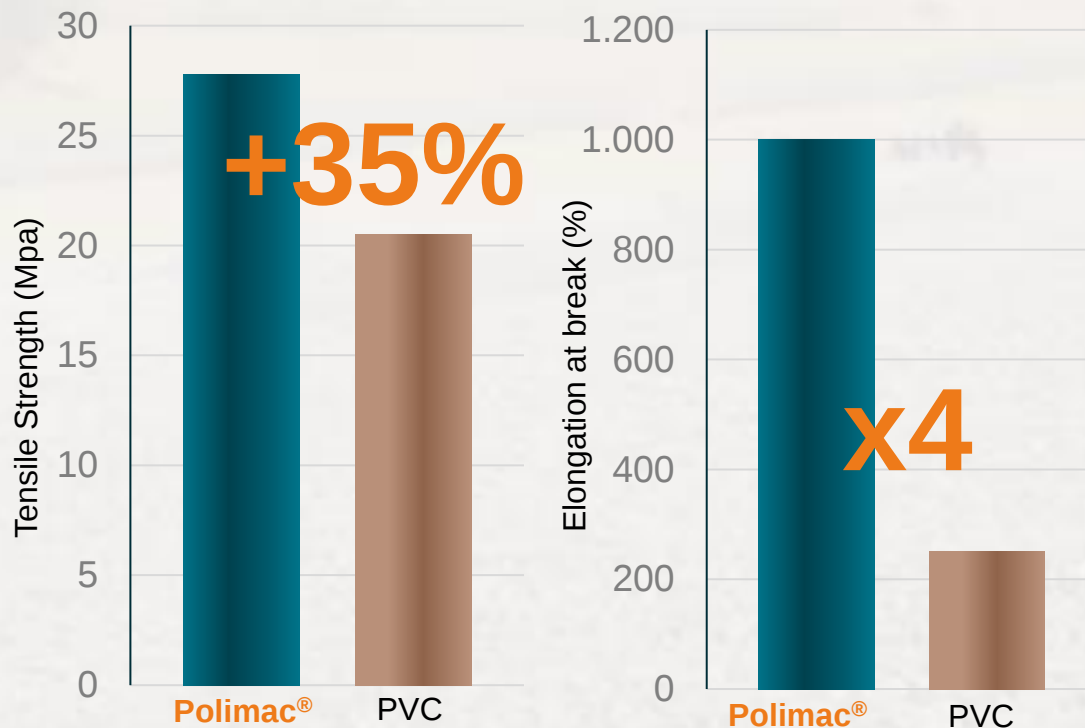
- M** TRI results indicated that the brittleness temperature was less than -35°C
- M** Higher resistance to brittleness allows installation of **PoliMac®** in cold climate conditions

PoliMac® maintains its properties as low as at -35°C, preventing cracks when products are installed in extreme temperature conditions

RESISTANCE AFTER UV EXPOSURE

ISO 4892-3 “*Plastics - Methods of exposure to laboratory light sources (Fluorescent UV lamps)*”

ISO 527-1 “*Determination of Tensile Properties*”



RESISTANCE AFTER UV EXPOSURE

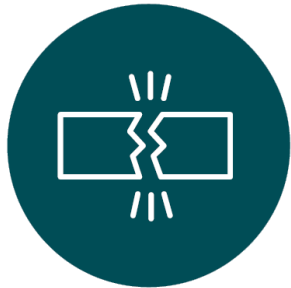
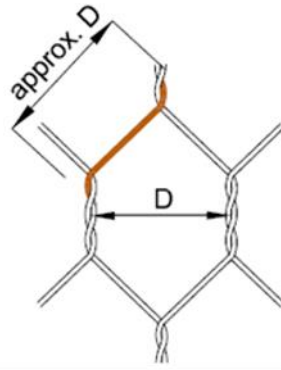
ISO 4892-3 "Plastics - Methods of exposure to laboratory light sources (Fluorescent UV lamps)"
ISO 527-1 "Determination of Tensile Properties"

- M** **PoliMac®** was exposed to UV radiation, simulating the weathering effects to the solar radiation.
- M** **PoliMac®** tensile strength and elongation were measured after 2,500 hours of UV exposure

PoliMac® has a better elongation and hence less brittleness after UV rays exposure, preventing coating cracks.

CORROSION SPREAD TEST - ASTM A975-21

After immersion of 2500 hrs in a HCl solution, the measured **maximum corrosion length of the steel wire** shall be **less than a mesh repetition**, in compliance with the requirements of ASTM A975-21.



LESS THAN
30%
OF THE MESH
OPENING

CORROSION SPREAD TEST - ASTM A975-21

Test report issued by «La Sapienza» University, Rome



Compliance testing

“In order to achieve an adequately durable structure, the expected environmental conditions should be taken into account along with particular protective measures”

European Standards on Structural Design
§ 2.3, 2.4 Eurocode 0

Which products are available with **PoliMac[®]** ?

POLIMAC® COATED PRODUCTS

MacArmour™

Reno Mattress Plus™

TerraMesh® System

Gabion™

TerraMesh® Green

TerraMesh® Mineral

RenoMac
Plus™

CubiMac™

SteelGrid™

Use of **PoliMac[®]** coated products

PoliMac® coating is highly suited for use in projects with abrasive or chemically aggressive environments including

**Hydraulic
works**

**Rockfall
works**

**Infrastructure
works**

**Mining
works**

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Bank revetments



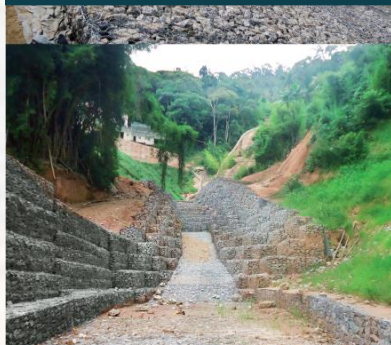
Artificial channels



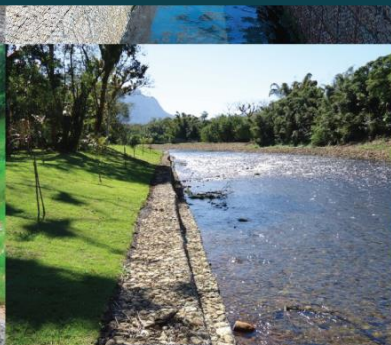
Transverse works



Groynes



Channel linings



Longitudinal works



Culverts



Bridge abutments



Soil reinforcement with
Terramesh® System



Gabion walls

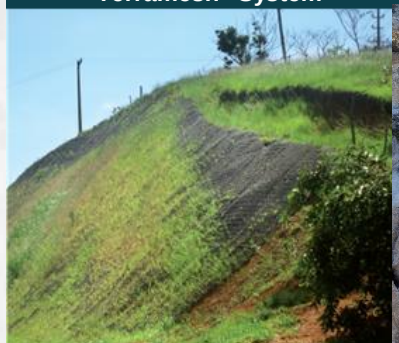


Retaining walls



Infrastructure works

Soil reinforcement with
Green Terramesh®



Erosion control



Rockfall protection



Slope protection



Rockfall works

Rockfall Embankments

Has **PoliMac[®]** obtained any certifications?



Approval on the product quality including testing in laboratories, onsite evaluations, quality management checks and inspections of production.



Continuous control of product performance in compliance with EU legislation.



Rigorous certification procedure to ensure that the performances of commercial kits conform to predefined performances criteria.



Our **PoliMac®** achieved the Environmental Product Declaration (EPD), an independently verified and registered document that communicates transparent and comparable information about the life-cycle environmental impact of products.

Does your design
address exposure and working conditions
expected in the future?

SOLUTIONS DESIGNED WITH THE FUTURE IN MIND

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Changing conditions require a change in the design approach

The changing climate and environmental conditions require a change in the way we think about design

PoliMac® coated solutions **at 120 years** have the aim of cutting maintenance costs, ensuring the most sustainable integration with the natural environment

OVER
120
YEARS OF WORKING LIFE



Going even more green



BIO POLIMAC®

PoliMac® is also available as full green wire coating.
BIO **PoliMac®** is the bio version of our polymer coating.
BIO **PoliMac®** is made of bio-nafta derived from sustainable raw materials originated from organic wastes



PoliMac®

WIRE PROTECTION FOR A CHANGING WORLD



maccaferri.com/polimac