

A HIGH –PERFORMANCE *POLYAMIDE FOR FAUCET SYSTEM COMPONENTS*

As the quest for new material solutions for metal replacement in drinking water contact components is becoming stronger and lead limits in drinking water have been strengthened, Envalior is innovating the materials to make it possible.

Envalior's EcoPaXX® offers a completely lead-free solution for faucet system components. Industry leaders already are successfully using EcoPaXX® Q-DWX10, a 50% glass-fiber-reinforced polyamide 410, for faucet mixing valves because of its outstanding performance. This material enables the design of faucet mixing valves with lower risk of part failure and water leakage, a key focus for the industry.



EcoPaXX® Q-DWX10 (PA410)

- Lead-free
- Superior stiffness and toughness
- High strength
- Static pressure > 500 psi
- Bending strength > 61 N.M.
- High screw thread strength
- No water leakage in lifetime cycle tests up to 1 million cycles
- Superior hydrolysis resistance: extremely low decrease in strength after 60°C (140°F) and 90°C (194°F) water contact
- Passes all major drinking water approvals, like NSF61, KTW, W270 etc.
- High dimensional stability

PLASTIC IS THE NEW METAL

The water management market is looking for high-performance polymers that can withstand the stringent requirements of hot-water contact, while still meeting all major drinking water approval schemes.

Legislation also has been driving replacement of metals in applications that involve direct contact with drinking water. Brass and other metals traditionally have been used for such applications as faucets, water meters and boilers. Lead contamination in drinking water is a major concern worldwide, leading to more stringent regulation on lead limits in drinking water. This has driven the industry to look for alternatives, and engineering plastics such as EcoPaXX® offer a completely lead-free solution and fully comply with those regulations.

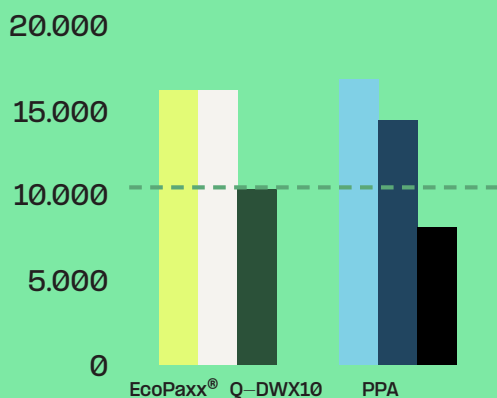
Faucet mixing valves need to provide long-term durability and perform reliably when in contact with both warm (60°C/140°F) and hot water (90°C/194°F). EcoPaXX®

offers superior toughness, better hydrolysis resistance and dimensional stability than other polyamide-based materials. It is not only lead-free, but also yields improved torque and bending strength, even after extended exposure to boiling water. EcoPaXX® absorbs 30% less water and offers superior chemical resistance, which is especially important when in contact with chlorinated water. It has passed more than 1 million lifetime cycles of testing in varying water temperatures, and fully complies with all major drinking water certifications, such as NSF/ANSI 61 and KTW (Kunststoff-Trinkwasser).

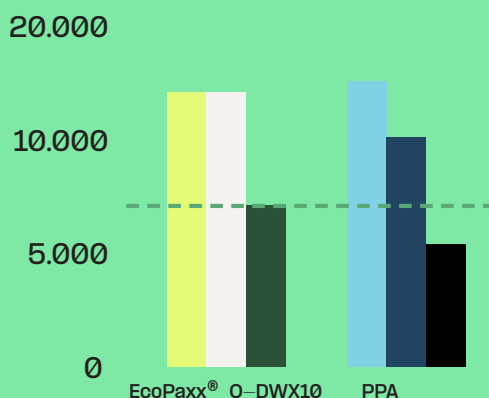
NOTE: Envalior is planning to do EU-MHR (European Union Minimum Hygienic Requirements) conformity assessments and certification according to the EU DWD (European Drinking Water Directive). Under the EU DWD framework, warm water approval can be used up to 70°C (158°F) instead of 60°C (140°F), making EcoPaXX® suitable for more domestic sanitary applications in Europe.

TENSILE MODULUS WITHOUT AND WITH WELD LINE (50% GF COMPOUNDS)

Tensile modulus without weld line [MPa]



Tensile modulus with weld line [MPa]



■ Dry as molded: 23°C
■ Conditioned: 23°C after 70°C (158°F)/62%RH
■ Fully saturated: 23°C after 80°C (176°F)/100%RH

EcoPaXX® Q-DWX10 exhibits a 30% higher tensile modulus vs. PPAs, even when fully saturated in water. This is confirmed by customers, who see an extremely low decrease in torque strength of faucet mixing valves made

from EcoPaXX® after long-term 90°C/194°F water contact. High tensile modulus, even at the weld line, allows for the design of complex parts.

PROCESSABILITY • SPIRAL FLOW LENGTH

Spiral flow length
PPA



Spiral flow length PPA
Temp = 310°C / 590°F
Length = 70 mm

Spiral flow length
EcoPaXX® Q-DWX10



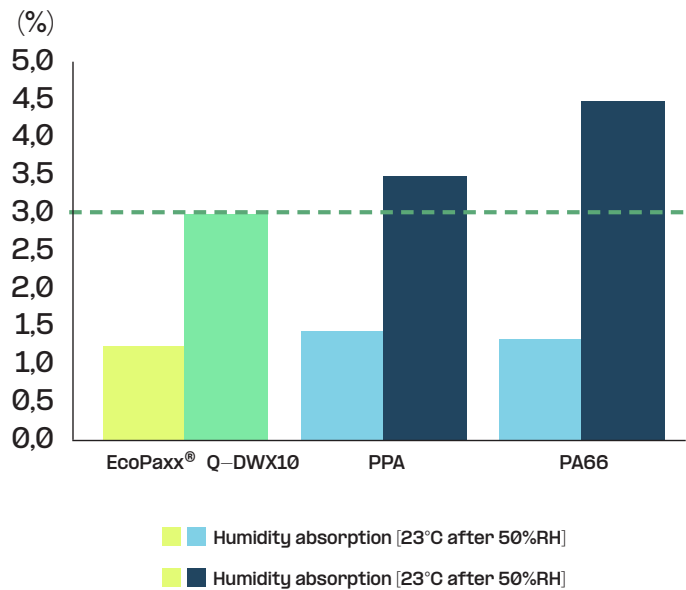
Spiral flow length
EcoPaXX® Q-DWX10
Temp = 310°C / 590°F
Length = 102 mm



EcoPaXX® has a wide processing window which makes it easy to process and suitable for large mass production. EcoPaXX® enables superb "bonding" performance in over-mold design. Compared to PPAs, EcoPaXX® superb flow and slow crystallization speed enables excellent surface quality even up to 60% GF reinforcements. Superb flow means better over-mold stability/bonding, less internal stress, and more design freedom for faucet system manufacturers.

LOW MOISTURE ABSORPTION IN COMBINATION WITH EXCELLENT HYDROLYTIC STABILITY (50% GF COMPOUNDS)

EcoPaXX® absorbs 30% less moisture than other polyamide-based materials in combination with excellent hydrolytic and dimensional stability. Thanks to its long aliphatic chains, EcoPaXX® offers superior chemical resistance, which is especially important when in contact with chlorinated water. More than 1 million lifetime cycles have passed testing in varying water temperatures.



PROPERTIES OF ECOPAXX® Q-DWX10

Mechanical properties	Dry/cond	Unit	Test method
Tensile modulus	16500 / 16000	MPa	ISO 527-1/-2
Stress at break	240 / 210	MPa	ISO 527-1/-2
Strain at break	3 / 3.3	%	ISO 527-1/-2
Flexural strength	380 / 330	MPa	ISO 178
Charpy impact strength (+23°C / 73.4°F)	100 / 80	kJ/m2	ISO179/ieU
Charpy notched impact strength (+23°C / 73.4°F)	16 / 13	kJ/m2	ISO179/ieA
Rheological properties	Dry/cond	Unit	Test method
Molding shrinkage (parallel)	0.13 / *	%	ISO 294-4
Molding shrinkage (normal)	0.73 / *	%	ISO 294-4
Other properties	Dry/cond	Unit	Test method
Water absorption	3 / *	%	SIM. T0 ISO 62
Humidity absorption	1.2 / *	%	SIM. To ISO 62
Density	1570 / –	kg/m³	ISO 1183

ECOPAXX®: A GREEN POLYMER FOR FAUCET SYSTEMS

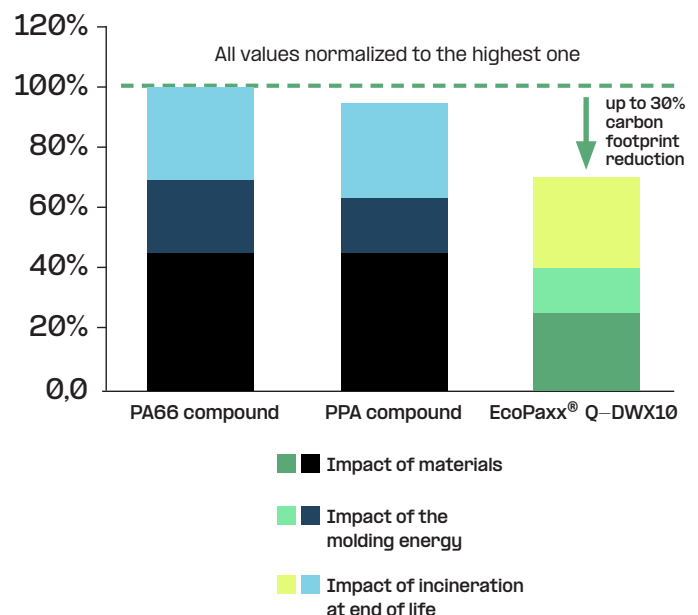
EcoPaXX® is a bio-based polymer, helping the industry to reduce the environmental footprint of its products.

- 70% of the polymer is bio-based, ASTM certified
- EcoPaXX® polymer is carbon neutral from cradle to gate, externally validated
- EcoPaXX® has 30% lower carbon footprint compared to benchmark materials with similar function (faucet mixing valve)
- Envalor offers industry-leading, in-house Life Cycle Assessment (LCA) expertise to help customers quantify the environmental impact of their products



EcoPaXX® LCA on faucet mixing valve: 30% lower carbon footprint than benchmark materials

- Carbon footprint comparison: Cradle-to-grave
- Functional unit: 1 mixing valve for faucet
- Assessment method: IPCC 2013 GWP 100a
- Sources: DSM primary data, Plastics Europe, Envalor estimate



TURNING ADVANCED MATERIALS *INTO REAL-WORLD SOLUTIONS*

Innovative materials are only part of the picture. We also know how to apply them, working together with the world's leading brands and OEMs in detailed application design and development.

Our material science centers bring together a team of experts who understand our products and their manufacturing processes inside and out. They're equipped

with advanced technology and specialized equipment that create significant efficiencies and synergies for customers, from co-designing components with molders to conducting rigorous testing and validation.

No matter what the product is, we continue to work with the industry to use the right material, in the right way, at the right price.



To learn more about our lead-free solutions for faucet components, contact us via [Entalior.com](https://www.entalior.com)



Entalior is a leading global Engineering Materials company employing around 4,000 people worldwide. With a long track record of customer-focused innovation, Entalior focuses its deep material and application expertise on sustainable and high-performance solutions. The company supplies many of the world's key markets including Automotive, New Mobility, Electronics & Electrical, and Consumer goods. For more information visit www.entalior.com.
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