ENVIRONMENTAL PROFILE OF THE POLYMER/AL/POLYMER COMPOSITE PIPE SYSTEM FOR HOT AND COLD WATER (CRADLE-TO-GRAVE) IN ABSOLUTE FIGURES PER FUNCTIONAL UNIT

IMPACT CATEGORY	Abiotic depletion	Acidification	Eutrophication	Global warming	Ozone layer depletion	Photochemical oxidation
Life cycle phases	kg Sb eq	kg SO2 eq	kg PO4--- eq	kg CO2 eq	kg CFC-11 eq	kg C2H4 eq
PRODUCT STAGE						
Production raw materials for polymer ML pipes	0,00401	0,00079	0,00007	0,23096	2,45E-10	0,000076
Transport of raw materials for polymer ML pipe to converter	0,00004	0,00002	0,00001	0,00589	9,69E-10	0,000001
Production of aluminium layer for the polymer ML pipe	0,00071	0,00057	0,00021	0,11981	7,30E-09	0,000047
Transport of aluminium layer to converter	0,00001	0,000005	0,000001	0,00124	2,04E-10	0,00000
Extrusion polymer ML pipes	0,00076	0,00038	0,00024	0,09853	5,84E-09	0,000016
Production of PPSU fittings	0,00103	0,00041	0,00040	0,10530	4,91E-08	0,000116
Production of brass fittings	0,00030	0,00148	0,00160	0,04336	2,90E-09	0,000056
Production of metal compression rings	0,00016	0,00022	0,00001	0,04074	0,00E+00	0,000010
CONSTRUCTION PROCESS STAGE						
Transport of complete polymer ML pipe system to the building site (apartment)	0,00023	0,00012	0,00003	0,03282	4,92E-09	0,000005
Installation of polymer ML pipe system (in apartment)	0,00066	0,00031	0,00018	0,09950	3,94E-09	0,000036
USE STAGE						
Operational use of polymer ML pipe system	0	0	0	0	0	0
Maintenance of polymer ML pipe system	0	0	0	0	0	0
END OF LIFE STAGE						
Transport of polymer ML pipe system to EoL (after 50 years of service life time)	0,00004	0,00002	0,00001	0,00630	9,55E-10	0,0000008
EoL of PEX pipe system (after 50 years of service life time)	-0,00026	-0,00012	-0,000099	0,05252	-1,38E-09	-0,0000062
Total	**0,00768**	**0,00421**	**0,00265**	**0,83697**	**0,0000000750**	**0,000358**

A: contribution > 50 %: most important, significant influence

B: 25 % < contribution ≤ 50 %: very important, relevant influence

More detailed information about this material comparison can be obtained via www.teppfa.eu or by contacting TEPPFA at: info@teppfa.eu

teppfa

The European Plastic Pipes and Fittings Association

Channelling Performance

The European Plastic Pipes and Fittings Association (TEPPFA) is the trade association representing manufacturers and national associations of plastic pipe systems in Europe. We are actively involved in the promotion of plastic pipe systems for all applications. We want to raise awareness of the value that plastic pipe systems offer for a sustainable future.

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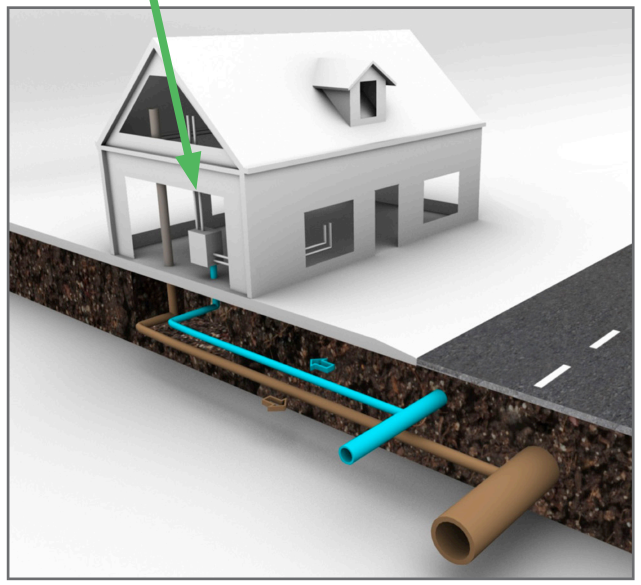
The European Plastic Pipes and Fittings Association

Channelling Performance

Polymer/aluminium/polymer multi-layer pipe systems vs copper environmental impact comparison

An independent study following ISO 14040 and 14044 methodology by the respected Flemish Institute for Technological Research (VITO), and validated by the Denkstatt sustainable development institute in Austria, is conclusive in its findings that systems made from polymer-aluminium-polymer multi-layer plastic pipes for plumbing hot and cold solid wall applications have a lower environmental impact than those made from copper.

hot and cold plumbing



RELATIVE SIZE OF ENVIRONMENTAL FOOTPRINT

COPPER

POLYMER ML

To make a fair comparison between these two different materials and determine the environmental impacts of both, each stage of their lifecycle was analysed.

“Environmental footprints” can be either adverse or beneficial. Adverse effects such as emitting greenhouse gases may arise in either the product’s production or disposal process; beneficial effects help to reduce greenhouse gas emissions by saving energy whilst the product is in use.

DETERMINING A PRODUCT’S ENVIRONMENTAL FOOTPRINT

A scientifically-based full Life Cycle Assessment (LCA) is the standardised method for fairly comparing the environmental impacts of different products or services. This type of assessment involves systematically collecting and evaluating quantitative data on the inputs and outputs of material, energy and waste flows associated with a product over its entire life cycle. Therefore a whole range of processes need to be assessed to calculate overall impacts, beginning with the manufacturing of raw materials, to transforming them into products; continuing through the product’s transportation and installation, the product’s lifetime of use, and ultimately, the product’s disposal or re-processing at the end of life.

The findings of LCA assessments are typically published in the form of Environmental Product Declarations (EPDs) to help communicate a product's overall environmental impact.
The VITO study involved collecting data on plastic pipe systems from companies covering more than 50% of the European market. Data for copper was based on publicly available information.

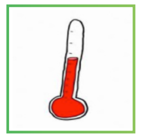
ENVIRONMENTAL IMPACT CRITERIA

The environmental impact of each pipe material was assessed against six different criteria across its full life cycle.

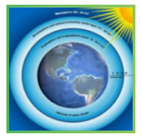
'Abiotic-depletion' potential: the over-extraction of minerals, fossil fuels and other non-living, non-renewable materials which can lead to exhaustion of natural resources.

'Acidification' potential: emissions, such as sulphur dioxide and nitrogen oxides, from manufacturing processes, result in acid rain which harms soil, water supplies, human and animal organisms, and the ecosystem.

'Eutrophication' potential: which arises from of the over-fertilisation of water and soil by nutrients (such as nitrogen and phosphorous). This speeds up plant growth and kills off animal life in lakes and waterways.



'Global warming' potential (its carbon footprint): the insulating effect of greenhouse gases - CO_2 and methane - in the atmosphere is a major contributor to global warming, affecting both human health and that of the ecosystem in which we live.



'Ozone-depletion' potential: depletion of the ozone layer in the atmosphere caused by the emission of chemical foaming and cleaning agents allows the passage of greater levels of UV from the sun, causing skin cancer and reducing crop yields.

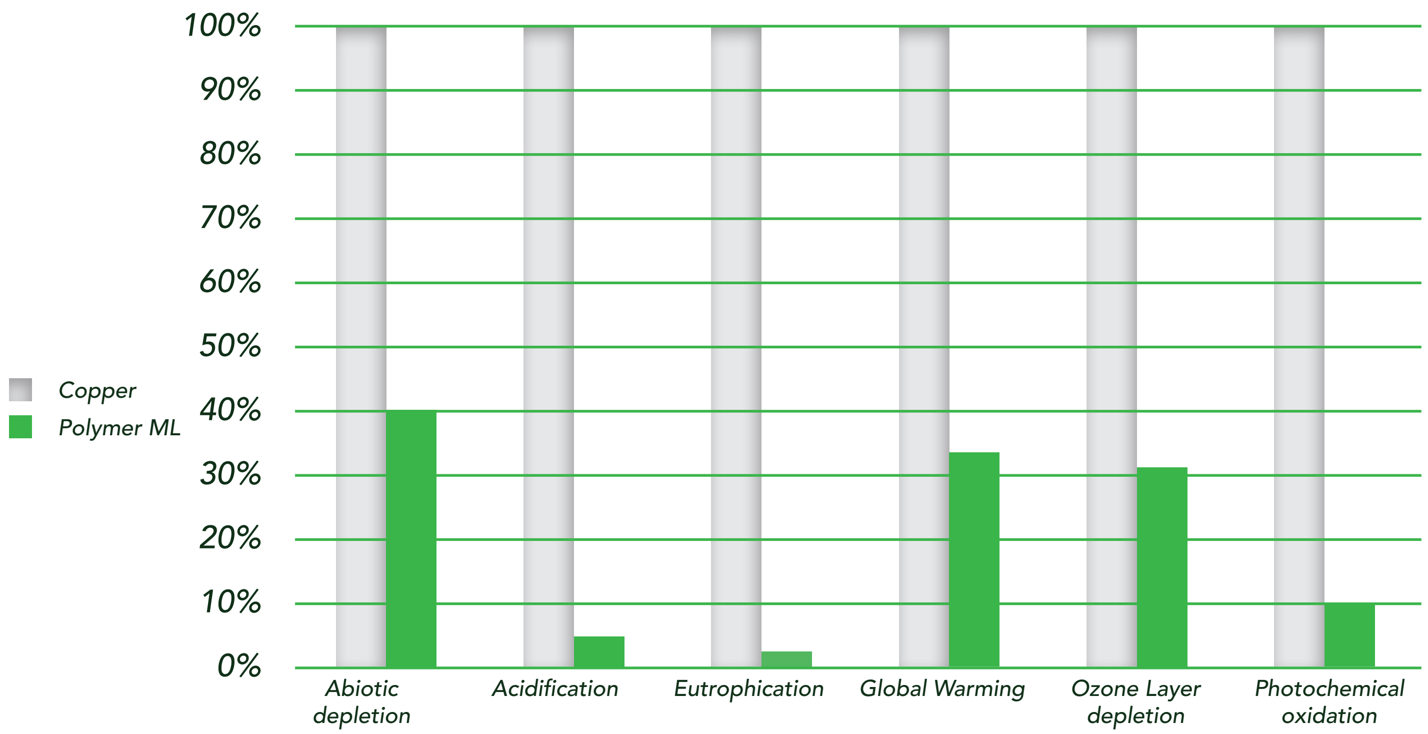
'Photochemical-oxidation' potential: where the photochemical reaction of sunlight with primary air pollutants such as volatile organic compounds and nitrogen oxides leads to chemical smogs that affect human health, food crops and the ecosystem in general.

COMPARISON BASED ON IDENTICAL FUNCTIONAL UNITS

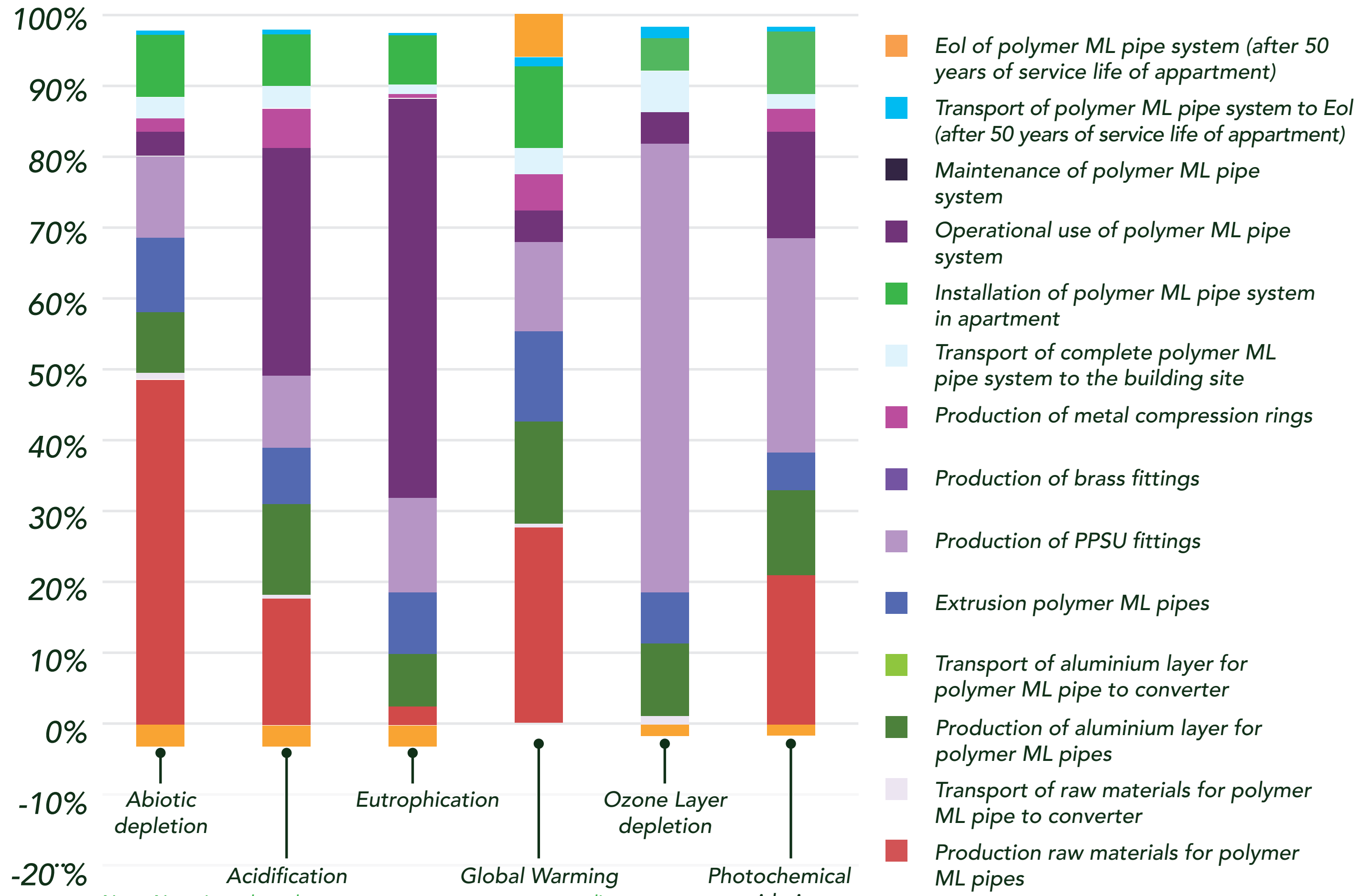
For the purposes of a direct fair comparison between alternative materials the following identical functional unit was used in the LCA study for plumbing hot and cold solid wall systems:

- The pressure supply and transport of hot and cold drinking water from the entrance of an apartment of 100 m^2 to the tap
- A 50 year service life has been assumed which aligns with the normal lifetime expectancy of a building.

COMPARISON OF POLYMER/AL/POLYMER TO COPPER FOR THE 6 ENVIRONMENTAL IMPACT CRITERIA



ENVIRONMENTAL PROFILE OF THE POLYMER/AL/POLYMER COMPOSITE PIPE SYSTEM FOR HOT AND COLD WATER IN THE BUILDING FROM CRADLE-TO-GRAVE PER FUNCTIONAL UNIT



Note: Negative values shown represent energy recovery credits