

Evaluating the environmental impacts of hot and cold water supply systems in a building to aid product choice: Life Cycle Assessment



Keywords

- Life Cycle Assessment (LCA)
- Environmental impact categories
- Sustainability
- Construction
- Functional unit

Article Highlights

This is the second in a series of bulletins which together describe the environmental benefits of plastic piping in hot and cold water systems. The bulletins build a resource which supports the development of knowledge of Environmental Product Declarations (EPDs) and Life Cycle Assessments (LCAs) to select the best sustainable options.

What does the bulletin cover?

This bulletin explains the concept of Life Cycle Assessment, the life cycle stages and application to piping systems. It summarises the standards used internationally for development of LCAs and EPDs.

Introduction

At the highest level, a Life Cycle Assessment or Life Cycle Analysis is a technique to assess the environmental impacts, directly or indirectly caused by a product, associated with all the stages of life from raw material extraction through materials processing, manufacture, distribution, use, repair and maintenance and disposal or recycling. The main use of an LCA is to quantify the potential environmental impacts of a product, to allow comparisons with other products for the same application and identify the potential for improving manufacturing processes to further reduce environmental impact.

This bulletin explains the elements used for determining the environmental impact of a material, product or system through Life Cycle Assessment. The Life Cycle Assessments prepared by The European Plastics Pipes and Fittings Association (TEPPFA) for hot and cold water supply inside buildings are used to illustrate these points.

International Standards for Life Cycle Assessment

International Environmental Management Standards:

The ISO 14000 suite of International Standards provides tools for companies to manage their environmental responsibilities. Readers may be familiar with BS ISO 14001 which a company can follow to set up an effective environmental management system.

BS ISO 14040 and BS ISO 14044 address the principles, framework, requirements and guidelines for undertaking Life Cycle Assessment in a consistent manner as part of the overall management system. Furthermore, BS ISO 14025 sets out the principles and procedures for developing standardised environmental declarations. By using a system compliant with these standards, specifiers can be confident that a uniform method for developing an LCA has been used for assessing the attributes of a product or service in relation to sustainability over its entire life cycle. The standards can be used for any product.

To verify that an LCA study meets the standards, it is subject to a critical review. This can be carried out by an expert in the same organisation but independent of the LCA study team; by an expert from a different organisation; or by a review panel of interested parties chaired by an external independent expert. For all LCAs for hot and cold water supply systems in buildings developed for TEPPFA by Belgian research organisation (VITO), the critical review was carried out by independent experts from an Austrian organisation (Denkstatt).

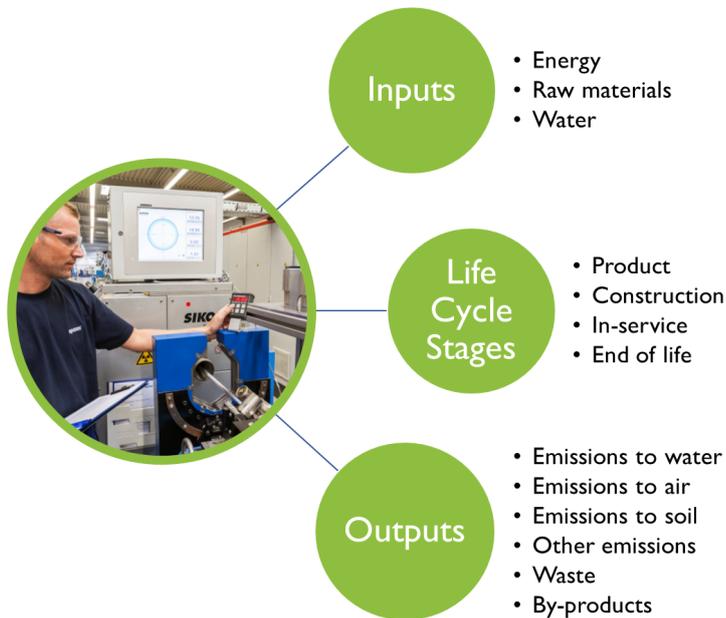
European Standards for Construction Works:

European Standard BS EN 15804 “Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products” has been adopted in the UK and is specific to construction products and construction services for buildings and other construction works. It sits under the umbrella of BS ISO 14025 and provides the essential detail on life cycle stages, calculation rules, selection and quality of data and categories against which impacts are assessed. An Environmental Product Declaration (EPD) is the means of presenting the Life Cycle Assessment of a product and when using EPDs for sustainable procurement, specifiers should check that it is in line with BS EN 15804.



Life Cycle Assessment—Piping Systems

Life Cycle Assessment considers the impact of all inputs through all stages of life on a specified set of categories.



Product: manufacturing of all pipe system components including transport and processes upstream of the manufacturing stage e.g. raw material supply and energy provision.

Construction: transport of the complete pipe system to the building site and installation of pipe system in the building.

In-service: operation (installed pipe system), maintenance and repair, including all transport.

End of life: de-construction, reuse, demolition, recycling and disposal of the complete pipe system, including transport.

Functional Unit—Piping Systems

A pipe, fitting or other component is not used in isolation in a building but forms part of a piping system. So, the Life Cycle Assessment studies carried out for TEPPFA do not simply consider a unit length of pipe but a complete system, described as a “functional unit”. A functional unit comprises pipes, fittings and ancillary components with the quantities, design, installation and specification representative of a typical hot and cold water supply system inside a building. This allows a building designer to readily compare different plastic piping systems and plastic piping to other materials (providing the same functional unit and full life cycle from cradle to grave has been used for the LCA).

The European Plastics Pipes and Fittings Association (TEPPFA) has prepared LCAs for hot and cold water supply inside buildings made from:

- Crosslinked polyethylene (PEX)
- Polymer/Aluminium/Polymer composite
- Polypropylene (PP)
- Polybutene (PB)

The functional unit used is “the pressure supply and transport of hot and cold drinking water, from the entrance of a well-defined apartment to the tap, by means of a [pipe material] hot and cold drinking water pipe system installation supplying a 100 m² apartment, incorporating a bathroom, separate WC, kitchen and washroom (considering the service life time of the pipe system to be aligned with the 50 year service life time of the apartment), calculated per year”.

In the next bulletin, the environmental impacts considered when undertaking an LCA are described and their significance explained.

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Bulletin 2: Life Cycle Assessment (LCA)

Bulletin 3: Balancing the environmental impacts

Bulletin 4: Interpreting Environmental Performance Declarations (EPDs)

Bulletin 5: Applying your knowledge

Bulletin 6: Asking the right questions - making choices

About the BPF Pipes Group

Part of the British Plastics Federation, the BPF Pipes Group is a trade association representing manufacturers and material suppliers of plastic piping systems across the UK.

Committed to sustainable construction, its aims are to provide a forum for the exchange of technical expertise between member companies and to promote the importance of plastic as a pipework material, for the full spectrum of above and below ground, pressure and non-pressure applications. It also plays a key role in initiating and disseminating research and informing and influencing the standards bodies pertaining to plastic pipe systems. It works closely with TEPPFA, The European Plastic Pipes and Fittings Association.

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