EPD®

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Environmental Product Declaration

in accordance with ISO 14025 and EN 15804

COOL-FIT 2.0F for air conditioning systems

Georg Fischer Piping Systems Ltd
Ebnatstrasse 111
8201 Schaffhausen/Switzerland
+41 (0) 52 631 11 11
sustainability.ps@georgfischer.com
www.gfps.com

Declaration

Declaration owner	Georg Fischer Piping Systems Ltd.
Program operator	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com
EPD registration number	S-P-06019
Published	2022-07-20
Valid until	2027-07-01
Geographical scope	Global

EPD-Type	Cradle to gate with options
Data calculated by	Swiss Climate AG
Third-party verifier	Dr. Nikolay Minkov, greenzero.me GmbH
Life Cycle Inventory (LCI) source for generic background processes	Ecoinvent 3.7
Software	SimaPro (Version 9.2.0.2)

ISO 9001 TÜV SÜD ISO 14001 ISO 45001

ECO PLATFORM EPD VERIFIED

1. Declaration of general information

1.1 Introduction

GF Piping Systems is one of the three division of Georg Fischer AG with its headquarters in Schaffhausen, Switzerland. GF Piping Systems is a leading provider of plastic and metal piping systems with a global presence, enabling the safe and sustainable transport of fluids. The company specializes in plastic piping systems and solutions as well as services in all project phases. The product portfolio includes pipes, fittings, valves and the corresponding automation and jointing technology for industry, building technology as well as water and gas utilities. GF Piping Systems proactively incorporates its environmental responsibility into its everyday business activities. Because we view environmental awareness as one of the corporation's core values, internal structures and processes are geared towards sustainability. Within this context, we increasingly utilize Life Cycle Assessments (LCA) to gain insight into the environmental footprint of our piping systems or products across its different life cycle phases.

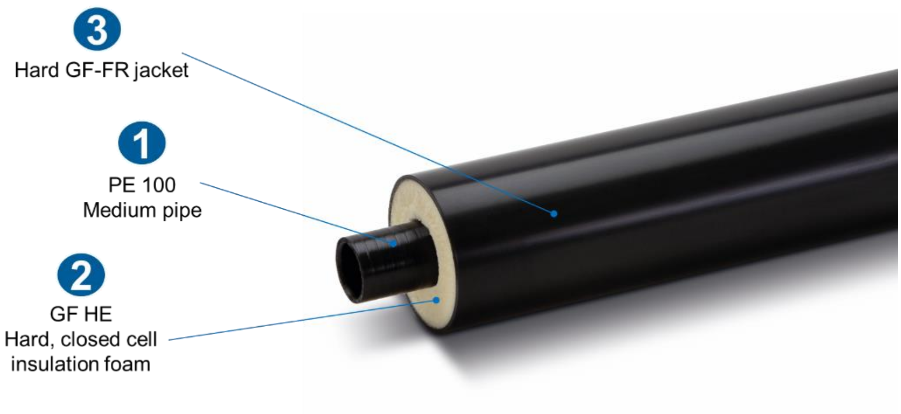
This EPD is based on a detailed background report written by Swiss Climate AG. The report is in line with EN 15804:2012+A2:2019 "Sustainability of construction works – environmental product declarations – Core rules for the product category of construction products" and the Product Category Rule (PCR) for Construction Goods (PCR 2019:14 by the International EPD System). Data regarding the production of the COOL-FIT 2.0 and COOL-FIT 2.0F piping systems for air conditioning application is company specific and was provided by GF Piping Systems.

1.2 System

Product system description

The GF Piping Systems' substitute with COOL-FIT 2.0F system is a pre-insulated, corrosion and condensation-free solutions designed for the transport of chilled water for a variety of cooling applications. The COOL-FIT 2.0F system include pre-insulated pipes as well as pre-insulated fittings, valves, flexible hoses, relevant jointing technologies and tools.

COOL-FIT 2.0 products feature a 3-layer structure. COOL-FIT 2.0F pipes have a PE100 inner pipe, GF HE insulation and a flame retardant GF FR outer jacket. The single components are firmly connected with each other. COOL-FIT 2.0 fittings have a PE100 inner layer and GF-HE insulation and outer layer. Both systems have a dimension range from d32/D75 mm up to d140/D200 mm and the nominal insulation is 22 mm.
COOL-FIT 2.0 is suitable for indoor cooling applications with cooling agent temperatures from 0°C to 60°C and the GF FR jacket of COOL-FIT 2.0F pipes provides increased fire classification. Typical applications are industrial process cooling, air conditioning or cooling of data centers.

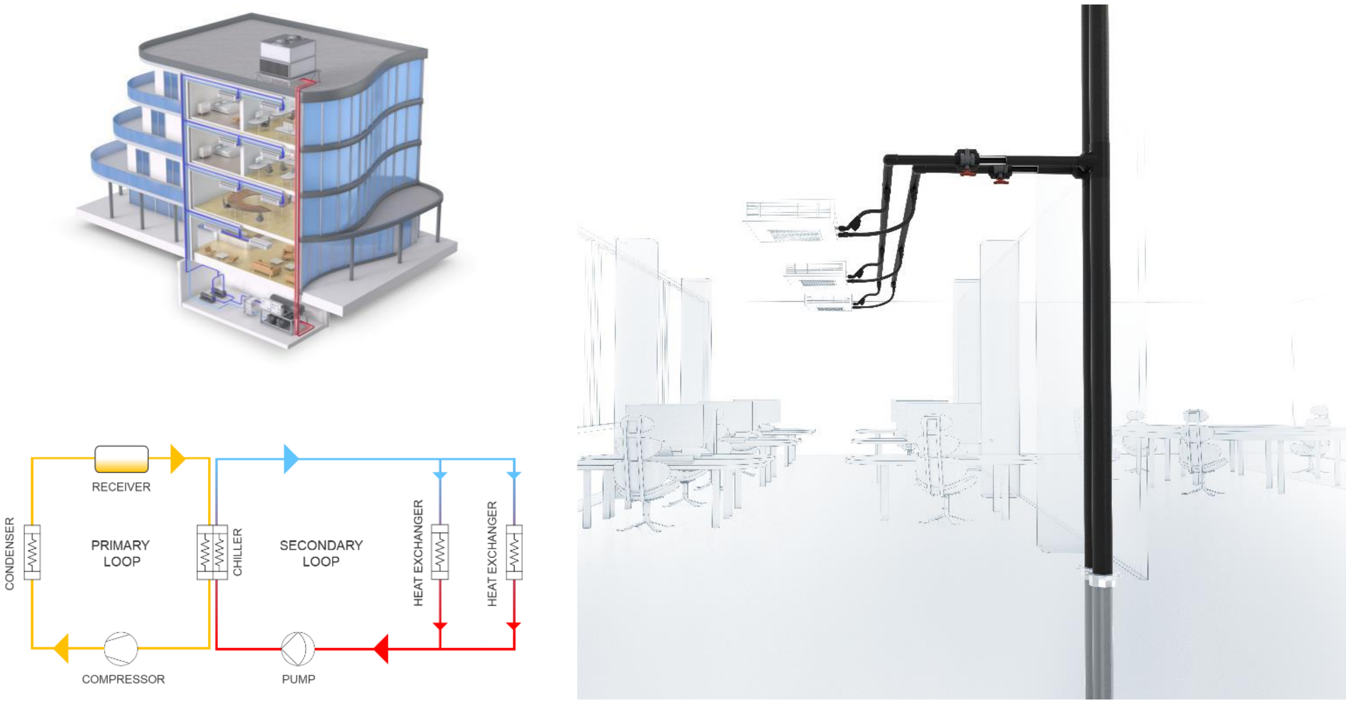


Pre-insulated 3-in-1 layered structure of a COOL-FIT 2.0F pipe

Functionality and use

The piping system considered comprises mainly COOL-FIT 2.0 products and COOL-FIT 2.0F pipes used for air conditioning. The purpose of an air conditioning system is to keep the temperature in a room or building between 19°C to 23°C – often called "comfort cooling". The chiller unit cools down water to a temperature between 4 and 8°C (inlet temperature). The chilled water is pumped through the building to offices, hotel rooms or residential apartments inside the COOL-FIT 2.0 system and COOL-FIT 2.0F pipes. Fan coils absorb hot air from the space where they are installed and release cool air at the same time. As a consequence the chilled water heats up to 12 to 18°C (return temperature).

The cooling of the refrigerant liquid is achieved via primary and secondary closed loops as schematically shown below. The primary loop is short, it contains a small amount of HFC liquid and it is used to cool down the larger secondary loop containing a water based HFC free liquid. The secondary loop distributes the cooling liquid to the utilities (i.e. fan coils, cold ceilings). The COOL-FIT 2.0F System is used in the secondary loop, that is the system under consideration.



Top left: exemplary building and air conditioning system. Bottom left: Primary (yellow) and secondary (red/blue) cooling loops. Right: comfort cooling of an office with COOL-FIT 2.0F system

Materials

The material of the main pipe system components (pipes and fittings) is PE100 (HDPE). The whole system consists of the materials as listed below:

Material	Weight (kg)
HDPE, GF-HE, PVC-U and other plastics	930
Ferrous metals	102
Fibre reinforced polyamide	14
Non-ferrous metals	9

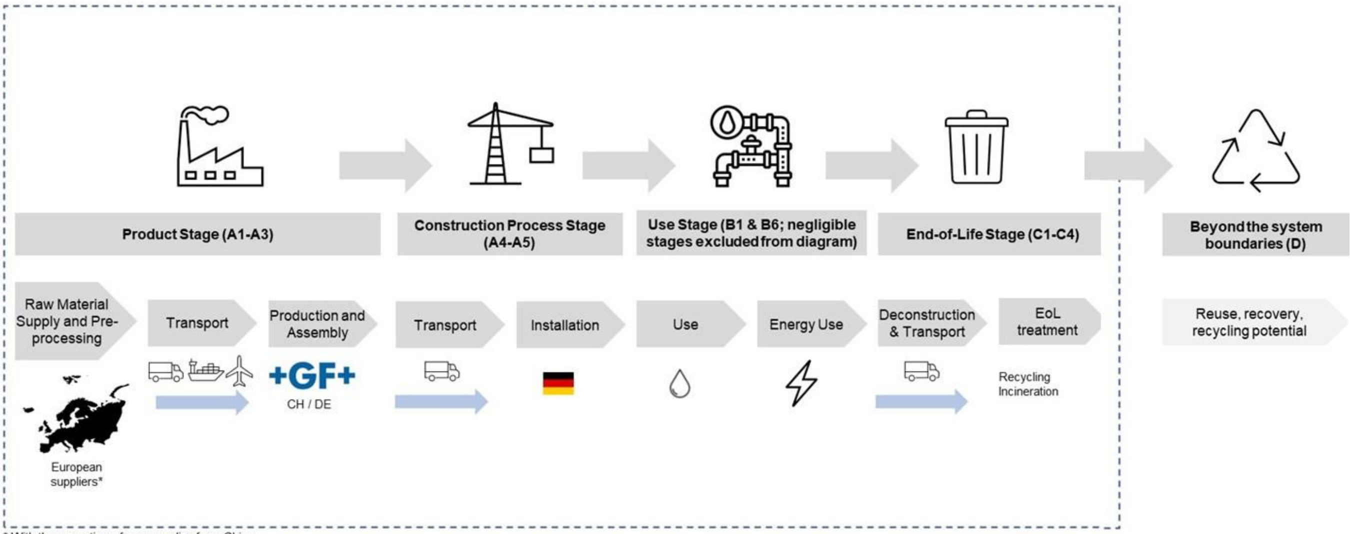
Reference service life

The results are evaluated for a reference service life of 25 years.

Declared Unit (DU)

In accordance with the PCR 2019:14 the declared unit is defined as 1 meter of COOL-FIT 2.0F. In order to express the environmental impacts per meter piping, the conversion factor 380 was used, corresponding to the piping length of one COOL-FIT 2.0F system.

COOL-FIT – System Boundaries



* With the exception of one supplier from China

1.3 Components of the system

The system mainly consists of GF Piping Systems components. However, to complete the system also external components (Ext.) which are not produced by GF Piping Systems are necessary. The calculation of the environmental impact of these products is based on publicly available data and assumptions.

System Components	Product Code	Pieces or meters	Main material
Pipes			
COOL-FIT 2.0F Pipe 32/75	738 174 308	206 m	HDPE, GF-HE and PVC-U
COOL-FIT 2.0F Pipe 40/90	738 174 309	36 m	HDPE, GF-HE and PVC-U
COOL-FIT 2.0F Pipe 50/90	738 174 310	28 m	HDPE, GF-HE and PVC-U
COOL-FIT 2.0F Pipe 63/110	738 174 311	48 m	HDPE, GF-HE and PVC-U
COOL-FIT 2.0F Pipe 75/125	738 174 312	4 m	HDPE, GF-HE and PVC-U
COOL-FIT 2.0F Pipe 90/140	738 174 313	58 m	HDPE, GF-HE and PVC-U
Fittings			
COOL-FIT 2.0 T90° equal 32/75	738 204 108	12	HDPE and GF-HE
COOL-FIT 2.0 T90° equal 40/90	738 204 109	8	HDPE and GF-HE
COOL-FIT 2.0 T90° equal 50/90	738 204 110	6	HDPE and GF-HE
COOL-FIT 2.0 T90° equal 63/110	738 204 111	4	HDPE and GF-HE
COOL-FIT 2.0 T90° equal 75/125	738 204 112	2	HDPE and GF-HE
COOL-FIT 2.0 T90° equal 90/140	738 204 113	2	HDPE and GF-HE
COOL-FIT 2.0 Reducer 40/90 x 32/75	738 904 206	12	HDPE and GF-HE
COOL-FIT 2.0 Reducer 50/90 x 32/75	738 904 209	8	HDPE and GF-HE
COOL-FIT 2.0 Reducer 50/90 x 40/90	738 904 210	4	HDPE and GF-HE
COOL-FIT 2.0 Reducer 63/110 x 32/75	738 904 212	4	HDPE and GF-HE
COOL-FIT 2.0 Reducer 63/110 x 40/90	738 904 213	2	HDPE and GF-HE
COOL-FIT 2.0 Reducer 63/110 x 50/90	738 904 214	2	HDPE and GF-HE
COOL-FIT 2.0 Reducer 90/140 x 63/110	738 904 222	4	HDPE and GF-HE
COOL-FIT 2.0 Reducer 75/125 x 63/110	738 904 318	4	HDPE and GF-HE
Adaptor fitting PE/Brass with male thread R 32/ 1"	738 954 528	36	Non-Ferrous metals / HDPE & GF-HE
COOL-FIT 2.0 Coupler 32/75	738 914 108	33	HDPE and GF-HE
COOL-FIT 2.0 Coupler 40/90	738 914 109	13	HDPE and GF-HE
COOL-FIT 2.0 Coupler 50/90	738 914 110	7	HDPE and GF-HE
COOL-FIT 2.0 Coupler 63/110	738 914 111	7	HDPE and GF-HE
COOL-FIT 2.0 Coupler 75/125	738 914 112	4	HDPE and GF-HE
COOL-FIT 2.0 Coupler 90/140	738 914 113	4	HDPE and GF-HE
COOL-FIT 2.0 Elbow 90° 32/75	738 104 108	62	HDPE and GF-HE
COOL-FIT 2.0 Elbow 90° 40/90	738 104 109	6	HDPE and GF-HE
COOL-FIT 2.0 Elbow 90° 50/90	738 104 110	6	HDPE and GF-HE
COOL-FIT 2.0 Elbow 90° 63/110	738 104 111	4	HDPE and GF-HE
COOL-FIT 2.0 Elbow 90° 75/125	738 104 112	4	HDPE and GF-HE
COOL-FIT 2.0 Elbow 90° 90/140	738 104 113	6	HDPE and GF-HE
COOL-FIT Flange adaptor PE d 90	738 710 013	2	HDPE and GF-HE
Backing flange PP-Steel metric PN10 d90	727 700 313	6	Ferrous metals / other plastics
Backing flange PP-Steel metric PN10 d75	727 700 212	8	Ferrous metals / other plastics
Backing flange PP-Steel metric PN10 d63	727 700 211	4	Ferrous metals / other plastics
Valves			
COOL-FIT 2.0 Ball valve 542 PVC-U/EPDM d32	138 541 308	30	Other plastics
COOL-FIT 2.0 Ball valve 542 PVC-U/EPDM d40	138 541 309	18	Other plastics
COOL-FIT 2.0 Ball valve 542 PVC-U/EPDM d50	138 541 310	6	Other plastics
Butterfly Valve 565 d63	199 565 000	2	Other plastics
Butterfly Valve 565 d75	199 565 001	4	Other plastics
Butterfly Valve 565 d90	199 565 002	2	Other plastics
Pump	N/A	1	Ferrous metals
Clamps	N/A	221	Ferrous metals

1.4 Comparability

EPDs of construction products may not be comparable if they do not comply with the EN 15804:2012+A2:2019.

2. Declaration of environmental parameters derived from LCA

2.1 Flow diagram of the processes included in the LCA

A	B	C	D
Product stage A1: Raw material supply A2: Transport A3: Manufacturing **Construction-installation process** A4: Transport to installation A5: Installation	**Use stage** B1: Use B2: Maintenance* B3: Repair* B4: Replacement* B5: Refurbishment* B6: Operational energy use B7: Operational water use*	**End of life stage** C1: Deconstruction/ Demolition C2: Transport C3: Waste processing C4: Disposal	**Beyond the system boundaries** D: Reuse-Recovery-Recycling-Potential

* Stage is negligible. Please refer to chapter 2.4 for details.

2.2 Core environmental impact indicators

Parameters describing core environmental impacts		Product stage				Construction process stage		Use stage		End of life			Beyond the system boundaries
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Use	Operational Energy Use	Deconstruction	Transport	Waste processing	Reuse-Recovery-Recycling-Potential
		A1	**A3**	**A3**	**A1-3**	**A4**	**A5**	**B1**	**B6**	**C1**	**C2**	**C3**	**D**
Climate change - Total	kg CO_2 eq	8,86E+00	1,81E-01	1,28E+00	1,03E+01	2,40E-01	5,38E+00	2,15E+00	5,57E+02	3,59E-02	1,10E-02	3,17E+00	-2,35E+00
Climate change - Fossil	kg CO_2 eq	8,76E+00	1,80E-01	1,22E+00	1,02E+01	2,39E-01	5,60E+00	2,12E+00	5,09E+02	3,58E-02	1,10E-02	3,16E+00	-2,28E+00
Climate change - Biogenic	kg CO_2 eq	8,64E-02	4,02E-04	5,99E-02	1,47E-01	5,69E-04	-2,32E-01	2,71E-02	4,79E+01	1,01E-04	2,61E-05	3,34E-03	-6,00E-02
Climate change - Land use and LU change	kg CO_2 eq	5,02E-03	6,44E-05	1,18E-03	6,26E-03	7,96E-05	6,95E-03	2,31E-03	6,73E-01	1,57E-05	3,65E-06	1,13E-04	-1,44E-03
Ozone depletion	kg CFC11 eq	1,60E-06	4,10E-08	7,03E-08	1,71E-06	5,48E-08	1,79E-06	8,40E-07	1,40E-05	6,48E-09	2,51E-09	4,12E-08	-3,31E-08
Acidification	mol H+ eq	4,32E-02	1,08E-03	5,12E-03	4,94E-02	9,67E-04	2,36E-02	9,50E-03	1,18E+00	1,41E-04	4,43E-05	1,59E-03	-6,45E-03
Eutrophication freshwater	kg P eq	2,93E-03	1,21E-05	7,06E-04	3,65E-03	1,66E-05	2,11E-03	9,22E-04	7,46E-01	6,25E-06	7,62E-07	5,66E-05	-1,73E-03
Eutrophication aquatic marine	kg N eq	9,70E-03	3,05E-04	1,11E-03	1,11E-02	2,95E-04	5,03E-03	1,96E-03	3,75E-01	3,36E-05	1,35E-05	8,63E-04	-1,34E-03
Eutrophication terrestrial	mol N eq	8,93E-02	3,35E-03	1,10E-02	1,04E-01	3,22E-03	5,01E-02	1,92E-02	2,73E+00	3,61E-04	1,47E-04	6,32E-03	-1,30E-02
Photochemical ozone formation	kg NMVOC eq	3,08E-02	9,91E-04	5,06E-03	3,69E-02	1,01E-03	2,29E-02	7,15E-03	6,84E-01	1,24E-04	4,62E-05	1,60E-03	-5,72E-03
Depletion of abiotic resources - minerals and metals	kg Sb eq	3,21E-04	5,79E-07	1,18E-04	4,40E-04	8,00E-07	7,50E-05	3,33E-05	4,31E-03	4,75E-07	3,67E-08	1,15E-06	-1,79E-05
Depletion of abiotic resources - fossil fuels	MJ	1,96E+02	2,73E+00	1,40E+01	2,13E+02	3,66E+00	1,06E+02	4,42E+01	6,87E+03	4,91E-01	1,68E-01	2,32E+00	-6,73E+01
Water use	m^3 depriv.	6,63E+00	8,33E-03	3,03E-01	6,95E+00	1,15E-02	4,71E+00	2,08E+00	2,98E+01	3,25E-03	5,27E-04	1,47E+00	-1,29E+00

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2.3 Additional environmental impact indicators

Parameters describing additional environmental impact indicators		Product stage				Construction process stage		Use stage		End of life			Beyond the system boundaries
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Use	Operational Energy Use	Deconstruction	Transport	Waste processing	Reuse-Recovery-Recycling-Potential
		A1	A3	A3	A1-3	A4	A5	B1	B6	C1	C2	C3	D
Particulate Matter emissions	disease inc.	4,79E-07	1,33E-08	5,27E-08	5,45E-07	1,84E-08	2,11E-07	7,13E-08	4,90E-06	1,75E-09	8,41E-10	1,15E-08	-3,74E-08
Ionizing radiation, human health	kBq U-235 eq	6,00E-01	1,42E-02	2,21E-01	8,35E-01	1,91E-02	8,06E-01	3,53E-01	8,64E+01	2,52E-03	8,77E-04	1,29E-02	-1,95E-01
Eco-toxicity (freshwater)	CTUe	3,61E+02	2,09E+00	8,73E+01	4,50E+02	2,84E+00	4,44E+02	2,10E+02	5,37E+03	6,69E-01	1,30E-01	6,23E+01	-1,15E+01
Human toxicity, cancer effects	CTUh	4,73E-08	7,74E-11	2,69E-09	5,00E-08	9,86E-11	6,02E-09	2,34E-09	1,55E-07	3,67E-11	4,52E-12	3,98E-10	-2,47E-10
Human toxicity, non-cancer effects	CTUh	4,21E-07	2,12E-09	3,96E-08	4,62E-07	2,93E-09	4,40E-07	2,12E-07	4,43E-06	4,59E-10	1,34E-10	2,07E-08	-1,22E-08
Land use related impacts / Soil quality	Pt	2,26E+01	2,28E+00	5,90E+00	3,08E+01	3,22E+00	9,32E+01	6,19E+00	1,43E+03	2,05E-01	1,48E-01	1,21E+00	-9,80E-01

2.4 Scenarios and additional technical information

The investigated product system is the COOL-FIT 2.0F comprising of a system of components listed in 1.3, designed for air conditioning and manufactured across various locations in Germany and Switzerland.

Product stage	
A1	The production of the raw material was modeled using generic European data (source: ecoinvent) and complemented by specific data from GF Piping Systems to consider the company specific combination of raw materials.
A2	Wherever possible, the specific transport distances were taken into account. Data from ecoinvent with the respective parameters was used to model the transportation of raw materials and pre-products, including all packaging materials, to GF manufacturing sites in Germany and Switzerland. Data of an average lorry (EURO5) and average load factor from ecoinvent was selected. For sea freight, the average container ship was selected.
A3	In the module A3, the COOL-FIT 2.0F is manufactured across a number of locations in Switzerland and Germany. Pipes are produced by an external manufacturer located in Switzerland. The outer jackets for the COOL-FIT 2.0F are produced in Dautphetal, Germany. Fittings are produced in Schaffhausen, Switzerland. For a certain portion of the electricity consumption, a guarantee of origin allowed for a calculation of electricity using the exact source (hydropower). Where the energy source was not known, the average medium voltage electricity mix for Switzerland and Germany respectively was used. Disposal of waste which was incurred during manufacturing (including production scraps and to some extent packaging) was calculated according to specific scenarios estimated by production specialists at GF Piping systems. The production of components purchased from external suppliers was modeled using generic ecoinvent data for the process in question.

Construction process	
A4	After the manufacturing process the pipes are first sent to a distribution center in Schaffhausen, Switzerland, where the fittings are produced. From there, these components are transported to a retailer in Reinsdorf, Germany. It is assumed that other components are transported directly from the production site to the retailer in Reinsdorf, Germany and finally to the installation site in Oelsnitz, Germany. The mode of transportation is truck, whereby an average lorry (EURO5) and average load factor from ecoinvent were used for the calculation.
A5	At the installation site in Oelsnitz, Germany, the COOL-FIT 2.0F is installed into the reference building. Installation waste and waste from packaging is disposed of in this stage. Average data relating to disposal scenarios in Germany were used (scenarios listed under C3). This stage also involves the introduction of a refrigerant into the system where specific information is available for the consumption thereof. Some energy is required for welding activities whereby the average medium voltage electricity mix for Germany is used. Estimations made by an internal installation expert were used to derive estimates for the transportation requirements for construction staff. For the transportation of construction staff, an average passenger vehicle was used for the calculation.

Use stage	
B1	Environmental impacts in the use phase are derived from the need for replacement of 2 % of the refrigerant solution per annum over the 25 year reference life. Specific information is used to account for the liquid refrigerant lost each year as well as the emissions to air that are caused through this loss.

B2-B5	The system is designed to be operated without repair, maintenance, replacement or refurbishment during the reference service life. This is subject to the condition that the system is operated according to the specifications given by GF Piping Systems. Therefore, these stages are considered as not relevant.
B6	Operational energy use represents a significant process within the use stage. Here, electricity is consumed on the one hand through circulating pumps which are required to circulate the refrigerant throughout the system. On the other hand, another minimal amount of electricity is consumed through chillers that are required to compensate for heat lost through the system during the 25 years of reference service life. The circulating pump requires significant electricity consumption, as the refrigerant fluid is circulated 24 hours per day for the entire 25 years of reference service life. As the exact electricity mix during the use phase is unknown, the average medium voltage electricity mix for Germany, where the system is installed, was used.
B7	No operational water use is necessary for the system. Therefore, this stage is considered as not relevant.

End of life stage	
C1	Deconstruction of the system is mainly manual work. Estimations made by an internal installation expert were used to derive estimates for the transportation requirements for construction staff. For the transportation of construction staff, an average passenger vehicle was used for the calculation. A minimal amount of energy input is also required to cut the pipes.
C2	An average distance of 20 km was assumed as a conservative estimate of the distance required to transport the materials to an appropriate disposal site within the city of Oelsnitz, Germany. The mode of transportation is truck, whereby an average lorry (EURO5) and average load factor from ecoinvent were used for the calculation.
C3	The following table summarizes End-of-Life scenarios for different material categories included in the COOL-FIT 2.0F system. Calculations are based on average data for Germany for each of the processes (i.e. recycling and incineration of the respective material categories).
C4	It is assumed that materials are recycled or incinerated according to the scenarios defined under C3. Therefore module C4 is not relevant.

C3 scenarios:

Material category	**Scenarios**
Ferrous and non-ferrous metals	100 % recycling
HDPE, GF-HE, PVC-U and other plastics	40 % recycling 60 % incineration

2.5 Parameters describing resource use

Parameters describing resource use		Product stage				Construction process stage		Use stage		End of life			Beyond the system boundaries
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Use	Operational Energy Use	Deconstruction	Transport	Waste processing	Reuse-Recovery-Recycling-Potential
		A1	A2	A3	A1-3	A4	A5	B1	B6	C1	C2	C3	D
Primary energy resources – Renewable: Use as energy carrier	MJ, net calorific value	8,69E+00	3,60E-02	5,50E+00	1,42E+01	4,98E-02	2,41E+01	2,92E+00	1,45E+03	1,31E-02	2,28E-03	1,64E-01	-3,45E+00
Primary energy resources – Renewable: Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Primary energy resources – Renewable: Total	MJ, net calorific value	8,69E+00	3,60E-02	5,50E+00	1,42E+01	4,98E-02	2,41E+01	2,92E+00	1,45E+03	1,31E-02	2,28E-03	1,64E-01	-3,45E+00
Primary energy resources – Non-renewable: Use as energy carrier	MJ, net calorific value	2,10E+02	2,90E+00	1,47E+01	2,27E+02	3,88E+00	1,13E+02	4,72E+01	7,39E+03	5,22E-01	1,78E-01	2,48E+00	-7,24E+01
Primary energy resources – Non-renewable: Used as raw materials	MJ, net calorific value	2,99E-01	0,00E+00	4,85E-02	3,47E-01	1,04E-03	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Primary energy resources – Non-renewable: Total	MJ, net calorific value	2,10E+02	2,90E+00	1,48E+01	2,28E+02	3,89E+00	1,13E+02	4,72E+01	7,39E+03	5,22E-01	1,78E-01	2,48E+00	-7,24E+01
Secondary material	kg	2,16E-04	0,00E+00	0,00E+00	2,16E-04	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Renewable secondary fuels	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water	M3	1,43E-01	2,80E-04	1,82E-02	1,61E-01	3,84E-04	1,05E-01	4,53E-02	1,10E+00	1,14E-04	1,76E-05	4,76E-02	-1,76E-02

2.6 Parameters describing waste production

Parameters describing waste production		Product stage				Construction process stage		Use stage		End of life			Beyond the system boundaries
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Use	Operational Energy Use	Deconstruction	Transport	Waste processing	Reuse-Recovery-Recycling-Potential
		A1	A3	A3	A1-3	A4	A5	B1	B6	C1	C2	C3	D
Hazardous waste disposed	kg	1,95E-04	6,64E-06	2,32E-05	2,24E-04	9,26E-06	1,20E-04	4,29E-05	9,42E-03	2,15E-06	4,24E-07	5,88E-06	-2,05E-05
Non-hazardous waste disposed	kg	1,52E+00	1,66E-01	1,92E-01	1,88E+00	2,35E-01	8,01E-01	2,69E-01	3,26E+01	1,24E-02	1,08E-02	3,82E-01	6,99E-02
Radioactive waste disposed	kg	2,33E-04	1,87E-05	6,70E-05	3,19E-04	2,50E-05	2,84E-04	1,12E-04	2,69E-02	2,91E-06	1,15E-06	9,86E-06	-5,80E-05

2.7 Parameters describing output flows

Parameters describing output flows		Product stage				Construction process stage		Use stage		End of life		
		Raw material supply	Transport	Manufacturing	Total (of product stage)	Transport	Construction installation	Use	Operational Energy Use	Deconstruction	Transport	Waste processing
		A1	A3	A3	A1-3	A4	A5	B1	B6	C1	C2	C3
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material recycling	kg	0,00E+00	0,00E+00	2,63E-02	2,63E-02	0,00E+00	1,57E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	9,68E-01
Materials for energy recovery	kg	0,00E+00	0,00E+00	1,53E-01	1,53E-01	0,00E+00	8,45E-01	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,25E+00
Exported energy, electricity	MJ	0,00E+00	0,00E+00	5,96E-01	5,96E-01	0,00E+00	2,33E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	4,78E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	1,56E+00	1,56E+00	0,00E+00	6,10E+00	0,00E+00	0,00E+00	0,00E+00	0,00E+00	1,25E+01

References

CEN. (2019). DIN EN 15804:2020-03, Nachhaltigkeit von Bauwerken- Umweltproduktdeklarationen- Grundregeln für die Produktkategorie Bauprodukte; Deutsche Fassung EN_15804:2012+A2:2019. Beuth Verlag GmbH.

EPD International. (2019). Product Category Rules (PCR) – Construction Products.

Panda, Achyut K., et al. "Thermolysis of Waste Plastics to Liquid FuelA Suitable Method for Plastic Waste Management and Manufacture of Value Added Products—A World Prospective." Renewable and Sustainable Energy Reviews, no. 1, Elsevier BV, Jan. 2010, pp. 233–48. Crossref, doi:10.1016/j.rser.2009.07.005.

Umweltbundesamt. "THE ROLE OF WASTE INCINERATION IN GERMANY". 2008, https://www.umweltbundesamt.de/sites/default/files/medien/publikation/long/3872.pdf.

GF Piping Systems

Georg Fischer Piping Systems Ltd
Ebnatstrasse 111
8201 Schaffhausen / Switzerland
Phone +41 52 631 11 11
sustainability.ps@georgfischer.com
www.gfps.com