Environmental Product Declaration

Sloan Valve Company | Optima® EBF Sensor Faucets

Declaration Owner
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Product
Sloan Optima® EBF Sensor Faucets

Functional Unit
1 packaged, installed unit with a Reference Service Life of 10 years in a building with an Estimated Service Life of 75 years

EPD Number and Period of Validity
SCS-EPD-09756
EPD Valid January 10, 2024 through January 9, 2029
Version Date: July 21, 2025

Product Category Rule
UL. PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. December 2018.
UL PCR Guidance for Building-Related Products and Services Part B: Kitchen and Bath Fixture Fittings and Accessory Products EPD Requirements. Version 1.0. October 2020.

Program Operator
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Version Date:	July 21, 2025
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Beth Cassese, SCS Global Services
LCA Software and LCI database:	OpenLCA 2.0.3 software and the Ecoinvent v3.9.1 database
Product's Intended Application:	Fitting designed to discharge a specific volume of water into a lavatory.
Product RSL:	10 Years (ESL 75 Years)
Markets of Applicability:	North America
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Grave
LCIA Method and Version:	CML-IA Baseline and TRACI 2.1
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒ external
LCA Reviewer:	Thomas Gloria, PhD., Industrial Ecology Consultants
Product Category Rule:	UL PCR Guidance for Building-Related Products and Services Part B: Kitchen and Bath Fixture Fittings and Accessory Products EPD Requirements. Version 1.0. October 2020.
PCR Review conducted by:	Jim Mellentine, Angela Fisher, Christopher Marozzi
Independent verification of the declaration and data, according to ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Thomas Gloria, PhD., Industrial Ecology Consultants
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Comparability: *The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.*

In accordance with ISO 21930:2017, EPDs are comparable only if they comply with the core PCR, use the same sub-category PCR where applicable, include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works. The owner of the declaration shall be liable for the underlying information and evidence; SCS shall not be liable with respect to manufacturer information, life cycle assessment data, and evidence supplied or made available to SCS.

1. ABOUT Sloan

Sloan is the world's leading manufacturer of commercial plumbing systems and has been in operation since 1906. Headquartered in Franklin Park, Illinois, USA, the company is at the forefront of the green building movement and provides smart, sustainable restroom solutions by manufacturing water-efficient products such as flushometers, electronic faucets, sink systems, soap dispensing systems, and vitreous china fixtures for commercial, industrial, and institutional markets worldwide.

The Sloan Optima® EBF sensor faucets are manufactured in Zhejiang, China.

2. PRODUCT

2.1 Product Description

Sloan faucet products belong to the Commercial Plumbing Fixtures specification code, CSI code 22 42 39 and the UNSPSC code 30181700.

A faucet is a fitting designed for discharge of a specific volume of water into a lavatory that is turned on mechanically or electronically, and intended to be installed in non-residential bathrooms that are exposed to walk-in traffic. The volume or cycle duration can be fixed or adjustable. Lavatory faucets are used primarily for hand washing or simple rinsing. Optima® faucets feature a cast brass spout, quick connect fittings, infrared sensors and integrated water shut-off. The product systems under study include the following products.

		
EBF 415	**EBF 425**	**EBF 650**

Table 1. *Sloan Optima EBF sensor faucet models represented in this EPD.*

Model	Flow Rates	Power Source
EBF 415	0.35 gpm/1.3 Lpm 0.5 gpm/1.9 Lpm	Battery
EBF 425	0.35 gpm/1.3 Lpm 0.5 gpm/1.9 Lpm	Battery
EBF 650	0.35 gpm/1.3 Lpm 0.5 gpm/1.9 Lpm 2.2 gpm/8.3 Lpm	Battery

*gpm=gallons per minute | Lpm=Liters per minute

2.2 Application

Sloan sensor faucets are designed for use with lavatories as the dispensing unit for the water supplied. The faucets are primarily installed in commercial, industrial, and institutional markets worldwide.

2.3 Representative Product

All three of the Optima® EBF sensor faucet product lines share similar raw material component breakdown, mass, and the same manufacturing process, with the main differences being the internal configurations and slight shape changes to the exterior design. An average product was calculated as the representative product for the sensor faucet in this study.

2.4 Flow Diagram

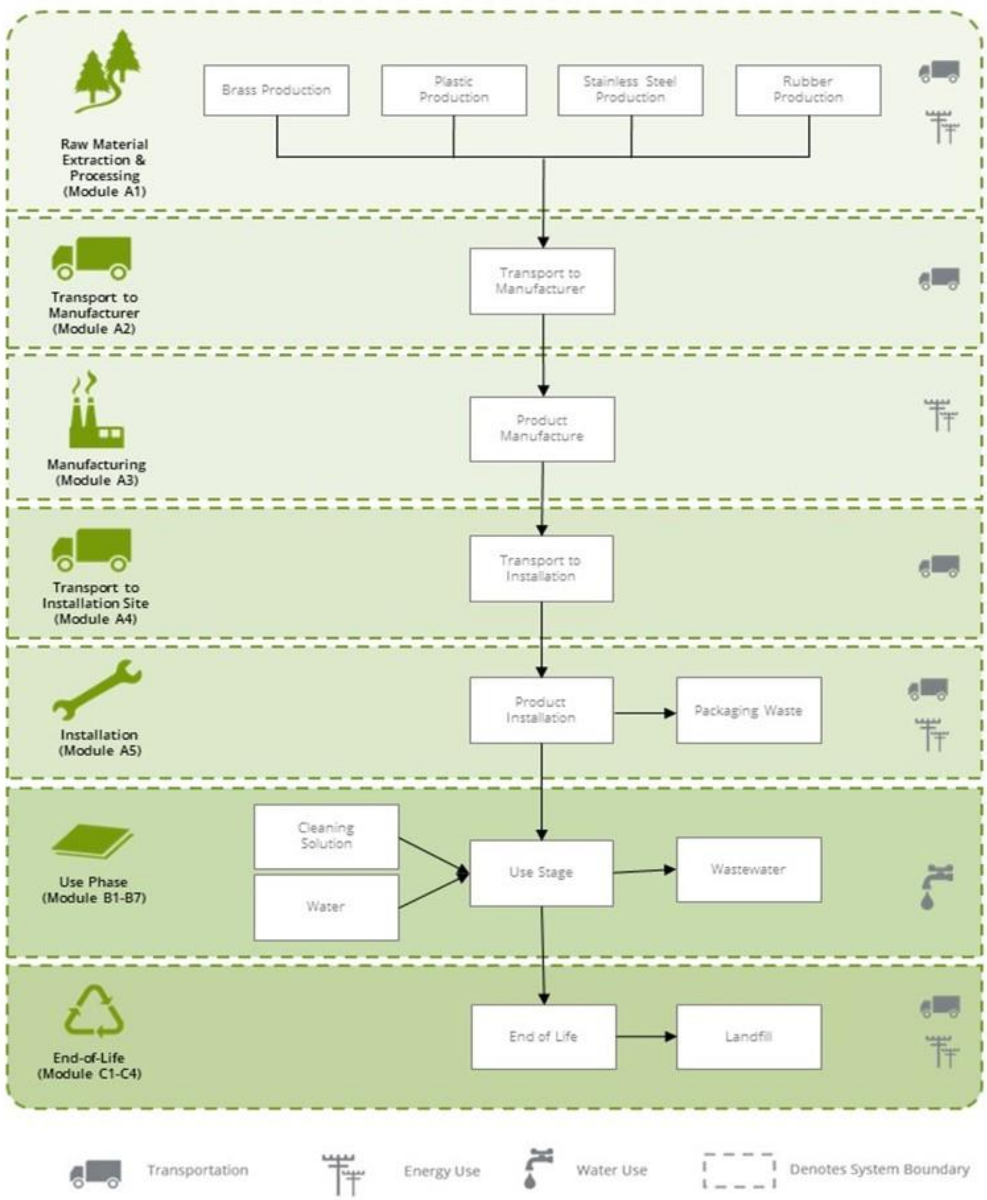

Figure 1. *Flow diagram for the Sloan Optima EBF sensor faucets.*

2.5 Material Composition

Table 2. *Sloan Optima® EBF sensor faucet material components.*

Material	Mass (kg)	Percentage of Total Mass	Pre-Consumer Recycled Content	Post-Consumer Recycled Content
Brass	1.25	55.3%	0%	0%
Plastic	0.627	27.6%	0%	0%
Stainless Steel	0.294	13.0%	0%	0%
Steel	0.020	0.90%	0%	0%
Battery	0.020	0.88%	0%	0%
EPDM	0.019	0.83%	0%	0%
Acetal	0.014	0.63%	0%	0%
Rubber	0.011	0.47%	0%	0%
NBR	0.006	0.28%	0%	0%
HDPE	0.003	0.13%	0%	0%
Total	**2.27**	**100%**	-	-

2.5 Technical Requirements

Table 3. *Sloan Optima® EBF Sensor Faucet Technical Requirements.*

Property	Test Method	Unit	Value
Flow rate		Gallons per minute Liters per minute	0..35, 0.5, 2.2 1.3, 1.9, 8.3

3. LCA: METHODOLOGICAL FRAMEWORK

3.1 Functional Unit

The functional unit used in the study is one (1) packaged, installed unit with a reference service life (RSL) of 10 years. The building estimated service life (ESL) is assumed to be 75-years in order to be consistent with ASHRAE 189.1 (2014, Section 9.5.1).

Table 4. *Sloan Optima® EBF Sensor Faucet Functional Unit Properties.*

Property	Unit	Value
Functional Unit	One (1) packaged, installed product	
RSL	Years	10
ESL	Years	75
Mass	kg	2.27

3.2 System Boundary

The scope of the EPD is cradle-to-grave, including raw material extraction and processing; raw material transportation; product manufacture, including packaging; product distribution; installation; use; and end-of-life.

Table 5. *Sloan Optima® EBF Sensor Faucet System Boundaries.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	MND

X = Included in system boundary
MND = Module not declared

3.3 Allocation

Manufacturing resource use was allocated to the products based on mass. Impacts from transportation were allocated based on the mass of material and distance transported.

3.3 Cut-off criteria

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results.

3.4 Data Sources

Primary data were provided by the manufacturing facility in Zhejiang, China. The principal source of secondary LCI data is the Ecoinvent 3.9.1 database.

Table 6. *LCI datasets and associated databases used to model the Sloan Sensor Faucet products.*

Component	Dataset	Geography	Data Source	Date
Product				
Acetal	market for polypropylene, granulate | polypropylene, granulate | Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for injection moulding | injection moulding | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Battery	market for battery cell, Li-ion, LiMn2O4 | battery cell, Li-ion, LiMn2O4 | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Brass	market for brass | brass | Cutoff, U	RoW†	Ecoinvent 3.9.1	2022
	market for casting, brass | casting, brass | Cutoff, U	Global	Ecoinvent 3.9.1	2022
EPDM	market for synthetic rubber | synthetic rubber | Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for injection moulding | injection moulding | Cutoff, U	Global	Ecoinvent 3.9.1	2022
HDPE	market for polyethylene, high density, granulate | polyethylene, high density, granulate | Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for injection moulding | injection moulding | Cutoff, U	Global	Ecoinvent 3.9.1	2022
NBR	market for synthetic rubber | synthetic rubber | Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for injection moulding | injection moulding | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Plastic	market for polypropylene, granulate | polypropylene, granulate | Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for injection moulding | injection moulding | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Rubber	market for synthetic rubber | synthetic rubber | Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for injection moulding | injection moulding | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Stainless Steel	market for steel, chromium steel 18/8, hot rolled | steel, chromium steel 18/8, hot rolled Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for metal working, average for chromium steel product manufacturing | metal working, average for chromium steel product manufacturing | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Steel	market for steel, low-alloyed | steel, low-alloyed | Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for metal working, average for steel product manufacturing | metal working, average for steel product manufacturing | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Package				
Cardboard	market for containerboard, unspecified | containerboard, unspecified | Cutoff, U	United States	Ecoinvent 3.9.1	2022
Paper	market for kraft paper | kraft paper | Cutoff, U	RoW	Ecoinvent 3.9.1	2022
PE Plastic	market for packaging film, low density polyethylene | packaging film, low density polyethylene | Cutoff, U	Global	Ecoinvent 3.9.1	2022
PP Plastic	market for polypropylene, granulate | polypropylene, granulate | Cutoff, U	Global	Ecoinvent 3.9.1	2022
	market for extrusion of plastic sheets and thermoforming, inline | extrusion of plastic sheets and thermoforming, inline | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Transport				
Ship	market for transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U	Global	Ecoinvent 3.9.1	2022
Truck	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U	RoW	Ecoinvent 3.9.1	2022
Manufacture				
Electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U	East China	Ecoinvent 3.9.1	2022
Water	market for tap water | tap water | Cutoff, U	RoW	Ecoinvent 3.9.1	2022
Waste				
Hazardous Waste	market for hazardous waste, for incineration | hazardous waste, for incineration | Cutoff U	RoW	Ecoinvent 3.9.1	2022
Landfill	market for inert waste, for final disposal | inert waste, for final disposal | Cutoff, U	RoW	Ecoinvent 3.9.1	2022
Wastewater	market for wastewater, average | wastewater, average | Cutoff, U	RoW	Ecoinvent 3.9.1	2022

†Rest of World

3.5 Data Quality

Table 7. *Data Quality Assessment.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The manufacturer provided primary data on product manufacturing for the manufacturing facility on annual production for 2022. Representative datasets (secondary data) for upstream and background processes are generally less than 5 years old.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data modelled for the specific electricity grids represented in this study. Surrogate data used in the assessment are representative of global or European operations and are considered sufficiently similar to actual processes.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations. Representative component datasets, specific to the type of material, are used to represent the actual processes, as appropriate.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the products. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. Data sources of similar quality and age are used; with a bias towards Ecoinvent v3.9.1 data where available. Different portions of the product life cycle are equally considered.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of the data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing energy use at the manufacturing facilities represent a 12-month average and are considered of high quality due to the length of time over which these data are collected, as compared to a snapshot that may not accurately reflect fluctuations in production. For secondary LCI data, Ecoinvent v3.9.1 data are used.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in the products and packaging is low. Actual supplier data for upstream operations was not available for all suppliers and the study relied upon the use of existing representative datasets. These datasets contained relatively recent data (<10 years) but lacked geographical representativeness. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment methodology includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

3.6 Period under review

The period of review is based on a 12-month period from January 2022 through December 2022.

3.7 Comparability

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

3.8 Estimates and Assumptions

- Specific data were not available on acetal polymers in the product recipe. Secondary datasets for polypropylene were used from the Ecoinvent database to represent these polymers in the LCA model.
- Specific data were not available on EPDM and NBR in the product recipe. Secondary datasets for synthetic rubber were used from the Ecoinvent database to represent these materials in the LCA model.
- Specific data were not available for the generic plastic included in the product recipe. Secondary datasets for polypropylene were used from the Ecoinvent database to represent the material in the LCA model.
- Product transport from point of purchase to the building site is assumed to be 500 km by truck as required by the Part B PCR.
- Product transport from the Sloan distribution centers in Los Angeles, CA and New York, NY to points of purchase was assumed to be 4500 km by truck, representing the assumed longest distance across the United States.
- Product transport from the manufacturing site to a sea port for ocean transport is assumed to be 280 km by truck.
- Ocean transport of the product is assumed to be 10,571 km for products manufactured in the manufacturing facility.
- Installation of the products is assumed to be manual, requiring no additional materials or energy use.
- Transport of the packaging waste at installation is assumed to be 100 km by truck as required by the Part B PCR.
- Transport of the product at end-of-life to waste processing and disposal is assumed to be 100 km by truck as required by the Part B PCR.
- The Reference Service Life (RSL) of the products was modeled as 10 years, as required by the Part B PCR.
- The Estimated Service Life (ESL) of the building/construction works was assumed to be 75 years, as required by the Part B PCR, in order to be consistent with ASHRAE 189.1 (2014, Section 9.5.1).
- The maintenance of the products is assumed to include daily cleaning with a cleaning solution of 10 ml of 1% sodium lauryl sulfate solution as specified in the Part B PCR.
- The repair of the products is assumed to include the replacement battery component parts, including an assumed 50 km by truck transport, 2 times over the RSL, according to manufacturer experts.
- The products are assumed to require no replacement during the 10-year RSL, but in accordance with the Part A PCR and Part B PCR, requires replacement 6.5 times over the 75-year ESL.
- The use phase module B5 (Refurbishment) is assumed to have no impacts, as there is no resource or energy use associated with this module.
- The use phase modules are modelled for the building/construction works ESL of 75 years.
- For the product end-of-life, disposal of product is assumed to follow the disposal scenario indicated in the Part A PCR.

4. LCA: TECHNICAL INFORMATION AND SCENARIOS

4.1 Manufacture

This module includes the manufacturing, assembly and packaging of the Optima® EBF sensor faucets at the manufacturing facility in Zhejiang, China.

4.2 Packaging

Table 8. *Sloan Optima® EBF Sensor Faucet Packaging Material Components.*

Packaging material	Mass (kg)	Percentage of Total Mass	Pre-Consumer Recycled Content	Post-Consumer Recycled Content
Cardboard	1.35	95%	3%	5%
Paper	0.042	2.9%	3%	5%
Polyethylene	0.025	1.8%	3%	5%
Polypropylene	0.002	0.1%	3%	5%
Total	**1.42**	**100%**	**-**	**-**

4.3 Transportation

Table 9. *Sloan Optima® EBF Sensor Faucet Transportation Summary.*

Name	Unit	Value
Vehicle Type	-	Freight Truck
Liters of fuel	l/100 km	18.7
Fuel Type	-	Diesel
Transport Distance	km	5280
Factory to Port (assumed)	*km*	*280*
Port to Distribution (assumed)	*km*	*4500*
Point of purchase to installation (per PCR)	*km*	*500*
Capacity utilization	%	50
Vehicle Type	-	Ocean Freighter
Liters of fuel	l/100 km	0.41
Fuel Type	-	Heavy Fuel Oil
Transport Distance	km	10,571
Port to Port (assumed)	*km*	*10,571*
Capacity utilization	%	n/a
Gross mass of products transported[1]	kg	3.69

[1] including packaging

4.4 Installation

The installation of the sensor faucet products is completed using manual labor and does not require additional ancillary materials. Waste is generated from the disposal of the packaging materials and is modeled as required in the Part A PCR.

Table 10. *Sloan Optima® EBF Sensor Faucet Installation Summary.*

Name	Unit	Value
Ancillary materials	kg	0
Net freshwater consumption specified by water source and fate	m^3	0
Other resources	kg	0
Electricity consumption	kwh	0
Other energy carriers	MJ	0
Product loss per functional unit	kg	0
Waste materials at the construction site before waste processing, generated by product installation	kg	0
Output materials resulting from on-site waste processing	kg	0
Mass of packaging waste specified by type	kg	1.42
Recycle	kg	*1.05*
Landfill	kg	*0.297*
Incineration	kg	*0.074*
Biogenic carbon contained in packaging	kg CO_2	2.56
Direct emissions to ambient air, soil, and water	kg	0
VOC emissions	μg/m^3	0

4.5 Use

Table 11. *Sloan Optima® EBF Sensor Faucet Maintenance Summary.*

Maintenance	Unit	Value
Description of process	-	Daily cleaning with 10 ml 1% sodium lauryl sulfate solution
Maintenance cycle	Cycles/RSL	3650
Maintenance cycle	Cycles/ESL	27,375
Net freshwater consumption		
City water disposed to sewer	m^3	0.036
Ancillary materials		
Sodium lauryl sulfate solution	kg	0.365
Other resources	kg	0
Energy input	kWh	0
Other energy carriers	kWh	0
Power output of equipment	kW	0
Waste materials from maintenance	kg	0
Direst emissions to ambient air, soil, and water	kg	0
Further assumptions for scenario development	-	-

Table 12. *Sloan Optima® EBF Sensor Faucet Repair Summary.*

Repair	Unit	Value
Repair process information	-	Per manufacturer, batteries may require 2 replacements per RSL to repair product
Inspection process information	-	N/A
Repair cycle	Cycles/RSL	2
Repair cycle	Cycles/ESL	15
Net freshwater consumption	m^3	0
Ancillary materials	kg	0.040
Battery	kg	0.040
Energy input	kWh	0
Waste materials from repair	kg	0.040
Landfill	kg	0.040
Direct emissions to ambient air, soil, and water	kg	0
Further assumption for scenario development	-	-

Table 13. *Sloan Optima® EBF Sensor Faucet Replacement Summary.*

Replacement	Unit	Value
Reference Service Life	Years	10
Replacement cycle (ESL/RSL)-1	-	6.5
Energy input	kWh	0
Net freshwater consumption	m^3	0
Ancillary materials	kg	0
Replacement of materials	kg	2.27
Direct emissions to ambient air, soil, and water	kg	0
Further assumptions for scenario development	-	-

Table 14. *Sloan Optima® EBF Sensor Faucet Refurbishment Summary.*

Refurbishment	Unit	Value
Refurbishment process	-	N/A
Refurbishment cycle	Cycles/RSL	0
Refurbishment cycle	Cycles/ESL	0
Energy input	kWh	0
Net freshwater consumption	m^3	0
Material input	kg	0
Waste materials	kg	0
Direct emissions to ambient air, soil, and water	kg	0
Further assumption for scenario development	-	-

Table 15. *Sloan Optima® EBF Sensor Faucet Operational Energy and Water Use Summary.*

Operational Energy and Water Use	Unit	Lavatory Faucet Products		
		0.35 gpm (1.3 Lpm)	0.5 gpm (1.9 Lpm)	2.2 gpm (8.3 Lpm)
Net freshwater consumption				
City water to sewer	m^3/RSL	77.5	111	487
Ancillary materials	kg	0	0	0
Energy input	kWh	3,107	4,438	19,527
Equipment power output	kW	0	0	0
Characteristic performance	-	-	-	-
Direct emissions to ambient air, soil, water	kg	0	0	0
Further assumptions for scenario development (per PCR)	water use is assumed 70% hot water, 30% cold water heating for hot water is assumed 50% electricity (0.1765 kwh per gallon), 50% natural gas (0.8784 mcf per 1000 gallons)			
Number of users per product	30			
Number of uses per user per day	3			
Number of use days per year	260			

4.6 End-of-Life

Table 16. *Sloan Optima® EBF Sensor Faucet End-of-Life Summary.*

End-of-life		Unit	Value
Assumptions for scenario development			Manual deconstruction, followed by 100 km truck transport to final disposal in landfill
Collection process	Collected separately	kg	0
	Collected with mixed construction waste	kg	2.27
Recovery	Reuse	kg	0
	Recycling	kg	0
	Landfill	kg	2.27
	Incineration	kg	0
	Incineration with energy recovery	kg	0
	Energy conversion	-	-
Disposal	Product of material for final deposition	kg	2.27
Removals of biogenic carbon (excluding packaging)		kg CO_2	0

5. LCA: Results

Results of the Life Cycle Assessment are presented below. It is noted that LCA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks. All LCA results are stated to three significant figures in agreement with the PCR for this product and therefore the sum of the total values may not exactly equal 100%. Modules with zero (0) impacts: B1, B5, C1, and C3 are omitted from the results tables. Module B6 and B7, Operational Energy Use and Operational Water Use, are reported separately for the various flow rate applications available.

The following environmental impact category indicators are reported using characterization factors using the CML-IA impact assessment method and the TRACI 2.1 impact assessment method. Note that for global warming calculations, the CML characterization factors are based on IPCC 2013, while TRACI 2.1 global warming calculations are based on IPCC 2007. Note also that neither characterization method includes biogenic carbon uptake or biomass CO2 emissions. Based on the component materials of the product and production processes, there are no impacts associated with land-use changes, nor are environmental impacts associated with carbonation relevant for the product system.

Table 17. *Mandatory Environmental Impact Assessment Categories.*

CMLI-A Impact Category	Unit	TRACI 2.1 Impact Category	Unit
GWP: Global Warming Potential	kg CO_2 eq.	**GWP:** Global Warming Potential	kg CO_2 eq.
ODP: Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	**ODP:** Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.
AP: Acidification Potential of soil and water	kg SO_2 eq.	**AP:** Acidification Potential of soil and water	kg SO_2 eq.
EP: Eutrophication Potential	kg PO_4^{3-} eq.	**EP:** Eutrophication Potential	kg N eq.
POCP: Photochemical Oxidant Creation Potential	kg C_2H_4 eq.	**SFP:** Smog Formation Potential	kg O_3 eq.
ADPE: Abiotic Depletion Potential, elements	kg Sb eq	**FFD:** Fossil Fuel Depletion	MJ Surplus
ADPF: biotic Depletion Potential, fossil fuels	MJ		

These impact categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes. The following inventory parameters, specified by the PCR, are also reported.

Table 18. *Additional Transparency Categories.*

Resources	Unit	Waste and Outflows	Unit
RPR_E: Renewable primary resources used as energy carrier (fuel)	MJ, LHV	**HWD:** Hazardous waste disposed	kg
RPR_M: Renewable primary resources with energy content used as material	MJ, LHV	**NHWD:** Non-hazardous waste disposed	kg
$NRPR_E$: Non-renewable primary resources used as an energy carrier (fuel)	MJ, LHV	**RWD:** Radioactive waste, conditioned, to final repository	kg
$NRPR_M$: Non-renewable primary resources with energy content used as material	MJ, LHV	**CRU:** Components for re-use	kg
SM: Secondary materials	kg	**MR:** Materials for recycling	kg
RSF: Renewable secondary fuels	MJ, LHV	**MER:** Materials for energy recovery	kg
NRSF: Non-renewable secondary fuels	MJ, LHV	**EE:** Recovered energy exported from the product system	kg
RE: Recovered energy	MJ, LHV	**EE:** Recovered energy exported from the product system	MJ, LHV
FW: Use of new freshwater resources	m^3		

Sloan Optima® EBF Sensor Faucet Results

Table 19. *Impact indicator results for Sloan Optima® EBF Sensor Faucets.*

CML Impact Method	GWP	ODP	AP	EP	POCP	ADPE	ADPF
	kg CO_2 eq	kg CFC-11 eq	kg SO_2 eq	kg PO_4^{3-} eq	kg C_2H_4 eq	kg Sb eq	MJ
A1	16.4	1.92×10^{-7}	0.536	0.198	0.021	0.010	214
A2	0.476	6.25×10^{-9}	0.003	5.27×10^{-4}	1.10×10^{-4}	1.38×10^{-6}	6.55
A3	8.83	8.29×10^{-8}	0.035	0.010	0.002	9.66×10^{-6}	85.3
A1-A3 Total:	**25.7**	**2.82×10^{-7}**	**0.574**	**0.209**	**0.022**	**0.010**	**306**
A4	4.09	5.39×10^{-8}	0.021	0.004	8.38×10^{-4}	1.23×10^{-5}	56.7
A5	0.068	5.03×10^{-10}	1.18×10^{-4}	4.86×10^{-5}	5.53×10^{-6}	9.82×10^{-8}	0.460
B2	6.67	1.02×10^{-7}	0.024	0.008	0.002	4.30×10^{-5}	150
B3	0.003	5.70×10^{-11}	1.42×10^{-5}	3.43×10^{-6}	7.45×10^{-7}	5.66×10^{-9}	0.059
B4	194	2.19×10^{-6}	3.87	1.39	0.151	0.064	2360
C2	0.043	5.71×10^{-10}	1.40×10^{-4}	3.59×10^{-5}	6.77×10^{-6}	1.39×10^{-7}	0.604
C4	0.021	4.31×10^{-10}	1.07×10^{-4}	2.60×10^{-5}	5.64×10^{-6}	4.28×10^{-8}	0.447

TRACI Impact Method	GWP	ODP	AP	EP	SFP	FFD
	kg CO_2 eq	kg CFC-11 eq	kg SO_2 eq	kg N eq	kg O_3 eq	MJ Surplus
A1	16.2	2.63×10^{-7}	0.483	0.438	2.50	22.0
A2	0.473	8.24×10^{-9}	0.003	4.67×10^{-4}	0.074	0.937
A3	8.69	1.84×10^{-7}	0.040	0.019	0.607	4.68
A1-A3 Total:	**25.4**	**4.55×10^{-7}**	**0.526**	**0.458**	**3.18**	**27.6**
A4	4.06	7.11×10^{-8}	0.024	0.004	0.554	8.09
A5	0.068	6.42×10^{-10}	1.43×10^{-4}	7.97×10^{-5}	0.004	0.065
B2	6.65	1.22×10^{-7}	0.026	0.034	0.352	19.8
B3	0.003	7.57×10^{-11}	1.72×10^{-5}	3.33×10^{-6}	4.59×10^{-4}	0.009
B4	192	3.43×10^{-6}	3.58	2.99	24.3	233
C2	0.043	7.52×10^{-10}	1.68×10^{-4}	4.04×10^{-5}	0.004	0.086
C4	0.021	5.73×10^{-10}	1.30×10^{-4}	2.52×10^{-5}	0.003	0.065

Table 20. *Additional Resource Use and Waste indicators for the Sloan Optima® EBF Sensor Faucets.*

Resource Use	RPR_E	RPR_M	$NRPR_E$	$NRPR_M$	SM	RSF	NRSF	RE	FW
	MJ	MJ	MJ	MJ	kg	MJ	MJ	MJ	m^3
A1	42.9	0.00	241	0.00	0.00	0.00	0.00	0.00	0.333
A2	0.080	0.00	6.64	0.00	0.00	0.00	0.00	0.00	7.81×10^{-4}
A3	28.6	0.00	100	0.00	0.114	0.00	0.00	0.00	0.062
A1-A3 Total:	**71.6**	**0.00**	**348**	**0.00**	**0.114**	**0.00**	**0.00**	**0.00**	**0.395**
A4	0.704	0.00	57.5	0.00	0.00	0.00	0.00	0.00	0.007
A5	0.006	0.00	0.466	0.00	0.00	0.00	0.00	0.00	1.81×10^{-4}
B2	5.05	0.00	158	0.00	0.00	0.00	0.00	0.00	0.338
B3	6.51×10^{-4}	0.00	0.060	0.00	0.00	0.00	0.00	0.00	5.09×10^{-5}
B4	470	0.00	2640	0.00	0.741	0.00	0.00	0.00	1.70
C2	0.008	0.00	0.612	0.00	0.00	0.00	0.00	0.00	7.72×10^{-5}
C4	0.005	0.00	0.453	0.00	0.00	0.00	0.00	0.00	3.85×10^{-4}

Waste & Output	HWD	NHWD	HLRW/ILLRW	CRU	MR	MER	EE
	kg	kg	kg	kg	kg	kg	MJ, LHV
A1	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A3	0.012	0.026	0.00	0.00	0.033	0.00	0.00
A1-A3 Total:	**0.012**	**0.026**	**0.00**	**0.00**	**0.033**	**0.00**	**0.00**
A4	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A5	0.00	0.372	0.00	0.00	1.05	0.00	0.00
B2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B3	0.00	0.00	0.00	0.00	0.00	0.00	0.00
B4	0.00	14.8	0.00	0.00	0.00	0.00	0.00
C2	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C4	0.00	2.27	0.00	0.00	0.00	0.00	0.00

Sloan Optima® EBF Sensor Faucet Results for Operational Energy and Water Use Modules (B6 and B7)

Table 21. *Impact indicator results for Sloan Optima® EBF Sensor Faucets Module B6 per ESL.*

CML Impact Method		Operational Energy Use		
		0.35 gpm	0.5 gpm	2.2 gpm
GWP	kg CO_2 eq	6,450	9,210	40,500
ODP	kg CFC-11 eq	4.59×10^{-5}	6.56×10^{-5}	2.88×10^{-4}
AP	kg SO_2 eq	13.3	18.9	83.3
EP	kg PO_4^{3-} eq	10.4	14.9	65.6
POCP	kg C_2H_4 eq	0.727	1.04	4.57
ADPE	kg Sb eq	0.039	0.056	0.244
ADPF	MJ	84,200	120,000	529,000
TRACI Impact Method		**Operational Energy Use**		
		0.35 gpm	**0.5 gpm**	**2.2 gpm**
GWP	kg CO_2 eq	6,400	9,140	40,200
ODP	kg CFC-11 eq	8.26×10^{-5}	1.18×10^{-4}	5.19×10^{-4}
AP	kg SO_2 eq	13.4	19.2	84.4
EP	kg N eq	22.9	32.7	144
SFP	kg O_3 eq	159	227	999
FFD	MJ Surplus	10,400	14,900	65,500

Table 22. *Additional Resource Use and Waste indicators for the Sloan Optima® EBF Sensor Faucets Module B6 per ESL.*

Resource Use		Operational Energy Use		
		0.35 gpm	0.5 gpm	2.2 gpm
RPR_E	MJ, LHV	10,000	14,300	62,800
RPR_M	MJ, LHV	0.00	0.00	0.00
$NRPR_E$	MJ, LHV	111,000	159,000	701,000
$NRPR_M$	MJ, LHV	0.00	0.00	0.00
SM	kg	0.00	0.00	0.00
RSF	MJ, LHV	0.00	0.00	0.00
NRSF	MJ, LHV	0.00	0.00	0.00
RE	MJ, LHV	0.00	0.00	0.00
FW	m^3	33.7	48.1	212
Waste & Output		**Operational Energy Use**		
		0.35 gpm	**0.5 gpm**	**2.2 gpm**
HWD	kg	0.00	0.00	0.00
NHWD	Kg	0.00	0.00	0.00
HLRW/ILLRW	kg	0.00	0.00	0.00
CRU	kg	0.00	0.00	0.00
MR	kg	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00
EE	MJ, LHV	0.00	0.00	0.00

Table 23. *Impact indicator results for Sloan Optima® EBF Sensor Faucets Module B7 per ESL.*

CML Impact Method		Operational Water Use		
		0.35 gpm	0.5 gpm	2.2 gpm
GWP	kg CO_2 eq	716	1,020	4,500
ODP	kg CFC-11 eq	1.70×10^{-4}	2.43×10^{-4}	0.001
AP	kg SO_2 eq	3.10	4.42	19.5
EP	kg PO_4^{3-} eq	1.12	1.61	7.06
POCP	kg C_2H_4 eq	0.162	0.232	1.02
ADPE	kg Sb eq	0.003	0.005	0.021
ADPF	MJ	7,600	10,900	47,800
TRACI Impact Method		**Operational Water Use**		
		0.35 gpm	**0.5 gpm**	**2.2 gpm**
GWP	kg CO_2 eq	709	1,010	4,450
ODP	kg CFC-11 eq	1.74×10^{-4}	2.49×10^{-4}	0.001
AP	kg SO_2 eq	3.21	4.59	20.2
EP	kg N eq	2.20	3.14	13.8
SFP	kg O_3 eq	44.6	63.7	280
FFD	MJ Surplus	558	797	3,500

Table 24. *Additional Resource Use and Waste indicators for the Sloan Optima® EBF Sensor Faucets Module B7 per ESL.*

Resource Use		Operational Water Use		
		0.35 gpm	0.5 gpm	2.2 gpm
RPR_E	MJ, LHV	824	1,180	5,180
RPR_M	MJ, LHV	0.00	0.00	0.00
$NRPR_E$	MJ, LHV	8,630	12,300	54,300
$NRPR_M$	MJ, LHV	0.00	0.00	0.00
SM	kg	0.00	0.00	0.00
RSF	MJ, LHV	0.00	0.00	0.00
NRSF	MJ, LHV	0.00	0.00	0.00
RE	MJ, LHV	0.00	0.00	0.00
FW	m^3	554	791	3,480
Waste & Output		**Operational Water Use**		
		0.35 gpm	**0.5 gpm**	**2.2 gpm**
HWD	kg	0.00	0.00	0.00
NHWD	Kg	0.00	0.00	0.00
HLRW/ILLRW	kg	0.00	0.00	0.00
CRU	kg	0.00	0.00	0.00
MR	kg	0.00	0.00	0.00
MER	kg	0.00	0.00	0.00
EE	MJ, LHV	0.00	0.00	0.00

6. LCA: INTERPRETATION

The interpretation phase conforms to ISO 14044.The interpretation included the use of evaluation and sensitivity checks to steer the iterative process during the assessment, and a final evaluation including completeness, sensitivity, and consistency checks, at the end of the study.

The contributions to total impact indicator results are dominated by the use phase impacts, specifically, the operational energy and water use modules (B6 and B7) with as much as 90% of the overall impacts and secondly by the use phase replacement module (B4). When examining the results without the operation use phase impacts and without the replacement module impacts, the results are dominated by the raw material module (A1) with the manufacturing module (A3) and product maintenance module (B2) also showing significant impacts.

Figure 2. *Contribution analysis for the Sloan Optima EBF Sensor Faucets (excluding Modules B4, B6, and B7).*

7. ADDITIONAL ENVIRONMENTAL INFORMATION

Sloan is a proud member of the United States Green Building Council (USGBC) and through the use of Leadership in Energy and Environmental Design (LEED) Green Building Rating System, Sloan recognizes and validates the importance of best-on-class building strategies and practices of high performing green buildings. Sloan's Optima® EBF faucets within this EPD can be used to help achieve water efficiency goals as well as gaining USGBC LEED v4 points and complying with building codes.

No environmental or health impacts are expected due to extraordinary effects including fire and/or water damage and product destruction.

For more information on Sloan's certifications and environmental initiatives please visit the website at www.sloan.com.

8. REFERENCES

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