

LifeStraw®




SIP

Performance + Test Reports



TABLE OF CONTENTS

LifeStraw Difference	3
How we test our products	4
Performance Data Sheet	5
Performance Longevity Test	6
NSF/ANSI P231 AND NSF/ANSI 53 Microbial Reduction Test	10
Micron Microsphere Reduction Test	12
Contaminant Removal Test	14



LifeStraw products have a history of use in some of the harshest conditions around the world, from refugee camps to natural disasters to extreme back-country, our products have to work because lives depend on them. Our testing and transparency is unparalleled, as is our commitment to social impact and environmental sustainability.

WHAT SETS LIFESTRAW APART

1.

Tough and Minimalist: Our products are made with minimal spare parts and are used in the toughest conditions around the world.

2.

LifeStraw is the only water filter brand that owns and operates its own fully equipped ISO certified water laboratory

3.

4-step quality control including microbiological testing over every single batch of filters.

4.

We give back: We provide a year of safe water to a child in need for every LifeStraw product sold.

5.

Transparent testing: We share all internal and external lab reports publicly, on our website.

6.

Optimal flow rates: Optimized to operate off of human sucking & last longer in sandy & silty conditions.

7.

Sustainable packaging: All packaging is free of plastic and is fully recyclable or compostable

8.

It's all about the 9s: We report log removal (99.999999%) data for all of our microbiological claims.



HOW WE TEST OUR PRODUCTS

LifeStraw's testing and transparency is unparalleled and we use the most trusted performance criteria based on protocols established by the World Health Organization, the US EPA, NSF International and the Water Quality Association.

ALL LIFESTRAW PRODUCTS REMOVE:

- LOG 8 (99.999999%) for Bacteria
- LOG 5 (99.999%) for parasites/amoebas/cysts
- LOG 5 (99.999%) for microplastics
- BPA FREE
- FDA Food Grade Materials

4 STEP QUALITY CONTROL

LifeStraw puts 100% of its filters through a rigorous quality control process.

STEP 1: Resistance test at high pressure.

STEP 2: Bubble test to confirm pore size.

STEP 3: Particle test to ensure nothing the size of bacteria or larger can pass through the filters.

STEP 4: We send a sample from every batch for full Bacteria and Protozoa log removal tests.

MICROBIOLOGICAL TESTING - HOW ITS DONE

The only accepted scientific evaluation of microbiological filtration performance is log values (the number of 9s in 99.999999%). PERIOD. All internationally accepted protocols from ANSI, WQA, NSF International, the US EPA, and the World Health Organization evaluate performance through log removal testing. None of these bodies will certify anyone based on pore size; it is ACTUAL PERFORMANCE that matters. LifeStraw products exceed all log-based performance standards.

LifeStraw is the only water filter brand that owns and operates its own fully equipped ISO certified water laboratory capable of performing cutting age tests on microbiological performance longevity, turbidity and other performance indicators. LifeStraw also tests all products through external internationally recognized labs.





PERFORMANCE DATA

for all lifestraw sip reusable water filter straws

Independently Tested

LifeStraw water filters are rigorously tested by independent labs and our own ISO certified lab to meet protocols established by the US Environmental Protection Agency (EPA) and NSF International/ANSI.

All Components BPA-Free

All components of LifeStraw Sip have been fully tested for presence of BPA. BPA content was NOT detected in all components: membrane, pipe, mouthpiece, connectors, net etc.

Membrane Microfilter

LASTS UP TO 1,000 LITERS (264 GALLONS)



Pore size - 0.2 micron
Meets NSF/ANSI P231 standard for reduction of bacteria and parasites

REMOVES 99.999% OF PARASITES

- | | | |
|-----------------------|----------------------|-----------------|
| Ascaris lumbricoides | Giardia intestinalis | Taenia saginata |
| Cryptosporidium spp. | Naegleria gruberi | |
| Entamoeba histolytica | Schistosoma mansoni | |

REMOVES 99.999999% OF BACTERIA

- | | | |
|---------------------------|---|----------------------------|
| Brucella melitensis | Yersinia enterocolitica | Mycoplasma pneumoniae |
| Campylobacter jejuni | Yersinia pestis | Burkholderia pseudomallei |
| Francisella tularensis | Enteropathogenic Escherichia coli (E. coli) | Salmonella enterica |
| Pseudomonas aeruginosa | Haemophilus influenzae | Salmonella typhi (Typhoid) |
| Shigella | Klebsiella pneumoniae | Streptococcus pneumoniae |
| Staphylococcus aureus | Legionella pneumophila | Streptococcus pyogenes |
| Vibrio cholerae (Cholera) | Mycobacterium tuberculosis | Leptospira |
| Vibrio parahaemolyticus | | |

REMOVES 99.999% OF MICROPLASTICS

REDUCES TURBIDITY (SILT, SAND, CLOUDINESS)

The above is not an exhaustive list of all bacteria, parasites, and other contaminants removed by LifeStraw filters but rather the main waterborne disease-causing contaminants. If you have additional questions about a specific contaminant not included on the list, please email us at info@lifestraw.com.

Study Report

PHÒNG THÍ NGHIỆM NƯỚC
Water Laboratory

Performance on Longevity of LifeStraw Sip

Study number: LSP.16.2005.8

Attention to: Jean Luc Madier	Date of issuance: 20 th Dec 2023
Issued by: Tham Thi Duong	Approved by: Le Thu Cao

Overview

LifeStraw (LS) Sip is the water filter product applying Microfiltration (MF) membrane technology for outdoor activities to remove the microorganisms in water.



In this study, the longevity (filtration lifetime) of LS Sip was evaluated, and microbiological removal efficacy was tested along the longevity test. The filtration lifetime of product was tested following US EPA (1) and NSF P231 (2) protocols.

Longevity of LS Sip reached 1000L under NSF P231 test conditions. At the beginning, the average flowrate of LS Sip was about 693 mL/min then decreased gradually and maintained stably around 440ml/min since 200L testing. At the end of its lifetime, the average flowrate was about 432 ml/min.

Bacteria and protozoa removal efficacy of all tested samples was higher than 8.1 log and higher than 5.3 log, respectively till 1000L. Turbidity of filtered water was always lower than 0.5 NTU at all sampling points and it was about 0.1 NTU in average. The quality of the filtered water exceeded requirements of WHO (3)/US EPA/NSF P231 on bacteria removal (≥ 6 log), protozoa removal (≥ 4 log), and NSF 53 (4) on turbidity removal (≤ 0.5 NTU).

References

- 1) US EPA Guide Standard and Protocol for Testing Microbiological Water Purifiers. April 1987.



Water Laboratory

Performance on Longevity of LifeStraw Sip (Finished Good)

- 2) NSF Protocol P231, Microbiological Water Purifiers, 2014.
- 3) WHO (2011). Evaluating household water treatment options: Health-based targets and microbiological performance standards, Geneva, World Health Organization.
- 4) NSF/ ANSI 53, Drinking water treatment units – Health effects, 2022.
- 5) WL. SOP. 141. v1. SOP for Normal Aging Procedure of LS Sip.

Testing principles

Following US EPA/ NSF P231 protocols, three replicates of LS Sip were aged with general test water. At the beginning and after each 300L of longevity, samples were tested with challenge test water to evaluate the microbial removal efficacy (Bacteria and protozoa) of the product.

Testing water conditions were prepared and controlled following US EPA (1), NSF P231 (2).

Operating the product during testing was done following WL. SOP. 141. v1, in which:

- Monthly cleaning was applied for all tested samples every 100L,
- Unclogging procedure was performed during testing if the flowrate of the product was lower than 400ml/min (the clogging point definition of current LS mouth drawn products).

Results

1. Longevity performance

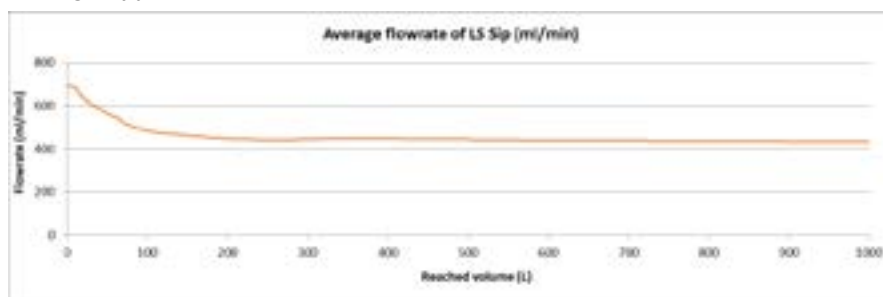


Figure 1. Average flowrate of all tested LS Sip samples during 1000L longevity

- All three tested samples of LS Sip reached 1000L longevity when tested with NSF P231 general test water.
- Figure 1 showed that: At the beginning, flow rate of LS Sip was in the range of 655-765 ml/min (average 693ml/min). At the end of lifetime, it was in the range of 417-450ml/min (average 432ml/min). Along its 1000L lifetime, the average flowrate decreased gradually and maintained stably around 440ml/min since 200L testing.

Water Laboratory

Performance on Longevity of LifeStraw Sip (Finished Good)

- Turbidity of effluent water of LS Sip was always lower than 0.5NTU (about 0.1 NTU in average) at all sampling points (Table 1). This result met NSF 53 and US EPA requirements on turbidity of effluent water.

Table 1. Summarize turbidity (NTU) of effluent water of LS Sip

Sample codes	Turbidity of effluent water (NTU)		
	LS.23.406.11	LS.23.406.12	LS.23.406.13
Min	0.06	0.06	0.05
Max	0.13	0.29	0.29
Average	0.09	0.12	0.13

2. Microbial removal efficacy

- LS Sip uses hollow fiber microfiltration technology which can remove microorganisms bigger than its pore size of 0.2µm, thus, it can remove *E.coli* bacteria (ca. 0.5x2µm) and protozoa cysts (minimum 3µm).

- The removal of protozoa was only tested for all samples at the end of lifetime - 1000L point (as 3µm microspheres surrogate). Removal of *E.coli* (the smaller tested organisms) guaranteed removal of protozoa at all testing points.

- Table 2 presented that all tested LS Sip samples removed more than 8.1 log of *E.coli* bacteria and more than 5.3 log of 3µm microspheres.

- LS Sip product exceeded requirements of WHO (3)/US EPA/NSF P231 on bacteria removal (≥6 log), protozoa removal (≥4 log).

Table 2. Summary on microbial removal efficacy of LS Sip

Sample codes	<i>E.coli</i> removal (*) (Log ₁₀ reduction at challenging points)					Microspheres removal (*) (Log ₁₀ reduction at 1000L challenging point)
	Beginning	100L	400L	700L	1000L	1000L
LS.23.406.11	>8.1	>8.7	>8.8	>8.7	>8.7	>5.3
LS.23.406.12	>8.1	>8.7	>8.6	>8.7	>8.7	>5.3
LS.23.406.13	>8.1	>8.7	>8.8	>8.7	>8.7	>5.3

(*) *E.coli* strain ATCC 25922 was added to the challenging water and analyzed following SMEWW-9222G (Standard Methods for Examination of Water and Wastewater)

(**) Protozoa cysts were tested with 3µm microspheres surrogate as alternative. Microspheres analysis method was conducted following US EPA 05/9205/EPADWCTR method


Water Laboratory

Performance on Longevity of LifeStraw Sip (Finished Good)

Summary/Conclusions

LifeStraw Sip product:

- Reached 1000L longevity under NSF P231 test condition. At the beginning, the average flowrate was about 693ml/min, then decreased gradually and maintained stably around 440 ml/min since 200L. At the end of lifetime (1000L), the average flowrate was about 432 ml/min.
- *E.coli* and microspheres removal efficacy of all tested samples was higher than 8.1 log and higher than 5.3 log, respectively till 1000L. These results met the requirements of NSF P231/ NSF 53, USEPA, WHO in bacteria removal efficacy (≥ 6 log reduction) and protozoa removal efficacy (≥ 4 log reduction).
- Met NSF 53 and USEPA requirements on turbidity of effluent water. At all sampling points, turbidity of effluent water was always lower than 0.5NTU (average 0.1NTU).

 IAPMO INDIA PRIVATE LIMITED	Document #	IAPMO/ILAB/TR/01
	Test Report #	IAPMO/ILAB/20084/23-24
	Date	23.11.2023
	Reference	IN HOUSE
TEST REPORT OF LS SIP WATER FILTER		

Report No: IAPMO/ILAB/20084 /23-24

Date: 23 November 2023.

CUSTOMER DETAILS	SAMPLE DETAILS	TEST DETAILS
Name &Address: Kind Attn: Tham Duong Vestergaard Frandsen Inc., 333, W Ostend St. Suite 300 Baltimore, MD 21230 USA	Sample received: 08.11.2023	Method: NSF P231 NSF 53
	Sample code no: IAPMO/ILAB/20084/23-24	
	Sample Description: LS Sip water filter	
	Sample Quantity for Testing: 1 Nos	
	Submitted by: Vestergaard Frandsen Inc.,	
	Date of Analysis started: 15.11.2023	
	Date of Analysis Completed: 17.11.2023	
Subcontract: Not Applicable	Sample condition when received: Intact	

EXECUTIVE SUMMARY:

One sample of LifeStraw Sip water filter product was tested for reduction of *E. coli*, *Klebsiella terrigena* bacteria, and 3-micron Microspheres as artificial cysts at very high loads in influent water. The product has reduced *E. coli* (8.77 log), *Klebsiella terrigena* (8.69 log), and 3-micron Microspheres (5.14 log) which exceeds requirements of NSF P231 standard on bacteria and protozoa removal. The sample was tested for Turbidity reduction test with 11 ± 1 NTU as per the requirements of NSF-53 and the product water shown <0.5 turbidity hence, passing the criteria as per of NSF 53 for turbidity reduction test.

PICTURE OF PRODUCT




Report No: IAPMO/ILAB/20084 /23-24 Date: 23.11.2023, Page 1 of 2

RECOGNIZED BY IAPMO R&T – USA

We undertake analytical job for water, food, biocidal reagents, detergents & sanitizers and soil. We carry out performance evaluation of drinking water treatment units as per NSF/ANSI specifications. Based on performance we can arrange for certification from IAPMO – USA.

Note:

1. The results pertain only to the tested samples and applicable parameters.
2. Samples will be disposed after 15 days from the issue of test certificate unless otherwise specified, in case of bacteriological tests, the samples will be disposed after 7 days from the date of issuing the certificate.
3. This report is not to be reproduced either wholly or in parts and cannot be used as evidence in the court of law and should not be used in any advertising media without prior written permission.
4. In case, any recommendation of contents of this certificate is required please contact our office.

 IAPMO INDIA PRIVATE LIMITED	Document #	IAPMO/ILAB/TR/01
	Test Report #	IAPMO/ILAB/20084/23-24
	Date	23.11.2023
	Reference	IN HOUSE
TEST REPORT OF LS SIP WATER FILTER		

Test data: Microbial Reduction, 3 Micron Microspheres Reduction test and Turbidity Reduction after 10 liters of filtration

Tested parameter	LifeStraw Sip water filter		
	Input Water Microbial Count	Output Water Microbial Count	% Reduction
<i>E. coli</i> MTCC 68	6.0 x 10 ⁸ Cfu/ml	No Viable counts/100 ml	>99.9999999 (8.77 log)
<i>Klebsiella terrigena</i> MTCC 2271	5.0 x 10 ⁸ Cfu/ml	No Viable counts/100 ml	>99.9999999 (8.69 log)
3-micron microsphere	2.19 x 10 ⁷ Microspheres/ L	<160 Microspheres/L	>99.9992 (5.14log)
Turbidity in NTU	Input water turbidity in NTU	Output water turbidity in NTU	96%
	11.5 NTU	<0.5 NTU	

Cfu: Colony forming units.

<160cells/L: detection limit of 3-micron microsphere analysis method

LifeStraw Sip water filter - Flow rate: 550ml/min

General Test Water Composition:

pH-7.30, TDS-250ppm, Turbidity- 1.0 NTU, TOC- 1.0 mg/L Temperature- 23.8°C


Dr. Vishwanath.N.H
Technical Manager

Report No: IAPMO/ILAB/20084 /23-24 Date: 23.11.2023, Page 2 of 2


00-----End of the Test Report-----00

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	Date	23.11.2023
	Reference	IN HOUSE
TEST REPORT OF LS SIP WATER FILTER		

Report No: IAPMO/ILAB/20084 /23-24

Date: 23 November 2023.

CUSTOMER DETAILS	SAMPLE DETAILS	TEST DETAILS
Name &Address: Kind Attn: Tham Duong Vestergaard Frandsen Inc., 333, W Ostend St. Suite 300 Baltimore, MD 21230 USA	Sample received: 08.11.2023	Method: Microplastic reduction (as 1 micron plastic spheres) – black dyed microspheres
	Sample code no: IAPMO/ILAB/20084/23-24	
	Sample Description: LS Sip water filter	
	Sample Quantity for Testing: 1 Nos	
	Submitted by: Vestergaard Frandsen Inc.,	
	Date of Analysis started: 15.11.2023	
	Date of Analysis Completed: 17.11.2023	
Subcontract: Not Applicable	Sample condition when received: Intact	

EXECUTIVE SUMMARY:

One sample of LifeStraw Sip water filter product was tested for reduction of Microplastic (as 1 micron poly styrene black dyed microspheres) at very high loads in influent water. The product has reduced Microplastic (as 1-micron microspheres) at >99.9992% (5.12 log).

PICTURE OF PRODUCT




Report No: IAPMO/ILAB/20084 /23-24 Date: 23.11.2023, Page 1 of 2

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 IAPMO INDIA PRIVATE LIMITED	Document #	IAPMO/ILAB/TR/01
	Test Report #	IAPMO/ILAB/20084/23-24
	Date	23.11.2023
	Reference	IN HOUSE
TEST REPORT OF LS SIP WATER FILTER		

Test data: 1-micron microspheres reduction test after 10 liters of filtration

Tested parameter	LifeStraw Sip water filter		
	Input Water Microbial Count	Output Water Microbial Count	% Reduction
1-micron microsphere	2.13 x 10 ⁷ Microspheres/L	<160 Microspheres/L	>99.9992 (5.12log)

<160cells/L: detection limit of 1 micron microsphere analysis method

LifeStraw Sip water filter - Flow rate: 550ml/min

General Test Water Composition:

pH-7.30, TDS-250ppm, Turbidity- 1.0 NTU, TOC- 1.0 mg/L Temperature- 23.8°C


 Dr. Vishwanath.N.H
 Technical Manager

Report No: IAPMO/ILAB/20084 /23-24 Date: 23.11.2023, Page 2 of 2

00-----End of the Test Report-----00

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Certificate of Analysis

PHÒNG THÍ NGHIỆM NƯỚC/ Water Laboratory
ISO/IEC 17025 accredited

Sample Information

Sample	: LifeStraw® SIP	Requested by	: PARA Membranes Ltd.
Quantity	: 3 pcs	Description	: QC cartridge
Date of receipt of test sample (dd/mm/yyyy)	: 23/02/2024		

Analysis Result

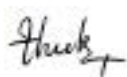
Parameter	Microbiological log ₁₀ reduction		Physico-chemical characteristics		Conclusion	
	Bacteria (<i>E.coli</i>)	Protozoa (3µm spheres surrogate)	Turbidity of effluent water (NTU)	Flow rate (ml/min)		
Reference method	SMEWW 92221:2023 (*)	US EPA 05/9205/EPADWC (Modified) (*)	SMEWW 2130B:2023 (*)	WL.SOP.145		
Specification	Min 8	Min 5	Max 0.5	Min 500	PASSED	
1	24214B1-0424	>8.9	>5.2	0.21	670	PASSED
2	24214B1-0424	>8.9	>5.2	0.28	610	PASSED
3	24214B1-0424	>8.9	>5.2	0.28	730	PASSED

Note: (*) ISO/IEC 17025 accredited methods

I, the undersigned, hereby declare that the findings provide a true and accurate record of the results obtained on samples as received.

Date and signature

26/02/2024



Cao Thu Le
Head of Water Laboratory



