Economic Feasibility of Using Innovative Water Treatment Technology for Water Chlorination

Introduction

- With funding from **Conrad N. Hilton Foundation**, **PATH**, **World Vision**, and **Mountain Safety Research (MSR) Global Health** are collaborating on the development and testing of a new chlorine generator (SE-Flow) for treating water for drinking and cleaning purposes.

- The technology uses readily available consumables (salt, water, and electricity) to produce a chlorine solution through the process of electrolysis.

- Testing SE-Flow in different African countries is ongoing to obtain feedback from communities for its development and improvement.

SE-Flow technology

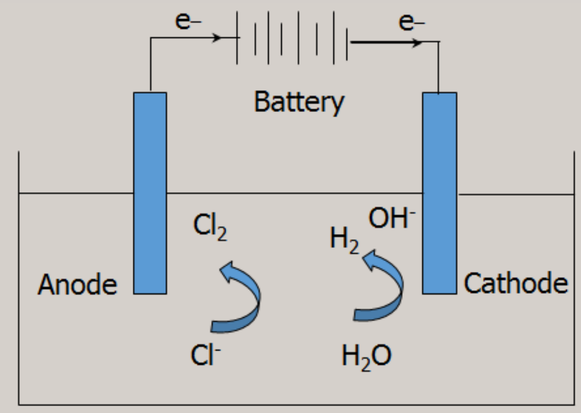
When use SE-Flow?

- Chlorine is not readily available
- Chlorine is expensive

Where use SE-Flow?

- Emergency setting (camps)
- Health care facilities
- Water points
- Schools and others

How does SE-Flow work?



$$2\,NaCl + 2\,H_2O \longrightarrow Cl_2 + H_2 + 2OH^- + 2Na^+$$

$$2\,OH^- + Cl_2 \longrightarrow Cl^- + ClO^- + H_2O$$

Objective

- The purpose of this study is to determine the economic feasibility of using SE-Flow for water chlorination and to compare it to alternative method to determine the appropriate conditions for its application.

Methods

- A case study was conducted in Rwanda involving 11 SE-Flow devices (producing equivalent chlorine to HTH used).
- The expenses associated with SE-Flow (cost of salt, electricity and labor) were compared to the ones of conventional method (HTH) (cost of HTH and labor) for 5 years of operation of SE-Flow.
- A sensitivity analysis was then performed for a range of SE-Flow capital costs and electricity prices since the cost of SE-Flow has not been finalized yet and electricity price varies across Africa (high in Rwanda).

Results

- We assumed a capital cost of $500 for the technology and a life time of 5 years.
- In this case study, SE-Flow is more economically feasible than HTH due to saving on HTH and labor (Table 1).
- The sensitivity analysis shows where SE-Flow is feasible (positive values) and where HTH is preferred for water chlorination (negative values) (Table 2).

Table 1: Advantage of using 11 SE-Flow devices for water chlorination in Rwanda for 5 years

Expenses	($)
Expenses associated with 11 SE-Flow devices	
Capital cost	5,500
Cost of salt	12,160
Cost of electricity consumed	9,378
Cost of labor	4,606
Total cost with SE-Flow	31,645
Expenses associated with equivalent HTH	
Cost of HTH	25,078
Cost of labor	9,212
Total cost with HTH	34,291
Cost saving by using SE-Flow	**2,646**

Table 2: Cost saving ($) with SE-Flow compared to HTH with various capital and electricity costs

Kwh \ Capital cost	500	750	1000	1250	1500
0.05	**9,893**	**7,143**	**4,393**	**1,643**	-1,107
0.1	**7,761**	**5,011**	**2,261**	-489	-3,239
0.15	**5,630**	**2,880**	**130**	-2,620	-5,370
0.22	**2,646**	-104	-2,854	-5,604	-8,354
0.3	-765	-3,515	-6,265	-9,015	-11,765

Summary and Conclusion

- SE-Flow generates chlorine from salt in the presence of electricity and it can help treat water, prevent diseases and save lives in areas where chlorine is not readily available.
- The technology is still being developed and tested by PATH, World Vision and MSR. A case study was considered to compare the expenses associated with SE-Flow and HTH in Rwanda.
- SE-Flow can result in saving $2,646 over a period of 5 years (assuming capital cost of $500 of the technology and electricity price of 0.22 $/kwh).
- A sensitivity analysis was performed for various electricity values and SE-Flow capital costs.
- SE-Flow is a **promising technology** that has the potential to **treat water for drinking and cleaning purposes** in remote regions where **chlorine is not available or too expensive**.
- While testing of the technology is ongoing, **the current analysis will help identify best fit environments for the application of SE-Flow and will contribute to its development process.**

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WATER FOR EVERYONE

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