

The Design and Development of an Improved Self-Closing Valve

LifeTap

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Problem Statement

The service connection is the critical last point in any water distribution system. According to the World Bank, 45 million cubic meters of water are lost daily due to water leakage in distribution systems—enough water to completely serve 200 million people¹ or meet the basic water needs of 640 million people. Most of this leakage occurs at the service connection because of damaged or improperly closed valves^{1,2}. Contamination at the outlet is also a concern. Leakage during use allows water to contact users' hands, which causes contamination. When clean water contacts unwashed hands, it is a main contributor to transmission of infectious disease^{3,4}. As communal water points often do not receive proper care, these locations experience an increased failure rate. Sturdier valve design and construction can help alleviate water leakage².

Overmold Poppet

Provides a durable seal that has been tested to more than 2,000,000 cycles.

Robust Body Design

Withstands heavy use, under harsh conditions.

Brass Handle

Prevents the spread of disease with naturally antimicrobial materials.

Current Technology

Design Outreach (DO) is proposing an innovative redesign of the community water valve: LifeTap. ODRINO, a partner working in Haiti, requested that DO consider an alternate valve design for use on water distribution networks in Northwest Haiti. When using the market standard self-closing valve, ODRINO would see valve leakage after only a few weeks and complete valve failure within six months. From data collected in Haiti and market research, four principal areas of improvement were identified:

- The valve should have a robust self-closing mechanism.
- Seal performance should be improved.
- The user interface should be moved away from the water outlet.
- Overall durability should be increased when subjected to harsh conditions.

Improving these four aspects of the valve will help prevent contamination of water at the service connection and drastically reduce the amount of wasted water.

LifeTap Concept

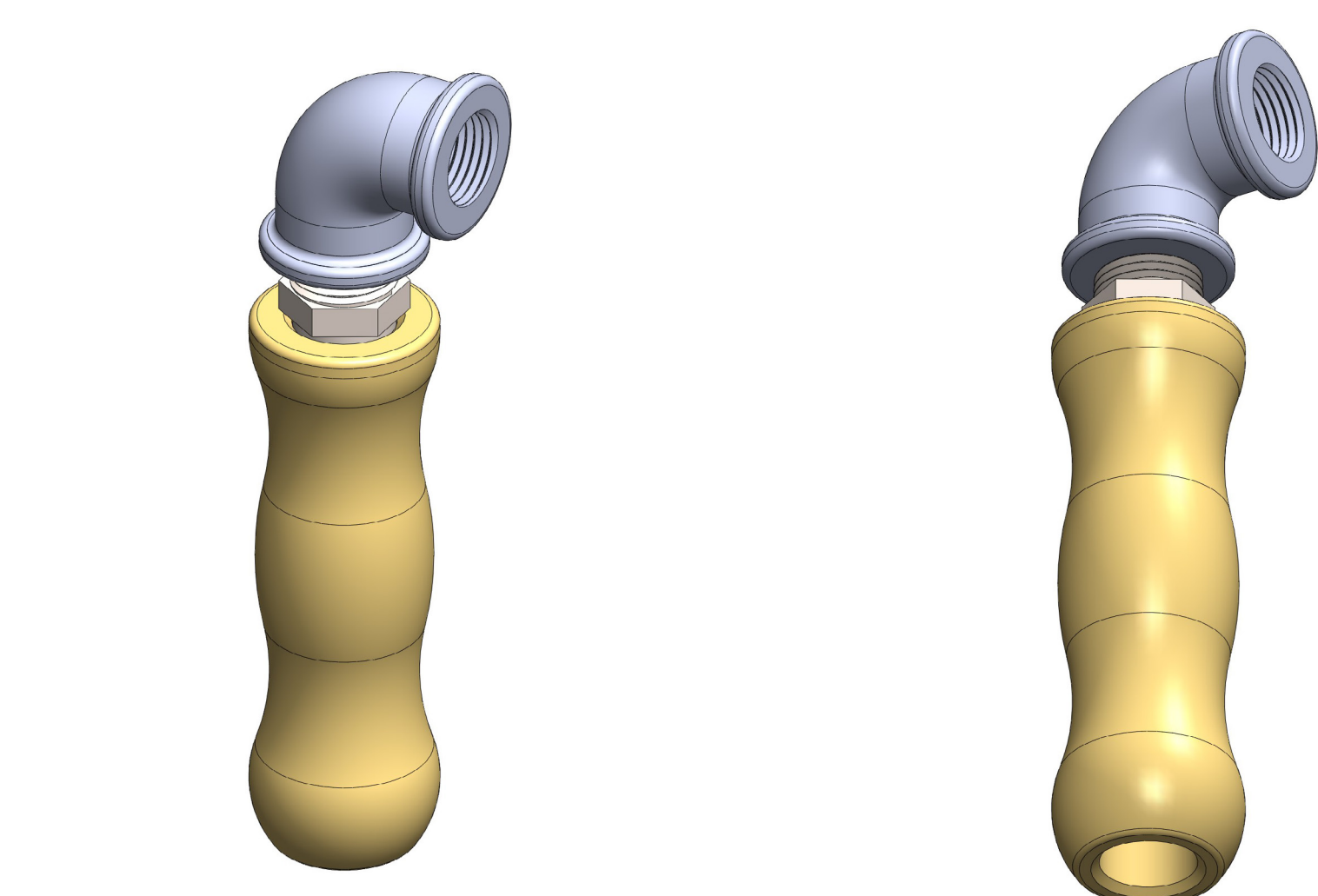
The LifeTap is an adaptable service connection that can be used on a variety of water access points, including municipal pipelines, community stand posts, cisterns, water kiosks, and household connections. New and existing systems can be easily adapted to use the LifeTap, which is designed to be installed on standard threaded connections. DO is developing LifeTap in conjunction with key government and NGO partners who specialize in WASH programs. Customer needs surveys are currently being conducted in Africa, Asia, and the Caribbean. Initial field testing is planned for January 2018 with select partners. LifeTap pricing is to be determined by the key design features identified in customer feedback. Testing and further studies are to be conducted on valve performance, user acceptance, and sanitary benefit to provide insight into the effects and benefits of a proper service connection on various development programs, resource management, and social impact.

Spring Closure

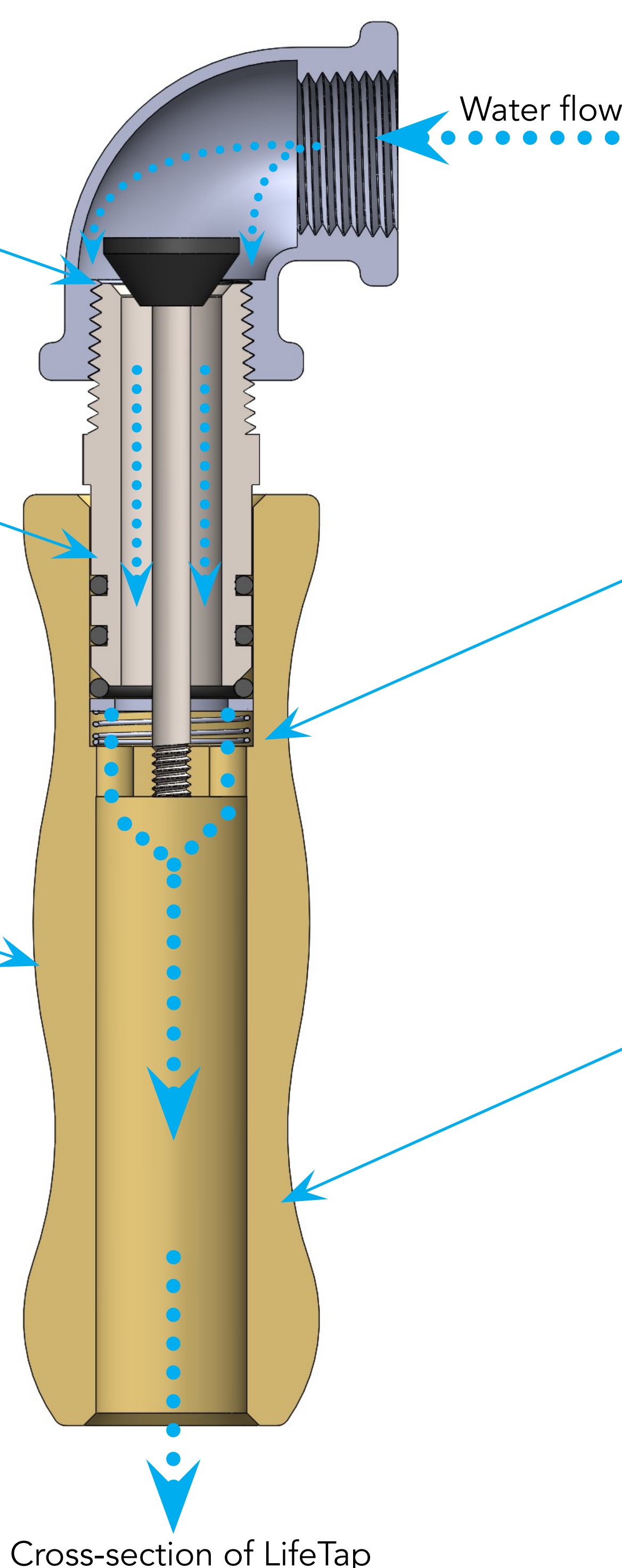
Prevents water loss under low-pressure conditions.

Ergonomic Grip

Provides a comfortable user interface for all ages while keeping users' hands away from the water outlet.



3D renderings of LifeTap



Cross-section of LifeTap



DesignOutreach

¹ Bill Kingdom, Roland Liemberger, and Philippe Marin, "The Challenge of Reducing Non-Revenue Water (NRW) in Developing Countries," Water Supply and Sanitation Sector Board Discussion Paper 8, December 2006, World Bank Washington, DC
² Francois Brikké and Maarten Bredero, "Linking technology choice with operation and maintenance in the context of community water supply and sanitation", World Health Organization and IRC Water and Sanitation Centre, 2003, Geneva, Switzerland
³ World Health Organization, (July 2017). Drinking Water - Fact Sheet [online]. Available: <http://www.who.int/mediacentre/factsheets/fs391/en/>
⁴ J.T. Macy, and R.E. Quick, "WATER AND HEALTH - Vol. I - Transmission and Prevention of Water-Related Diseases" National Center for Infectious Diseases, Centers for Disease Control and Prevention, USA