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Better Pumps: Reliable Handpump Infrastructure

Andrea Hunsberger

Joshua L. Maxson

Matt J. Caldwell

Caleb E. Danehower

Darren Kulp

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Authors

Andrea Hunsberger, Joshua L. Maxson, Matt J. Caldwell, Caleb E. Danehower, Darren Kulp, Darin M. Landis, Jacob Valentine, Emma L. Workman, Tony Beers, Matthew Schwiebert, and David T. Vader

Better Pumps: Reliable Handpump Infrastructure

Andrea Hunsberger and Joshua Maxson

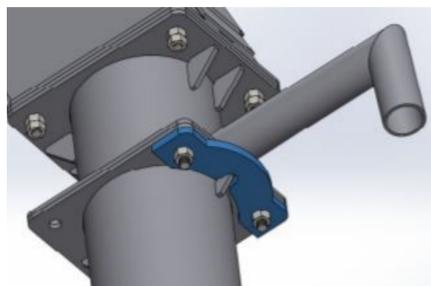
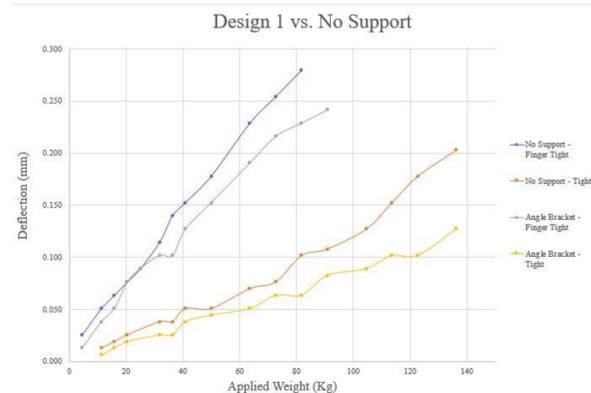
Testing Functioning Flanges

Problem: Flange weld failures disable pumps.

Solution/Design: A gusset or bracket, Functioning Flanges, (bottom left) reduces weld stress.

Action: Measure flange deflection to validate analysis.

Results: Promising data suggests that a bracket can strengthen or repair a pump flange on site.



Future Work

- Design and build a test machine for Afridev handpumps.
- Longevity testing of the new India Mark II bearing design.
- Nozzle delivery study for higher water collection efficiency.



Mission

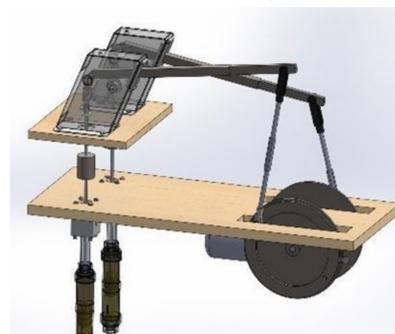
Engineering support for partners working to improve reliable access to water for users of hand pumps.

- ~1.3 billion people rely on handpumps for daily water
- ~30% of India Mark II and Afridev handpumps are non-operational due to component failures



India Mark II Handpump Test Machine (Designed by Anthony Beers)

- Repetitive actuation of the India Mark II handpump.
- Adjustable equivalent depth applied to pump cylinders.
- New side loading to better simulate field conditions.
- Simultaneous longevity testing of bearings and seals.



old design



new design

Acknowledgements

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- Project Manager: Dr. David Vader
- Clients: Anthony Beers and Matthew Schwiebert
- Partners: AlignedWorks, Brethren in Christ World Missions, and Living Water International

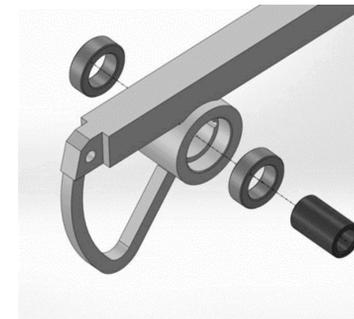
Testing Select Bearings

Problem: Stock ball bearing (left) failures cause additional damage to pumps. Bearings are replaced every 6-9 months.

Solution/Design: The new design, Select Bearings, (right) is made of a sintered iron bushing and Delrin adaptor rings.

Action: Refining the new design by understanding field failures through laboratory replication.

Results: Side loads confirmed as the likely cause of failure.



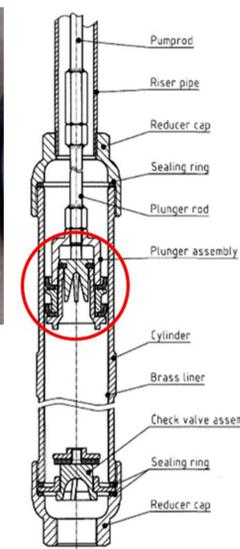
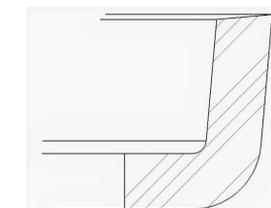
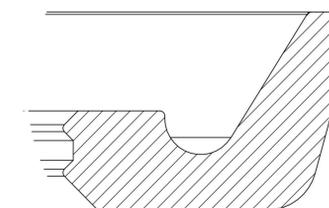
Testing Superior Seals

Problem: Stock nitrile seal (middle) failures cause pump inefficiencies. Seals are replaced every 6 months.

Solution/Design: The new design, Superior Seals, (left) is made of polyurethane with a geometric cross-section.

Action: Longevity and Static Leak Rate testing.

Results: Preliminary results clear new seal design for field trials by Living Water International.



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