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Better Pumps: Promoting Reliable Water Infrastructure for Everyone

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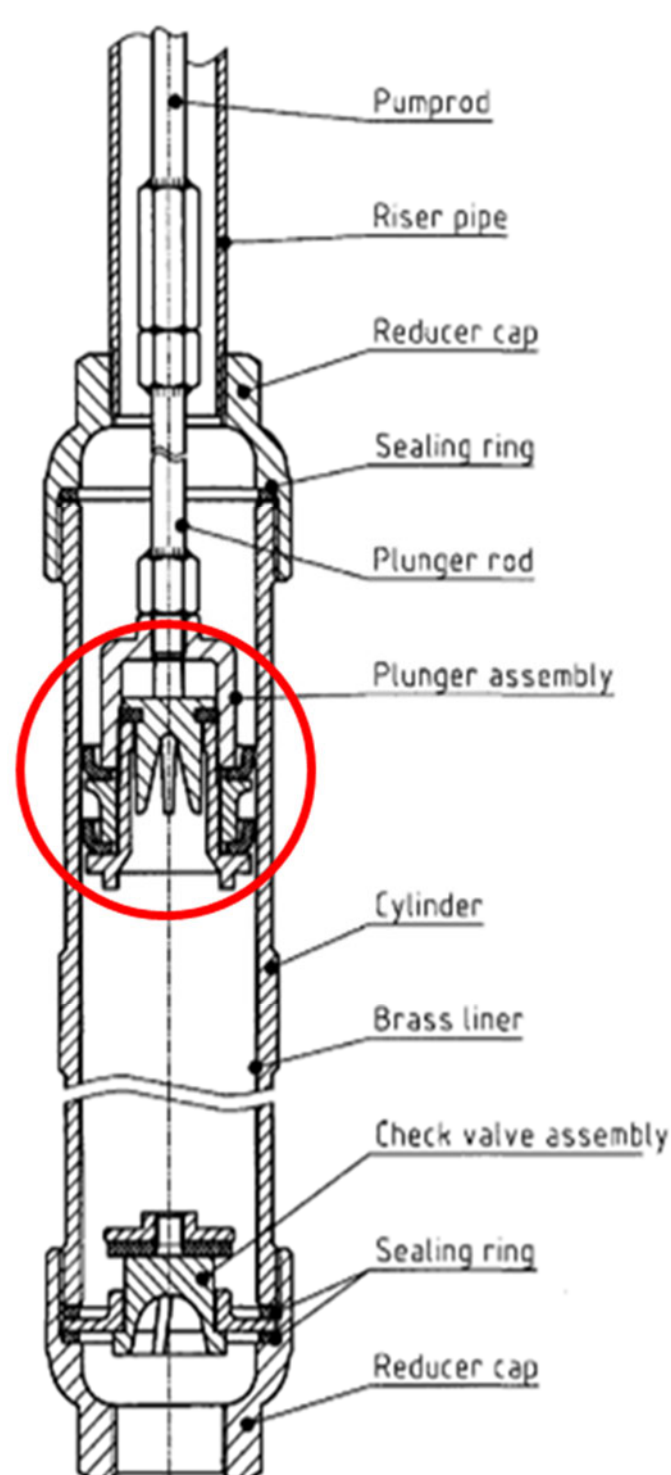
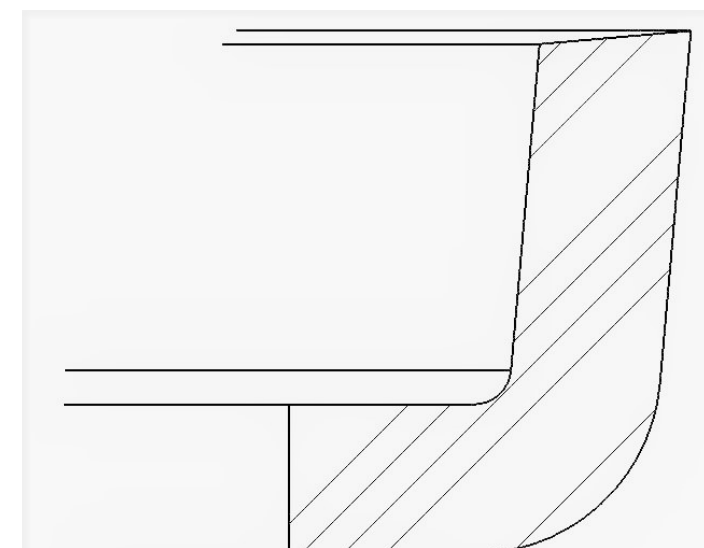
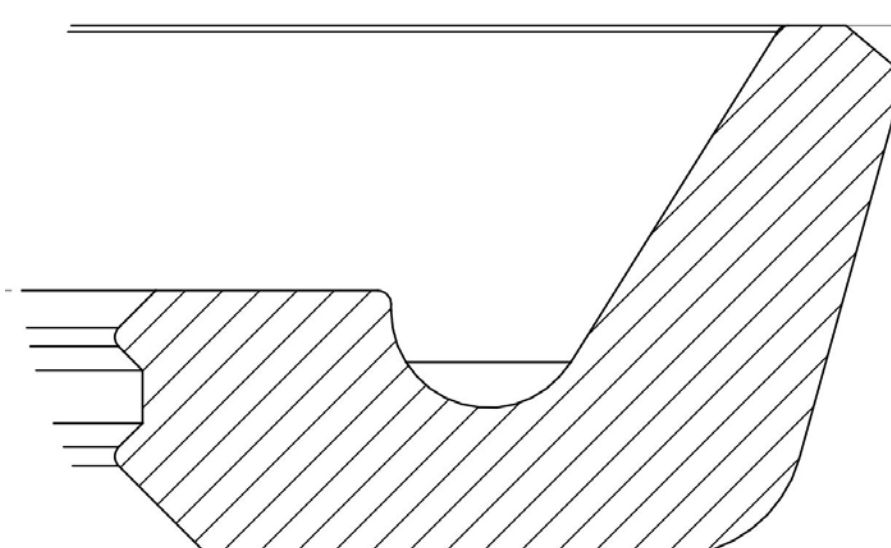
Andrea Hunsberger and Ben Brandt

Seal Testing

Problem: Stock nitrile seal (top right) failures cause users to work harder while lifting less water.

Solution/Design: A new India MK II seal design (top left) by Matthew Schwiebert is made of polyurethane with a new geometric cross-section.

Action/Results: Longevity and Static Leak Rate tests provided preliminary results that cleared the new design for field trials by Living Water International. Clear Cylinder tests (bottom right) identified and resolved leakage paths while comparing seal performance.



Mission

To provide engineering support for partners working to improve handpump reliability.

- Millions lack access to safe water, despite the installation of water infrastructure.
- Even as new technologies emerge, approx. 1 billion people still rely on handpumps.
- As many as 30% of handpumps are non-operational due to O&M failures.

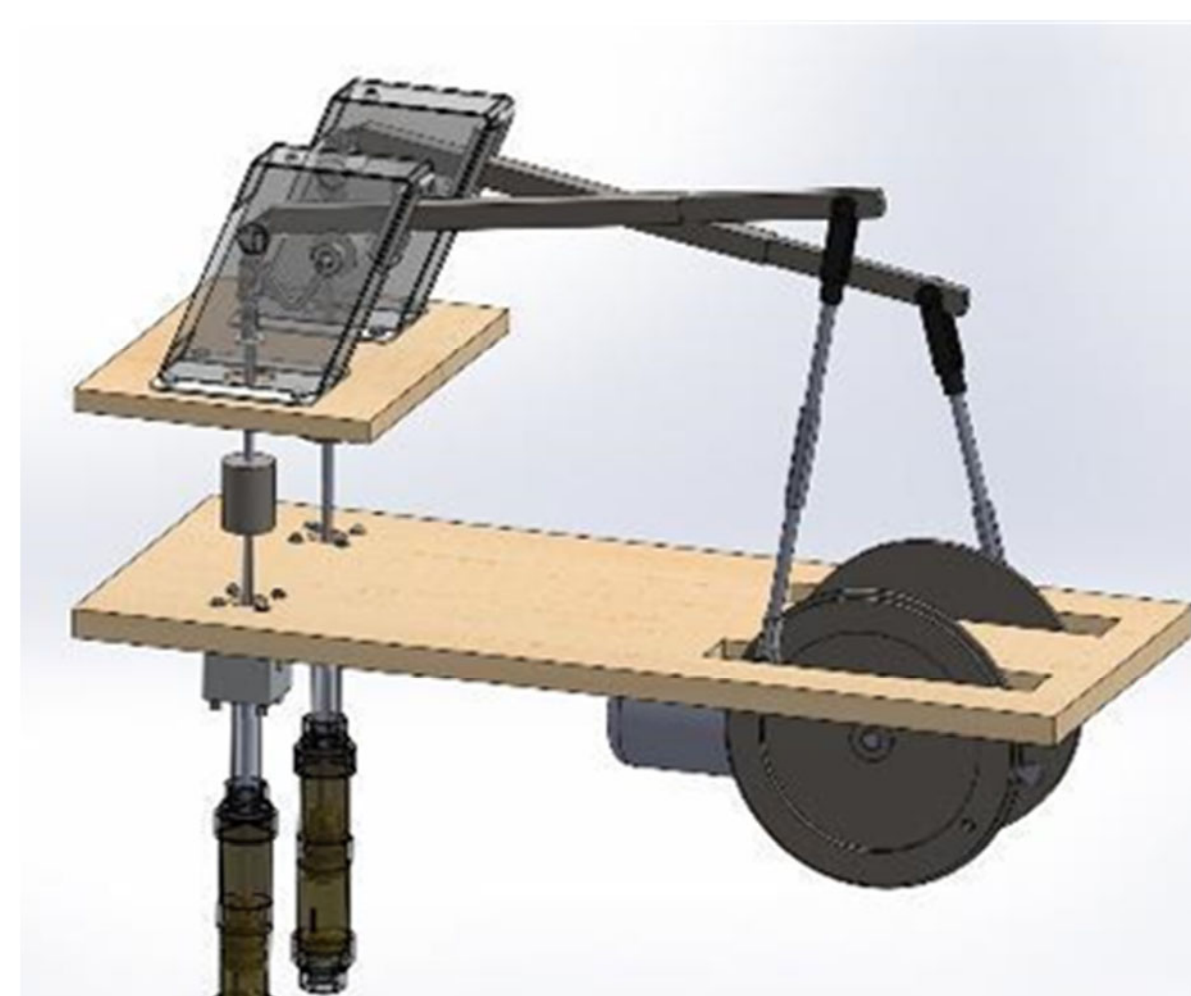


Handpump Test Machine Design

Problem: Simulate field conditions on handpump components in a laboratory environment.

Solution/Design: Rebuild the India MK II test machine to add side loading and increase longevity. Select components and design the frame for an Afridev test machine.

Status: The India MK II machine is finished. Components selected and frame dimensions sized for the Afridev test machine. The motor and gearbox required are identified.



Acknowledgements

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Team Members: Ben Brandt, Joshua Card, Reese Johnston, Joshua Maxson, and Jonathan Wyrick.

Project Managers: Andrea Hunsberger, Dr. David Vader.

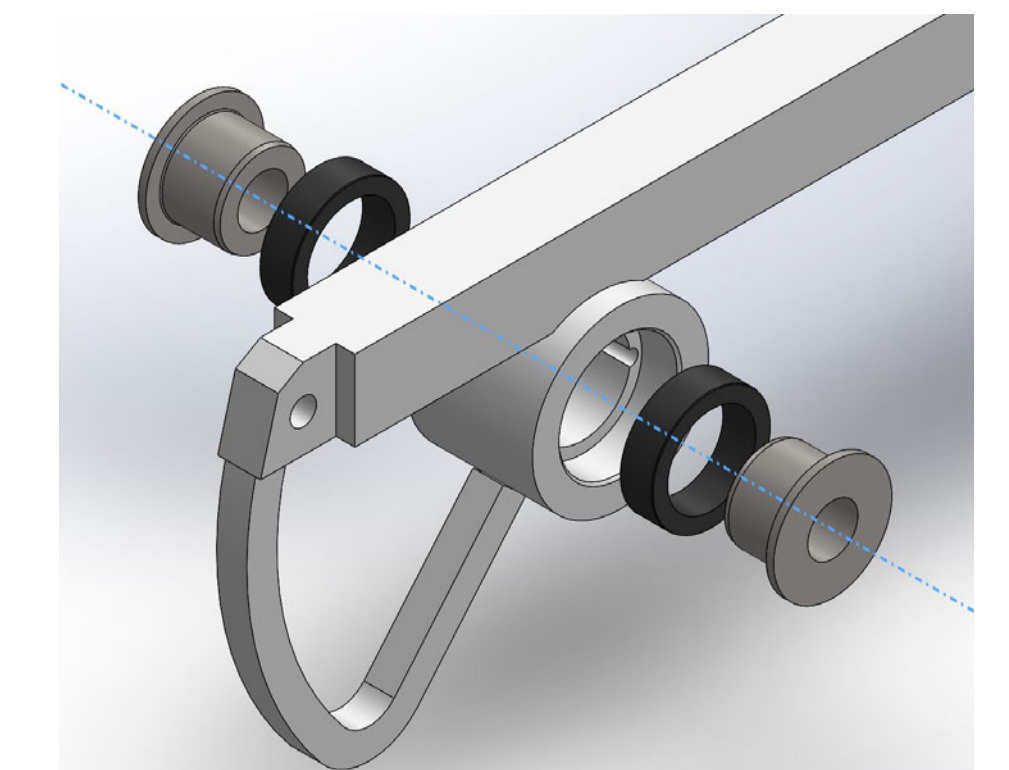
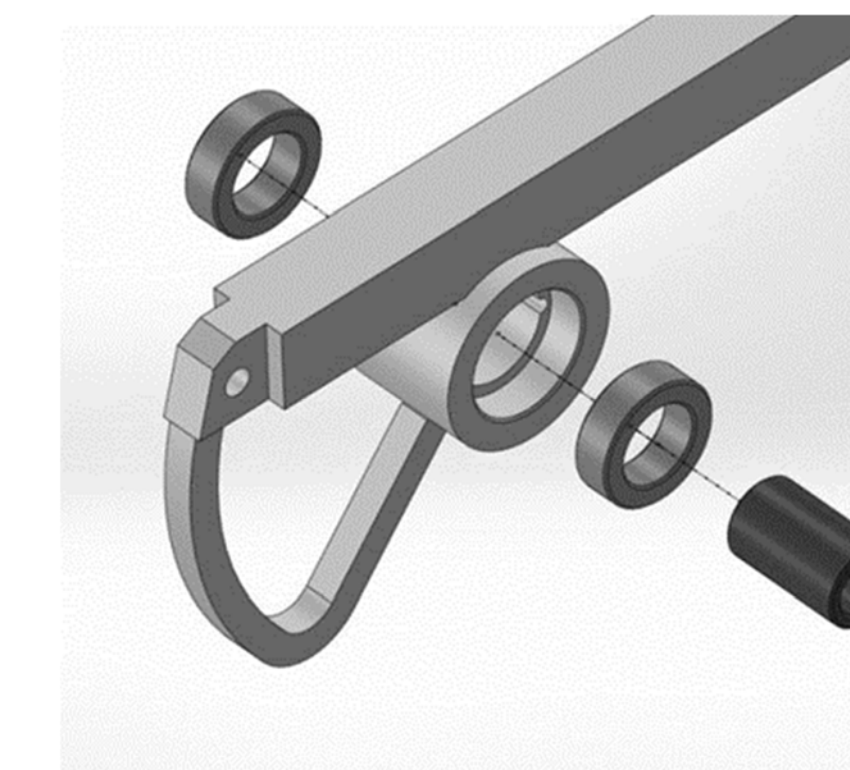
Select Bearings Testing

Problem: Stock ball bearing (top) failures cause additional and more expensive damage to pumps.

Solution/Design: The first design (left) by Anthony Beers is made of a sintered iron bushing and Delrin adaptor rings.

The second design (right) by Joseph Longenecker, is made of sintered iron sleeves and steel bushings.

Action/Results: Side loading on the pump handle was confirmed as a likely cause of field failures of the stock and first new bearing designs. The second new design is in testing.



Future Work

- Assemble Afridev handpump test machine.
- Longevity test Afridev seals and bearings.
- Longevity test second Select Bearing design.
- Extend seal testing capabilities to Afridev handpumps.
- Validate team's seal testing protocols.



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