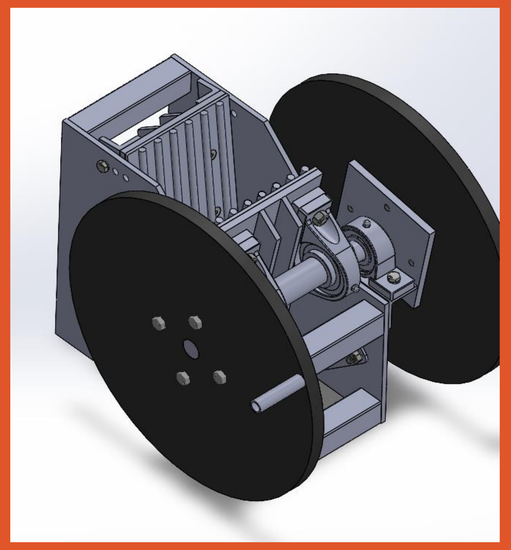
ROCK CRUSHER

After three years of capstone teams, the crusher is finally able to crush rocks.



OVERVIEW

- This Project was sponsored by Waffle Lomilo a missionary working in Uganda, and an NGO called Community Livestock-Integrated Development Consultancy.
- Concrete has been a major catalyst of economic growth around the world as it is essential for infrastructure.
- Currently in Uganda, particularly for people in rural areas, the processes of creating gravel for concrete is extremely labor intensive while providing inadequate results. It consists of people smashing rocks with hammers or larger rocks, which is both unsafe and inefficient.
- The main objective of this project is to create a design and manufacturing plan for a human powered Jaw crusher that is feasible to create in Uganda.
- This is the third iteration of this project, using analysis and testing from previous teams and our own work, the rock crusher is now able to crush rocks using human power.
- While progress has been made there are still some changes to implement that we believe will push this machine to be completely operational.

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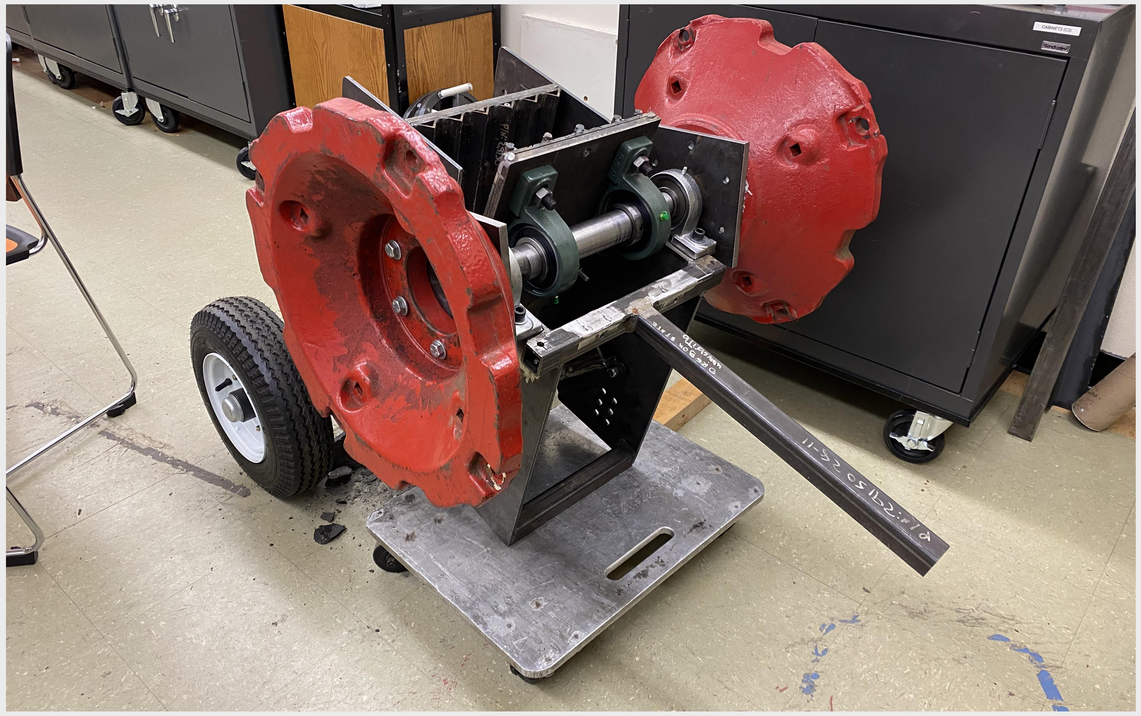

WHAT WE'VE IMPROVED ON

There have been several improvements made over the course of the program; Some of the key ones include:

Redesigning the eccentric shaft: We increased the diameter of both the eccentric portion and the overall shaft to reduce bending and the increasing compressive force.

Redesigning the Toggle system: We increased the angle at which the plates move, creating more horizontal motion in the jaws, increasing the throw.

Changing the teeth of the plates: The teeth of the jaws were changed from angled iron to welded rebar. This gave the teeth more grip and reduced potential jam areas
.
Increasing the weight of the flywheels: The flywheels were replaced with much heavier weights. This was done to increase the inertia of the shaft and increase the crushing potential of the machine.

FUTURE IMPROVEMENTS

- One of the things we desired to complete but were not able to achieve was the full conversion of rebar inside the jaws. Changing the angle iron to rebar and increasing the size of the rebar would allow for a decrease in chance of the rocks sliding inside and lead to improved crushing.
- Another improvement/change that could be made in the future is creating a trailer for the crusher to sit upon for easier transportation rather than the current expensive wheel system it has now.
- A final improvement that can be made is decreasing the width of the jaws, making it the maximum width that the rocks are designated to be, reducing the chance of rocks sliding around, reducing the cost of materials, and reducing the overall weight of the crusher.

DESIGN

- Mimics the design of an industrial jaw crusher, using a four-bar linkage to define the motion of the moving jaw.
- Large flywheels allow for a human to input and store energy over a long period of time, increasing the ergonomic aspect of the system.
- Frame walls laser cut from a single piece of steel allows for simplistic assembly, and multiple options for component placement. This freedom is ideal for experimentation of the position of different components..
- Solid 2in steel eccentric shaft allows for 13mm of throw and mitigates risk of bending within system.
- Rebar on the face of the jaws reduces the amount of slippage from the rocks, increases the stresses within the rocks, and controls the final size of the aggregate.
- Mutiple positions for the static jaw plate allows the size of the crushed rock to be controlled with relative precision and increases efficiency.
- Four bearings distributes the load from the shaft to the jaw plate and reduces the chances of bending.