



# WPI



# Uplifting Paraguay: 5 Tons at a Time

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# AVINA



## Abstract

In the low-income communities of Paraguay, the well systems are not properly designed and many of the water pumps are breaking. The problem comes with removing the water pumps from one hundred and eighty meter deep wells. The current system of removal is highly inefficient, as well as expensive for the community as a whole. As we assessed the problem we took into consideration the conditions that we would be working with, including the elementary educations of the people of Paraguay. It became clear that an important goal of this project would be to allow the people of Paraguay to become more self sufficient and less dependent on outside help. We worked closely with Paula Burt of the AVINA Foundation at developing the most useful and efficient system of well pump removal. We decided upon a crane system that will be independently standing and will have the ability to be transported on a trailer pulled by a pickup truck. Overall, we are confident that our design will help improve the quality of life for the people of Paraguay.

## Project Goals

Create a way to extract pumps from community wells that is:

- Cost-effective
- Energy-efficient
- Convenient
- Composed of available materials

## Background

### Problem

- Communities in Latin America depend on deep wells as their main source of water
- Removing pumps that need to be repaired or replaced is problematic for communities



### Current Solution

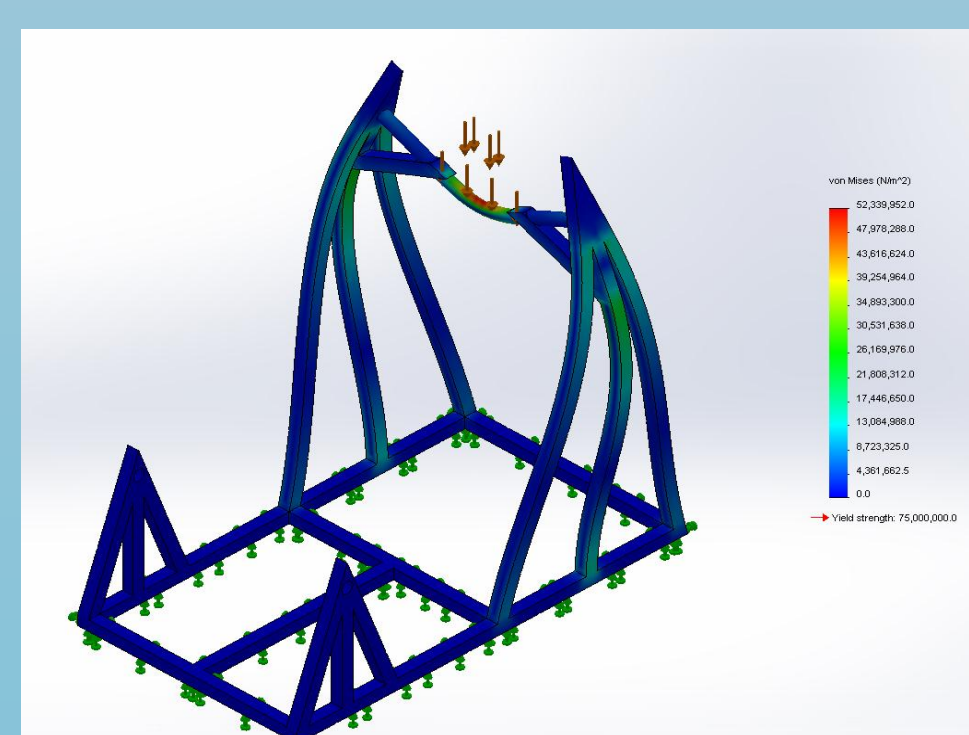
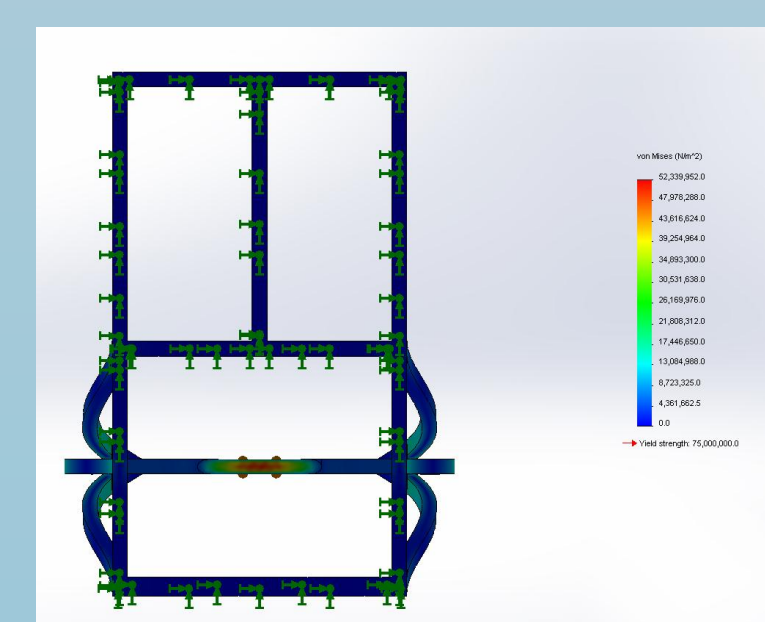
- Rope with hook (many for emergencies)
- Hydraulic, crane-mounted trucks
  - Cost \$50,000
  - Only 25 trucks for almost 3,000 wells
  - Not energy efficient



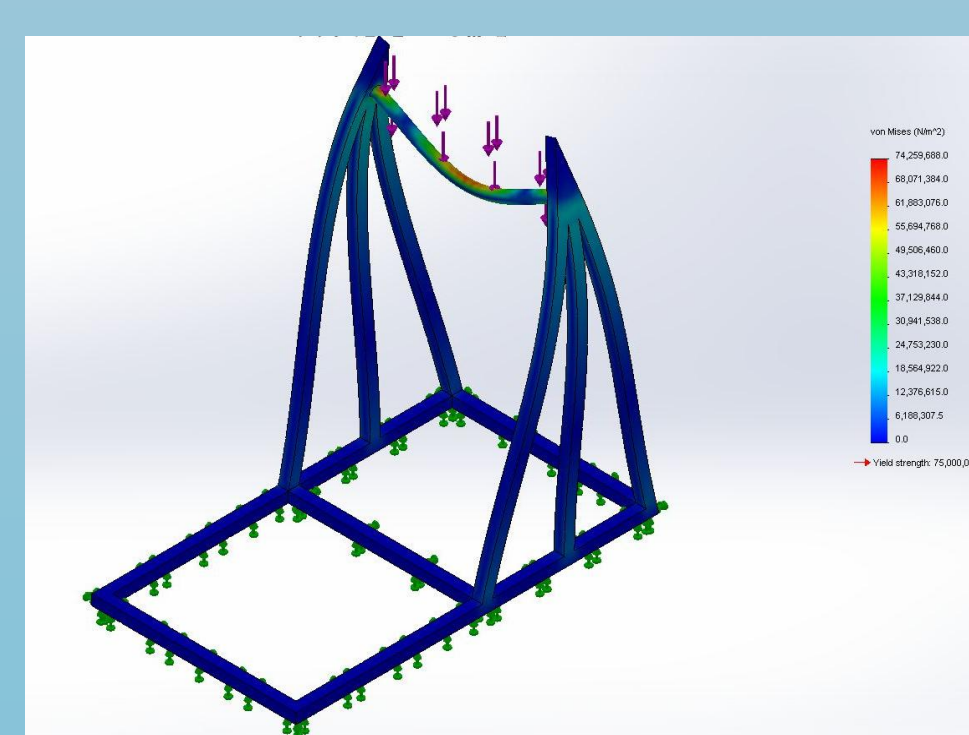
## Recommendations

Have Future WPI IQP or GPS Group:

- Run more comprehensive tests on our design
- Finalize design
- Create manual for design
- Look into more sustainable fuel sources for pump motor

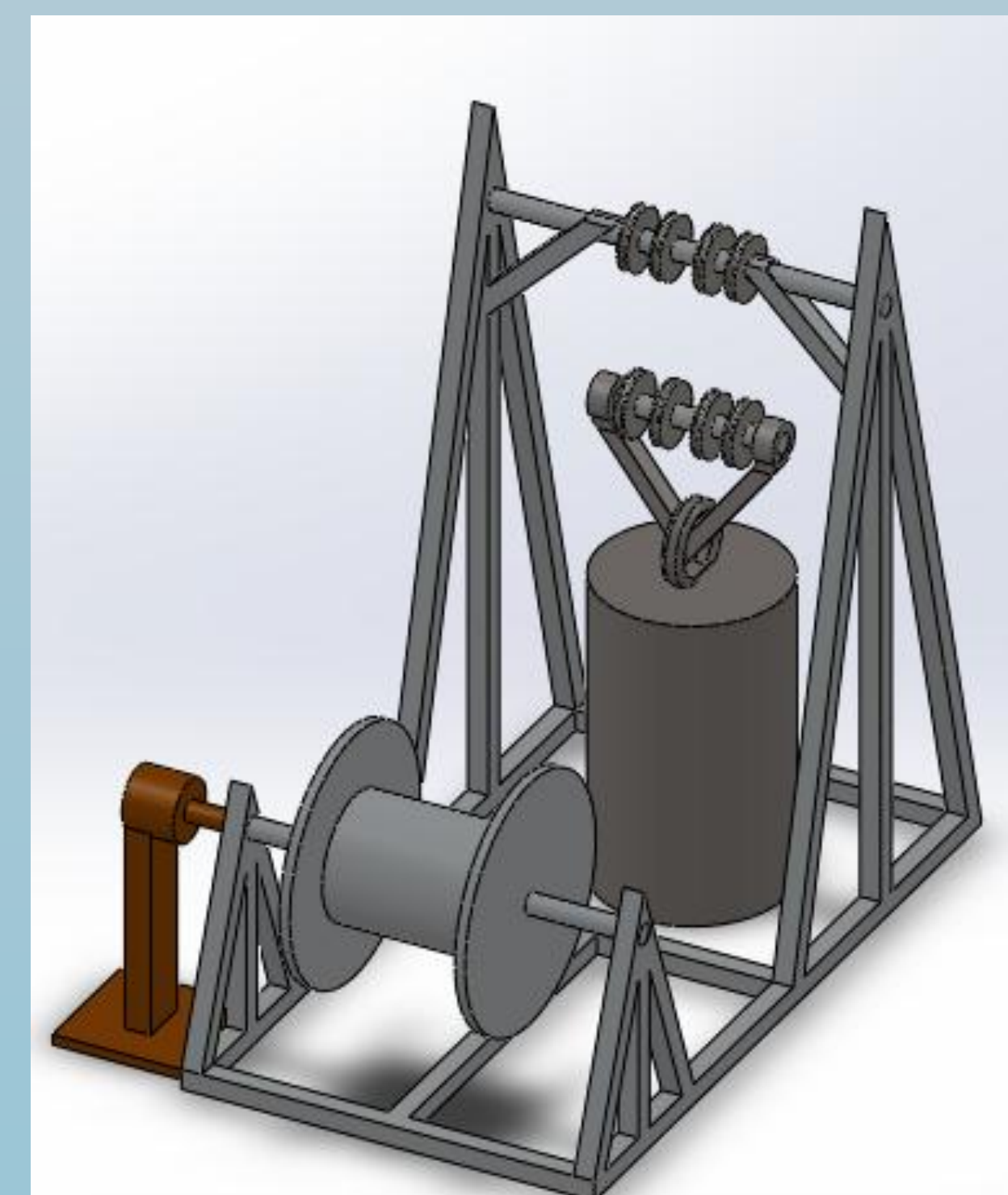


With Extra Supports



Without Supports

## Results



	Truck with Crane	Rope with Hook	Our design
Cost	\$50,000	\$431.04* (Calculated from two sources)	\$7,600
Efficiency (time)	<b>Time consuming</b>	<b>Time consuming</b>	<b>Reduced time</b>
Environmental Friendliness	<b>No;</b> truck emits pollutants	<b>Yes;</b> only man-power used	<b>Somewhat;</b> emits some pollutants
Reliability	Once present, <b>very reliable</b>	<b>Not very reliable</b>	<b>Unknown</b>
Safety	<b>Low Risk</b> of injury	<b>High Risk</b> of Injury	<b>Low Risk</b> of injury

- 12ft by 6ft by 12ft crane designed in SolidWorks
- Crane can successfully lift five tons which equals the weight of water pumps
- Crane weights close to 7,000 pounds - must be transported on a trailer due to this
- Frame built out of Aluminum 10-60-H12 beams; pulleys, cable, and collection spool built out of steel
- Crane design costs \$7,600 to build

## Methods

- Established contact with the AVINA Foundation and were asked by Mirtha Paez, the President of Paraguay's water boards, to design a transportable crane system
- Researched the current system of pump removal, pick-up trucks and crane designs
- Became familiar with the program SolidWorks to design our crane system
- Constructed and tested a crane prototype in SolidWorks
- Kept in contact with Paula Burt at the AVINA Foundation, providing her with updates to our project and asking any questions that came up

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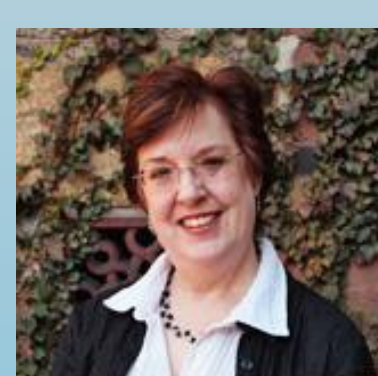
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## Acknowledgements



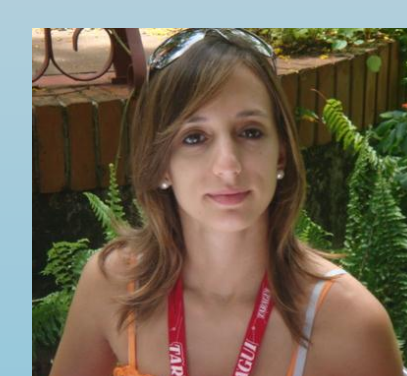
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