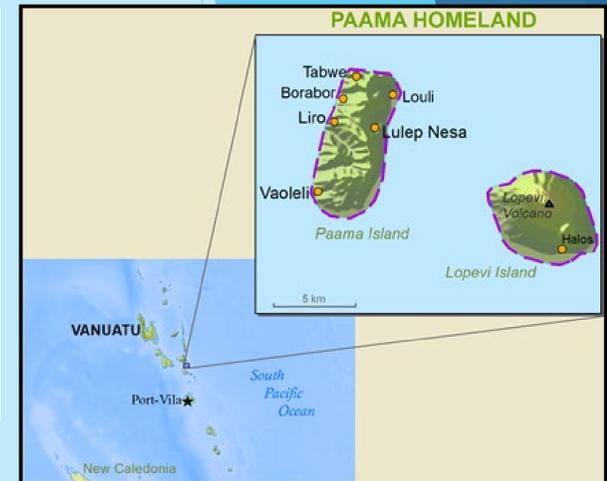


Micro-Hydro Generator Project

Angus Gallagher and Joshua Tippet

Problem

A small community on Paama island in Vanuatu requires an alternative power source to the current solar system during the rainy season. Our client requested a micro-hydroelectric generation system that can charge a battery bank, that can in turn charge the locals cell phones and run a LED lighting system in the community hall. Constraints for this project were that it must be light weight, low maintenance and be made with a low budget.

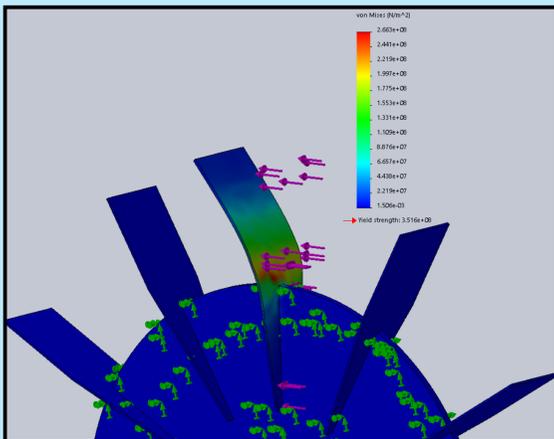


Paama Island

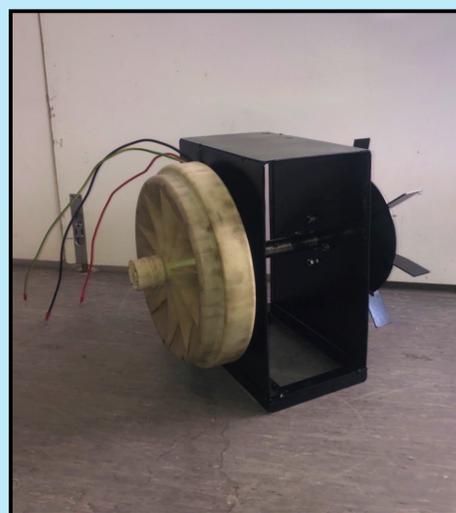
Solution

Our solution to the problem is a Pelton turbine attached to a recycled smart-drive motor as the generator unit.

- Pelton turbine is an impulse turbine which uses a high-pressure water jet spraying onto the buckets to rotate the shaft.
- smart-drive motor is a 3-phase Permanent magnet motor. It has been rewired to bring the output voltage down to a usable 12-24volts. The output from the generator goes to a 3-phase full bridge rectifier which turns the output into a constant dc voltage suitable for battery charging.



The image above shows a simulation of the Pelton turbines and the stresses acting on the bucket due to the jet in Pascals.



The completed Pelton generator



The testing the generator output

Conclusion

In testing, just with a hand crank we were able to produce 6-7 volts at very low rpm, our target rpm is in between 100-140rpm to get the required voltage for battery charging. Drawbacks of the design is that when using a Pelton turbine you need a high-water head to produce the required pressure to spin the turbine.

Recommendations for the project would be to make a durable housing to protect it from the elements and for there to be a place to mount the water jet nozzles for the turbine.

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