

IPRO 348:

**Techno-Business Study of Water Pump
Motor Technologies**

P U M P

Pentair Utilities Motor Project

Outline

➤ Background

➤ Research

➤ Results

➤ Problems

➤ Solutions

➤ Impact

➤ Future



Mission Statement

“ Find a new motor for Pentair to use in their water pumps that is more economically and environmentally friendly, through research and testing of potential new motor technologies.”

Organization of Team

Sponsor

Pentair Inc.

Advisor

Phil Lewis

Team Leader

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Technical Team

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Recording Team

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Lisa Jackson

Background





Renewable Energy

Solar Power

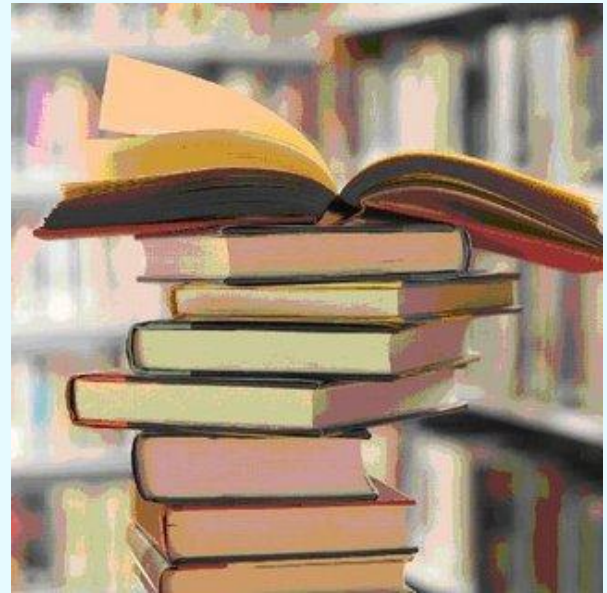
Hydroelectric



Wind

Geothermal

Research



Research

Pump Systems



Motor Types



Research

Alternative Energy



Controllers



Research

➤ What's in the market?



Results

➤ Switched Reluctance Motors

Not very available, other disadvantages due to noise and vibration.

➤ Servo Motors

More control than necessary and very expensive

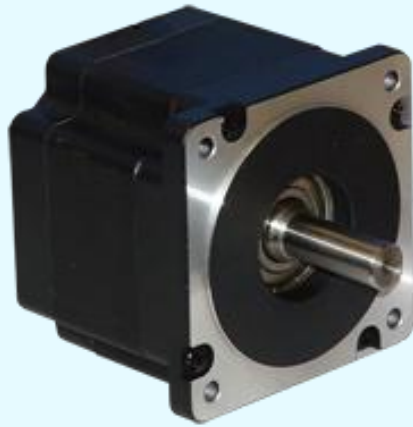
➤ Permanent Magnet Motors

Lower availability and higher maintenance

➤ Brushless DC Motors

Best possibility

Motor Specifications



- Voltage: 160-310 V
- Current: <7 A
- Speed: 3500 RPM
- Torque: >360 oz-in
- Cost: ~\$300

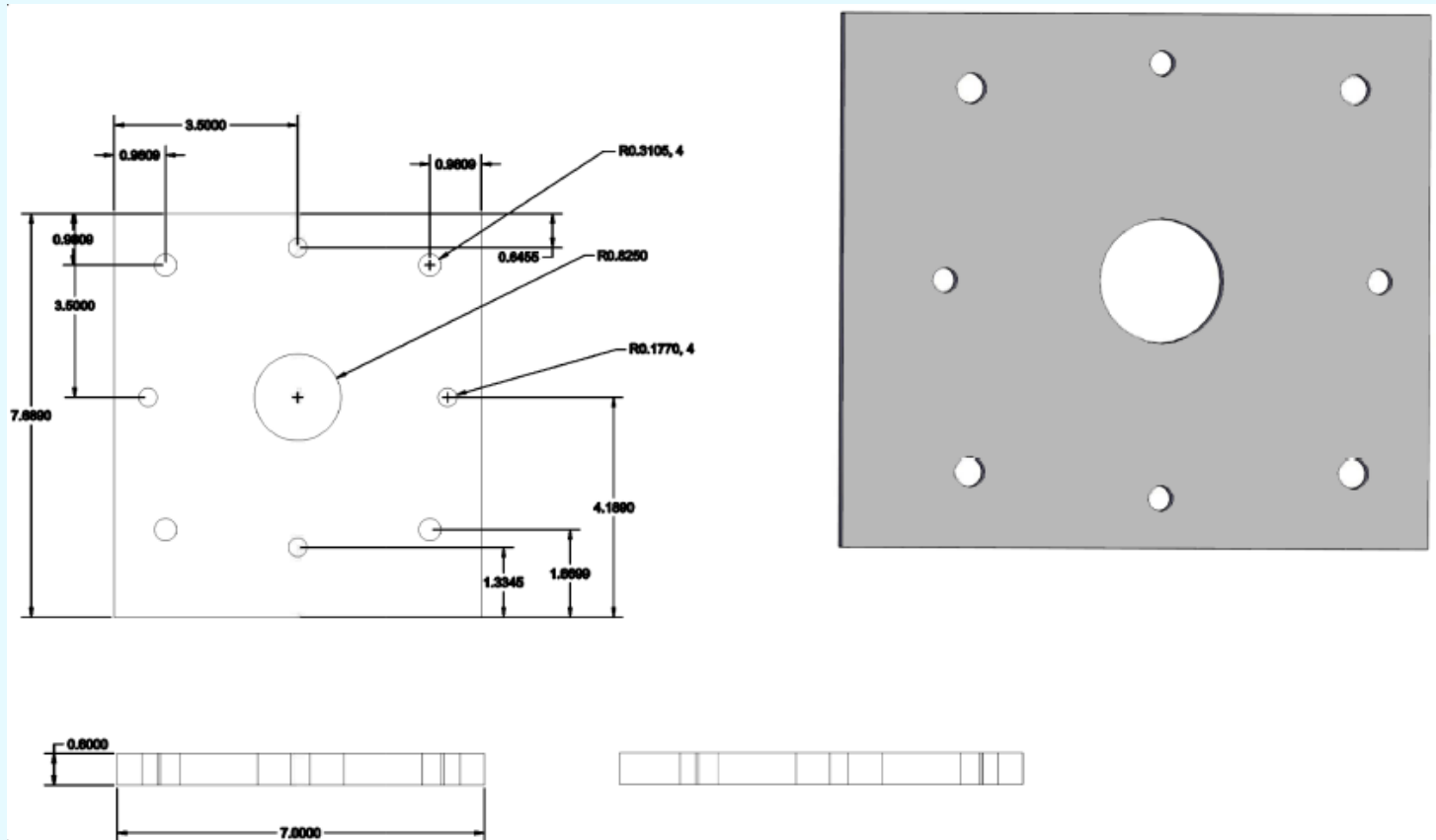
Advantages/Disadvantages

	Motion King 90BLDC125A- 640	Anaheim Automation BLY344D-160V-3000	<u>Anaheim</u> <u>Automation</u> <u>BLZ482S-160V-3500</u>
Advantages	<ul style="list-style-type: none">•Cheapest Motor• Controller•High Voltage	<ul style="list-style-type: none">•Small Size•Customizable	<ul style="list-style-type: none">•NEMA size 48•Pentair liked best
Disadvantages	<ul style="list-style-type: none">•Imported from China	<ul style="list-style-type: none">•Expensive controller	<ul style="list-style-type: none">• Expensive Motor• Controller

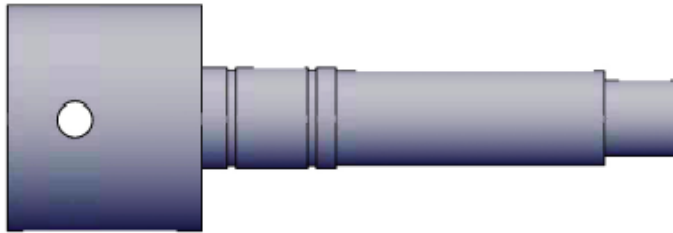
Challenges

- Purchasing
- Shipping
- Retro-fitting pump
- Controller

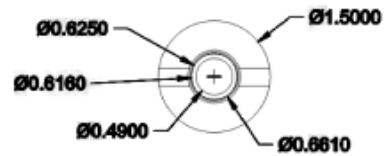
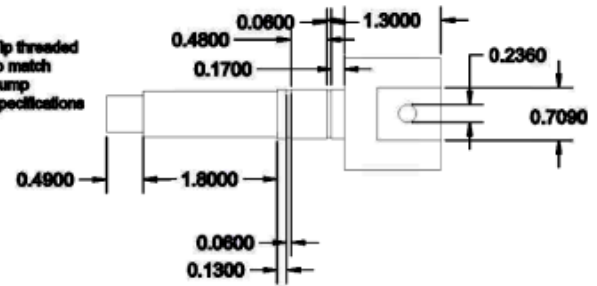
Adapter Plate



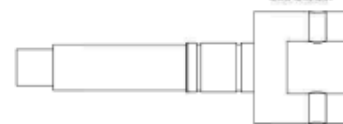
Adapter Shaft



Tip threaded to match pump specifications



Shaft threaded for set screw



Final Proposal

We believe that direct current brushless (DCBL) motors are the best possible technology to use that are readily available on the market.

Benefits

- Smaller Size
- Reduced SKUs
- Less power used
- Better performance
- Double the Lifetime

Renewable Energy

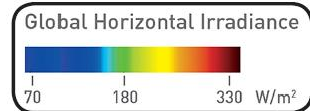
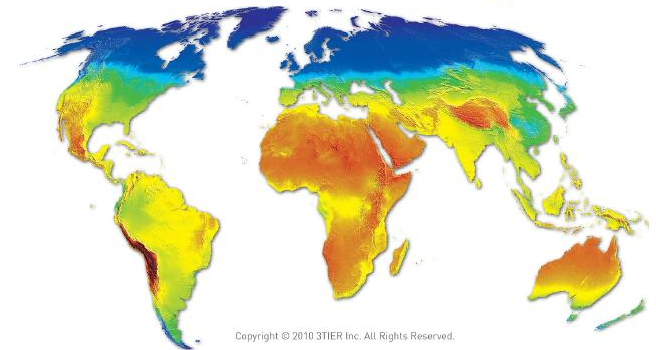
➤ India

- Dense population
- Leader in wind power
- Solar power

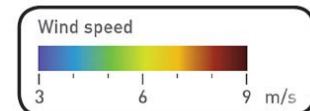
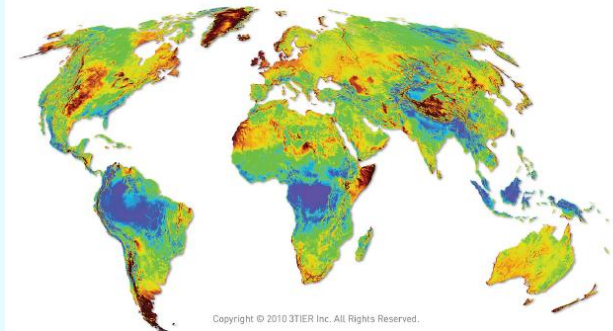
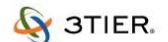
➤ Africa

- No grid
- Solar power
- 325 days of strong sunlight

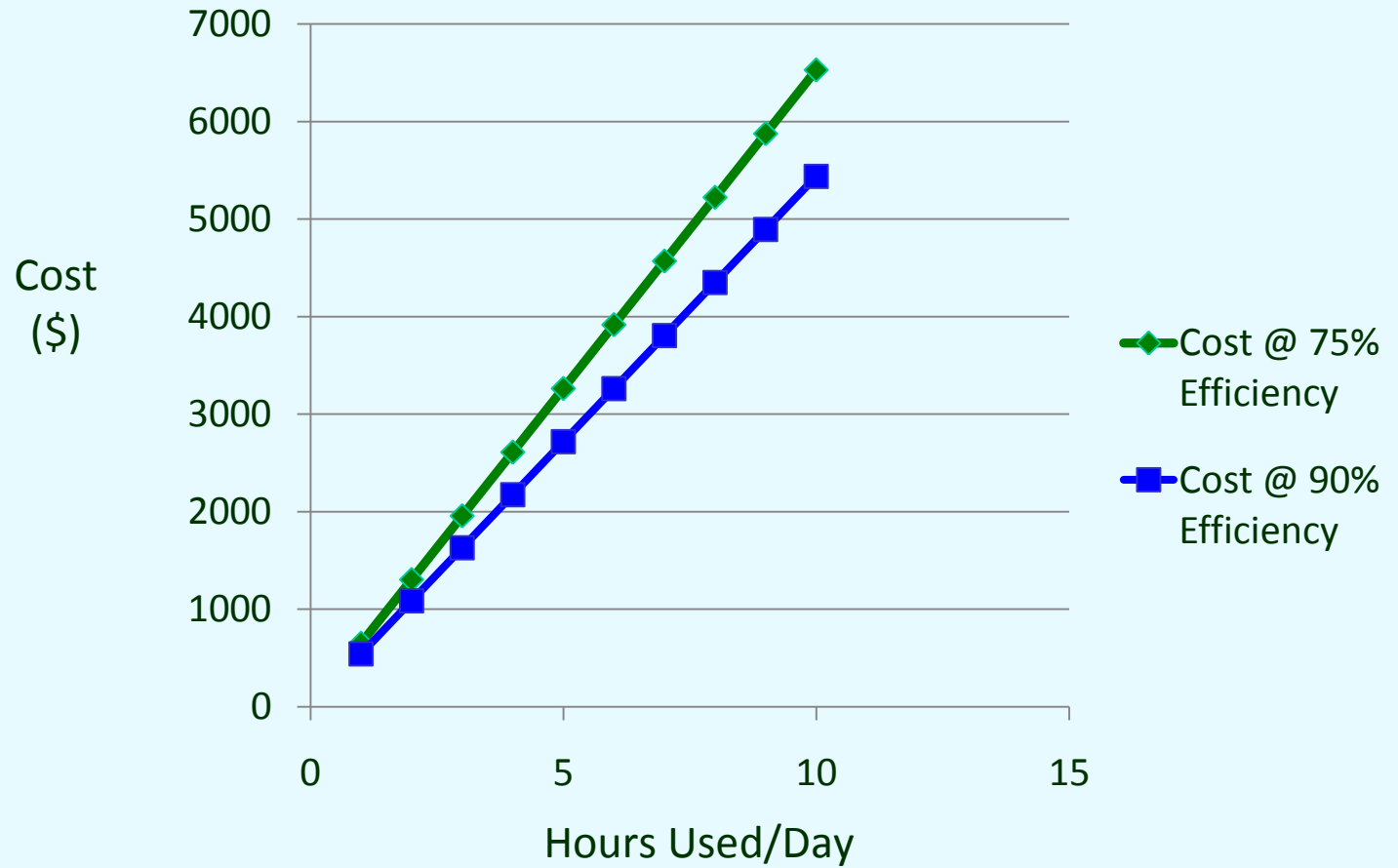
Global Solar Irradiance



5km Global Wind



Efficiency



Next Steps

- Retro-fit the motor
- Run the tests
- Compare and analyze the results

Future Problems

- Complications in pumping action of the DC retro-fitted pump
- Customer view of the size difference.
- Integrating controller into pump system.

Expectations

- The DC motor will run more efficiently
 - Less power to run
 - Constant torque
- Controller
 - Adjustable flow rate
 - Higher consistency

QUESTIONS ?

