IPRO 348:

Techno-Business Study of Water Pump Motor Technologies

PUMP
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
Jarrett Oberg

Technical Team
Sunho Lee
Khalid Matariyeh
Andre Colmenares
Jarrett Oberg

Recording Team
Tejash Patel
Veronica Hannink
Lisa Jackson
<table>
<thead>
<tr>
<th>Months</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
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<td>1st Visit with Pentair</td>
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<td>09/06 to 09/13</td>
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<td>Project Presentation with Pentair (3rd visit)</td>
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Background
Renewable Energy

Solar Power

Wind

Hydroelectric

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

<table>
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<tr>
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<th>Motion King 90BLDC125A-640</th>
<th>Anaheim Automation BLY344D-160V-3000</th>
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<tr>
<td><strong>Advantages</strong></td>
<td>• Cheapest Motor</td>
<td>• Small Size</td>
<td>• NEMA size 48</td>
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<td></td>
<td>• Controller</td>
<td>• Customizable</td>
<td>• Pentair liked best</td>
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<td></td>
<td>• High Voltage</td>
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<td><strong>Disadvantages</strong></td>
<td>• Imported from China</td>
<td>• Expensive controller</td>
<td>• Expensive Motor</td>
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<tr>
<td></td>
<td></td>
<td></td>
<td>• Controller</td>
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Challenges

- Purchasing
- Shipping
- Retro-fitting pump
- Controller
Adapter Plate
Adapter Shaft
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
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?