Zöe Drivetrain \\& Wheels

Life in the Atacama Design Review
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Description and Motivation

• Improve upon existing Hyperion drivetrain
  • Less backlash (no chains)
  • Higher efficiency (w.r.t. packaging as well as power)
  • Higher torque capacity
  • Higher top speed
  • Smaller part count (improved reliability)

• More appropriate wheel selection
  • Optimized interface to drivetrain
  • Wider contact patch for soft soils
Current Design

• Match motor/drive as closely as possible to speed and voltage requirements
  • Custom wound motor
• Efficient, high torque capacity harmonic drive gearing
• Compact, lightweight thin section output bearings with reliable seals
  • Entire drive assembly environmentally isolated
Drivetrain Packaging

- Complete drive system contained within axle
  - Concealed wiring
  - Sealed motor and gearing
Single Wheel Testbed

• Single wheel testbed created to qualify drivetrain and wheel options
  • Power data used to confirm new motor selection
  • 3 Wheels tested
    • Existing Hyperion bicycle wheel (26x1.75”)
    • Motorcycle wheel (28x3”)
    • Large diameter bicycle wheel (27.5x3”)
  • Drivetrain to be prototyped and endurance tested early 2004
Initial Wheel Tests

48V: Average Power vs. Weight

(speeds are commanded speeds, not necessarily attained, especially at 0.45 m/s)
Closing in on Zoe Wheel…

Power vs. Weight

Average Power (W)

Weight (kg)

0 10 20 30 40 50 60 70 80 90

0 10 20 30 40 50 60 70 80 90

15 cm/s

30 cm/s

45 cm/s
Recommendations

• 24” bicycle rim with 3” wide tire combined with custom machined hub
  • Slightly smaller in diameter than Hyperion wheel
  • Custom hub allows for optimized wheel mounting
  • Low weight
  • Short integration time
  • Simple, reliable solution

• Further testing to be done with mock-up of new drive system on single wheel testbed (new wheel, motor, gearing, amp)
  • 100km endurance test to insure reliability

• Custom wheel designs may be considered if time allows