

Precision Microdrives Motor Case Study

Digital PID Servo Motor For Weather Balloon Measurement Lab

THE APPLICATION & SOLUTION

Weather balloons are used to perform all kinds of experiments in the atmosphere. The balloon is filled with enough helium to reach the target atmospheric layer, and carries underneath it a small radio-controlled measurement lab. In this case study our customer had been contracted to build a large volume of single use balloons and measurement labs, which would be too difficult to recover after the experiments had been concluded.

Their single-use measurement lab was a cut-down version of a much more expensive multi-use platform, and used a servo motor to drive a pump. The customer was struggling to find a motor supplier that could match the performance of a Swiss motor, but in higher volumes and at a fraction of the cost. The prototype had worked acceptably with a tape-deck analogue servo motor, but in addition to the analogue PID driver being obsolete, ultimately the speed variation under varying torque loads was unacceptable. Our steps therefore were to test the motor used in the prototype, design a specification, and develop a digital PID driver that would turn a regular brushed motor into a cost-effective precision servo.



TECHNICAL SPECIFICS

Having characterised the prototype motor, we designed the final part around a 32mm frame and optimised the magnetic circuit and windings for 4 mNm torque @ 2500 rpm. We then designed a digital PID controller PCB back-pack for the motor, and extended the motor shaft into the controller enclosure. The controller was based around a microcontroller sampling motor speed and motor current, which adjusted the drive voltage accordingly. The resulting controller stabilised the speed within 0.4% over a range of 0 ~ 6 mNm of torque. A connector also provided real-time motor parameters to the lab's host controller.

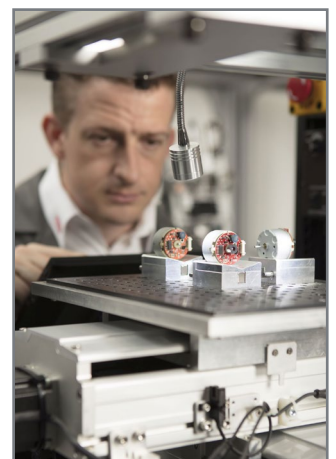


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