Application Note

Industry: Aerospace

Application: PID-style Antenna Pedestal

Challenges:

- Accuracy over azimuth, elevation, and polar axes
- Precise and quick rotary movement of heavy structures

Situation

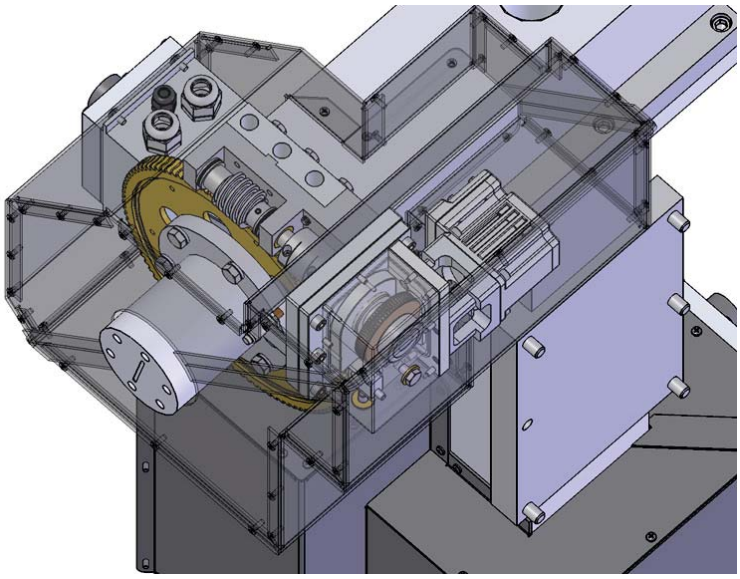
PID (proportional, integral and derivative algorithm based) style antenna pedestals are used to control three axes of movement of an antenna: azimuth, elevation, and polarity. These pedestal systems are created for everything from researching planets in space to tracking satellites for the military or government. For projects needing more accurate tracking, a bigger reflector dish can be used to create a tighter beam width and more concentrated power. Consequently, the tighter beam width creates a smaller radius to connect with its target, forcing the antenna position to be extremely accurate.

Problem

Antenna pedestals need to support up to a 12-foot antenna reflector that can weigh nearly 200 pounds and be able to move at a velocity of 4-6 degrees per second in each of its three axes. In the past M², who manufactures the tracking pedestals for antenna dishes, had installed a DC motor and a closed loop system which created an accuracy of 0.25 degrees in one direction. The accuracy of each axis was critical in order to control the narrow beam width for antennas, however the DC motors M² used were not precise enough for their goals and the results were weak and lost signals.

Solution

M² switched to Moog Animatics' SmartMotor integrated servo motor and ran it through two separate worm gear sets in order to achieve maximum velocity and accuracy. The result was improvement over the unidirectional stepper motor in all three axes, bringing the accuracy down from 0.25 degrees to 0.02 degrees. The implementation also elicited the opportunity for improvement, with the SmartMotor being capable of moving a 1,500 pound, 20-ft diameter dish up to 30 degrees/sec all while maintaining pinpoint accuracy.



Full case study available at www.animatics.com/applications