The term servomotor is often misinterpreted or misrepresented by manufacturers and design engineers alike. Servo is derived from the Latin servus (Slave) and as such a slave must have a master, otherwise it is free. In order to be an obedient slave it must be able to complete the commands and report to its master. Conversely, to be an effective master it must be able to listen to its slave in order to effectively issue new commands. This relationship forms a servomechanism.

This slightly philosophic introduction is to illustrate one regularly overlooked point: To be a servomotor it must have feedback and be connected with a controller.

This will seem a paradox to many within industry and in particular to hobbyists who for many years have been misinformed by manufacturers who supply DC motors with no feedback, non-linear performance characteristics and little or poor control capabilities under the guise of a “servomotor”. So servomotor products may not be what we are typically led to believe. Here to illustrate this point are some atypical servomotor examples supplied in 2012 that would not normally conform to common perceptions.

1) Flat Brushless (Pancake) DC motor and high torque gearbox.

This strange servomotor combination was used in a robotic joint application where very high torque was required with limited length. The customer manufactured a double skin housing that surrounded the motor and gearbox forming the arm, joint and mounting.

It was controlled on a multi axis CAN Open positioning system and optical encoders.
2) Double gearbox brushless DC servo motor.

The range of maxon EC-max motors and many EC 4-pole brushless DC motors have a constant through shaft diameter and matching bearing protrusions on both the front and rear of the motor. This allows the rear shaft to be used for mounting not only the standard feedback devices but also the entire range of planetary gearheads. This combination manufactured for a robotic welding traction application. One can easily imagine it would also be of great benefit in ROV and Pipe Tractor applications.

3) Mixed manufacturers

This example consists of a zero backlash gearhead, brushed DC motor and a 16 Bit absolute encoder. Used in an optical test instrument requiring high torque and precision positioning. If you use components from multiple manufacturers ensure that one of the component suppliers does the system assembly. Components such as these require precision alignment and you are much better off if your supplier takes this responsibility.
4) Right angle hollow shaft helical gear and flat brushless motor.

In this application the customer wanted to pass corrosive liquid through the bore of the gearhead. It is being used in a hand tool so the helical gearhead was selected for its 98% efficiency rating.

5) Four pole brushless DC motor with ceramic planetary and worm gearhead.

For most applications space and weight are becoming more and more critical and in none more so than aerospace. This combination of a 17,000 rpm four pole motor, high speed capable ceramic planetary gearhead, right angle worm gearhead with single piece machined alloy housing and a 2000 quad count digital encoder illustrates the “outside of the box” servomechanism product blends that are required for applications with tight mounting arrangements and stringent positioning requirements.
6) Linear Servo motor

I need to build a fast gripper for picking up rows of biscuits. Sounds like an easy request so far. The first thought would be to use a linear DC motor – they are fast. But then as you delve deeper into the requirements the linear motor falls short. The biscuits are in long rows and short rows, some are soft some are brittle. Now you need on the fly current sensing and very accurate high torque control at full speed, you also need to change into a position and speed control mode with feed forward. To achieve all this we use a gearhead with an integrated set of radial and axial thrust bearings. Instead of the normal planetary gearbox shaft we have a ball screw exiting the bearing block. Attached is a high speed brushless DC servomotor and encoder combination. –without the right mix of products your solution is crumbs.

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