Summer 2010
VOLUME 22, NO. 3

Valve MAGAZINE

Producing Linear Output with a Rotary Electric Actuator

Also...

- Exploring Marine & Mining Applications
- Valves in Severe Service
- The Reclaimed Water Market
- Do You Really Know the Meaning of Double Block and Bleed?
- Spotlight on Suppliers

Producing Linear Output with a Rotary Electric Actuator

By Paul Souza

Linear actuators come in a variety of types, which are typically broken down by power source: i.e., hydraulic, pneumatic and electric. This article will address two different ways to achieve linear motion using electric rotary actuators.

The many applications suited for linear output of an actuator can be broken down further by stroke length. Short stroke applications include diaphragm valves and control valves. Applications that require a long stroke typically include sluice and weir gates. However, there are many other special applications well suited for linear actuators including paper machines, dampers, decanters, skimmers and much more.

First, let's discuss the rotary actuator to linear output using a threaded valve stem with stem nut. Secondly, we'll address rotary actuators with an integrated linear output drive. Please note that most of the information in this article can be used with manually operated actuators (manual multi-turn gearboxes) because we simply convert the rotary output of the actuator to a linear motion.

Since rotary electric actuators are a frequent topic of discussion in *Valve Magazine*, we'll let readers refer to other issues for information on these actuators. For purposes of this article, we simply need to note that the output of the actuator rotates clockwise and counter-clockwise.

Rotating a threaded stem nut within an output drive will cause the threaded valve stem to rise and fall depending on the rotational direction of the actuator. This sounds simple; but after many more years in this industry than I care to admit, I hear almost every week about a "wrong rotation" actuator. This is typically an issue when a right-hand valve stem is attached to a valve instead of a left-hand stem. It's also often an issue when a valve or gate closes in the opposite direction (weir valve vs. gate valve). However, with good communication between supplier and customer, such issues are usually preventable. Usually, a simple reprogramming or wiring change of the actuator can fix the problem.

The stem nut also must be made of a material that will not gall to the valve stem. Typical stem nut materials include aluminum, bronze, stainless or cast steel, and sometimes plastic. Usually, choosing a material that is dissimilar from the valve stem material is required.

The stem nut should be supported both top and bottom with a thrust-type bearing assembly in a separate drive housing. This separate housing will provide support for the stem nut and allow for easy installation and removal of the actuator if required. Additionally, if the output drive assembly is supplied with a grease fitting, it should be lubricated at the time of installation and that lubrication should be retained with a high quality lubricant designed for thrust-bearing applications.

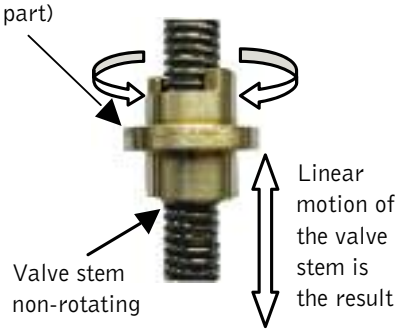

Figure 1. Threaded stem nut and valve stem. One of the benefits of this design is that very long operating strokes are possible.

THE BASICS

The basics for the rotary actuators with stem nut type output drives are:

Actuators that have an integral linear output drive may also be part of a rotary actuator combination. The linear integral

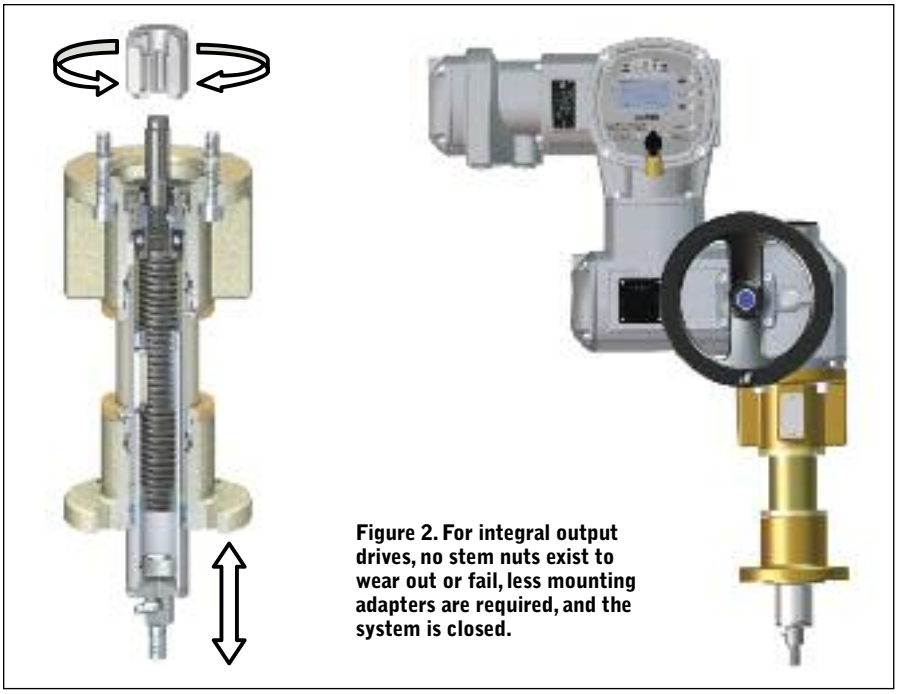

Figure 2. For integral output drives, no stem nuts exist to wear out or fail, less mounting adapters are required, and the system is closed.

output drive assembly would replace the threaded valve stem, actuator stem nut and associated parts shown in Figure 1. As the actuator rotates clockwise and counter clockwise, the linear output drive will extend or retract. This type of output drive is usually limited in stroke to 20 inches or less.

A threaded stub shaft is usually provided on the end of the output drive to attach a coupling for valve attachment. An integral valve mounting flange would be attached to the base of the linear drive.

As stated earlier, since there are reverse operating valve applications, the linear output drive should also come in a version that extends or retracts clockwise.

Options that may be available include pedestal mounting for pivoting applications, and spring compensation for high temperature or very fast applications.

The benefits of the integral output drive include the fact no stem nuts exist to wear out or fail, less mounting adapters are required, and the system is closed, which eliminates the ingress of dust and dirt, etc.
(Figure 2).

When converting a rotary actuator to linear output, the force measurement at the final output element is measured as thrust. The actuator manufacturer can provide the conversion information so that torque switches can be properly set. Microprocessor-controlled rotary electric actuators also are available with integral output drives that will do this calculation internally with settings done in thrust values.

The torque setting values when a threaded stem and stem nut are used are typically out of the hands of the actuator manufacturer. Values such as stem factor are typically the valve manufacturer's responsibility. With this knowledge in hand, converting to a rotary torque value becomes a simple calculation.

These are just two of the most common and cost-effective methods to convert rotary actuators to linear output. Applications with other types of output drives such as ball screws will benefit from further research by end users. **VM**

Paul Souza is quality assurance manager for AUMA Actuators, Inc. (www.auma-usa.com), Canonsburg, PA. Reach him at paul.souza@auma-usa.com.

AUMA Linear Electric Actuators

AUMA SA / LE Linear Electric Actuator
Thrust output up to 48,825 lbs / 217 kN
Linear stroke up to 19.7 in / 500 mm
Linear speed up to 17 in per min / 432 mm per min

auma®
Solutions for a world in motion

AUMA Actuators, Inc.
Canonsburg, PA USA
Ph: 1-724-743-2862
www.auma-usa.com
mailbox@auma-usa.com