

# Wind Turbine Welding System Uses Linear Motion Modules

*Linear actuators help provide reliable performance in submerged arc welding*

*Fig. 1 — Welding system setup for welding inside the “can.”*



Wind turbine technology, with its massive arrays of streamlined windmills blanketing hillsides, is an established sustainable, green technology. Many consider it a technology that will help define the energy future. But wind energy also depends, to a great extent, on traditional manufacturing techniques like welding, which is vitally important for fabricating the wind towers.

## Fabricating the Towers

The massive wind turbine towers can be close to 90 meters (~ 300 ft) high. Typically, a flat metal plate is rolled into a cylindrical shape called a “can.” The can (the most common size is approximately 9 ft long by 8 to 15 ft in diameter) is then rotated, while the welding machine, staying more or less stationary, performs circumferential welding across the entire diameter. Longitudinal welds are also required. Wind tower welding systems generally operate both inside (Fig. 1) and outside of the can at different times. The welding equipment is usually suspended from a guide rail for outside welding — Fig. 2. In each case, while the bulk of the welding equipment remains stationary during a weld, the weld head constantly moves small distances along at least 2 (sometimes 3) axes, both along and across the joint. A linear control actuator mounted at the end of a horizontal arm determines the motion of the weld head.

## Designing a System

AMET, Inc., a machine builder, was called upon to create a cost-effective, dependable welding system that could perform accurate longitudinal and circumferential submerged arc welding. The design, including the linear motion for weld head control, would ideally be relatively straightforward and simple.

One of the most important challenges, however, was to assure smooth and precise (within 1/100th of an in.) control of the weld head, to avoid the need to redo

*Story based on information supplied by Bosch Rexroth, Hoffman Estates, Ill. (boschrexroth-us.com). Submit inquiries to Craig Dees, AMET, Inc. (www.ametinc.com), Rexburg, Idaho.*

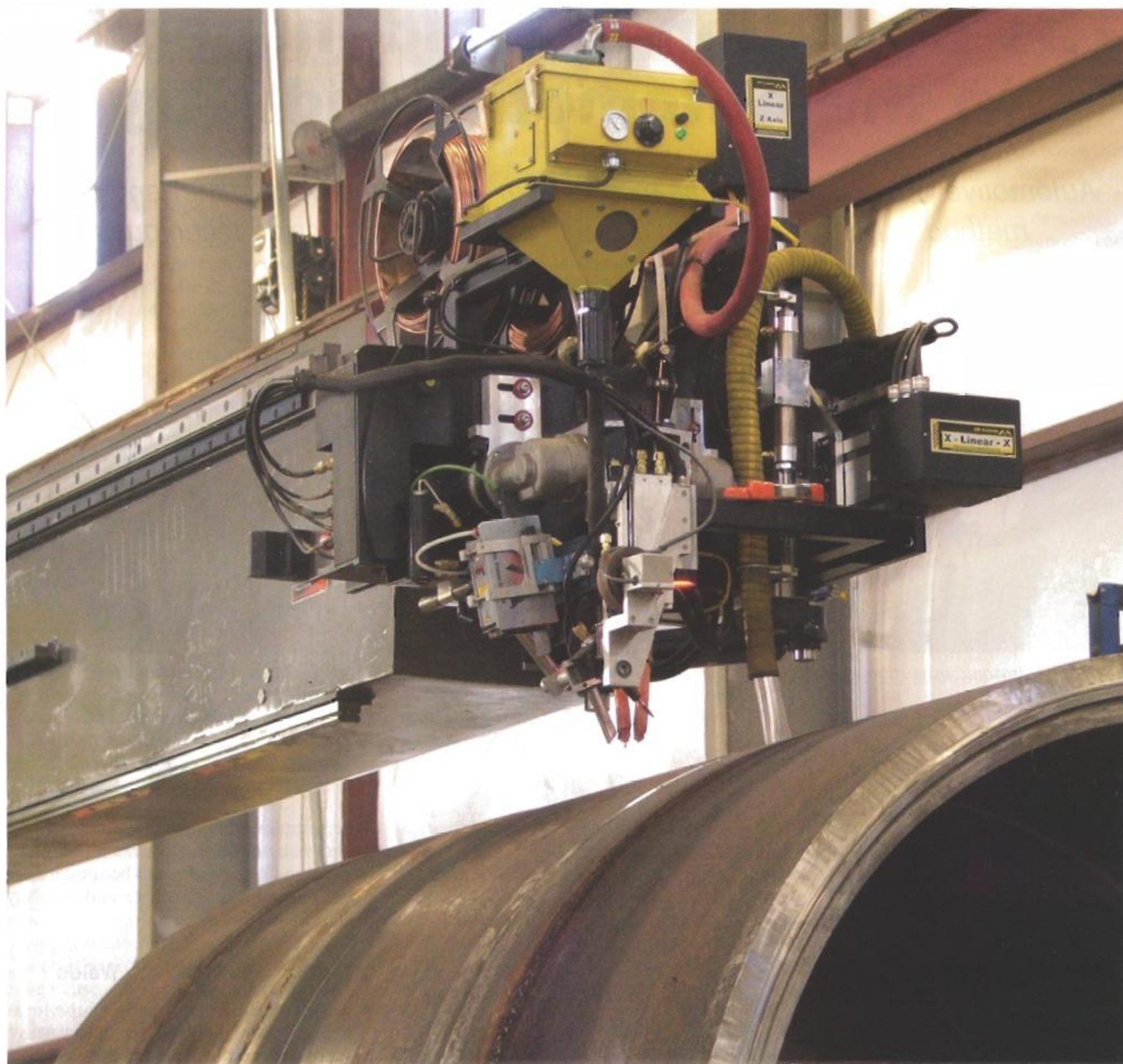


Fig. 2 — Welding equipment is usually suspended from a guide rail for outside welding.

welds, which wastes time and materials. This precise control had to be maintained within a demanding environment.

"The tremendous amount of particulates, especially flux dust, generated by this form of welding can really cause problems for this machine's finer controls, particularly with systems such as linear actuators," said Craig Dees, AMET engineering manager. "We needed to be sure that the linear motion components would stand up to this harsh welding environment, especially inside the can."

In addition to good protection against flux particulates, the linear motion elements had to offer good strength (dynamic

loads in excess of 20,000 newtons) with light weight and compact size. Another challenge was to support smooth weld head acceleration of up to  $3 \text{ m/s}^2$ , for a travel speed of 1.5 m/min.

To meet these needs, a source for linear motion components, Northwest Motion, Inc., a distributor of Rexroth CKK modules, was contacted. The company recommended a linear motion module with the desired strength-to-weight ratio. Hardened steel guide rails were specified for the guide rail that carries the suspended weld head for outside welding.

The linear actuator specified was CKK 20-145, which features a sealed rolling

strip. This seal keeps the module protected from the pitting that's caused by particulates generated from welding. The two-carriage design gives the welding system a guideway dynamic load capacity of up to 61,000 newtons for the stability needed in the application.

The modules are complete prepackaged systems, with bearings and ball screws integrated in the module. This simplifies design, saves space, and removes the costs and effort of machining, assembly, and bearing alignment. The modules are helping AMET welding systems ensure dependable performance in wind tower applications. ♦