Team Laser Control Solutions (LCS) worked alongside Mactech On-Site Machining Solutions to develop and test a real-time self-leveling system for their Large Diameter Facing Machine (LDFM). The LDFM is used to machine large diameter flanges (6'-18’) for the oil, marine, and power industries. The goal of this project was to reduce overall machining tolerances from .015” to .005” using a laser measurement system and a custom designed control loop.

**Project Description**

**Control Loop**

The designed control loop implements a high-precision laser, servo motor and ball-screw to make continuous height adjustments. The system is capable of adjustments as small as .001”.

The desired milling plane is entered into the human machine interface before starting the control loop. The motion controller takes a reading from the laser and then adjusts the servo motor to keep the mill head in the desired plane. The new modified mill head assembly is adjusted by turning a precision ball screw. Once the adjustment has been made the motion controller takes a new laser measurement and repeats the control loop until milling is finished.

**Electrical System**

Trio Motion MC403 Motion Controller
Emerson Epsilon EP204 Servo Drive
PULS CS3 DC Power Supply

**Human Machine Interface**

A Human Machine Interface (HMI) was created so that operators could use the laser system in either manual or automatic control loop mode. Two separate screens are used, one for each operating mode. Both screens show information about the detector, including vertical height.

Control mode implements the laser in a feedback loop to automatically maintain .005” tolerance.

Manual mode allows for the operator to manually move the mill head up or down. Depth of Cut keeps a running sum of the total movement.