

## Balanced approach

**C**obalt-alloy hip components are among the numerous musculoskeletal reconstructive devices produced by medical product manufacturer Biomet Orthopedics Inc., Warsaw, Ind. Biomet machines the parts on Okuma LU15-M turning centers in single-digit lot sizes determined by just-in-time production strategies. The hockey stick-shaped parts range in overall length from 4" to 16".

### END USER

Biomet Orthopedics Inc.

### INDUSTRY

Medical devices.

### CHALLENGE

Overcome vibration when turning eccentrically shaped part.

### SOLUTION

Real-time balancing system.



Lord Corporation

Lord Corporation's balancing solution has reduced cycle times more than 20 percent. Benefits of minimizing Biomet's vibration problem include extending the life of the machine spindle bearings and other components, decreased maintenance as well as surface finish improvements on the product.

The parts' eccentric shape, however, posed a machining problem: Unacceptable levels of vibration resulted when spindle speeds rose.

Biomet had partially controlled the vibration by dynamically balancing the machine's 2-jaw chuck while it gripped a medium-size part. Nevertheless, to achieve the high quality crucial for medical components, spindle speed was limited to a maximum of 1,000 rpm.

According to Dan Cordill, manufacturing engineer in Biomet's Hip Group, "If you rotated the spindle up to 1,050 rpm and put your hand on the outside of the machine, you could feel the vibration."

As demand grew, Biomet investigated ways to increase production. With the final alternative being the purchase of additional machines, the goal became finding a way to decrease cycle times and boost output by raising spindle speeds while eliminating vibration.

After investigating a number of possible solutions, Biomet installed an EM-2000 turning center balancing system from Lord Corporation ([www.lordmpd.com](http://www.lordmpd.com)). The system's basic components are a balancing ring that mounts on the machine chuck adapter and an actuator coil located on the turning center's housing. A noncontact power supply bridges the air gap between the rotating ring and the stationary coil. Sensors monitor the level and phase angle of vibration in the spindle, chuck and workpiece. When the system detects a predetermined level of vibration, Lord Corporation's "Adaptive Influence Coefficient" control moves two counterweighted rotors in the ring to restore balance while machining continues. Balancing takes from 3 to 10 seconds.

The system immediately produced positive results. Biomet can now turn the parts at up to 2,000 rpm, which reduces cycle time to 4 minutes, 16 seconds from 7 minutes, 20 seconds. Overall cycle times, including other operations, have dropped more than 20 percent.

Longer tool life was an unexpected benefit. Before the balancing system was in-



Lord Corporation

Lord Corporation's balancing ring mounts on the machine chuck adapter, allowing Biomet to turn hip components at higher speeds and cut overall cycle times by more than 20 percent.

stalled, an insert edge machined about a dozen parts before wear made indexing necessary. Cordill said, "After installing the balancer, we may run one corner all day long, which may be 90 [to] 100 parts."

Slower insert wear also slows the progress of variance within tolerance specifications, which reduces the need to adjust machine offsets during production.

Surface finish also improved. Cordill said that before the balancing system was employed, surface finishes routinely were about 16 rms. "Now we're running considerably below that," he said, crediting the higher spindle speeds as well as the vibration-free operation.

Lord Corporation says minimizing vibration also extends the life of the machine's spindle bearings and other components.

Three months after installing the first balancing system, Biomet installed two more units. The improved output that resulted from the shorter cycle times eliminated the need to buy another machine tool.

Cordill said the way of thinking that led to acquiring the balancing system is common at Biomet. Rather than simply buy another machine, the company went in a new direction. "If you continue to buy what you already have, you're going to get the same result," he said. "We want to take advantage of new technology."