Spindles

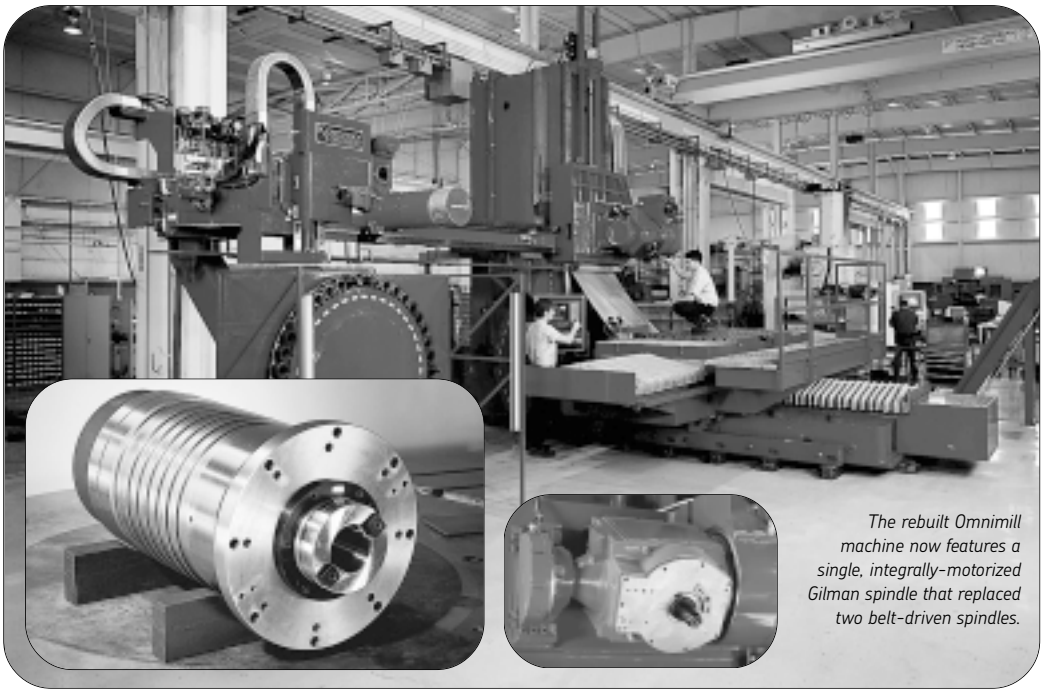
Idea bulletin

OM-3 and OM-4 Sundstrand Omnimills' spindle upgrade

Single, 25 hp, CAT 50 integrally-motorized spindle replaces two belt-driven spindles

Application

A major aircraft engine manufacturer wanted to upgrade the spindle on its OM-3 and OM-4 Sundstrand Omnimills (5-axis machining centers with a 150 degree tilting head). Material being machined was Inconel, Titanium and other aerospace alloys.



The rebuilt Omnimill machine now features a single, integrally-motorized Gilman spindle that replaced two belt-driven spindles.

Challenge

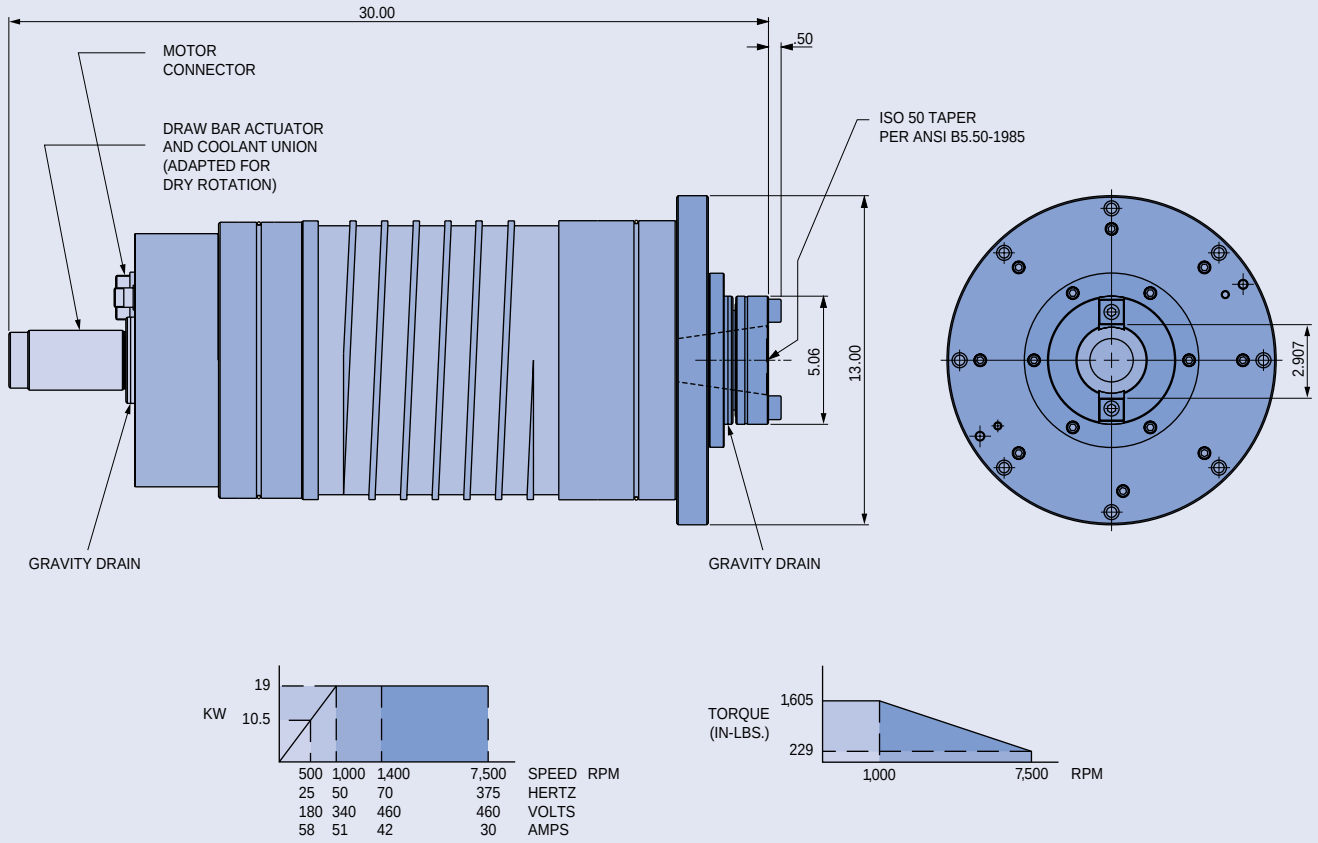
Converting the original two-spindle arrangement (a low-speed spindle to handle large tools and a high-speed spindle for small tools) presented a number of challenges.

A conventional rebuild would require a completely new slide casting together with a two-speed, timing, belt-coupled spindle cartridge requiring oil-bath bearing lubrication, a complicated design that would be both hard to adjust and maintain.

Solution

Instead of redesigning the head to accommodate a conventional belt-driven spindle, the machine builder suggested an integrally-motorized spindle for better functionality. Ultimately, the solution came in the form of a single, 25 hp (18.6 kW) spindle capable of 7,500 RPM, with CAT 50 taper and through-spindle coolant.

A stock spindle being unavailable, an SKF engineering team visited the rebuilder to review the application. After research, the engineers recommended Indramat windings to fit within the severe space constraints of the head. A new head casting configuration, machined to allow coolant to circulate around the spindle body, allowed the spindle to drop into the housing and bolt through a flange, making spindle removal an under-30-minute job. To eliminate the problem of a hose band moving with the tilt head, the housing is also inner-drilled and plumbed to handle all hydraulic, coolant and electrical requirements.



All dimensions in inches unless otherwise indicated.

Technical specifications

Spindle:

- Preloaded Triplex set ABEC 7, 25° hybrid ceramic angular contact ball bearings nose end (90mm I.D.)
- Preloaded pair ABEC 7, 15° angular contact ball bearings back end (70mm I.D.)
- Kluber NBU15 grease lubrication
- Inpro VBX seals each end
- Indramat encoder feed back for closed loop operation with Indramat drive
- OTT Hydraulic draw bar with coolant thru and taper air blast cleaning
- 7,500 RPM maximum
- Maximum thrust into spindle 1,200 lbs.

Motor:

- The spindle is driven by an Indramat intelligent AC vector drive. Stop and orient mode takes less than 3 seconds at 7,500 RPM. The rebuilt machine has a wide range of speeds without gear changes.

Cost savings

Redesigning and rebuilding saved the user approximately one half the cost of a new machine. Six machines have been converted to date.

Time line

Total project time, from initial consultation to spindle delivery, was 18 weeks. Since the first spindle was delivered four years ago, not a single problem has been reported.