

# Anatomy of a Rebuild

Bringing older gear machines back to life

Tony Johnson, Director, Sales and Marketing,  
Machine Tool Builders, Inc.

From the outside, Gallmar Industries, nestled into an Oshkosh, WI, neighborhood, looks like any unassuming, medium-sized gear shop. Then take a plant tour with Gallmar's VP of Operations Kenan Zolota—and prepare to be amazed. The facility stretches on like the Army's warehouse at the end of *Raiders of the Lost Ark*, with everything from gear cutting to heat treat, gear grinding to inspection, all under one roof. Gallmar's breadth of product line is in evidence too: defense-related transmission gears, 60-in. diameter internal gears for mining equipment, axle components for fire/rescue trucks five feet in length, right down to a bin of brass ammunition casings that Zolota says are a special order.

"Because lives are at stake!" Zolota exclaims when asked why his company has made the investment to control every process and eliminate outsourcing wherever possible. "Failure is not an option for the types of products we produce, and the vehicles they go into, whether an armored MRAP or rescue truck. We don't shy away from complex, demanding work; outsourcing adds an element of unacceptable risk. The buck stops here."





*Machine Tool Builders' complete rebuild of a circa 1990s Pfauder P400G Form Grinding Machine adds years to its useful, productive life at Gallmar Industries.*

## New Life for an Old Grinder

Perhaps most amazing of all at Gallmar is the machine that Zolota says is one of his most important, and productive: a Pfauter P400G CNC Form Grinding Machine built sometime in the 1990s. If you're skeptical that a roughly 30-year-old grinding machine with outdated CNC could live up to the quality and AGMA 15 accuracy requirements demanded of the hard finishing, high-precision work that Gallmar specializes in, you'd be right. Zolota bought the machine just a few years ago in "like-new" condition from Machine Tool Builders (MTB), specialists in rebuilding, retooling, and recontrolling gear machines of all makes and models. "We saved many thousands of dollars by buying this machine, and months on delivery," recalls Zolota. "The machine came with an extended warranty too, not unlike what you would expect for a new machine. Most importantly, MTB is there for us at the drop of a hat, whether for service, spare parts, or help with parts

programming, just as if this was a new machine direct from the OEM."

The P400G's journey from *obsolete to awesome* started on the shop floors of MTB, where founder Ken Flowers and his team of technicians view each rebuild as an opportunity that's akin to restoring a classic Corvette. "If the framework, the 'iron' is sound then the restoration can proceed in similar fashion," Flowers explains. "Nothing is left untouched, every active component, including CNC, is upgraded, every mechanical piece meticulously inspected then repaired or replaced."

The MTB rebuild methodology has been refined for almost 30 years and hundreds of gear machines of all types, makes, and sizes. While no two machines are exactly alike, MTB's gear machine rebuild process has been efficient and effective in the industry—and unfolds for every gear production machine (whether hobber, shaper, or grinder) in similar steps in less than a year, once the machine is on MTB's shop floor:

### 1. Cleaning

The machine is completely disassembled, and each piece is thoroughly cleaned, either by hand-scraping (or -grinding) or by blast-freezing with CO<sub>2</sub> and blowing off the frozen oil, sludge, and debris. This process ensures a totally clean, dry surface. Meanwhile, engineering is already at work, designing the mechanical and control features, utilizing 3D modeling software.

### 2. General Mechanical

All way surfaces are refinished, either by hand scraping or grinding. Turcite material on the slide underside is used to restore proper alignment with the drive shaft and screw, plus to provide a low-friction slide.

### 3. Head and Spindle

The head and components are thoroughly cleaned and inspected, and the spindle, outboard, and internal bearings are replaced, along with seals and gaskets. Geometric alignments of spindle(s), axes, outboard bearings, and tooling are performed to ensure true square precision performance.



Recontrol to latest Siemens CNC, and MTB's new Form Grinding Conversational Software, combined to empower machine operators and simplify their daily tasks.

#### 4. Worktable

The table is disassembled, and all parts are inspected for wear. Final drive parts are inspected for spacing errors and contact, and the table is then reassembled with the proper lash set. The column and machine base are assembled, radial/axial slide scraping is completed, and the table housing is readied for reassembly.

#### 5. Hydraulics

Hydraulics is overhauled, including A) hydraulic pressure valves; and B) hydraulic pumps. MTB installs new or rebuilt hydraulic pumps, hoses, pressure switches, pressure-reducing valves, flow controls, and pressure regulators.

#### 6. Lubrication

New lubrication valves, pumps, meter blocks, hoses, and feedback are installed.

#### 7. Coolant

All coolant components, such as the pump, motor, hoses, and nozzle, are replaced or repaired.

#### 8. Guarding



*MTB's meticulous rebuild process leaves nothing untouched. Every component is upgraded, and every mechanical structure is carefully inspected, replaced, or repaired.*

All guarding is returned to its original configuration and function. If guarding is damaged, requires modification for splash protection from coolant, or affects aesthetics, newly formed panels are designed and manufactured.

#### 9. Chip Extraction

Chip conveyors of various designs and performance configurations are cleaned of swarf, chips and metal particles. Then, all parts, including upper and lower curves, belt rollers, and hinge pins are inspected for wear.

#### 10. Electrical

A new electrical cabinet is installed, with all new motor starters, relays, power supplies, transformers, terminal strips, and more. Since panel building and wiring practices are very critical for integrating

controls, MTB is meticulous in its details for control layout and wiring methodology. All new machine wiring is run throughout both the main and auxiliary equipment. New feedback systems, glass scales, and encoders for all axes are installed.

#### 11. Controls and Software

The machine gets new CNC, generally the latest generation CNC FANUC or Siemens control system, along with servo motors and drives. Installation of all new digital drives for the axes, and



[www.involutegearmachine.com](http://www.involutegearmachine.com)

**A Perfect Mesh**

American ingenuity, service and support teamed with Japanese efficiency, quality and technology.

### Kashifuji CNC Gear Hobbing Machines



**KN152 Gear Hobber**



**KE251 Gear Hobber**



**KPS 201 Gear Skiving Machine**

100+ Years of Manufacturing Gear Hobbing Machines      8 Models of Machines from 50 to 1000mm

### OSAKA SEIMITSU KIKAI CNC Gear Inspection and Double Flank Rolling Machines

65+ Years of Manufacturing Gear Inspection Machines



**CLP-35DDSF Gear Tester**



**GTR25 Double Flank Gear Roller**

Machine Models to 850mm OD Capacity

46449 Continental Drive  
Chesterfield, MI 48047  
Phone: 1-586-329-3755  
Fax: 1-586-329-3965  
[rodne.ysoenen@involutegearmachine.com](mailto:rodne.ysoenen@involutegearmachine.com)

a new digital spindle drive and spindle motor on its axis. The entire electrical cabinet is replaced, including the air conditioner, and all components and wiring inside will be new. This includes all motor starters, relays, power supplies, transformers, terminal strips, etc. Existing feedback devices will be replaced with absolute scales, thus eliminating the time-consuming homing process. All the motor power and feedback cabling are replaced as well. Most importantly, the CNC is loaded with all the required PLC and conversational program software. MTB's Windows-based conversational software program is designed to speed up and simplify the operator's programming and day-to-day operating tasks. The software is designed to allow operators to run both existing part programs and create new part programs; quickly and seamlessly.

## 12. Install, Runoff, Train

The final steps are identical to those of a brand-new machine. The machine is delivered to the customer. A team of MTB technicians installs the machine, loads software, and performs the runoff. MTB provides operator and maintenance

training following installation. Documentation is provided, including new operating and maintenance manuals as required.

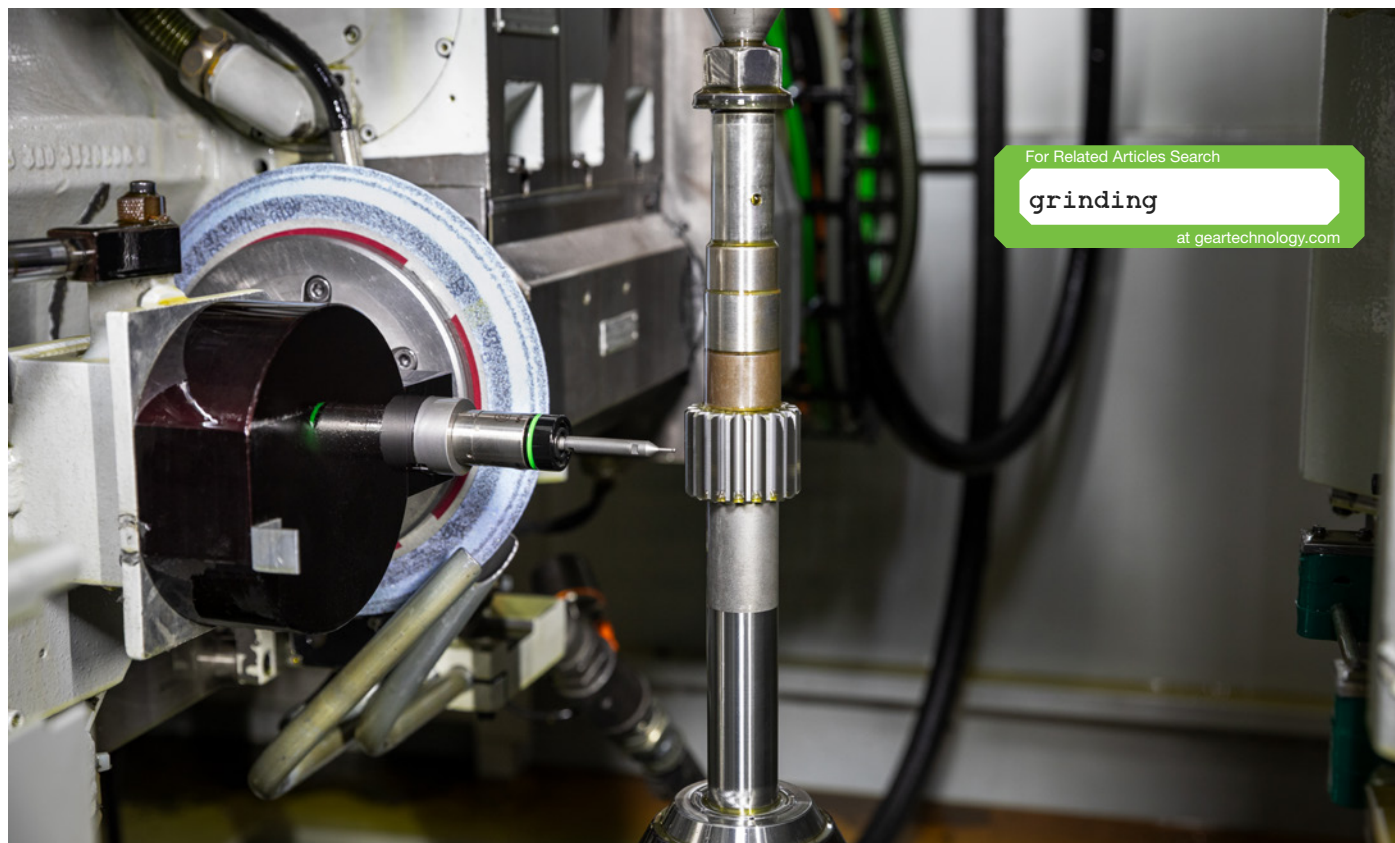
## Smart Move

What impresses him most about the machine, according to Gallmar's Zolota, is its versatility—and brainpower. MTB bought the P400G originally as a test bed for the development of its powerful new *Form Grinding Conversational Software*, designed specifically to help bring older CNC form grinding machines to the performance levels of today's machines. This new software package supports all grinding, onboard wheel dressing, and onboard inspection functionality. The package also includes a new onboard, 3D inspection probe to replace the outdated probes typically found on older CNC form grinders. Now, armed with this extremely user-friendly software, the operators of this machine can more easily, and quickly, shift gears from one-off prototype work to production runs of many hundreds of parts. Zolota says he has also used the machine to completely grind prototype gears from solid, thereby eliminating

the cost and delivery time required for ordering special hobs to first cut the part conventionally.

Ultimately, as Gallmar Industries has discovered, an MTB rebuild can help address the conundrum that many gear manufacturers today are faced with—either replace their older CNC machines with expensive new equipment or gradually lose the race for more productivity, quality, and reliability. Neither decision is an easy one. New machines bring plenty of added firepower, but with capital expenses that can be hard to justify; relying on legacy machines for too long, however, can lead to cataclysmic downtime and production losses while the user fruitlessly searches for replacement parts and repair expertise. For Gallmar Industries, the rebuilt P400G was the perfect solution: quick delivery of a machine delivering performance on par with modern CNC form grinders, but with a price tag well below that of a new machine.

[machinetoolbuilders.com](http://machinetoolbuilders.com)  
[fvht.com/gallmar/](http://fvht.com/gallmar/)



For Related Articles Search

grinding

at [geartechnology.com](http://geartechnology.com)

Rebuild includes a modern 3D probe and software for comprehensive on-board inspection.