

**Machine Tool Division**  
Gear Technology Center  
46992 Liberty Drive  
Wixom, MI 48393  
248.669.6136

## IN THIS ISSUE:

PAGE 2

**Introducing the  
ZE15B & ZE24B**

PAGE 2

**Introducing  
the ZE40A**

PAGE 3

**Service Bay  
& Tech Center**

PAGE 4

**ST40CNC Video**

## Out With The Old, In With The New.

This was the thinking when the new range of Mitsubishi gear grinding machines were launched in Japan. With over 250 potential customers visiting Mitsubishi's Ritto plant over two days in February, the main menu was a technology treat which takes Mitsubishi's hard gear finishing range up several notches.

Three new models were launched creating a trifecta of improvements in gear grinding for customers in high production grinding and also in small to medium batch production.

For more info on the new models, see page 2.



## In Our Hearts & Minds

**Spare a thought for the suffering souls in Japan.**

Although some time has now passed since the horrific scenes of Japan's disastrous earthquake were emblazoned across our television screens, we ask you to join us in sparing a sympathetic thought for the thousands of survivors that continue to struggle with day to day living and the concern of what the future will hold for them. Although Mitsubishi's machine tool plant in Shiga prefecture was left unscathed by the disaster, relatives of our plant employees living in the affected areas were not so lucky. It is these survivors who need our help and support which we know America is the best at giving. We at Mitsubishi gratefully thank you on behalf of the people of Japan and assure you that all factory orders are being processed and delivered without any interruption.

# SERVICE BAY

## MITSUBISHI OVERHAUL

### BEFORE & AFTER.

In the last issue of Gear News we displayed the "before" photos of two overhaul and retool projects currently in progress at the Machine Tool Division of Mitsubishi in Wixom. One was a standard Mitsubishi RD32 grinder; the other was an FC30 CNC shaving machine. In this article we will discuss the overhaul of the FC30 shaving machine.

The FC30 arrived after 12+ years of running multiple shifts in an automotive facility to produce FWD transfer case input gears. Our job was to evaluate the condition of the machine, overhaul the critical machine sub assemblies and retool the changeover to automotive pinions. The retool included the addition of a gravity feed input and output loading system and full enclosure for dry floor factory.

The overhaul was not a "clean and repair" job; this FC30 machine was completely dismantled to its core. A thorough deep cleaning of the entire machine bed, column and saddle was performed. All sub assemblies for the cutter head, outer support, headstock, tailstock and X Axis drive train were completely overhauled with factory original bearings, collars and as needed spindle shafts and ballscrews.

The partial enclosures were removed and replaced with a complete full enclosure. Panels were installed with windows for easy maintenance access. The customer mandated a dry floor environment for their new facility which required modifications to the FC30 to make sure all cutting fluids remained in the machine. We were completely successful in fulfilling their requirements!

The total time from receiving the machine to delivery was a short 11 weeks! Run off was successful to a 1.67Cpk for size and the leads well within tolerance.

And now the best part... **All for only 30% the cost of a new machine!** In addition, a full one year warranty is offered on all materials and workmanship.

We know there are plenty of Mitsubishi machines getting a little long in the tooth. Keep your investment producing at its highest quality for the next 15 ~ 20 years by considering the expertise of Mitsubishi, your OEM, to meet all of your overhaul needs.



## ZE15B & ZE24B High production gear grinders.

With the use of multi start worms and improvements in wheel technology we have seen grinding cycle times tumble over recent years. These developments have increased pressure to reduce non productive times within the grinding cycle. The newly developed "B" series ZE15 and ZE24 address this issue in a very unique way.

Typical non production movements within the gear generating process consist of workpiece clamping, automatic meshing and automatic loading. Some of these process steps can be totally eliminated from adding to the productive time or to a great degree, minimized. After taking time to evaluate the best way to achieve the targeted goals, Mitsubishi engineers decided a "twin tailstock" concept



## ZE40A Generating and form grinding in the same machine.

Mitsubishi has long been the lead supplier of gear hobbing and shaping machines to the job shop industry. What has been missing is a flexible gear grinding machine which allows customers to pick and choose the grinding technology of their choice. i.e. generating or form grinding. The ZE40A fills this niche perfectly. Make no mistake this machine is purpose built from the ground up specifically designed for the demands of our job shop customers.

The excitement caused by this machine is positively palpable.

### Here are just some of the highlights which make it special:

- Form or generating grinding with a simple 15 minute changeover.
- Mitsubishi designed CNC controlled dresser capable of utilizing various types of dressing disc's.
- Swing away tailstock design.
- Integrated gear measuring system.
- High precision direct drive table design.
- Auto meshing of the grinding wheel to the dresser for first time dressing.
- Small Module grinding possible down to 0.5mm.
- Auto profile adjustment with single point dressing.
- Bias correction for helical gears.
- Programmable dressing frequency for table mounted dresser.
- 9 CNC axes controlled by the latest Fanuc 31 series control.



# TECH CENTER

would prove to be the most effective and uncomplicated way to achieve the desired results. This concept allows meshing and clamping of the pre-cut workpiece integral to the grinding cycle. The lightweight tailstock assembly allows faster indexes similar to that of a conventional ringloader. With both the machine and workpiece rotating at grinding speed a seamless transition to the grinding phase is accomplished.

## Other improvements developed to reduce cycle times for the ZE15 and ZE24 making them "B" versions are:

- Faster spindle speeds.
- Improved direct table drives.
- Mitsubishi designed CNC dresser permits the use of various dressing disc formats.
- Initial meshing of the grinding worm to the dressing disc is automatic.
- Multi start grinding worm dressing with dramatically reduced dressing times.
- Up to 12 CNC axes controlled with the latest high speed Fanuc 31 series CNC control.

## Developments to improve workpiece quality are:

- Hirth couplings for exact positioning of the "twin tailstock" and dresser.
- Profile and bias adjustment function.
- Integrated wheel balancing function.

The list of capabilities for these machines can be explored further by contacting your local sales manager or calling us at 248-669-6136.



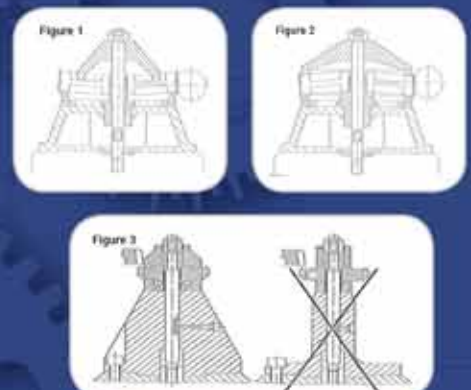
## ACCURATE BLANK & FIXTURE = QUALITY GEAR

The resulting precision of a gear will be very much influenced by the positioning of the workpiece blank. A good work holding fixture should serve three basic principles: Blank centering, driving and supporting.

**CENTERING** – It is always good policy to separate the elements of centering and clamping. This is not always possible as some parts must be clamped by the centering system as well. An example of good work centering would be a solid arbor, which is a very durable and inexpensive solution. Unfortunately in cases where bore tolerances are excessive this solution will result in excessive run-out of the finished parts. In order to obtain optimum conditions and highest accuracies, an expansion arbor should be utilized for centering the blank.

**DRIVING** – The blank must be clamped firmly to the fixture so that its location, relative to the table during cutting, does not change. In case the fixture does not provide positive driving of the blank, the clamping force must be increased or cutting conditions decreased to avoid any positional changes. Experience has proven that for flat gears with bores, fixtures with solid or expanding arbors for centering and clamping collars which face clamp the blank are eminently suitable. The blanks should be supported as close as possible to the root diameter of the gear. The force from tailstock arm to execute this clamping is usually not sufficient enough to drive the blank and could also distort the tailstock. The result could be an inaccurate gear. Power clamping systems in the table should be used instead as it provides 5 to 10 times larger forces without distorting anything. Care should be taken when designing the fixture to avoid distorting the blank as shown in the examples designated figure 1 and 2.

**SUPPORTING** – The work holding fixture must be designed and manufactured as rigid as possible in order to prevent distortion so that movement of the workpiece position is avoided. Workpieces with small diameters, or small shafts and pinions should be supported with the machines tailstock. Workpiece fixtures must also be designed to avoid distortion of the workpiece, especially those with thin walls. Figure 3 shows what is, and what is not acceptable in fixture design. This problem is very often significant in the job shop environment where flexibility takes importance over design correctness. Fixtures are often assembled from many existing components thus sometimes compromising rigidity of the setup. This should be avoided in order to reduce the compromise of quality and production.



Machine Tool Division  
Gear Technology Center  
46992 Liberty Drive  
Wixom, MI 48393

PRESORTED  
FIRST-CLASS MAIL  
U.S. POSTAGE  
**PAID**  
A06

## **Gear News**

### **ST40CNC Robot Cell Video**

Visit YouTube to view an interesting and informative video recently created by Mitsubishi Heavy Industries America. Capturing an actual machine in production, this video demonstrates the capabilities of an ST40CNC gear shaping machine using a flexible automated robot cell to produce quality gears with maximum efficiency.

Please search "Mitsubishi ST40 Video" on YouTube or visit the link directly:

<http://www.youtube.com/watch?v=6bqrBOPo74Y>

