

# GLOBAL SOLUTIONS

GLEASON CORPORATION • KEEPING THE WORLD IN MOTION™

# ALL-WHEEL DRIVE at



# GETRAG

***GETRAG All-Wheel Drive AB uses the latest Gleason PHOENIX® II bevel gear production technologies to help meet the world's growing demand for All-Wheel Drive vehicles.***

**R**unning full out, three shifts a day – and 22 hours on weekends – GETRAG All-Wheel Drive AB has indeed hit the ground running since its launch January 1, 2004. If all goes well, this GETRAG/Dana (60% interest) and Volvo (40% interest) joint venture will produce some 500,000 gear sets by year's end for its All-Wheel Drive (AWD) Power Takeoff Units (PTUs) and Rear Drive Units (RDUs) at its Köping, Sweden facility.

**An appetite for All-Wheel Drive.** No one could have imagined just a few years ago that a single facility would – or could – produce AWD components in such large volumes. After all, AWD was once considered something of an exotic option made available by only a few automakers at premium prices. But as the popularity of SUVs with 4WD has exploded worldwide, so too has the market for AWD. Automakers have been quick to catch on, and

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by 2006 car buyers seeking AWD will find some 42 models to choose from – up 62% from this year. And by 2008, the number of all-wheel drive cars on the road will be double today's count. Leading the way are automakers like Volvo and Ford Motor Co.

They're helping meet demand by offering AWD in even their most mainstream vehicles – Volvo, for example, with its hot-selling S60, S80 and the newly introduced S40 sedans, and Ford with its new Ford Five Hundred mid-size sedan, which has gotten very good reviews since its introduction at the '04 North American International Auto Show.

**'We do it better' at GETRAG.** These vehicles, and others like Europe's hot-selling Fiat Panda, will be equipped with AWD components from GETRAG All-Wheel Drive AB. "We do it better" is the company mantra, and few would argue that, when it comes to AWD, GETRAG is as good as it gets.

The Power Takeoff Units (PTUs) and Rear Drive Units (RDUs) built at GETRAG's Köping facility are among the most important components found in the AWD system. The GETRAG PTU is a lightweight, yet extremely rugged gearbox that houses a hypoid bevel gear set to input power from the transmission through the ring gear and direct power 90° to the rear axle with the pinion. The RDUs use a similar gear set, but with power being input through the pinion and output to the rear axle via the ring gear. In both cases, the quality and reliability of the gear set is of critical importance, since the PTUs and RDUs ensure that power is transmitted smoothly, reliably and quietly to all the wheels when needed.

**Putting its faith in PHOENIX®.** In order to meet its ambitious production requirements, GETRAG has added four PHOENIX® II 275HC Bevel Gear Cutting Machines and three PHOENIX® II 275G

Bevel Gear Grinding Machines to its pinion manufacturing cells, in addition to the three PHOENIX® 175HCs and seven 200Gs that were already there. In the ring gear manufacturing area, three PHOENIX® II 275HCs and four PHOENIX® II 275Gs join one PHOENIX® 175HC and two PHOENIX 200Gs.

This is one of the first, and largest, installations of PHOENIX® II technology in Europe – and if ever there was a proving ground tough enough to completely validate a new technology, this would be it. GETRAG operates an exceedingly lean environment, running around the clock, with the 275HCs expected to produce a part every 2.5 minutes on average.

**Doing more with less.** The PHOENIX® II's unique design delivers a number of highly desirable benefits that mesh nicely with GETRAG's desire to produce high quality gears faster. The most obvious is the size difference between the PHOENIX 175s and the new 275HCs, which occupy 35% less space (8.4 vs. 13 sq. M), yet are designed to machine gears with a pitch diameter as large as 275 mm.

## ELECTRONICALLY CONTROLLED ALL-WHEEL DRIVE

*"The electronically controlled all-wheel drive system in the new Volvo S40 AWD gives superb roadholding and get-you-there ability on all road surfaces. Drive is distributed at lightning speed between the front and rear wheels, as conditions change. If you are cruising on straight, dry roads, the car is almost entirely front-wheel driven for optimum stability and fuel economy. Under firm acceleration or when taking a sharp curve, for example, up to 50% of the drive is seamlessly re-allocated to the rear wheels within mere fractions of a second depending on what is needed to maintain maximum driving stability. And since the pair of wheels with the best grip always gets more power, the care is exceptionally stable and safe to drive in slippery conditions."*

**-Volvo-**





*New PHOENIX® II monolithic column design puts operator in very close proximity to cutter and workpiece, which now both face the operator. Ease of operator access helps reduce non-productive time.*

Capacity to do bigger gears in the future is important, but even more significant is the ability to do them faster with the 275s. PHOENIX® II's monolithic column design significantly reduces precious non-productive time by mounting the cutter and workpiece directly to the column, and facing the operator only 6" and 11" (15 and 28 cm) away respectively.

Easy operator accessibility is very important at GETRAG, where high volumes and two parts with some 16 different part numbers, means cutter head changeover occurs very frequently.

*GETRAG was able to buy fewer machines to make more parts, while at the same time running dry.*

In addition, direct-drive spindles are used, making possible travel rates as high as 10m/min. These

higher speeds, combined with the inherently shorter linear motions required with the new design, result in further reductions in non-productive time.

#### **POWER DRY CUTTING®.**

Driven by the fast-rising costs of chip and coolant disposal (estimated in Europe to be fully 15% of the total cost of manufacturing), many gear manufacturers are moving towards near- or completely dry machining. Again, PHOENIX® II provides a solution at GETRAG.

The PHOENIX® II design eliminates the need for a conventional machine bed, thus allowing hot dry chips to fall completely clear of the machine structure into a simple chip conveyor. There are no shrouds, vacuum systems or even hot chip-related temperature compensation, because there's no base to 'grow' with heat buildup.



1) Gleason's PENTAC® cutter system featuring advanced TiAlN coated carbide stick blades combines with direct-drive spindles to operate at much higher speeds and feeds and in a dry environment.

3) New Gleason Blade Profile Grinder (BPG) works even unattended throughout the night to keep pace with PENTAC's stick blade sharpening requirements.

2) GETRAG operates new PHOENIX® II machines efficiently with fewer operators and Felsomat automation to speed workpiece load/unload.

4) End result: some 500,000 precision gearsets will be produced by GETRAG's Gleason machines by year end.

Most importantly, the higher cutter and work speeds possible with direct-drive spindles created the opportunity for POWER DRY CUTTING®, a Gleason system combining faster speeds and feeds with the most advanced coated carbide cutters. GETRAG uses Gleason's PENTAC® cutter system, equipped with TiAlN coated carbide stick blades to cut ring gears and pinions roughly 30% faster than possible with the solid HSS cutters used previously.

**A complete Gleason system.** Rounding out the package of new Gleason machines purchased by GETRAG is Gleason's new Blade Profile Grinder (BPG). When

equipped with a Felsomat "speed box" type loader, the BPG will be able to run literally night and day unattended to keep up with the demand for fast, accurate sharpening of each PENTAC cutter head's 22 stick blades.

In all, GETRAG is running some 37 Gleason cutters, lappers, grinders, testers and sharpeners – a complete system approach that is now paying dividends in the demanding world of high volume, high quality bevel gear production for AWD.

*GETRAG All Wheel Drive AB: A center of excellence for all-wheel drive and chassis systems and components.*

### Köping plant



# Gleason

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