



# ANOTHER BREAKTHROUGH IN POWER SKIVING

The on-board cutter sharpening process works seamlessly with Gleason's closed-loop system to exchange data directly with the gear metrology machine for automatic profile corrections on the production machine. (Courtesy: Gleason)

# Power skiving with integrated tool reshaping establishes new quality and cost benchmarks, revolutionizing manufacturing process and tooling concepts for hard gear finishing.

By DR. EDGAR WEPPELMANN

**F**or the past decade, Gleason has been building power-skiving machines at its Gleason-Pfauter facility in Ludwigsburg, Germany. As the many benefits of this technology have become widely recognized, Gleason's series of power-skiving machines has grown to include different sizes for internal and external gear cutting and finishing, up to 800 mm in workpiece diameter.

## A POWER SKIVING BREAKTHROUGH

With most hard-gear finishing operations, power skiving takes the traditional approach: After a cutter has reached its maximum wear, the operator changes the cutter, enters or transfers the cutter data, cuts the next workpiece, takes it to the inspection room, waits for the first part inspection, and – if necessary – corrects the process by adjusting the machine parameters based on the findings in the inspection room before proceeding with serial production.

Because power skiving is a very fast process, cutter changes usually happen frequently and require operator action. Additionally, this procedure requires resources for cutter management, handling and refurbishing worn cutters (resharpening and recoating), and, finally, returning cutters into the production flow. Running a seamless production requires an adequate cutter inventory to bridge refurbishing time of worn cutters.

## REVOLUTIONARY ON-BOARD CUTTER SHARPENING

By adding the capability of sharpening cutters on the power-skiving machine, Gleason has taken a revolutionary step forward in raising the economy and quality of hard power-skiving applications. This feature enhances power-skiving results in virtually every significant area.

The fully-integrated, on-board sharpening unit is available for the vertical series of Gleason power skiving machines up to 600 mm in diameter. The cutter face can now be resharpened fully automatic in the

machine after it has cut a certain number of gears – without any operator involvement. Cutter settings are adjusted automatically considering the removed stock and serial production is continued without further interruption. By the way, recoating of the tool's cutting face is not required because the original coating on the tool flanks sufficiently protects the cutter teeth.

With machine-integrated cutter sharpening, the quality of hard-finished gears becomes independent from the quality fluctuations of cutter refurbishing because it changes the production process completely: Cutters are sharpened directly within the manufac-



Gleason's fully-integrated, on-board sharpening unit is available for the vertical series of Gleason power skiving machines up to 600 mm in diameter. (Courtesy: Gleason)

turing process, greatly reducing the frequency of cutter change. A single cutter can stay on the machine for several days or weeks before it is completely used up.

While cutters are resharpened more frequently, cutter change time is reduced to a minimum. Automatic cutter grinding cycles are executed in



As compared to the typical cutter resharpening process, the new on-board unit is remarkably fast and simple. The machine's axes position the cutter to the grinding wheel. The integrated cutter resharpening unit executes the necessary grinding strokes while the cutter performs the infeed and the indexing from tooth to tooth, all performed automatically and based on the cutter geometry that exists after a certain number of gears has been cut. (Courtesy: Gleason)

time to make sure stock removal per grinding cycle can be kept at a minimum saving on valuable tool life. Cutters are not overly worn out before the optimum point for resharpening is reached. Power-skiving cutters remain sharp at any given time, resulting in constantly high gear quality.

Additional time is saved since first-part inspection and machine corrections after a cutter change are no longer necessary because the current cutter simply stays in production until its end-of-tool life is reached. At the same time, this new process minimizes cost and reduces required capacities in the inspection room.

Cutter management and handling logistics for ordering new cutters are greatly reduced, and even the cutter inventory is positively affected: Without the need for refurbishing cycles, fewer cutters are required to ensure a continuous production. With on-board sharpening savings in cutter inventory may total up to 80 percent of previous requirements, which can account for hundreds of thousand dollars per year.

## FOR ALL APPLICATIONS

Integrated cutter sharpening can be applied to spur and helical step-sharpened cutters. The process is extremely beneficial for the hard-skiving process with carbide cutters. For resharpening, economic, standard grinding wheels can be employed. Grinding wheels don't need to be dressed as they remain sharp due to a self-sharpening effect, which takes place during the resharpening process. When carbide cutters are used for hard power skiving, savings from the described process change are considerable. The danger of damaging

expensive carbide cutters by improper handling is reduced as cutters stay much longer in the machine without being touched. The productivity of the power-skiving process is not jeopardized by frequent resharpening cycles since this time loss is offset by time savings of replacing worn cutters less often.

## CLOSING THE LOOP

The on-board cutter sharpening process works seamlessly with Gleason's closed-loop system to exchange data directly with the gear metrology machine for automatic profile corrections on the production machine. The machining process is supported by dedicated technology software to calculate the process and provide designs for required tools and workholding. For an even more comprehensive picture, power-skiving tool design can be verified within KISSsoft's gear and transmission design software. Together with KISSsoft, Gleason offers a comprehensive suite of software solutions to make power skiving simple and reliable, with a complete closed loop from design to the optimum application-tailored gear.

## ENTERING NEW FRONTIERS

Typical applications for power skiving of hardened gears are internal ring gears used in automotive conventional and e-drives, light and heavy truck transmissions, agriculture and construction equipment, robotics, as well as many other industrial applications. Gleason power-skiving machines with integrated cutter resharpening ideally support these requirements for quieter, high precision gears, with lower direct and indirect tool cost. 📌

## ABOUT THE AUTHOR

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