



Gleason-Pfauter GmbH

The world's first gear grinding machine with tool changer enables the use of dedicated tools for both efficient rough machining and achieving maximum surface quality during the finishing process



Photos: Gleason

■ Gleason-Pfauter GmbH, Germany

A New Paradigm

With its new Titan machine series, Gleason-Pfauter enters a new era in toothed gear grinding: An automatic tool changer, together with efficient CNC and the corresponding drives, enables large better-quality gear teeth to be used, thus ensuring a better surface finish with faster grinding of toothed gears.

To date, profile grinding is the only technology for producing the high-precision gear teeth that are required for heavy-duty large gears.

As a result of the demand for high quality, this is a very time-consuming process. Gleason-Pfauter Maschinenfabrik, of Ludwigsburg, Germany, specializes in gear cutting machines.

As a response to the growing demand from wind-energy plant manufacturers for large planetary gears with a diameter of up to six meters, Gleason-Pfauter has pushed grinding technology not only in the direction of maximum precision but also toward increased productivity. The innovative development of the tried-and-tested process continued apace until it reached its limit such that the complete processing of a toothed gear or gear rim blank involved one grinding wheel, which must remove the rough machining allowance as well as achieve high-precision finishing. The specification of the grinding wheel, therefore, has to balance the two targets of achieving a high removal rate and the required surface finish.

From the rough machining disc to the optimized grinding wheel

“During the development of our latest Titan range of equipment, we managed to combine the very high standards of tried-and-tested profile grinding technology with the principle of tool changing and a number of additional innovations,” explains Antoine Türich.

The majority of the rough machining allowance is now removed with a special rough machining disc. For the finishing of the workpiece, the process is switched to a grinding wheel optimized for precision and surface quality. This approach has several benefits: It drastically reduces the time required for rough machining and lessens the risk of overheating when grinding. A greater gear teeth precision and a higher surface finish quality can be achieved as dedicated fine-grain grinding media can be employed for the finishing.

Efficient generation grinding up to module 14

The Titan tool changer enables both using profile grinding discs that are specially adapted to the specific processing phase and combining threaded wheel and profile grinding on one machine. For gear teeth sizes up to module 14, this technology offers benefits even when compared to rough machining with profile discs: Because the machine is continuously in use and works without motion inversion during threaded wheel grinding, the method is very fast.

“For the smoothing process, the Titan not only changes the tool but also switches to high-precision profile grinding technology,” explains Antoine Türich. This is working so well that Gleason-Pfauter has given this method a trademarked name: “PowerGrind.”

Simple operation thanks to optimized automation

The basis of the successful and reliable implementation of the numerous innovations is quality-oriented, state-of-the-art mechanical engineering combined with the Sinumerik 840 D. This CNC meets the specific requirements of Titan in terms of system performance and reliability. It guarantees the indispensable precision of the axis guides for the gear teeth, which can withstand extreme pressure during grinding. This must be made available for the alternative or supplementary grinding technologies by means of a speed that is significantly greater than offered by traditional grinding machines. Motors and drives from Siemens are also used. Their control response facilitates extremely rigid drives, a stringent requirement of high-precision guiding.

The user interface of the machine should be designed in such a way that users can employ, operate, and use the innovative machine with confidence. The interface also has to automatically generate and optimize the part programs individually for each gear rim based on the results of the integrated centering.

For this purpose, Gleason-Pfauter has made full use of the openness of the Sinumerik 840D CNC and implemented a customized user interface that is technology-oriented and extremely user-friendly. The company has also integrated its own mathematic models into CNC for tool and workpiece guidance. Combined with the Sinumerik, the Gleason-Pfauter dialog program enables easy handling of the demanding manufacturing process.

The technology of the future

Gear manufacturers not only have expectations for high-quality large gear teeth that can withstand extreme pressure, but they also demand reliable manufacturing processes that have been truly mastered and have proven to offer long-term stability. Michael Vranic, the marketing director at Gleason-Pfauter responsible for the machines built at Ludwigsburg points out: “Many users are particularly taken with the two-phase profile grinding process that can now be used with Titan, your tool changer, and our user interface built into the Sinumerik CNC. But the Titan can do much more than this, particularly with workpieces with larger teeth. This is what makes it a future-proof investment. Once you have seen our PowerGrind in operation, you will be as certain as we are that this is the technology that will stand the test of time!” ■

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contact

www.siemens.com/sinumerik
j.frey@siemens.com