Bevel Grinding 'Rolling' Right Along

When Dr. Hermann J. Stadtfeld speaks, people tend to listen.

Considered one of the world's foremost experts on bevel gears, Stadtfeld, the vice president of bevel gear technology at Gleason, recently revealed several cutting-edge advancements that the company has been working on.

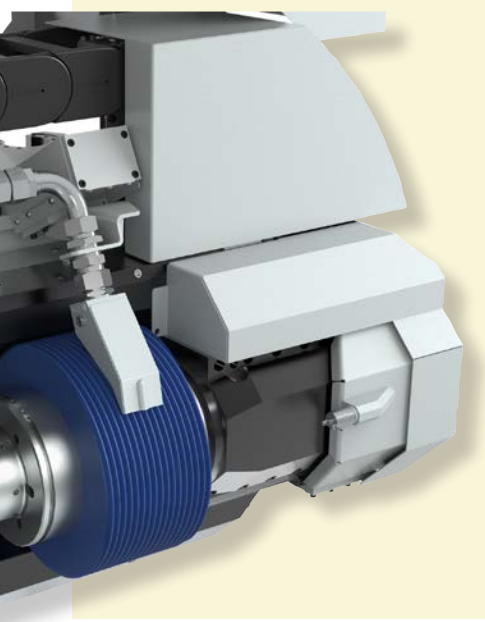
The first of which should have the industry's collective ears firmly planted to the ground.

"We came up with what we call the FormRolling process," Stadtfeld says. "It allows you to make a correction in the gear — a flank-form correction on top of the originally calculated flank-form. This particular correction allows the gear set to be as quiet as the best lapped gear set in face hobbing and the deflection forgivingness is the same or even higher than in face hobbing.

"This is brand new … and the result is awesome."

According to Stadtfeld and Gleason Gear Process Theoretician Robert T. Donnan, the term FormRolling relates to a method which creates an end relief and which is integrated into the plunging cycle of non-generated bevel gears. This method bases on the idea that the tool after feeding to the correct final tooth forming position (in case of non-generated gears) could be swung sideways out of cutting or grinding contact with the slot instead of a withdraw path which is identical to the plunge path but moves in the opposite direction. Such a swing motion can be conducted around an axis which is determined in three dimensional space exactly to achieve an end relief with a certain width (in face width direction), a certain magnitude of maximal relief and with a certain function (like relief build up linear, second or higher order relative to the distance from the relief begin).

After the side swing, the tool can move any path which is fast and avoids interference between part and tool in order to prepare for the next slot machining. Because the sideways swing is directly connected to the plunging process and presents the first part of the tool withdrawal, the additional time consumption is nearly negligible, according to Stadtfeld.



Stadtfeld summarized the recent innovation by saying that the introduced method of FormRolling to create end relief is not limited to grinding; it is also possible to apply the same swing motions in a cutting process. Within certain limits chamfers can also be generated with this correction feature. The solution of this motion concept in the established V-H setting environment does not require any changes of the common method of cutting and grinding Formate gears.

Also, the closed-loop with corrective V-H settings from G-AGE can be applied without any limitations. Secondary cuts and interferences are avoided by choosing the reference cross section for correction vector and rotation vector in the center of the relief section. The possibility to create end relief without a substantial time penalty will allow the manufacturing of ground bevel and hypoid gear sets with the same or higher insensitivity to housing, gear and bearing deflections as it was known in the past only from face hobbed geometries, according to Stadtfeld.

"There are new elements (with FormRolling being one of them) that all independently contribute to a higher production stability and economy," Stadtfeld says. "With these processes you can work faster and you can grind a part faster. There are several elements that when you look at them, they're completely independent. MicroPulse is independent from FormRolling and Universal Motion is independent from MicroPulse. But you take them all together and you get the first time in history where there's a grinding process that is more stable than it ever was.

"There is a future grinding process, and that future happens now."

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