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HISTORY OF GLEASON WORKS SPIRAL BEVEL GEAR TECHNOLOGY

MIKLÓS GÁBOR VÁRKULI[1] – GABRIELLA BOGNÁR[2]

University of Miskolc, Department of Machine and Product Design
H-3515, Miskolc-Egyetemváros
[1]machvmg@uni-miskolc.hu, [2]v.bognar.gabriella@uni-miskolc.hu
[1]https://orcid.org/0000-0003-4435-7629, [2]https://orcid.org/0000-0002-4070-1376

Abstract: The paper deals with the history of Gleason Works history in regard for their bevel gear manufacturing technology. In spiral bevel gear technology Gleason is a leading company, with many patterns and research studies in this field. The focus of this paper is to show the development of the technology provided by Gleason over the past more than 100 years.

Keywords: *spiral bevel gear, Gleason production machinery, Gleason production methods*

1. INTRODUCTION

In the gear manufacturing industry, three large companies played a decisive role in the development of bevel gears. The three major companies, Gleason, Klingelnberg and Oerlikon laid the foundations for the production and theoretical background of modern bevel gears. Today, a significant portion of the bevel gears are manufactured using Gleason technology.

Figure 1. *Gleason spiral bevel-gear pair [source: internet]*

2. HISTORY OF GLEASON WORKS

William Gleason founded his first machine tool manufacturing workshop in the United States in 1865, in Rochester, which later grew into what is now known as Gleason.

Figure 2. *Gleason Works 1865 [source: internet]*

In 1874, he created the first milling machine suitable for the production of bevel gears. In 1905, the first Gleason factory was built on University Avenue in Rochester, also the headquarter of the parent company. From 1913, the company began the active development of spiral bevel gears. In 1919, a Gleason milling machine called Generator No. 16 was created. It was designed to meet the production needs of the bevel gears in the automotive industry at the time. The machine was built by Paul Böttcher in 1910, It was developed on the basis of James Gleason's 1913, milling machine [2].
In 1928, Brandenberger developed a new type of profile milling machine that was suitable to produce normal and spiral bevel gears.
Before 1930, the idea of the tilted cutter head production machines, and the first working Gleason's model based on this principle was born. In 1956, the Gleason No. 116 Hypoid Generator was introduced, which is already equipped with a tilting cutting head and drive elements can be replaced. Thanks to this, more kinematic setups were possible during production [3], [4].

Figure 3. *Generator No.16 [source: internet]*

Figure 4. *Gleason No. 116 Hypoid Generator [source: internet]*

In 1977, Gleason introduced its PLC-controlled production equipment called the Gleason No. 641 Generator, which was able to create gears in a single workflow.

Figure 5. *Gleason No.641 Generator (PLC controlled) [source: internet]*

In 1986, the company presented its first CNC-controlled bevel gear production equipment. In 1988, a production machine called Phoenix was created. It was the first 6-axis CNC-controlled milling machine suitable for the manufacture of spiral bevel gears [7], [8].
In 2000, the Phoenix II. was introduced, which was already directly driven by a spindle drive it had higher productivity and faster grinding.

Figure 6. *Phoenix II. second gen. 6 axis Gleason bevel gear cutter [source: internet]*

Figure 7. *Gleason Genesis 210H (New Genesis series) [source: internet]*

In 2006, the company introduced the 'New Genesis' family of milling and grinding machines. In 2011, in cooperation with Heller, 5-axis gear machining centres were established to produce large gears. In 2014, their 'New Phoenix 280G' machining machine will be released, which will significantly improve the tooth grinding performance of the bevel gear.
In 2016, the 500CB analyser, and manufacturing equipment has been completed. The equipment is suitable for the manufacture and inspection of the machining heads.[5][6]

Figure 8. *Gleason 500CB [source: internet]*

In 2017, the Genesis 400HCD milling machine was introduced. This new machine was able to use cornering and delineating in parallel.

Figure 9. *Gleason 400HCD [source: internet]*

In 2018, Gleason began integrating KiSSsys design and FEM software with GEMS design and manufacturing software. This allows immediate action and communication between the design and manufacturing sides.
As we can see Gleason has created a solid knowledge base and a wide range of manufacturing tools to meet the growing demand for high-end bevel gears.

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