HELLER

# usersNEWS

TECHNOLOGIES AND INDUSTRY SOLUTIONS

www.usersnews.de TOPIC: **GEAR MILLING** ISSUE **03/2010**

# Revolution in **gear milling:** uP-Gear Technology

**Are there any alternatives to the traditional gear and bevel gear production processes? Are there any other solutions for this specific product segment apart from special-purpose machines? Are there ways to achieve a significant increase in productivity in this area?**

These questions have been raised by many machine tool manufacturers recently. HELLER provides a revolutionary solution that has resulted from a co-operation with its customer Voith and tool manufacturer Sandvik Coromant. It enables both pre-milling and gear milling on a conventional 5-axis machining centre. This concept called uP-Gear Technology does not require a CAD model as a basis for the machining operation.

Instead, the patented solution jointly developed by HELLER/Voith is based on direct input of gear parameters into the machine control.

The interview on the following pages illustrates how uP-Gear Technology works in detail and which benefits it offers to users.

### uP-Gear Technology at a glance:

**Machining**
- Utilisation of the special 5-axis kinematics provided by the C-head and use of powerful tools
- Complete machining in one setup

**NC cycles**
- User-friendly input of gear parameters
- Simple compensation procedure

**Cutting tools**
- Comprehensive tool package
- Semi-standard tools for roughing and finishing

**Support from HELLER**
- Process design, simulation, machining strategy, optimisation

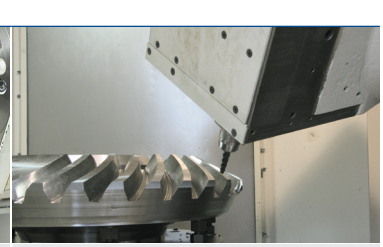
**Machine**
- Complete range of HELLER 5-axis machining centres

## Machining with uP-Gear Technology

- Roughing of the tooth **space** using standard tools

- Roughing/finishing of the tool **flank** using semi-standard tools

- Milling of the tooth **base** using semi-standard tools



- Deburring and chamfering using a standard end milling cutter

# Precise, flexible, productive:
## uP-Gear Technology

**Until a few years ago, manufacturers of gears and bevel gears had no other choice: for their production processes they had to rely on expensive special-purpose machines and special tooling. However, in the meantime, things have changed: since the successful introduction of 5-axis machining, flexible machining centres have become a possibility for realising challenging gear milling tasks whilst achieving maximum economic efficiency. UsersNews (UN) spoke to three experts from tool manufacturer Sandvik Coromant and HELLER to discuss the efficiency of applications outside the traditional application range of machining centres.**

*UN: Dr. Zipse, what were the reasons for HELLER to become that intensely involved in the subject of gear machining lately?*

Dr. Zipse: : With our new F series of machining centres we have taken 5-axis machining one step further, enabling us to provide a wide range of new solutions tailored to the needs of many different user industries. Therefore it seemed quite obvious to us to get involved in particularly complex areas such as gear milling in order to demonstrate the machines' wide range of possibilities. A project at our customer Voith in Heidenheim provided the ideal opportunity. Together with the customer and our co-operation partner Sandvik Coromant we have developed a new, revolutionary process which differs greatly from traditional processes whilst offering a wide range of benefits. We call it "uP-Gear Technology" and have already filed a patent for it.

»A completely new approach that fulfils two requirements by providing maximum flexibility and high productivity.«

*UN: What differentiates your uP-Gear Technology from traditional concepts?*

Siegler: Until now, there were mainly two different technological approaches. Well, first of all, the concept of special-purpose gear cutting machines is based on specialised tools dedicated to gear machining. Apart from that, 5-axis machining centres have recently come into use. Besides the traditional machining tasks, these machines are also suited for gear machining when programmed accordingly. However, they have one major drawback: the use of an end milling cutter provides flexibility but is not very efficient. That is why we decided to take a completely new approach and develop a solution that delivers both flexibility and high productivity…

»Major benefit: direct input of gear parameters from the drawing into the machine control.«

*UN: …and how does HELLER achieve that?*

Siegler: uP-Gear Technology is based on direct input of gear parameters from the drawing into the machine control. The control then generates the 5-axis paths for the roughing and finishing operations in real time. Another advantage of this concept: compensation data, e.g. on the basis of feedback data from the measuring machine – can be input directly via the machine control.

*UN: Is it possible to use conventional tooling with uP-Gear Technology?*

Sundberg: Of course you need tools that are tailored to the task to tap into the full potential of this new

concept. That is why Sandvik Coromant and HELLER co-operated to develop a modified crown-milling cutter with indexable inserts. Apart from these modified standard tools this has also resulted in a range of new products that will help to achieve even better results.

*UN: How important is the static and dynamic stability of the machines for your technology?*

Siegler: It really plays a major role. The key is very compact clamping. In detail this means that the position of the pallet chuck is very close to the upper pallet edge.

Standard and semi-standard tools from Sandvik


Additionally we use extremely robust spindles and highly rigid machine elements combined with short tools that are well-suited for the demanding roughing operation. This provides real benefits because - compared to the vertical machining processes used until now - we achieve significantly higher productivity in the roughing operation.

»As a result, companies only require a single machine for complete machining of the workpiece.«

*UN: For which diameters and modules will HELLER be offering a solution?*

Siegler: We start at module 3 but basically we can utilise the complete work area of the machine. Our 5-axis machining centre model FP 2000 is suited for workpiece diameters of up to 720mm, whilst our larger model FP 4000 and our MCH-C range can be used for diameters of up to 1500mm. An upcoming new machine range will enable machining of workpieces with a diameter of up to 3000mm.

*UN: Are there any other benefits to uP-Gear Technology?*

Siegler: Yes, definitely. Besides easy and highly efficient tooth space machining, it also allows complete pre-milling of blanks on the same machine. This means: complete pre-machining of internal and external contours, even mirrored contours is possible in the first setup, whilst tooth milling takes place in the second. For this purpose, we developed special cycles that can be controlled by the operator without any problem. As a result, manufacturers only require a single machine for complete machining of the workpiece.

*UN: Which particular target groups is HELLER addressing with this new technology?*

Dr. Zipse: Besides classic contract gear manufacturers, mainly system suppliers such as manufacturers of vehicles, machines or machine components. These companies all face the same challenge: they perform gear machining operations but also need to use the machine for other machining tasks. The process will definitely also be of interest to gearbox manufacturers. Being experts in gear cutting, these companies often also produce complete assemblies.

**We spoke to:**

- Reinhold Siegler
  Head of Technology Development, HELLER

- Kenneth Sundberg
  Global Business Development Manager, Sandvik Coromant

- Dr. Hannes Zipse
  Business Development Manager, HELLER

**Tools for milling of the tooth space …**

**…for roughing of tooth flanks and …**

**… machining of the tooth base.**

# uP-Gear Technology:
## the facts in a nutshell

**The four overviews provided on this page summarise the pre-requisites for using uP-Gear Technology and the benefits it provides. See for yourself!**

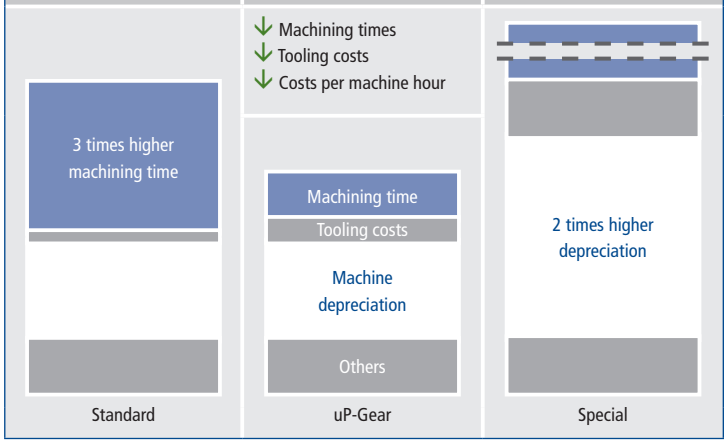
### uP-Gear Technology – pre-requisites

| Standard and semi-standard crown-milling cutter | HELLER high-performance machining centre for 5-axis simultaneous machining using special C-head kinematics | HELLER uP-Gear NC cycles (simple software)) |
|---|---|---|

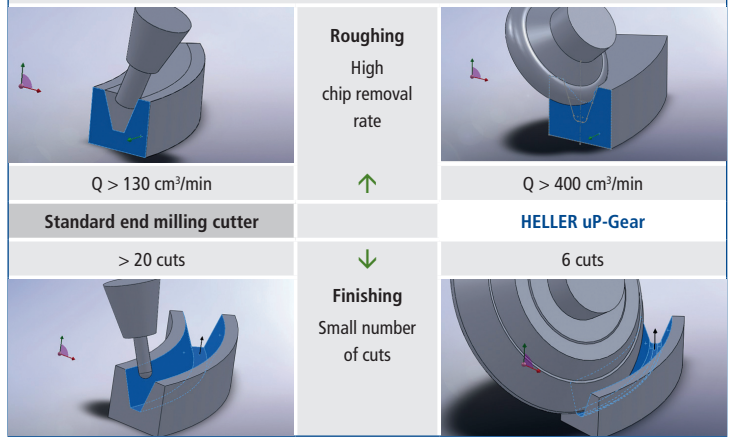
### uP-Gear Technology compared to other systems

| Description | HELLER uP-Gear 5-axis machining centre with Sandvik Coromant milling tools | Special-purpose gear milling machine with special tool | Standard 5-axis machining centre with standard end milling cutters |
|---|---|---|---|
| Flexibility | ↑ | ↓ | ↑ |
| Productivity | ↑ | ↑ | ↓ |
| Machine investment | ↓ | ↑ | ↓ |
| Tooling costs | ↓ | ↑ | ↓ |

### uP-Gear Technology – reduces per-piece costs




### uP-Gear Technology – 3 times faster milling




## uP-Gear Technology: your benefits at a glance

**Simple**
- No intervention into existing processes
- User-friendly data input at the machine control

**Flexible**
- 5-axis machining centres can be used for other components as well
- Manufacture of various types of gears
- Can be combined with robot-based or pallet-based automation

**Fast**
- No CAD/CAM process required
- Machining time is reduced to a third
- Time savings through complete machining in a single setup

**Profitable**
- Low machine investment compared to special-purpose machines
- Low tooling costs compared to special tooling

usersNEWS

**Publisher:**
Gebr. Heller
Maschinenfabrik GmbH
72622 Nürtingen
www.heller.biz

**Editor:**
Marcus Kurringer
Phone: +49 7022 77-5683
marcus.kurringer@heller.biz

Visit our website:
**www.usersnews.de**