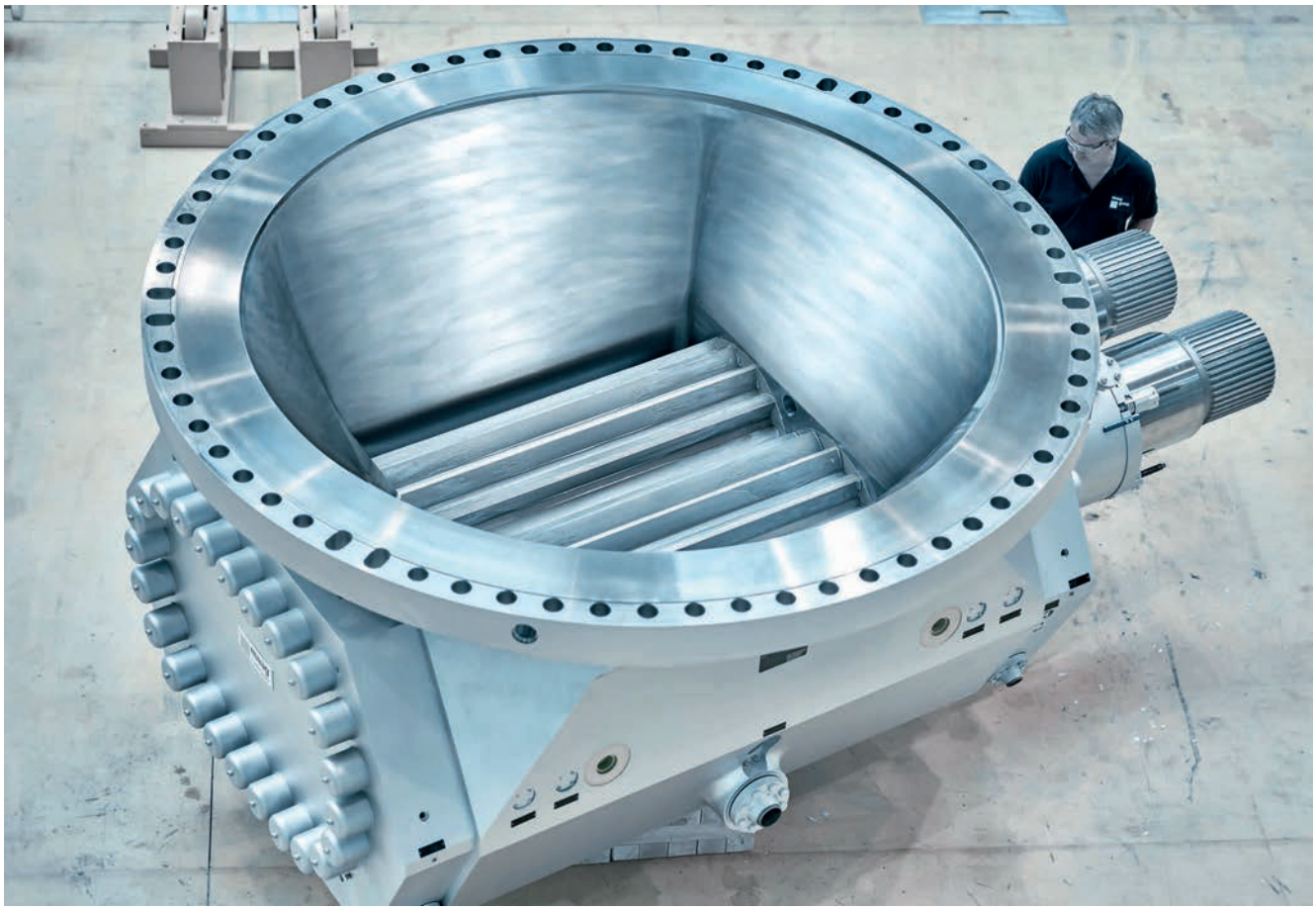
Pumps for Plastics Manufacture and Processing

Conveying, Displacing, Mixing: By Gear Wheels and Pumps

When a business has been thriving on the market for over 100 years, it is doubtless down to the sound original idea behind it. Today, the Swiss company Maag Pump Systems AG develops and manufactures gear pumps. The durable components are used in recycling, extrusion, and masterbatch production. Plastic Insights provides a look at the sometimes difficult history of Maag Group, and the special features of the business.



This ultrarex compounding pump holds the company's own record for size: it weighs 48 t, has a pump length of 4 m, and operates at a throughput of 50 t/h. © Maag

It is likely that not many of the artistes performing at the Tonhalle Maag on Zahnradstrasse 22 in Zurich know what it was originally built for. The venue is considered a cultural hotspot in Switzerland. A few years ago, an investor was planning to build new apartments on the site, and it was only saved from demolition through the organized resistance of politicians and members of the local cultural scene.

But back to the beginnings: The site was in fact where Max Maag founded his "Zahnradfabrik Max Maag" gear wheel factory. As the company name suggests, the focus was on the production of gear wheels. The invention of a toothing system and a planing machine for the production of toothed spur wheels, which were patented in 14 countries, allowed the company to grow rapidly (**see "Max Maag" Box page 34**). »

Marketing Manager Iris Fischer and Jonathan Hummer, Head of Product Management Pumps, invite Plastics Insights to tour the Maag Pump Systems AG headquarters in Oberglatt near Zurich, Switzerland. The picture shows the housing of a dual pump for two gear wheel sets.

Since 1928, the company has also been manufacturing gear pumps – though initially more as a by-product. The main line of business in gear wheels became increasingly difficult as crisis hit the machine tool manufacturing industry, and was finally discontinued in the 1990s. But the pumps are still being made, and Maag Pump Systems is still enjoying success with its product range today. In 2004 the company moved to Oberglatt, just around 12 miles away.

So What Was the Initial Spark? A Small Oil Pump

To ensure the smooth running and low wear of its large gear wheels, Maag needed oil on the machine's cutting head. And it needed pumps to get it there. The small oil pumps proved to be very useful. The product was developed further, and new areas of application opened up. The by-product gradually grew into a standalone business. Many pharmaceutical and chemical companies have a great need for them – now as back then.

"The industrial pumps enabled us to grow, and then we moved into the extrusion and polymers market in parallel," recounts Jonathan Hummer, Head of Product Management Pumps at Maag Pump Systems AG. Gear pumps specially designed for applications in the chemical and industrial sectors remain part of the Maag Group's portfolio today. The gear pumps meet the requirements for high process pressure and high temperatures, or for low inlet pressure and optimum filling across a wide viscosity range.

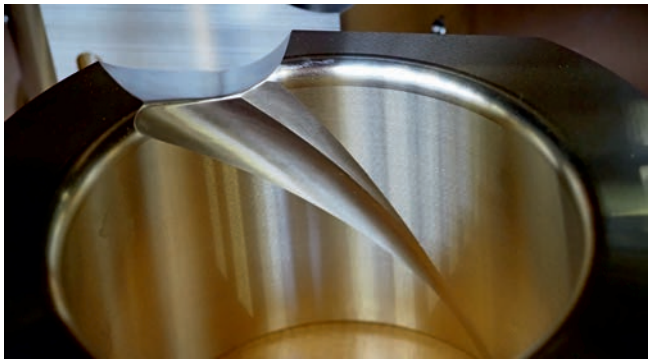
Nine Brands for Plastics Production and Processing

The worldwide Group employs 1700 people in total. The company operates nine brands, all in plastics manufacture and processing (**see Box**). The Groups headquarters and Center of Excellence for pumps is in Oberglatt, Switzerland. The other locations specialize in filter systems, pelletizing and pulverizing systems, pelletization, recycling, and control systems. Maag Pump Systems is headed by President Ueli Thürig, based at the headquarters in Oberglatt. He started out as production manager, and has now been with the company for 30 years.

Two business units operate in Oberglatt: Extrusion and Polymers. This year, 2024, marks something of a milestone: 20 years in Oberglatt. "We are having an Open Day on June 1st to celebrate our anniversary," Iris Fischer, Marketing Manager at Maag Pump Systems AG, tells us.

The Pumps Convey between Just a Few Grams and as much as 50 t per Hour

The Pumps Center of Excellence makes a wide range of products: The smallest pumps convey just a few grams of material per hour, while the largest deliver up to 50 t. The range extends from pumps for highly fluid liquids to systems for very viscous media and pellets. For the smallest systems, the Swiss company lives up to its national reputation for high precision: Micrometer precision is a commonplace in the mechanized production operation. "The tolerances have to be exact, otherwise the pump won't work," Hummer stresses. "We don't use ball bearings. Our pumps are lubricated by the melt stream flowing through the housing. For that to work, the



High-precision Swiss machining: The bronze color of this housing is dictated by its subsequent application. Depending on the material, different alloys are used to prevent the lubricating film from breaking up. The groove through which the material will later flow is clearly visible.

Info

The following brands belong to the **Maag Group:** Maag and Witte produce pump and filter systems. Gala, Scheer, AMN, Automatik and Reductin producel pelleting and pulverizing systems. Ettlinger is the Group's recycling specialist, while Xantec specializes in digitalization.
Since 2012, the Maag Group in its entirety has been part of the Dover Corporation. It employs some 24,000 people worldwide.

Online Article with Picture Gallery
Oberglatt site tour in pictures:
www.plasticsinsights.com/a/article-5561495

Smaller designs are produced in larger volumes. The machinery is designed to run unmanned shifts in order to handle those demands. Pictured here is a robot serving two milling centers. © Hanser/Schröder

The production operation is well able to handle the "big boys" too, however. © Hanser/Schröder

load-bearing capacity of the medium has to be calculated. A lubricating film has to build up inside the pump bearing. There are polymers that tend to break up the lubricating film. In such cases we choose a softer material for the pump housing, such as aluminum or bronze. There are also media that attack metals, and to handle them we use acid-resistant nickel-silver."

Areas of Application for the Systems

All the Maag Group companies work together to supply their customers with systems incorporating components from the different locations and provide a unified whole. Areas of application include:

- **Compounding:** From conveying, temperature control and filtration, pelletizing and milling, through to drying, Maag components interact seamlessly to create efficient processes. The pelletizers are suitable for products with high filler content or low melt stability; sticky materials and materials with a high melt flow index (MFI) can also be processed. The results are spherical or cylindrical pellets, micropellets or powders.
- **Extrusion:** During extrusion, the melt is transported extremely uniformly through the die, guaranteeing a consistently high quality of the end product – whether that be sheets, profiles, tubes or pipes, aerated plastics, blown film or hoses.
- **Hot melt adhesive:** The HMA pelletizing systems are designed to produce and process as many adhesives as possible. Pellets rather than blocks, lozenge forms or pads make downstream production processes easier. Examples of applications range from bookbindings, packaging, adhesive tapes and labels to heating, ventilation and air conditioning systems, car interior trims, and furniture assembly.
- **Masterbatches:** The systems for producing masterbatches and color concentrates support everything from conveying, temperature control, filtering, pelletizing or milling to drying. The results are spherical or cylindrical pellets, micropellets or powders.
- **Recycling:** PET recycling uses filtration technologies to turn bottles into fibers. In film recycling, Maag filters remove contaminants such as paper labels. Solid-state recycling – recovering recyclable materials from yogurt pots or car bumpers – is the most difficult application.
- **Virgin polymer production:** In this, underwater pelletizing systems process up to 80 t of material per hour, with custom-made AMN die plates even achieving throughputs of up to 125 t/h.

This custom-built product incorporates cooling ducts through which water or another cooling medium can flow. © Hanser/Schröder

View of the Maag warehouse. Most of the pumps manufactured are standard solutions that are configured from a modular system, and are held permanently in stock. © Hanser/Schröder

Oberglatt Site Tour

The Swiss are proud of their machinery in Oberglatt: "We have to cover a wide range to make our different product sizes, and that's a real challenge," Hummer comments. "We are committed to high levels of vertical integration. Most of all our pump components are produced – and designed – in-house. We are continually updating our machinery." This is evidenced by automated manufacturing cells that enable the company to run unmanned shifts. Only the toothed shafts, which form the core of the pumps, are manufactured elsewhere, at the Rozzano site in Italy. Final assembly takes place in Oberglatt.

Most of the pumps manufactured are standard solutions that are configured from a modular system, and are held permanently in stock. Maag Group also offers custom solutions. Rheological and pelletizing tests are carried out at the technical center in Grossostheim, Germany. "For the pump, it is important to know how the plastic will behave, and what specific properties we'll have to deal with," says Hummer. "With some materials, it might be that the pressures can't be built up using a normal extruder. A gear pump is then needed to support the process."

The Inventor Max Maag

Born in 1883, the mechanical engineer developed his high-quality, high-precision "Maag toothing" in 1910. The tooth shape engages more precisely, is sturdier because the teeth are exposed to less stress and abrasion, making the gearing more economical. Maag toothing became a byword for optimally designed gearing geometry, and is still used today. In 1913, the engineer founded his "Max Maag Zahnradfabrik" company, which by 1918 had grown into a large-scale operation with 1500 employees. In 1915, the enterprising businessman laid the foundations for the Zahnradfabrik Friedrichshafen gearing corporation in conjunction with airship builder Luftschiffbau Zeppelin GmbH.

He left the Maag Group in 1923. In 1928, Max Maag began developing razor blades and the associated grinding machines. He subsequently turned to organ building, and several of his instruments can still be found in Zurich churches today.

In 1955, the Swiss Federal Institute of Technology in Zurich awarded him an honorary doctorate in recognition of his creative achievements in the field of gear toothing.

What Customers Like about the Swiss Pumps

The Group sells some of its systems to OEMs. They include many leading machinery manufacturers in the extrusion, compounding and recycling sectors. What are the benefits of Maag products? "Key selling points are our longstanding know-how, including for custom applications, and our broad range of products – some of which have been in use for 50 years. Customers often just specify the plastic. We know which product is the best solution based on the proportion of fillers, the viscosity, or the degree of contamination," explains Hummer.

"We definitely have a unique selling point in very large pumps," adds Fischer. The production capacity in Oberglatt is around 2500 pumps per year – more than 300 of which fall into the "XXL" category.

Where the Pumps Are Used

Where are your systems used? "We sell a significant amount of our products to Asia. They are used both in the extrusion sector and in petrochemical plants in that market," Hummer reports. "The second most important market, with a similarly large share is Europe – mainly Germany, it is home to a lot of machinery manufacturers. Another important market is the USA, which accounts for around 10 percent of sales, though India is also growing in importance."

Switzerland itself is less prominent in terms of sales. The corporate headquarters is the Group's innovation hub; and Switzerland's low customs duties are also a favorable factor.

As we are leaving, Hummer sums up: "It's important to us that we sell systems, not just single components! Maag's work begins where the material leaves the extruder." That's where all the Group's gear wheels intermesh. Max Maag would certainly have liked that. ■

Susanne Schröder, editor-in-chief