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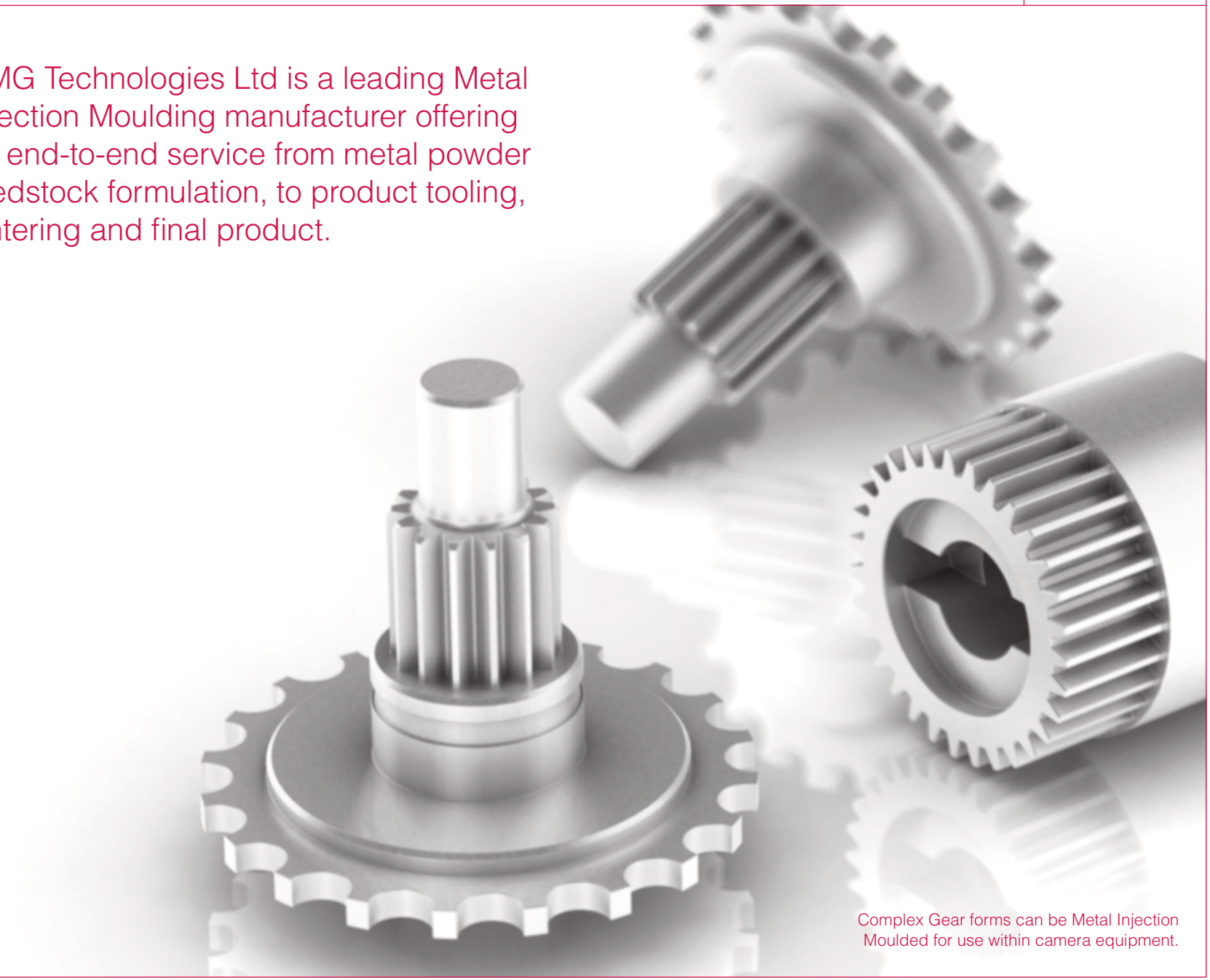
CMG Technologies Ltd

Net shape manufacture by Metal Injection Moulding

CMG Technologies Ltd is a leading Metal Injection Moulding manufacturer offering an end-to-end service from metal powder feedstock formulation, to product tooling, sintering and final product.



Complex Gear forms can be Metal Injection Moulded for use within camera equipment.

Key facts/data:
CMG Technologies Ltd

- Technology: Metal Injection Moulding
- Established: 2013 (originally founded, 1975)
- Type: Management buyout
- Location: Ipswich, Suffolk
- Employees: 29
- Managing Director: Rachel Garrett

Rachel Garrett succeeded her father as Managing Director of CMG Technologies in 2016. She joined CMG in 2004 as Technical Sales and Marketing Director. Previous to this she worked for Molson Coors Brewing (UK), progressing to Account Manager through their sales and marketing graduate scheme. She graduated from the University of Hull in Business Studies and Spanish.

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MIM and AM

Metal Injection Moulding (MIM) is much less heard about than Additive Manufacturing (AM), although they share the similarities that both enable net shape manufacture - so called because the powder metal is moulded, pressed or fused into the final shape with little or no secondary processing and no metal waste. Additive manufacture receives the limelight due to the possibility of making parts from the equivalent of a 'home' printer. However, for industrial manufacture, only MIM can compete with the established casting and machining processes for higher volume production of small metal parts.

Early days

Metal Injection Moulding was pioneered in America in the 1980s as an alternative to manufacturing techniques such as pressed powder sintering, investment casting, and machining. It gained further recognition in the years ahead as improvements resulted in an end product that performed similarly to or better than those made through the competing processes.

Telecoms market

The company, which is now called CMG Technologies, first started exploring the use of MIM technology in the late 1990s when it was trading as Europlus Technologies Ltd. Up to then Europlus had been supplying precision engineered metal receptacles, adapters and connectors as well as plastic moulded fibre management components to the telecoms industry. When its founder wanted to retire, he invited Chris Conway (now Chairman of CMG Technologies) to join as Managing Director.

In his previous job, as a purchasing manager with Hewlett-Packard UK, Conway had been introduced to MIM when he was visited by researchers from Manganese Bronze, which was at that time trialling a new MIM production process. Conway was impressed with the potential of the new process and one of his first steps as the new owner of Europlus was to establish the company as a MIM specialist. He was able to do this after Manganese Bronze's parent company entered financial difficulties and he could recruit the two key researchers. One of those was Dr Phil Marsh who is now Technical Director of CMG who brought extensive technological expertise and played a key role in establishing the company's MIM operation.

Chris Conway, Rachel Garrett and Dr Phil Marsh

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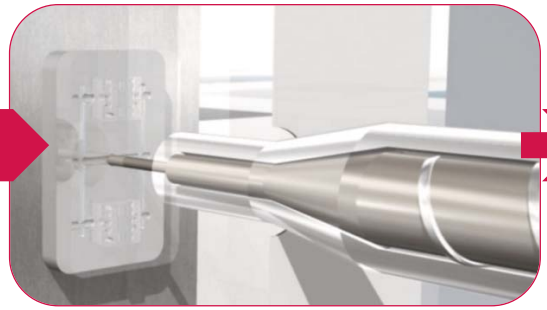
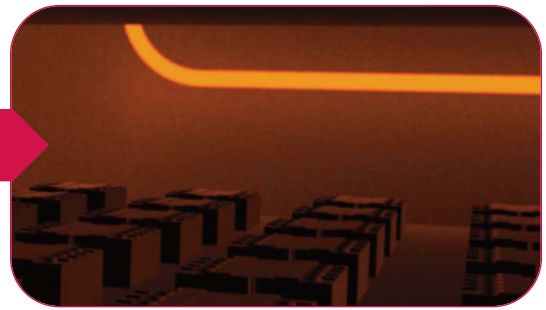
How the MIM process works

The process steps involve combining metal powders with wax and plastic binders to produce the “feedstock” mix (called ‘green’ part) that is injected as a paste into a hollow mould using plastic injection moulding machines. The ‘green part’ is cooled and de-moulded in the plastic moulding machine. Next, the majority of the binder material is removed using thermal or catalytic debind ovens. The resulting, fragile and porous (2-4% “air”) part, in a condition called the ‘brown’ stage, is sintered in a controlled atmosphere. Controlled, uniform shrinkage of on average 17% occurs at this stage and the component densifies to its finished size, shape and tolerance parameters. The high density ‘white’ component that emerges has equivalent properties to wrought materials and can be heat treated, polished, plated or welded.

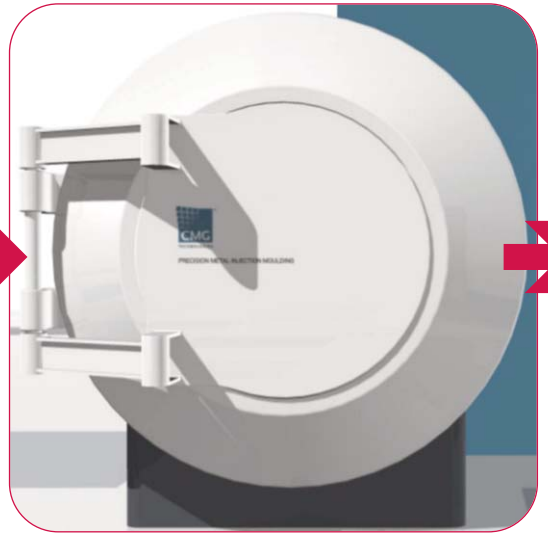
Create the Feedstock



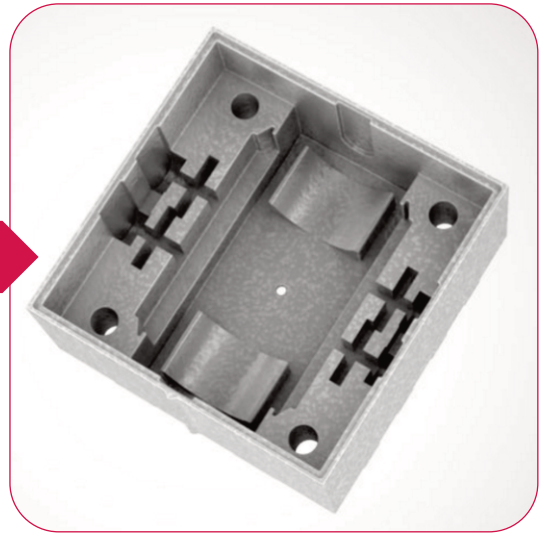
Moulding



De-Binding



Sintering



Post Sintering Operations

For an in-depth explanation of the process please visit:
www.cmgtechnologies.co.uk/en/metal-injection-moulding/how-mim-works.htm

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Management buyout

At first the business enjoyed tremendous growth due to the telecoms boom, but after the 'bubble' burst in 2000, Europlus was facing bankruptcy. One of its major customers, Egide SA, a French telecoms component supplier, offered to acquire the company in 2002 in order to maintain access to the company's manufacturing skills. Then after Egide SA decided to focus less on supplying the intricate parts which used MIM, it offered the senior management the opportunity to buy back the company. Thus, in 2013 it was renamed CMG Technologies Ltd, the letters standing for the names of the three founders: Chris Conway (Managing Director), Phil Marsh (Technical Director) and Rachel Garrett (Sales and Marketing Director). It was now once more a family firm with Rachel Garrett in line to succeed her father, Chris Conway.

Rachel Garrett

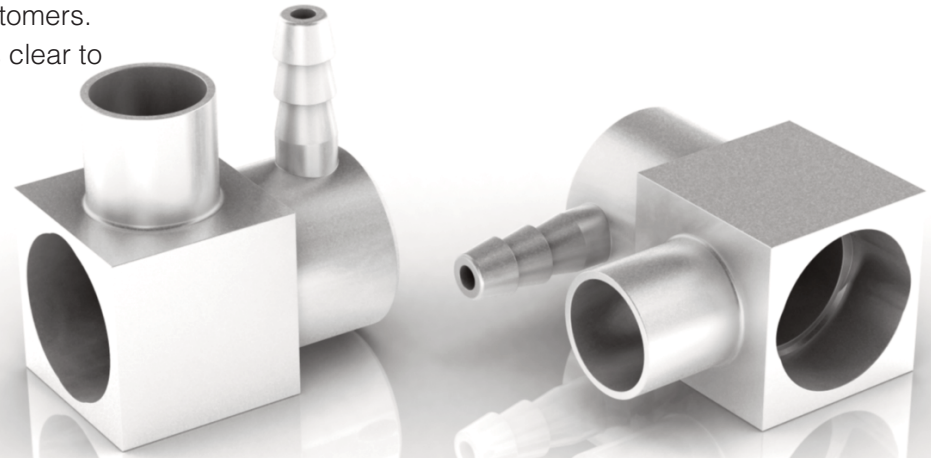
Rachel Garrett joined the firm in 2004 after having learnt her sales and marketing skills as an account manager at the brewery company, Coors. She set about deploying these skills to make the advantages of MIM more quickly recognisable to customers. How the company is focusing on 'educating' its market is clear to see on CMG's web site.

Market awareness

One of Garrett's marketing initiatives is to trademark the term, 'CMG Technologies 3D Metal Moulding®'. This makes a deliberate association between MIM and the 3D attributes of additive manufacturing. She says this is not simply marketing spin as there is a real association in the way the product design process in both cases are carried out; hence for example a product designer already familiar with additive manufacturing can apply the same design rules to the MIM process. Garrett explains that rather than being a competitor to 3D metal printing, MIM offers a stepping stone for companies looking for a solution between prototype and volume production.

When MIM is the best solution

MIM for example is often the best solution when the part is small (around100mm and 100g weight) and complex to machine; also when the metal material being processed is expensive. If there are multiple parts which have to be assembled, it is possible to mould the product as one net shaped component, reducing assembly costs and lead times and attaining higher yields.



Once four separate parts, CMG Technologies now produce a net shaped MIM component used within high precision measuring equipment.

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Benefits of MIM

- **Reduced cost:** only uses the metal required to manufacture
- **Value Added:** fine features can be moulded into the part, such as serrations, threads, and graphical symbols, removing the need for expensive secondary operations.
- **Lead times:** significantly reduced because only use one contractor.
- **Reshoring:** Reduced manufacturing costs by avoiding the costs of long distance logistics.
- **Quality:** surface finishes of between 0.4 to1.6 microns.
- **Materials:** MIM components can be produced in all kinds of materials including: Stainless Steels, Iron, Copper, Magnetic Alloys, Ceramic etc. as well as difficult to machine exotic materials such as Hastelloy and Titanium.
- **Weight saving:** parts can be cored or hollowed to reduce weight.
- **Environmental:** MIM uses around 55% less energy and 50% less waste compared with machining and forging.

Intricate internal details achieved for Gripple's wire joiners used for agricultural and construction applications.

In-house process

The company is able to add value for customers by undertaking the entire MIM process in-house - that is from compounding the metal powder feedstock, to the tool design and build, through to final sintering. Manufacturing its own feedstock allows it to tune the material to meet specific tolerances and surface finish requirements. It can also formulate much finer powders than typically found in off-the-shelf feedstock, as well as irregular or spherical powders, which help to achieve better densities, surface finishes and tighter tolerances.

For less demanding tooling applications it purchases off the shelf feedstock using BASF's Catamold system. It says that by offering a choice of manufacturing routes it is able to offer a more competitive service. The Catamold system also has the advantage that it is best for larger parts with thicker sections or where a more rapid cycle time is required.

Shrinkage control

The ability to manipulate the powder so that it controls the shrinkage of a part during sintering has the additional benefit that when customers bring their business to CMG it is usually only necessary to change the powder formulation in order to fit the geometry of the customer's part rather than make a new mould tool for the part, which is expensive and lengthens lead-times. This is also beneficial if the customer needs to change the material of the product as CMG can manipulate the powder-to-binder ratio and achieve the same final dimensions without having to make costly modifications to the tooling. This was an important advantage when one of its competitors, Metal Injection Mouldings Ltd, went out of business in 2013 and advised its customers to transfer their orders to CMG for continuation of supply.

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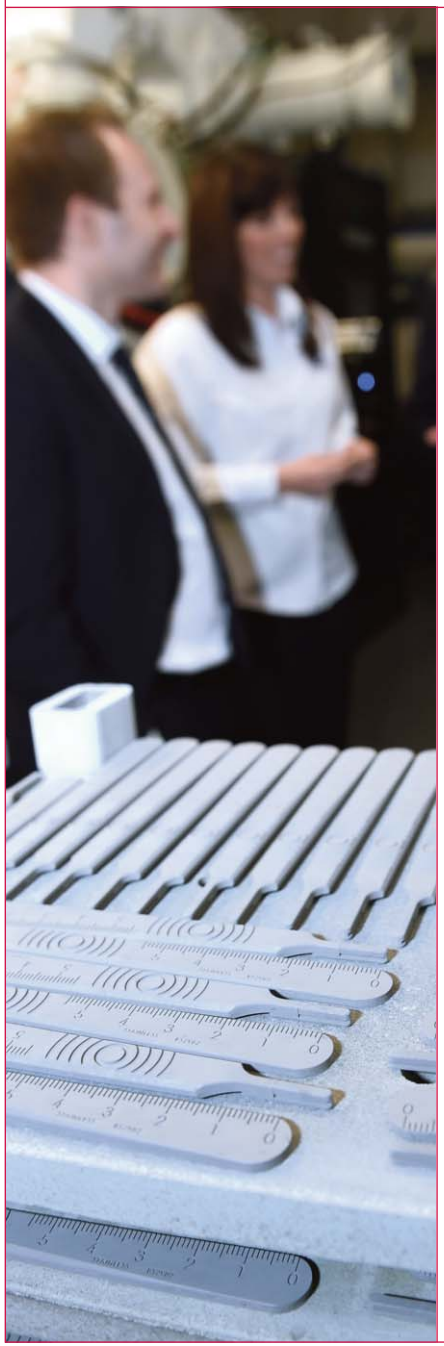

Strategic relationships

CMG proved in effect it can serve as an embedded supply chain partner when its predecessor was acquired by Egide SA. A good example currently of this kind of partnership is its relationship with Swann Morton, a leading supplier of the metal handles used in surgical knives for hospitals. Swann Morton adopted the MIM process because it makes it economic to use relatively expensive stainless steel for the handles since none of the stainless steel is wasted during production. CMG now supplies almost the complete range of Swann Morton's handles and has become in effect an extension of its business; this is more impressive still because originally Swann Morton insisted on guarding all of its production in-house.

Adding value

The MIM process has also offered Swann Morton opportunities to design blade handles which it could not do using conventional manufacturing routes. Working with CMG they have pushed the boundaries of MIM to manufacture handles as long as 210mm (normally MIM is limited to smaller dimensions). They have also been able to design a hollow handle made up of two parts sintered together, making a lighter weight, more pliable handle.

Titanium

Titanium metal is another means of light weighting parts, but the metal is expensive, hence net shaped manufacturing techniques are attractive. At the end of 2014 CMG acquired a new sintering oven for the manufacture of titanium components in-house after having completed a collaboration with Johnson Matthey and Sheffield University on forming titanium parts.

Swann Morton handles awaiting sintering stage

Sales

The reshoring trend is helping to boost demand from UK customers while sales overseas are expanding too (mainly to Europe) and now account for nearly 50% of total sales. Fibre optic components, the company's original business, continues to be an important market. Other markets include medical and aerospace. The high volume markets in electronics and firearms on the other hand are left usually to companies in Asia to supply.

Reshoring opportunity

Rachel Garrett is taking over from her father as MD at an exciting time she says when the trend to reshoring is becoming stronger, and when the uptake of metal powder manufacturing techniques are being investigated more actively due to the buzz around 3D printing. She sees her role as continuing to evangelise the cost savings possible with CMG's MIM technology which she believes will continue to attract more business, not least from reshoring. ■

www.cmgtechnologies.co.uk