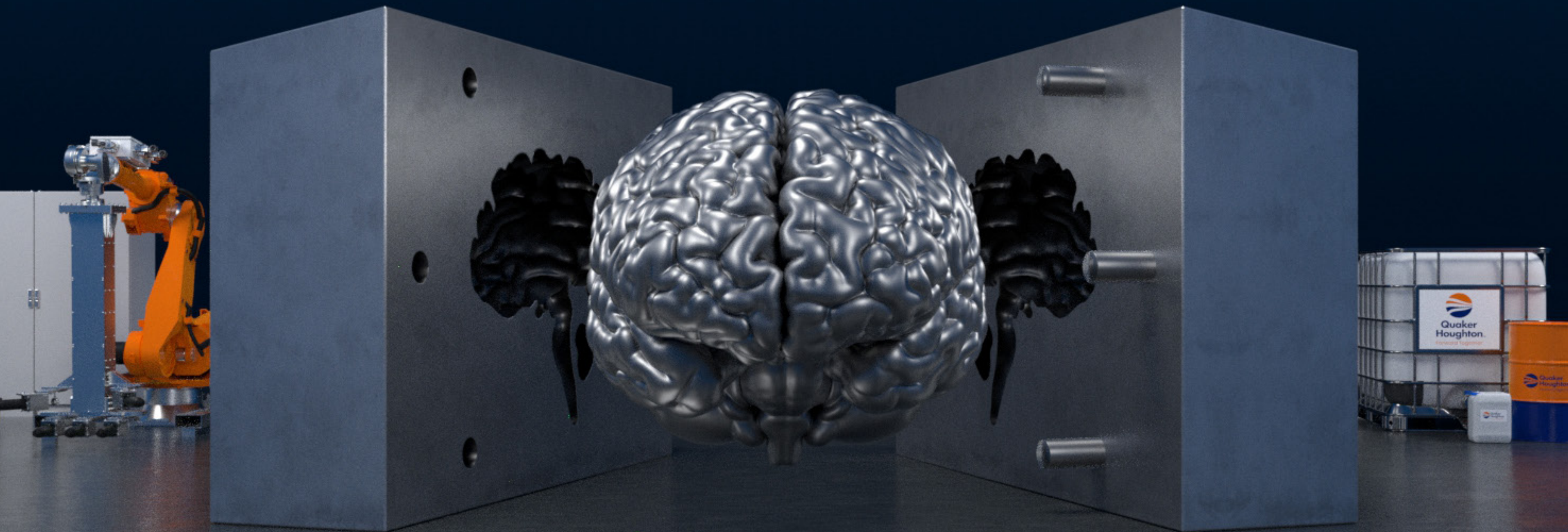


# DieCast iQ™





# Casting a light on our industry

The world of die casting is rapidly evolving to meet ever-changing customer demands. New innovations with cutting-edge technologies are being introduced throughout the industry. From structural aluminum castings that are now being adopted in higher volume, to embracing smart technology and implementing more digitized processes.

To meet these demands, die casters need to optimize their die casting process performance. Our expertise in die casting lubricants and application systems, process fluids, hydraulics and more makes Quaker Houghton the partner of choice to help your operations run even more efficiently, even more effectively... whatever comes next.

**These are exciting times and over the following pages we'll share our deep understanding of these changes and the positive impacts they will have.**

## Contents

02	Introduction and Executive Summary
04	Chapter 01: The need for more intelligent die casting
06	Chapter 02: Electrification of vehicles and lightweighting
09	Chapter 03: Sustainability
11	Chapter 04: The Importance of Die Casting Lubricants and Process Fluids
16	Chapter 05: Completing the Die Casting Performance Solution
18	Chapter 06: Data, artificial intelligence and automation
21	Chapter 07: Futuregazing
23	Chapter 08: Balancing the lubricant & equipment equation
25	Chapter 09: DieCast iQ™. The complete intelligent solution



Chapter 1

# The need for more intelligent die casting



# Why die casting needs to become more intelligent.

Across the globe production processes are evolving quickly.

With the ever-present need for cost-optimization, the manufacture of ever more complex components, improvements in productivity and better output quality, companies need to be innovative and stay ahead of the competition. In addition, increasing regulation and the transition to a low carbon economy drives a need to reduce the environmental footprint of manufacturing operations.

More intelligent die casting is necessary to improve productivity, efficiency and quality, reduce costs and enhance sustainability. Operations can be further optimized with modern monitoring technology to maintain parameters, helping to improve process stability, reduce cycle times and manufacture consistent high-quality products.

This is especially relevant when you consider that die casting is a short-cycle and repetitive process. Reducing process time by even just a few seconds,

or reducing chemical consumption, can lead to significant cycle time savings and impact directly on productivity and costs.

The electrification of the automotive industry is creating a paradigm shift in die casting, driving a demand for more complex, lightweight components. The growth in chassis and structural parts is leading to investment in larger high pressure die casting machines and more expensive tooling to keep up with these developments. To support evolving industry requirements, the equipment and lubricants used in die cast component production also need to advance.

And so, there is a necessity for die casting to become more intelligent to drive the industry forward and realize ever-more efficient production of components.



Chapter 2

# Electrification of vehicles and lightweighting



# Electrification of vehicles and lightweighting.

**The global high pressure die casting market is anticipated to register a CAGR of 6.36% during the forecast period 2021 to 2026<sup>1</sup>. A large driver for this demand is the need for increased aluminum content in vehicles as the push towards lightweighting continues.**

Traditionally die casting was used to produce powertrain parts such as engine blocks and transmission cases. Now die cast components are becoming increasingly complex, as engineers push new boundaries in design. As a result, the technique is now being used to cast far larger and more complex parts, aiding the ultimate goals of weight reduction.

Die casting is also helping vehicle manufacturers to move away from multi-component welded assemblies, with high-pressure vacuum die casting technology able to produce more complex single structural castings.

For example, California-based electric vehicle manufacturer, Tesla, has recently announced a shift in production methods that favors the use of a single piece die cast rear underbody structure to reduce a process that required 70 welded, stamped components down to just one. This requires the use of a new generation, larger die casting machine able to produce such a large one-piece casting – a change that could revolutionize the automotive industry.

<sup>1</sup> Source: Mordor Intelligence, High Pressure Die Casting Market – Growth, Trends, COVID-19 Impact, and Forecasts (2021 – 2026)



## **Casting larger and more complex structural components creates design and manufacturing challenges. These include:**

- Die temperature control
- Consistent, uniform lubricant application
- Reduced die life
- Increased die maintenance
- Longer cycle time
- Effluent considerations
- Considerations around spray head size and weight

An innovative technology available from Quaker Houghton, LUBROLENE WFR, is playing a key role in overcoming these challenges, particularly in the new generation of >4,500T die casting machines.

What's clear is that utilizing the core benefits of die casting means a reduction in assembly time with fewer components, while the vehicle's weight is dramatically reduced. In practice, substituting traditional steel components with lightweight, one-piece structures contributes to greater efficiency, increased range, reduced fuel consumption, and lower levels of CO<sub>2</sub> emissions.



Chapter 3

# Sustainability



# Sustainability.

**Sustainability performance is very much a part of business now and in the future. Through the better use of process chemicals and water, manufacturers are able to reduce waste, scrap, defects and more.**

At Quaker Houghton, we recognize that daily choices and investments contribute to sustainability goals for us and our customers. By 2030, Quaker Houghton will be carbon neutral in its global operations. With science-based targets to be set by 2030, this will support the achievement of net zero emissions across our value chain by 2050.

Intelligent die casting has a key role to play in improving sustainability in our industry. It can do this in a variety of ways such as helping to minimize chemical and energy consumption, improving EHS credentials, reducing wastewater and scrap from the die casting process.

Minimum quantity lubrication (MQL) solutions are making a significant difference to die casting process sustainability by reducing the amount of chemicals needed. MQLs also eliminate wastewater streams and issues with biological growth. Added to this, the CO<sub>2</sub> footprint is reduced and so is the energy consumption. All helping to drive improved sustainability.

With these innovations and many others across the industry as a whole, we can all play our part in building a sustainable solution.



Chapter 4

# The Importance of Die Casting Lubricants and Process Fluids



# The Importance of Die Casting Lubricants and Process Fluids.

**It's impossible to improve your die casting performance without the right lubricants – and the right expertise to support your process improvement plans. What die lubricants are available and which should you consider for your die casting operations?**

The die release lubricant technology landscape is predominantly split into: Water-Based, Water-Based MQL (WB), and Water-Free MQL including Water-Free electrostatic.

The die casting market itself is moving towards MQL lubricants, based on the needs of die casters to produce larger, more complex parts whilst improving efficiency and sustainability, and reducing costs and waste. This is accelerating at different speeds around the world, with some adopting faster than others.

More specifically, change is being driven by the types of components produced such as complex powertrain and structural parts like shock towers, longitudinal members and battery housings. For larger castings like single piece structural components, a crucial consideration will be water-free electrostatic lubricants to truly achieve a step-change.

Whether the ambition is to increase productivity, reduce cycle time, raise the bar on quality, lower costs or improve sustainability, Quaker Houghton is leading this drive with intelligent solutions. Market leading lubricants are just part of the equation, helping to achieve all these goals and improve die casting performance.



**Consider the various die release lubricant technologies available as well as other key functional products which are critical to effective operation of a die casting process.**

### **Water-Based (WB)**

Water-based, dilutable, die release lubricants are the traditional type of lubricant and most prevalent in the industry around the world. However, these more traditional die lubricants, are more challenging to adapt to the disparity in die temperatures caused by the wide-range of die size, design, complexity, parts produced, and heat profile of each system.

Whilst they can be suitable at protecting cooler areas of the die, hotter areas are susceptible to soldering. The choice faced by die casters here is to spray more lubricant to protect hot spots, however, this leads to overspray and build up on cooler areas. In turn, this causes a costly dilemma of lost production time and extra die maintenance.

To combat this, die casters can turn to Quaker Houghton's water-based DIE SLICK™ products with Smart Polymer thermodynamically reactive (heat activated) technology. This technology offers excellent protection on high temperature challenging areas of the die without excess coating on less demanding low temperature areas. For applications with sensitive post die cast costing processes, Quaker Houghton offers a special range of siloxane free lubricant technology that can be tailored to a specific customer need.

[Learn more](#)

### **Water-Based MQL**

There are many benefits from using minimum quantity die release lubricants, which are applied as supplied, without the need for further dilution. Compared with conventional water-based lubricants, these benefits include improving cost of operation by reducing application volume, extended die life, eliminating the effluent stream associated with water-based lubricants as well as significantly reducing cycle time through reduced spray time and reducing the need for air blow to remove residual surface water.

DIE SLICK™ AQ Series lubricants are based on unique Quaker Houghton Smart Polymer technology, but can also be supplied free from siloxane where this is required.

[Learn more](#)



### **Water-Free MQL**

Water-Free MQL offers the industry improved performance over conventional products and water-based MQL. By formulating the product to be free from water, the Leidenfrost effect is all but eliminated leading to improved lubricant adhesion and film formation, resulting in reduced application volume and time. Additionally, the DIE SLICK™ AH series from Quaker Houghton goes one step further by giving vastly improved die life through elimination of the thermal stresses caused by conventional water based technology.

[Learn more](#)

### **Water-Free Electrostatic**

A premium choice, water-free electrostatic spray creates a wrap-around effect which provides unrivalled performance when casting large parts with complex geometries and deep ribs. The electrostatic system delivers consistent, uniform lubricant coverage, irrespective of die complexity. Using specially developed electrostatic lubricant and application technology, LUBROLENE WFR further reduces soldering problems, providing full, unrivalled lubrication coverage. The very high adhesion performance offered by electrostatic lubricant reduces the amount of release agents

required by up to 99.9% per cycle. As well as reducing ongoing running costs, the reduced volumes of agents used results in less build-up, reducing the need for cleaning of both spray head nozzles and dies between cycles.

This speeds up production times, reduces the amount of lubricant needed, and gives better coverage over the whole die, including awkward areas such as surfaces behind slide cores and pins.

[Learn more](#)



### Plunger Lubricants

Plunger lubricants are used to keep the injection plunger and the shot sleeve of the die casting system running smoothly. Good plunger lubricants can improve metal castability, limit porosity, improve injection and lengthen the lifetime of the plunger tips and sleeves.

Quaker Houghton's range of Water-Free, Water-Based and Solid PLUNGER SLICK® lubricants withstand high temperatures for plunger tips and sleeves used in high pressure die casting applications. Enhanced tip and sleeve life is achieved by incorporating specialized additives that allow for proper lubrication at different pressures and temperatures encountered during the shot cycle. New product developments from Quaker Houghton focus on products with much improved fire resistance, a significant concern with widely used generic mineral oil lubricants.

[Learn more](#)

### Fire Resistant Hydraulic Fluids

Increasing die casting machine performance requirements mean the level of hydraulic fluid performance in terms of operating pressures, safety and reliability has increased. The potential for a hydraulic fluid leak, in close proximity to the molten metal, provides the need to use fire resistant hydraulic fluids in die casting plants. Quaker Houghton offers both water glycol (HFC) and synthetic water free (HFDu) options to meet the increasing performance needs of the die casting industry.

Quaker Houghton fire resistant hydraulic fluids are a safe choice. They:

- Keep equipment working at optimal performance with less downtime
- Support longer life span for equipment
- Improve environmental performance/reduce environmental impact
- Increase safety and reduce risk for a lower total cost of ownership

[Learn more](#)



Chapter 5

# Completing the Die Casting Solution



# Completing the Die Casting Solution

**To truly optimize the die casting process, you need to find the optimum combination of lubricants and application equipment.**

As a world-leading, complete solution provider of both die casting lubricants and application systems equipment, Quaker Houghton is uniquely placed to help optimize this element of the die casting process and achieve improved process stability, higher efficiency, reduced scrap and lowest cost of operation. Such a perfect synergy of chemicals and equipment results in reducing consumption, maintenance and investment, while increasing efficiency and productivity. This is a game-changer for the die casting industry.

Quaker Houghton has solidified this promise into a complete die casting solution with a die and plunger lubricant equipment range called QH FLUIDCAST™. Systems can be flexible and mobile – or centralized – depending on the process requirements and offer complete process control and stability.

The process of spraying die lubricant needs to be controlled, to ensure the temperature is right and the volume is the same in every cycle.

It's why our QH FLUIDCAST™ Proportional Mixing Systems for water-based lubricants provide a remarkable 0.01% precision in the dilution. The liquid pressure and volume are also precisely monitored and documented to improve process control and stability.

For even more complex castings, Quaker Houghton's electrostatic spray technology is uniquely positioned to take the industry to the next level. Utilizing a compact, lightweight, spray head this creates freedom in application, enabling it to be optimized and tailored for even the largest components and die casting machines. For one investment, this technology is suitable for multiple dies.

World-class turnkey packages, designed and engineered by Quaker Houghton, bringing together a mixing system and electrostatic spray technology to deliver the optimum die release performance.

[Learn more](#)



Chapter 6

# Data, artificial intelligence and automation



# Data, artificial intelligence and automation.

**Innovation rarely stands still, and the manufacturing industry has already embraced smart technology, implementing more digitized processes in a larger push toward Industry 4.0. Smart sensors and connected machines are being adopted, and they're also being driven and controlled by data-oriented systems.**

Data handling, monitoring and analysis to improve die casting process performance is a key area for Quaker Houghton. The reason is simple: to maximize quality by having a consistent, stable die casting process with complete traceability.

Die lubricant mixing equipment is programmable and logic-control driven, while smart human machine interfaces (HMI) allow for quick and easy access to all settings and parameters. Data is logged for every shot made and available, or can be uploaded or made accessible through networking systems. It ensures all the data is transparent and easy to reference time and time again.

## **QH FLUIDTREND™**

We provide a broad range of fluid services and solutions that improve manufacturing processes. QH FLUIDTREND™ is an intuitive and user-friendly customer portal developed by Quaker Houghton which can be used with our QH FLUIDCAST™ equipment range. This provides instant access to machine status, process stability and historical performance from your desk or anywhere in the world. QH FLUIDTREND™ allows you to make informed decisions about your production activities with complete confidence.

[Learn more](#)



## Data is the key

Soon, in the casting and metalworking world, artificial intelligence (AI), big data and machine learning solutions will analyze troves of incoming information, in real-time and make decisions on the fly. Customers can then adapt operations and machinery to match market trends, while output can instantly be scaled up or down to meet demands. Added to this, underperforming machinery can be repaired or pulled from service before major impacts occur in the supply chain. All the while, improving efficiency and productivity.

In addition, as new and more advanced development and assembly methods are discovered, they can be implemented at much faster rates.

Virtual reality (VR) has also now made its way into our industry. VR now allows metal casters to realize true-to-life models in a digital environment. While augmented reality (AR), an offshoot of VR, can help workers by superimposing images or virtual schematics in the real world.



Chapter 7

# Futuregazing



# Futuregazing.

**Automation, innovative alloys, smart technology, additive manufacturing and eco-friendly requirements are just a few of the trends shaping the future of metal casting. It's also important to realize that, while these trends are the most relevant right now, the market is dynamic and there are many more to come. Above all, flexibility is perhaps one of the most important requirements for metal die casting operations, if only to keep up with the changing times.**

## **Lightweighting**

Typically, die cast parts include wheels, engine blocks and transmission cases, yet these alone don't create a significant reduction in weight. With the advancement of various techniques in die casting such as clamping force and injection speed and pressure, larger parts such as battery housings and chassis underbodies can now be die cast in aluminum – this brings about a significant weight reduction and subsequent fuel consumption reduction.

## **One piece casting**

If the automotive industry is to make the most of one-piece casting, the demands on die casting machines will become much more stringent. With modern electric vehicle manufacturing, even bigger parts such as car body frames will be cast as single, structural parts.

To die cast such parts entails a higher clamping force, bigger platen size and injection weight, and crucially, much larger machines which require innovative, smarter solutions to make them work. This is where die lubricant and equipment innovations being brought to market by Quaker Houghton, such as water-free electrostatic solutions, will help transition the die casting industry towards more complex, lightweight and structural castings with minimum wall thicknesses.

## **Automation**

There will also be increasing automation of foundry processes, condition monitoring of foundry machines and demand for traceability of castings will continue, as well as a trend towards efficiencies through reductions in all non-value-added steps in production.



Chapter 8

# Balancing the lubricant & equipment equation



# Balancing the lubricant & equipment equation

**Equipment and process chemicals must be considered a complete turnkey solution. Iterative changes to one or the other will not lead to the step-change the industry needs to achieve the best results.**

Today, Quaker Houghton has balanced the die casting equation perfectly through its ability to bring together the best lubricant solutions and the best equipment for the first time. A unique offering that will enable die casters, foundries

and auto-makers to achieve the future advances with ease whether they choose water-based, MQL or water-free electrostatic die lubricants. By bringing equipment and lubricant solutions together in one turn-key solution,

Quaker Houghton is transforming the world of die casting and paving the way to better performance with higher efficiency, reduced scrap, improved sustainability and, reduced consumption of materials and tools.



Chapter 9

# DieCast iQ™

## The complete intelligent solution



# DieCast iQ™

# The complete intelligent solution

**With a comprehensive product range and unrivalled process expertise and experience, Quaker Houghton provides the complete solution to improving your die casting performance.**

We offer the ultimate choice of best-in-class die casting lubricants and process fluids, application systems and support services which can be customized precisely to your process needs, solving your challenges, improving quality and productivity, lowering total cost of ownership and delivering exceptional environmental performance.

With research, development, and innovation at the core of our business, we can deliver cutting-edge chemical and equipment solutions to meet the ever-changing dynamics of the die casting industry.

We also provide process expertise and customized support for your post casting operations with our comprehensive range of high performance metalworking fluids and support services.

This includes the ability to permanently seal porosity and leak paths in die cast, sintered and electronic components with our market leading ULTRASEAL impregnation solutions, which provides sealants, equipment and both on-site or outsourced impregnation service centers.

### **Optimizing your Process. Together**

Our technical experts partner with you to understand your die casting challenges and develop tailored lubricant and equipment solutions that will help your operations run more efficiently, more effectively and more sustainably.



With Quaker Houghton expertise and our die casting industry knowledge, together we can achieve:

- Quality improvements
- Reduced cycle times and increased productivity
- Decreased tool and die costs
- Reduced process downtime
- Reduced waste costs and product consumption
- Improved environmental performance
- Total cost approach improving operational efficiencies

**This is intelligent die casting from Quaker Houghton. This is DieCast iQ™.**

Find out more at [diecastiq.quakerhoughton.com](https://diecastiq.quakerhoughton.com)

Quaker Houghton can support you with all the following solutions and equipment:

#### **Die Casting Process Fluids**

- Die Release Lubricants
- Plunger Lubricants
- Fire-Resistant Hydraulic Fluids
- Ladle Coatings
- Trim Lubricants
- Heat Transfer Fluids
- Quenchants

#### **Die Casting Equipment**

- Die Release Mixing & Spray Systems
- Plunger Lubricant Application

#### **Porosity Sealing**

- Impregnation Chemicals
- Impregnation Equipment
- Impregnation Services

#### **Metalworking Fluids**

- Metal Removal Fluids
- Metal Finishing Lubricants
- Cleaning Solutions



**Corporate Headquarters**

Quaker Houghton  
One Quaker Park,  
901 E. Hector Street  
Conshohocken, PA 19428-2380  
Phone: +1.610.832.4000

[quakerhoughton.com](https://quakerhoughton.com) | [info@quakerhoughton.com](mailto:info@quakerhoughton.com)

©2021 Quaker Houghton. All rights reserved.

