PERFORMANCE SHEET

DIE SLICK® 2050 SERIES

Background

The DIE SLICK® 2050 Series is designed for excellent release and a bright cosmetic casting finish. These semi-synthetic, wax-free formulations are blended specifically to meet customers' production environments.

DIE SLICK® 2050 Series Industry Applications:

- Automotive
- Heavy equipment
- Lawn & garden
- Electronic
- Consumer goods

Smart Polymer Technology

The formulations in this series incorporate Smart Polymer technology and high molecular weight alkane cross-linking agents. Uneven protection caused by temperature variation on a die surface is a long-standing challenge in the die casting industry. Temperature variation is caused by the wide-range of die size, design, complexity, parts produced, and heat profile of each system. Traditional die lubricants, unable to adapt to the disparity in die temperatures, can be suitable at protecting hot areas of the die but can cause residue build up in cooler, less demanding areas. This costly dilemma causes solder, lost production time and extra die maintenance. DIE SLICK® 2050 Series lubricants with heat activated Smart Polymer technology evolved from these challenges. These polymers were developed to form a tough protective die coating when exposed to hot areas of the die while not leaving residue build up in cooler areas.

Series Benefits

- Forms a tough thermodynamically activated die film that resists soldering on hot die areas while not building on cooler die areas. This translates to decreased downtime due to reduced die maintenance, improved part quality, and prolonged die life
- Castings are extremely bright and clean
- No staining improves production by reducing scrap and rework, and reduces the cost per part produced
- Does not cause downstream paint or coating problems
- Exhibits excellent emulsion stability when diluted, lowering consumption
- Minimal smoke provides a cleaner working environment and improves air quality for operators

Effective Product Recommendation

Since die casting production trials typically require significant equipment and resources, and involve time investments and casting loss, Quaker Houghton has established a 4-part laboratory test method for chemical testing to evaluate die lubricants and generate product recommendations. This chemical testing method is an effective approach to obtain baseline data, which is used in context of the customer's objectives to determine an appropriate replacement product.

Quaker Houghton's testing methodology greatly streamlines the lubricant selection process, assists in optimization, and can be completed within hours. This eliminates the need for extensive, time-consuming process surveying. This lab evaluation method consists of four tests including solids content, visual analysis, thermogravimetric analysis, and infrared spectroscopy.

- **Solids content** – Determines amount of active content in die lubricant
- **Infrared Spectroscopy (FTIR)** – Indicates what the functional components are in the lubricant

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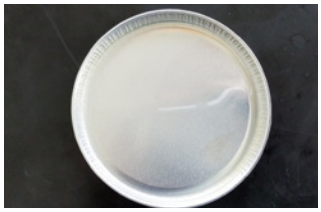
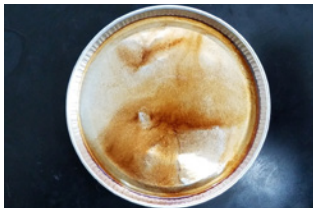
- **Visual analysis** – Reveals what a lubricant will look like on the die face, demonstrating if it will stain or build up

Visual Comparison of DIE SLICK® 2050 Series vs. Competitive Product



DIE SLICK® 2050

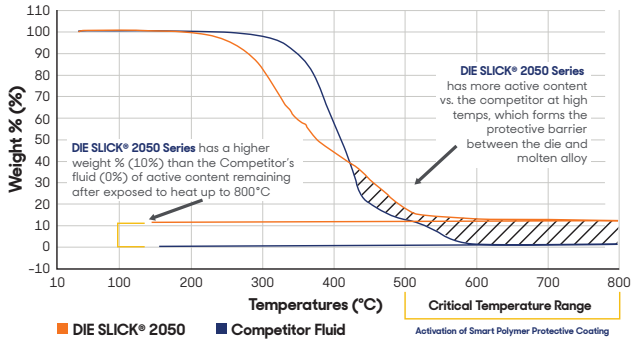


Competitive Product

The visual comparison shows the cleanliness of the lubricant after it has been exposed to high temperatures on the die surface. Products that turn brown when exposed to high heat may result in stained castings.

- **Thermogravimetric analysis (TGA)** – Presents how much protection a die lubricant will offer at critical temperatures

TGA Curve Comparison of DIE SLICK® 2050 Series vs. Competitive Product



TGA is used to evaluate the thermodynamic stability of the active content (non-water material) of a die lubricant. This is a measurement of how much heat a lubricant can tolerate before decomposition, which is graphed as weight percent versus temperature.

Case Study: Increasing Productivity and Reducing Consumption

Challenge: A global supplier of aluminum transmission cases manufactures high pressure aluminum die-castings for an array of automotive applications. The customer was specifically looking to alleviate the following issues:

- Poor quality of die cast parts
- Prolonged production downtime due to polishing

Solution: Quaker Houghton worked closely with the process control department to better understand their casting production utilizing thermal imagery on die surfaces and performed the comparative 4-part laboratory test method including FTIR spectroscopy, a visual residue evaluation, Thermogravimetric analysis (TGA) and solids content testing.

Based on laboratory analysis and thermal imagery results the soldering and build up problems were identified and Quaker Houghton recommended a DIE SLICK® 2050 Series product. The customer observed a significant reduction in downtime, better part quality and total overall cost savings as well as the following benefits:

- Improved performance by reduction in downtime
- Reduced overall cost by approximately 20%
- Significant improvement in polishing frequency

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