

White Paper

Increase Productivity & Reduce Fluid Usage with using Metalloid Lubrication / Finworks 709H

By Tyler Karnaz



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2 INTRODUCTION

Every Fin press needs adequate Lubrication. Metalloid strives to not only provide fluids that form excellent fins, but also engineered to protect the tooling and work piece. We factor in a plethora criteria in selecting the best fluid for the stamping application, including but not limited to; fins per inch, fin pattern & type, metal type (Grade, Alloy, Gauge, and Temper), and Tube Diameter, along with Fin Press & Die Manufacturer. We strive to not only give quality in the finished product out of the press but inside the press as well. Our fluids provide exceptional boundary lubrication which leads to a reduction in fluid usage. This also leads to increased productivity and less down time by being able to increase the stroke count and less time spent repairing and replacing tooling in the die.

3 PRODUCT

Finworks 709H is a new generation of fin stamping lubricant, combining a unique blend of additives which are miscible in existing and next generation refrigerants and does not form acids. **Finworks 709H** is designed to draw a wide range of collar heights. (6-22 fins per inch) **Finworks 709H** provides outstanding tool life and a dry-to-touch residue, which does not interfere with brazing.

Finworks 709H has super-wetting capabilities. A “super-wetter” is incorporated into products to provide elevated surface energy and decreased surface tension on the fin stock surface. This high surface energy allows for water to spread out on the fin-stock reducing the profile of the water droplet, which increases water shed from the fin pack and reduces the potential for condensate blowoff.

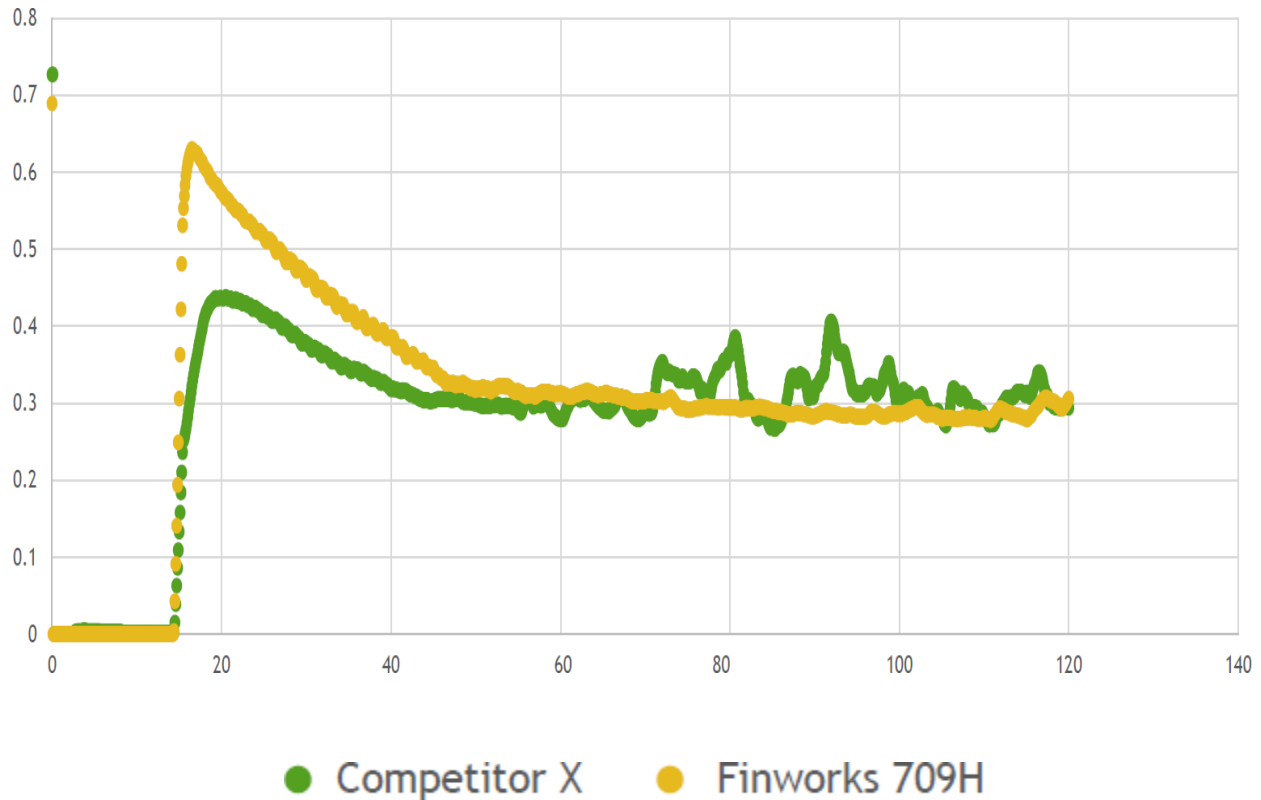
With the super-wetting capabilities and the boundary lubrication in the **Finworks 709H** it is possible to reduce the amount of usage in the fin die without compromising the integrity of the die, tooling, or quality of the finished fin.

4 COEFFICIENT OF FRICTION TESTING

Coefficient of friction is a measure of the amount of friction existing between two surfaces. When you find a coefficient of friction, you are calculating the resistance to motion at the interface of two surfaces of similar or dissimilar materials. Lubricants can reduce the coefficient of friction between the two surfaces allowing the part to be shaped/formed with reduced stress to the part.

See Figure 4.1 on the next page for more details.

4.1 FINWORKS 709H VS COMPETITOR X



There is a lower coefficient of friction for Competitor X's Stamping Fluid upon the onset of testing due to a lower viscosity compared to the 709H. This difference in viscosity can be explained by the additive portion of the 709H requiring heat/activation energy to decrease the viscosity and flow between the tool and part.

As testing progresses both fluids have comparable slopes as the coefficient of friction stabilizes.

Once the slope/curve flattens out the difference becomes evident for performance and coefficient of friction.

Erratic peaks in Competitor X's Stamping Fluid could potentially be explained as insufficient/inadequate boundary lubrication whereby the asperities between the tool piece and substrate are contacting with substantial friction. This would be correlated to a fin press drawing up the collar of the fin. With fluid film inconsistencies, it would be likely to see splits in the re-flare or cracking at the base of the collar or worst- case scenario, abrasive wear leading to cold welding of the two surfaces together promoting the collar being ripped from the fin stock.

Finworks 709H produces a smooth curve for the coefficient of friction and provides lubrication in both boundary and hydrodynamic lubrication often called mixed lubrication regime, which is the regime most prevalent in fin stamping operations.

5 KEY FINDINGS

5.1 PIERCE LUBE SPRAY REDUCTION



The above picture is an example during testing that we were able to reduce the amount of lubricant spraying into the die at the pierce station. A 9ms reduction in spray time. There was an attempt to reduce the spray even lower, however no spray would come due to low flow rate due to the pressure. At the 26ms spray time, the fins were coming out with the same quality and even less residue than from the competitor's product.

According to the client, at a spray time of 28ms, they could produce 4,600 units with Metalloid's Fluid over a certain period and liters used. When comparing the same amount of fluid with the current supplier Metalloid's fluid can produce 33% more units. This demonstrates that at 26ms spray time into the pierce station more units can be produced with the same amount of fluid used at 28ms.

5.2 STROKES PER MINUTE

It was also noted that during the initial trial, operators were able to increase the stroke rate while using the Metalloid Fluid compared to what they can achieve with the current supplier.

6 CONCLUSION

In Conclusion, presented here in conjunction with the results of the trial that Metalloid's **Finworks 709H** provides conclusive results that show reduction in usage and increased productivity in output of product.

During the trial **Finworks 709H** showed no adverse effects to the die or quality issues with the finished fins.

6.1 KEY TAKEAWAYS

- **Finworks 709H** shows a better coefficient of friction through testing.
- **Finworks 709H** can produce quality fins at a lower coating weight.