White Paper

Understanding Price vs Overall Cost – Metalworking Fluids

By Tyler Karnaz

TABLE OF CONTENTS

1 Introduction

Let's be honest, everyone is looking for the best deal. This is common across almost every industry, where many equate the best deal with the lowest cost for the best product. However, in the Metalworking Industry, the lowest cost doesn't always translate to the best product or deal for the customer.

The price of a finished Metalworking Fluid (MWF) that a client will use is influenced by numerous factors. Some customers might consider the best product to be the one with the lowest price, while MWF manufacturers may focus on the best-fit product for the operation. This difference in perspective is quite common and can significantly impact the performance of the fluid, the quality of the parts, the overall operational costs, and potential environmental impacts, among other things. This White Paper will explore the metalworking industry, comparing purchase price to overall cost.

2 Who is Metalloid

Working with Metalloid is an essential step towards a more sustainable and environmentally friendly future. We are your single source supplier for HVAC Manufacturing & Metalworking Fluids. Metalloid has been Formulating, Manufacturing, and Marketing MWFs to a broad Spectrum of Industries since 1951.

Metalloid is dedicated to delivering superior technology to ensure your manufacturing is accomplished with precision. By thoroughly analyzing our clients' operations, we excel at identifying opportunities for enhancing your success. With our extensive product range and innovative chemistries, Metalloid offers MFWs that set a new standard in the industry.

Metalloid has spent a great deal of time funding our R&D team to create products that will create a better working environment for our clients' workers and a more sustainable future for our environment. With over 25 lubricants registered in the USDA Certified Biobased Product Program it shows our commitment to our efforts to creating a better future in the industry.

For the HVAC Industry we developed a line of Low GWP products and consider ourselves experts in both VOC and Non-VOC chemistries for coil manufacturing. With worldwide OEM approvals and tooling/machine manufacturer's referrals, Metalloid sees themselves at the forefront of the industry.

3 Defining Price & Overall Cost

Price: Price is the immediate monetary expense required to purchase MWFs. Typically listed as a per gallon or per liter price. This monetary figure is often a primary consideration in procurement decisions.

Overall Cost: Overall Cost expands upon the price of the MWF and helps determine the working cost of the product. There are many factors that play a role in the overall cost, but all of which can have a significant impact moving the working cost up or down. These include:

- Initial purchase price
- Consumption rates
- Maintenance and disposal costs
- Compatibility standards
- Impact on tool life and machine performance
- Health and safety compliance
- Environmental regulations
- Potential downtime and productivity losses

4 Price of Metalworking Fluids

Metalworking fluid manufacturers face various factors that contribute to the final purchase price of their products. These factors can include:

- **Raw Materials:** The cost of the base oils, additives, and other raw materials used in the formulation.
- **Manufacturing Costs:** Expenses related to production, such as labor, energy, and equipment maintenance.
- **Overhead:** General administrative costs such as office space, utilities, and administrative staff.
- **Quality Control:** Costs associated with testing and ensuring the fluid meets industry standards.
- **Packaging:** The expense of containers, labeling, and packaging materials.
- **Distribution and Logistics:** Shipping, warehousing, and handling costs to deliver the product to customers.
- **Research and Development:** Investment in developing new formulations and improving existing ones.
- **Marketing and Sales:** Costs for advertising, promotions, and sales team efforts.
- **Regulatory Compliance:** Expenses related to meeting environmental, safety, and industry regulations.

5 Evaluating Overall Cost

Evaluating the overall cost of manufacturing is crucial for manufacturers, particularly when considering the use of MWFs, which can be a significant consumable in large-scale operations. Focusing solely on the price of a lubricant can adversely affect the manufacturing process. To accurately analyze overall costs, several aspects must be considered:

Consumption Rates:

- Measured by analyzing lubricant usage over a specific period to make a certain quantity of parts. Higher-quality MWFs use superior lubricity additives, these additives allow for better lubrication in process allowing for reduced consumption rates over low-quality MWFs.

Tool Life and Machine Performance:

- The quality of MWFs directly affects tool wear and machine efficiency. Higher-quality MWFs can extend tool life and improve machining performance, reducing downtime and maintenance costs with the use of different forms of lubrication regimes.

Productivity and Downtime:

- Inefficient MWFs can cause machine downtime to replace or fix tooling which lowers productivity, leading to increased operational costs.

Defects

- Inefficient MWFs can lead to a larger number of reject parts, leading to increased operational costs.

Maintenance and Disposal Costs:

- Proper management and disposal of MWFs are essential for compliance and environmental responsibility. Disposal fees and maintenance of fluid management systems can significantly impact overall costs.

Health and Safety & Environmental Compliance:

- Ensuring MWFs meet health and safety standards to protect workers from exposure-related illnesses. Non-compliance can lead to fines and increased healthcare costs. Complying with local and international environmental regulations regarding MWF disposal and emissions. Non-compliance can lead to significant penalties.

6 Optimizing Overall Costs

Selecting the best-fit MWFs:

- Investing in higher-quality fluids can reduce consumption rates, extend tool life, and improve machine performance, leading to long-term cost savings.

Implementing Fluid Management & Application Systems:

- Automated and efficient fluid management systems ensure optimal use and reduce waste, lowering maintenance and disposal costs. Similarly, automated fluid applicators ensure optimal precision and usage in process, lowering the consumption rates.

Training:

- Investing in employee training and safety programs to ensure proper handling and use of MWFs, reducing health risks and compliance costs. This can include training from Metalworking Fluid manufacturers on best-use practices for their fluids.

Maintenance:

- Proper maintenance of machines and tooling can strengthen the life of your lubricants, thereby lowering the overall costs.

Regular Monitoring and Analysis:

- Regular testing and monitoring of MWFs can facilitate the early detection of contamination or failures. By identifying these issues promptly, manufacturers can take corrective actions before the issue worsens, leading to downtime and maintenance. This proactive approach not only ensures the efficiency and reliability of the manufacturing process but also contributes to overall cost savings and improved operational performance.

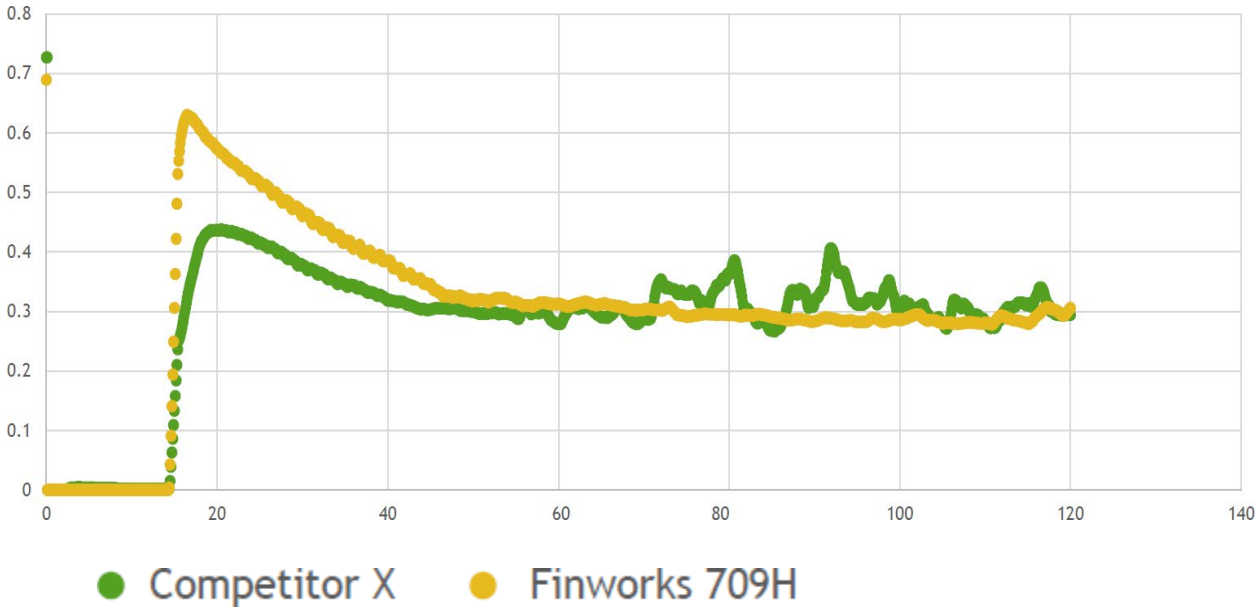
Compatibility:

- Proper selection of MWFs can significantly reduce the overall costs of parts and finished goods. If necessary, it is crucial that the lubricant undergoes thorough internal and/or external testing to ensure compatibility with components it will contact early in the process or within the finished product. Ensuring compatibility can effectively lower defect rates and minimize the occurrence of rejected parts in the process or when a consumer uses the finished product.

7 Metalloid Case Study #1

Pulled from another White Paper from Metalloid on their product FW 709H being tested in the field. FW 709H had a purchase price roughly 10-15% higher than that of their competition. Through the information below Metalloid was able to show ways of optimizing the process with their higher-quality MWF to provide lower overall costs in the process, with external testing for compatibility & performance metrics, and internal testing in process.

Figure 1 – Coefficient of Friction Testing



There is a lower coefficient of friction for Competitor X's Stamping Fluid upon the onset of testing due toa 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 offriction.

Erratic peaks in Competitor X's Stamping Fluid could potentially be explained as insufficient/inadequateboundary 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 thecollar 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 mostprevalent in fin stamping operations.

Figure 2 – Pierce Lube Spray Reduction

Spray System - Before Spray System - After

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 9 millisecond (ms) reduction in spray time. There was an attempt to reduce the spray even lower, however no fluid would spray 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.

Strokes per Minute

It was also noted that during the initial trial, operators were able to increase the stroke rate while using **FW 709H** compared to what they can achieve with the current supplier.

Key Takeaways

From this case study it is evident that although FW 709H had a 15% initial cost difference over the competition, in production it was able to show increased production speeds and significantly reduced usage.

8 Metalloid Case Study #2

Metalloid performed another study with FW 709H at the same supplier in their Copper Hairpin Bending Process. The client was using the same fluid in the hairpin bending process as the fin stamping process at the same price, 10-15% cheaper than FW 709H. Case study #1's **Figure 1** can be applied to demonstrate the potential for reducing the amount of fluid needed to produce copper hairpins with FW 709H as we accomplished with the fin stamping process as well.

Overview

The client was using roughly 1 drum per day collectively through all the benders of their current lubricant to manufacture their hairpins. The structure of the test was to compare the two products 709H and Competitor X in 4 stages: Bending, Lacing, Expanding, and Oven. To achieve a lower usage rate, the only adjustment to be made was to the spray time rated in ms. To produce a quality hairpin, Competitor X needs to run at 0.3ms per bend. This was the standard set for the test.

Results

FW 709H ran at the same standard needed to be met as Competitor X of 0.3ms, as well as reducing the usage as far as they could reduce without risk of the spray system not injecting fluid into the tubes. This rate was determined to be 0.1ms.

Bending – All bends needed to meet the QC specifications for quality to pass

- FW 709H – 0.3ms
    - Pass
- FW 709H – 0.1ms
    - Pass

Lacing – All lacing needed to meet the QC specifications for quality to pass

- FW 709H – 0.3ms
    - Pass
- FW 709H – 0.1ms
    - Pass

Expanding – All expanding needed to meet the QC specifications for quality to pass

- FW 709H – 0.3ms
    - Pass
- FW 709H – 0.1ms
    - Pass

Oven – The coils needed to meet the QC specifications for quality to pass and show low smoke

- FW 709H – 0.3ms
    - Pass
- FW 709H – 0.1ms
    - Pass

Key Takeaways

Metalloid was able to provide a fluid that could surpass the current standard set to achieve a quality hairpin. This reduction from 0.3ms to 0.1ms can show a 66.7% reduction in usage if implemented correctly.

Metalloid provides higher-quality fin & hairpin lubricants and shows our dedication to our R&D team selecting high-quality raw materials that exhibit performance benefits to our customers. Backing this with data and testing internally and externally to show compatibility in our customers finished HVAC systems.

At a daily rate of 1 drum in production it would originally take 5 working days to finish 5 drums of material of Competitor X, conversely after this study it is shown that FW 709H in a span of 5 workdays will only finish 1 & 2/3 drums.

Summary

Competitor X's purchase price is 10-15% cheaper than FW 709H, but through this testing it is determined that Metalloid provided our client with a product that can reduce their daily usage by 66.7 percent in their copper hairpin bending process. This can result in overall cost savings of over 50%. Through proper training and implementation these savings can be made almost immediately. This brings down the overall working cost of our FW 709H compared to our competitor.

9 Conclusion

Cost remains a pivotal factor in the MWF Industry, especially in a dynamic market where manufacturers must remain adaptable to meet evolving demands. While it may be tempting to prioritize products based solely on price, this approach can significantly impact the overall cost of using MWFs. A holistic strategy that considers all cost factors not only ensures substantial long-term savings but also enhances operational efficiency. By prioritizing overall costs rather than initial purchase price, manufacturers invest in MWFs that surpass standard requirements, optimizing production processes and ensuring sustained performance.

As a proven MWF manufacturer with over 70 years of industry experience, Metalloid is always ready to demonstrate the value of our products and how we can reduce overall costs for our customers. Reach out to us today to discover how we can enhance your manufacturing processes.

9 References

Society of Tribologists and Lubrication Engineers (STLE). https://www.stle.org

Metalworking World Magazine. https://www.metalworkingworldmagazine.com