ANGUS Chemical Company

CORRGUARD™ EXT Amino Alcohol: New Innovation in Specialty Additives Delivering Improved Metalworking Fluid Life and Performance

By Justin Costello, Product Marketing Manager North America, ANGUS Chemical Company, a wholly owned subsidiary of The Dow Chemical Company.

In today's competitive metalworking fluid and lubricant market, there is an increasing need for products that not only result in longer life, higher performance fluids, but also have the ability to be used in global formulations. In listening to the needs of our customers, ANGUS responded with the development of CORRGUARD™ EXT Amino Alcohol, a new-to-the-world primary amino alcohol that was specifically designed for the metalworking fluids market.

To help address industry needs, the commercially available CORRGUARD™ EXT Amino Alcohol delivers considerable value to a metalworking formulation as shown in Figure 1. As illustrated, this innovative technology offers many advantages and allows metalworking fluid formulators greater flexibility when developing new products. Due to its excellent oil and sufficient water solubility, formulators can easily incorporate CORRGUARD™ EXT Amino Alcohol into anything from solubles to semi-synthetics to full synthetics.

Through its ability to enable longer life fluids with improved performance, CORRGUARD™ EXT Amino Alcohol can be formulated to bring value to all types of metalworking fluids. From a commodity fluid containing high levels of ethoxamines to premium, specialty fluids, CORRGUARD™ EXT delivers.

To support global formulations, this product has been broadly registered for use, including in the United States, Europe, Canada, Japan, Korea, and China. Along with this broad registration, ANGUS supplies CORRGUARD™ EXT Amino Alcohol globally with multiple locations capable of providing commercial quantities.

With over 70 years of experience as the world's leading supplier of nitroaluminate chemistry, ANGUS goes beyond the services of a typical supplier to provide metalworking fluid formulators with the necessary technical support and application testing expertise to take full advantage of CORRGUARD™ EXT in their formulations.

Biocide Enhancement

To observe the exceptional effect that CORRGUARD™ EXT Amino Alcohol had on enhancing biocide performance, various biocide-free semi-synthetic metalworking fluid test formulations were completed. In all cases, CORRGUARD™ EXT Amino Alcohol had a drastic improvement on enhancing the performance of the biocide with controlling bacteria, as is shown in Figure 2. The improvement in weeks of bacterial protection ranged anywhere from 20% to well over 400%.

Figure 3 (page 34) displays the outstanding effect that CORRGUARD™ EXT Amino Alcohol had on enhancing biocide performance for improved fungal control. Once again, CORRGUARD™ EXT Amino Alcohol resulted in a step change improvement. This allows metalworking fluid formulators the ability to utilize biocides that may not previously worked well against fungal control.

In addition to minimizing the amount of microbial growth through the enhancement of biocide performance, CORRGUARD™ EXT Amino Alcohol also enables excellent pH control of the fluid.

CORRGUARD™ EXT Amino Alcohol provides greater formulation flexibility and optimization with its exceptional performance enhancement of biocides. As a result, formulators now have a new innovative technology available to more easily meet stringent customer and service demands. For example, if an end-user were to specify the use of a non-formaldehyde releasing biocide like Bioban® BIT 20 in a metalworking fluid, formulators now have the ability to drastically improve both the bacterial and fungal control through the simple addition of CORRGUARD™ EXT Amino Alcohol.

Favorable EH&F Profile

CORRGUARD™ EXT Amino Alcohol has a favorable environmental health and safety profile. CORRGUARD™ EXT is a primary amino alcohol that is readily biodegradable. Ex-

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**Figure 1**
CORRGUARD™ EXT Amino Alcohol: Together We Deliver...

<table>
<thead>
<tr>
<th>CORRGUARD EXT Value</th>
<th>Formulator/End-User Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Formulation Flexibility and Optimization</td>
<td>long-lasting, VWF's that are biodegradable</td>
</tr>
<tr>
<td>Biocide Enhancement</td>
<td>have a solution that is biodegradable, less toxic</td>
</tr>
<tr>
<td>Improved Corrosion Inhibition</td>
<td>allows users to use a single VWF with multiple metals</td>
</tr>
<tr>
<td>Favorable EH&amp;F Profile</td>
<td>VWF's will contain a new primary amine technology that is readily biodegradable and has been thoroughly tested and broadly registered</td>
</tr>
<tr>
<td>Supported by Application Experts</td>
<td>Formulators have access to ANGUS technical experts for formulation assistance and to ensure that all &quot;value&quot; performance of CORRGUARD EXT is captured</td>
</tr>
</tbody>
</table>

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**Figure 2**
CORRGUARD™ EXT Amino Alcohol: Enhance Biocide Performance for Improved Bacterial Control

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More information on the case study is available at www.ANGUS.com (under "Metalworking Fluids").
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We’re Listening – How We Can Help You Succeed?

In summary, the new innovative CORRGUARD™ EXT Amino Alcohol from ANGUS provides multiple benefits and outstanding value to all types of metalworking fluids.

In the same way that collaboration spurred the innovation of CORRGUARD™ EXT Amino Alcohol, ANGUS continues to work in partnership with our customers to better help them understand the value that this product can bring to their formulations. For a sample and/or additional information on CORRGUARD™ EXT, visit www.ANGUS.com or call 800-447-4369.

tensive testing was completed for this product to support the multiple regulatory approvals it has obtained, including being REACH compliant. Based on this profile, CORRGUARD™ EXT Amino Alcohol is an excellent choice for metalworking fluids sold globally.

**Case Study on Maximizing Fluid Life and Performance at Similar Cost**

Internal testing showed that metalworking fluids containing high levels of ethanolamines can be easily reformulated with CORRGUARD™ EXT Amino Alcohol to significantly improve fluid life and performance—all at a similar cost.

In one synthetic metalworking fluid, the commodity amines, TEA and MEA, were replaced by 5% and replaced by 4% CORRGUARD™ EXT Amino Alcohol and 11% Water. In addition to providing excellent corrosion control of steel, the incorporation of CORRGUARD™ EXT Amino Alcohol also improved the aluminum alloy corrosion control through the reduction of the total amine content. This capability results in the formulator and/or end user being able to use a single metalworking fluid across multiple metals.

Relative to the control fluid, which did not contain CORRGUARD™ EXT Amino Alcohol, the improvement in fluid life and performance were considerable, including:

- 50 percent longer fluid life
- 30 percent better cast iron corrosion control
- 40 percent improved pH stability
- 35 percent less cobalt leaching
- Excellent compatibility with aluminum alloys through reduction of total amine content

Best of all, formulating CORRGUARD™ EXT Amino Alcohol into this commodity metalworking fluid was done with only marginal cost impact!

So if you are a formulator interested in developing a similar cost commodity-type metalworking fluid that will have longer fluid life and improved performance, the answer is simple: CORRGUARD™ EXT Amino Alcohol.

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**CORRGUARD™ EXT Amino Alcohol**

Enhance Biocides Performance for Improved Fungal Control

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**The innovation behind CORRGUARD EXT Amino Alcohol enables metalworking fluids that are higher performing and longer lasting.**

CORRGUARD EXT Amino Alcohol from ANGUS provides formulators with:

- Exceptional performance enhancement of biocides providing greater formulation flexibility and optimization
- Excellent Corrosion Control of ferrous metals and opportunities for improved aluminum alloy corrosion control through reduction of amine content allowing for a single metalworking fluid to be used across multiple metals
- A new primary amine technology that is both readily biodegradable and REACH compliant

Whatever your metalworking fluid challenge, ANGUS can help. Visit http://www.ANGUS.com for more information and to review a recent case study of CORRGUARD EXT Amino Alcohol or call 1-800-447-4369 for more information.