

# Protects your absorption chiller from corrosion



Absorption chillers using lithium bromide as an absorbent have proven to be a cost-effective and an environmentally responsible alternative to chillers using CFC (chlorofluorocarbon) refrigerants. However, if not properly controlled, lithium bromide is corrosive. Therefore, steps need to be taken to protect the machine against premature component failure that can result in increased maintenance costs, unproductive downtime and shortened machine life. What follows is an explanation of the need for corrosion inhibitors, and evaluation of alternatives and a demonstration of why ADVAGuard® 750 is the superior alternative.

## Get a head start on corrosion

Corrosion brought on by lithium bromide starts very early in the operating life of the chiller. Therefore, a corrosion inhibitor must be present in the solution prior to commissioning (or start-up). In the absence of an inhibitor, the corrosion generates hydrogen gas. This gas, unless purged, will adversely affect chiller performance.

Generally speaking, corrosion inhibitors promote the formation of an oxide film, magnetite. It is this stable oxide layer that helps to minimize corrosion in the machine. Fortunately, the magnetite film forms on the steel surfaces in the vessel during initial operation of the unit.

## Maintain protection throughout machine life

To ensure the stability of this film, proper inhibitor levels must be maintained throughout the operating life of the machine. Unstable oxide films can lead to an increase in corrosion rates, resulting in decreased unit life and poor system performance from excessive hydrogen generation. An unstable film can also result in rapid inhibitor depletion causing contamination of the lithium bromide solution. The contaminated solution will then need to be filtered, adding to unit maintenance costs.

## All corrosion inhibitors are not equal

Customers who have experience with absorbers can relate to the importance of a corrosion inhibitor. But far too often, this experience leads to the misconception that all inhibitors offer the same level of protection. Available corrosion inhibitors, while effective in certain areas, can't offer complete protection, for instance:

- Molybdate – currently the most commonly used inhibitor – suffers from limited solubility in the lithium bromide solution, making it difficult to maintain a stable concentration of molybdate in the solution.
- Chromate inhibitors contain hazardous chromium compounds, which are potential carcinogens.
- Nitrate inhibitors typically generate ammonia, which may result in destructive stress cracking of the copper and copper alloy tubes. Ammonia also acts as non-condensable gas, which affects chiller performance.

## Why ADVAGuard 750 is unsurpassed

Where other inhibitors fail, ADVAGuard 750, developed by the lithium experts at FMC corporation, performs – time and again. Available exclusively from Johnson Controls, it is an inorganic corrosion inhibitor that provides superior corrosion protection. ADVAGuard 750 is effective over a wide range of temperatures as well, facilitating use in single-effect, double-effect and triple-effect machines that use lithium bromide as an absorbent.

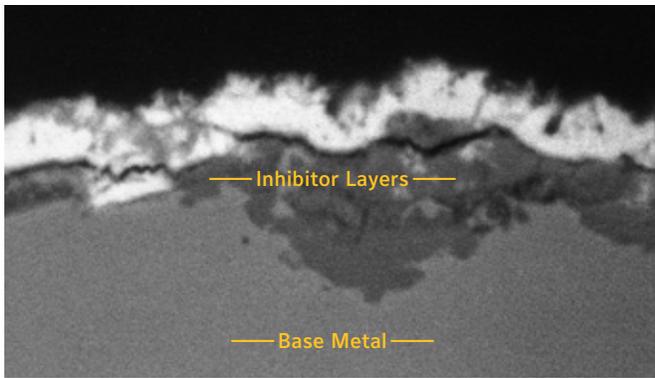


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**ADVAGuard 750 superior advantages**

- **Consistently meets solubility demands** – keeps chillers functioning at optimal levels
- **Environmentally acceptable** – it is a non-chromate inhibitor, has no hazardous by-products
- **Unsurpassed film stability** – holds more firmly than a magnetite layer created by a molybdate inhibitor
- **Lower corrosion rate** – approximately one-eighth of comparable molybdate products
- **Lower rate of hydrogen generation**

These advantages, along with its compatibility with most additives used to control corrosion and heat-mass transfer properties, make it the best alternative to other available inhibitors.

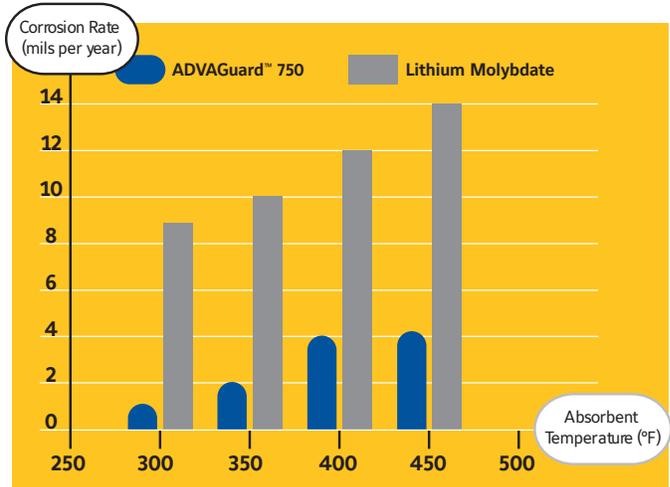


**Multi-layered protective film**

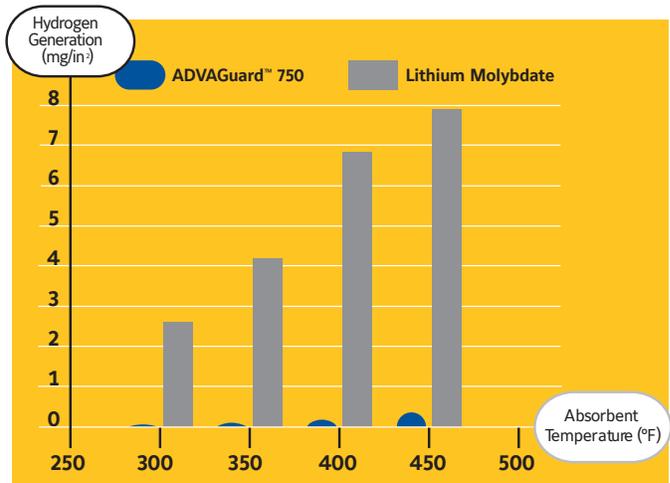
ADVAGuard 750's superiority is demonstrated by unique laboratory tests developed in the research laboratories of FMC Lithium Division. In the test, preweighed metal coupons were immersed in 65 wt% lithium bromide formulations with the inhibitor, maintained under vacuum (29.6 inches of Hg) at specified temperatures. Surface examination of the coupons revealed the presence of a unique protective, multilayered film of magnetite capable of withstanding system upsets and greatly reducing corrosion rates.

Corrosion rates were calculated from weight-loss measurements.

Figures 1 and 2 illustrate the superior performance of ADVAGuard 750 corrosion inhibitor when compared to lithium molybdate.



**Figure 1:** Shows the high corrosion-protection control of ADVAGuard 750.



**Figure 2:** Depicts the low hydrogen generation obtained with ADVAGuard 750.

**Conclusion**

ADVAGuard 750 corrosion inhibitor offers the best protection for your absorption chiller. Maintenance and operating problems normally associated with corrosion are vastly reduced with the use of ADVAGuard 750.

*And it's available exclusively from Johnson Controls.*

ADVAGuard 750 is a registered trademark of FMC Corporation.

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