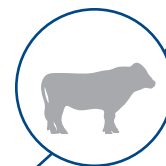


Research Notes

Arm & Hammer Animal and Food Production



Reduce alloy corrosion in processing facilities with BoviBrom.

INTRODUCTION

The study's purpose was to determine the extent of corrosion in a variety of alloys at varying concentrations of BoviBrom™ that ranged from 132 ppm to 517 ppm.¹

STUDY OVERVIEW

- **Black steel and iron** – Black steel pieces of pipe were completely immersed in four test solutions — potable water, aqueous chlorine containing solutions (20 and 50 ppm as Cl₂) and a 300 ppm BoviBrom solution for 14 days. In another study, BLKFE black iron and black malleable iron were completely immersed in 300 ppm hypobromous acid (HOBr) in glass jars. Jars were capped and immersed in a 40°F water bath for 30 days. The HOBr test solutions were replenished daily during week days.¹⁻²
- **Galvanized coated steel in hot box** – Two galvanized C1010 coupons were hung off a lateral line at carcass height directly above the spray nozzles for 30 days. The residuals averaged 206 ppm HOBr for the first half of the study and for the second half averaged 132 ppm HOBr.³
- **Concrete** – Cylinders of concrete were completely immersed in a 300 ppm HOBr solution for 30 days at room temperature. The HOBr test solution was replaced with fresh solution three times a week.⁴
- **Aluminum** – AL-3003 aluminum was completely immersed in a 300 ppm HOBr solution in glass jars. Jars were capped and immersed in a 40°F water bath for 30 days. The HOBr test solution was replenished daily during week days.⁵
- **Carbon Steel** – Hot dip galvanized steel was completely immersed in a 300 ppm HOBr test solution in glass jars. Jars were capped and immersed in a 40°F water bath for 30 days. The HOBr test solution was replenished daily during week days.⁶
- **Copper** – CDA-110 copper was completely immersed in a 300 ppm HOBr test solution in glass jars. Jars were capped and immersed in a 40°F water bath for 35 days. The HOBr test solution was replenished daily during week days.⁷
- **Various alloys in hot box** – 304 Stainless steel, 6061 aluminum, CDA 443 Brass and electro-galvanized iron were hung off a lateral line at carcass height directly above the spray nozzles in a hot box for 52 days. The HOBr residuals varied between 130 ppm and 517 ppm but were mainly in the range of 225 and 250 ppm. The temperature of the hot boxes was approximately 40°F (Table 1).⁸

| TABLE 1 | Coupons after 52-day test with BoviBrom (DBDMH) |
|--------------------|--|
| 304 Stainless |  |
| 6061 Aluminum |  |
| CDA 443 Brass |  |
| Electro-galvanized |  |

RESULTS

BoviBrom™ HOBr solution is compatible with all materials used in the testing. BoviBrom HOBr solution is suitable for use in spray chill environments.

- Black Steel – in the first study, no difference in corrosion rates measured. In the second study, discoloration was observed; corrosion rate was less than 4.8 mils per year (mpy)
- Galvanized Coated Steel in hot box – no appreciable level of corrosion occurred
- Concrete – no impact on strength or appearance (Figure 1)
- Aluminum – slight discoloration and surface staining was observed; corrosion rate was low at 0.43 to 0.5 mpy
- Carbon Steel – discoloration was observed; corrosion rate was less than 1 mpy
- Copper – very little pitting and some discoloration were observed; corrosion rate was less than 0.1 mpy
- Various alloys in hot box – discoloration and staining was observed; corrosion rate was less than 0.15 mpy

Figure 1: Concrete cylinders after 30-day test with BoviBrom (DBDMH)



5% Lactic acid 2.5% Lactic acid DBDMH Control

CONCLUSION

BoviBrom HOBr solution is compatible with concrete, steel and other common construction materials. BoviBrom HOBr solution is suitable for use in spray chill environments. BoviBrom HOBr solution has been tested against a variety of metals that are commonly used in commercial processing facilities. DBDMH (1,3-dibromo-5,5-dimethylhydantoin) does have some minor deleterious effects on a few alloys. However, this product has been used for many years in the industry because of its low overall impact in commercial facilities.

Compatibility in pure/neat form (nugget)

- High density polyethylene (HDPE)
- Low density polyethylene (LDPE)
- Polypropylene (PP)
- Teflon®
- Vinyl Chloride (PVC)
- Titanium
- Viton®
- Kynar®
- Hypalon®



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1 Corrosion testing of black iron. Data on file, 2013.
2 Corrosion testing of black steel. Data on file, 2010.
3 Corrosion testing of galvanized coated steel in hot box. Data on file, 2011.
4 Degradation testing of Concrete. Data on file, 2010.

5 Corrosion testing of AL-3003 Aluminum copper. Data on file, 2013.
6 Corrosion Testing of Hot Dip Galvanized 1010 Carbon Steel Coupons. Data on file, 2013.
7 Corrosion testing of CDA-110 Copper. Data on file, 2013.
8 Corrosion testing of coupons of various alloys in hot box. Data on file, 2013.