RESEARCH REPORT:
IMPACTS OF CORROSIVE PRODUCTS

Report Date: May 2012

adesco
competitive by nature

This research was designed to objectively compare the corrosiveness of various mould inhibitors available on the Irish market. The corrosive cost of a mould inhibitor refers to the economic cost of corrosion of grain store structures and equipment and is a real cost borne by grain merchants and feed manufacturers.

BACKGROUND INFORMATION

What are the harmful effects?

The consequences of corrosion are varied but the most harmful ones are

- Reduction of metal thickness leading to a loss of mechanical strength or structural failure
- Deterioration of appearance
- Mechanical damage to valves or pumps and blockages to pipes
- Perforation of vessels and pipes allowing content escape.

What factors drive the corrosion rate?

The following conditions facilitate the movement of iron atoms away from the surface of metal, over time resulting in mass loss and corrosion.

- High humidity and exposure to ambient air
- Presence of non-buffered corrosive chemicals and acids
- An existing rust coating – facilitates iron ion movement
- The corrosion rate is increased at below pH4.5.

What links mould inhibitors and metal corrosion?

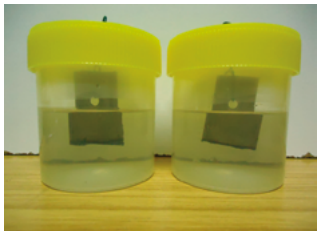
The chemical composition and pH of mould inhibitors varies greatly. Given the capital cost of grain store construction it is important that grain merchants and feed manufacturers understand the impact that product choice will have on their steel super structures. In order to gain insight into the relative corrosiveness of various products, practical corrosion tests were carried out.

TEST METHODOLOGY

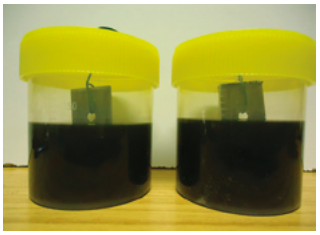
The test methodology used differs from the standard accelerated corrosion test (Section 37 C1) as the focus was to demonstrate the real world conditions of prolonged exposure to differing preservation products The products being tested were partially submerged in the differing liquid products so as to partially coat the surface (similar in contact as occurs with elevators or steel purlins). The partial exposure of the metal to ambient air demonstrates the accelerating effects of air and volatile acids in the headspace. This accelerating effect is most evident at the junction between the liquid and the air.

Test Set Up (Day 1)

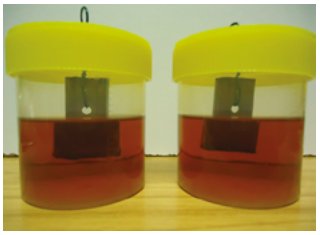
Mild steel strips were cut into equal lengths and weights (18g +/- 0.01g) and placed in partial submersion in a number of liquid mould inhibitors. 2 metal samples per treatment were used to reduce the impact of sample variation.



Water



Adesco Product A



Alternative Product B

VISIBLE CORROSION

Samples were allowed to rest in typical ambient conditions (+3 degrees to +20 degrees C) for a period of 9 months. Initial weight and pH were recorded at day 1 and then at day 56 and 270.

Water

Day 56 Day 270

Adesco Product A

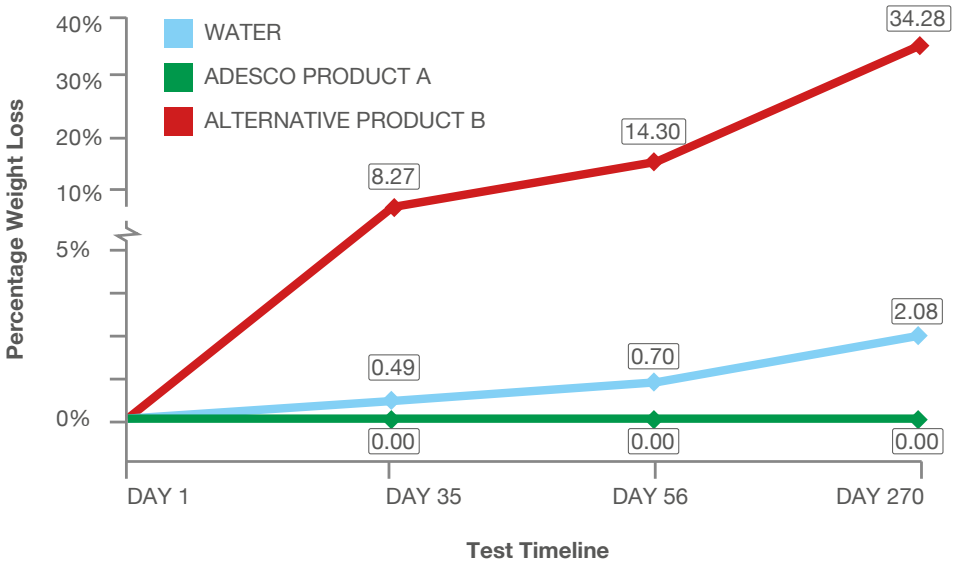
Day 56 Day 270

Alternative Product B

Day 56 Day 270

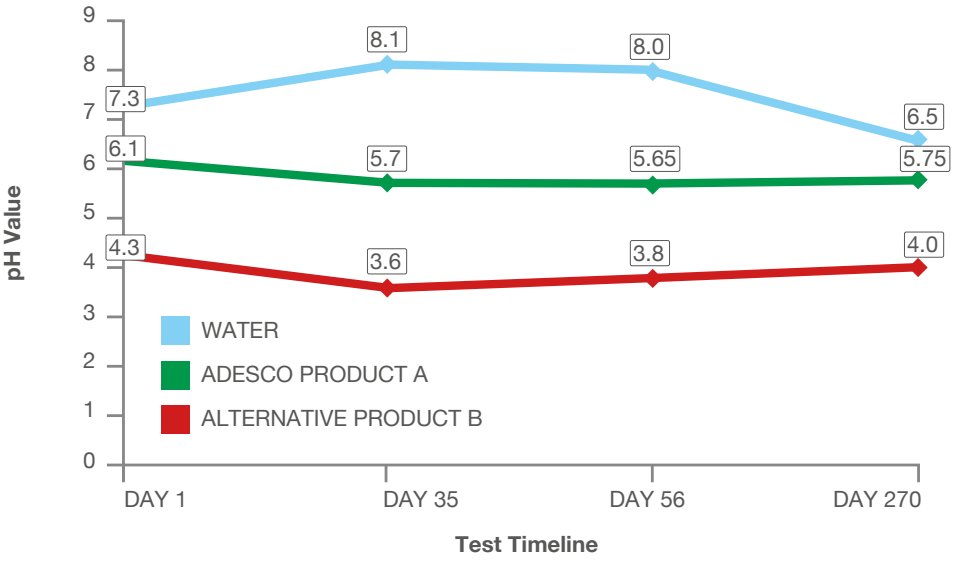
MEASURABLE CORROSION

Percentage Weight Loss of Mild Steel exposed to partial submersion in liquid product



Product B showed a significantly larger amount of corrosion than the other two liquids measured. Over 270 days the metal exposed to product B lost over one third (38.4%) of its total mass, compared to 2.08% for water and 0 for Product A.

Product pH during the Exposure Period



Corrosiveness is accelerated at a pH of 4.5 or below, in addition changes in pH often reflect an unstable acidic profile.

In the test results, water showed a drop in pH from 7.3 to 6.5, whilst Product B firstly dropped from 4.3 to 3.6 and then climbed through 3.8 to 4.0. Product A, stayed relatively stable between 6.1 and 5.65.

PRODUCT FORMULATION CHARACTERISTICS

	Water	Adesco Product A	Alternative Product B
Propionic Acid / Free Acid	NIL	MEDIUM	HIGH
Ammonium Propionate	NIL	HIGH	LOW
Surfactant	NIL	HIGH	NIL

SUMMARY & CONCLUSIONS

The results clearly show a high variance in surface corrosion caused by the products test. Second Generation mould inhibition products that have a buffering effect through more extensive inclusion of ammonium proponiate and surfactants demonstrate zero corrosiveness as compared to alternatives where over 30% metal mass loss occurs in just 9 months. The optimal formulation will, as in the case of all Adesco products, combine the appropriate combination of organic acids and their buffered salts plus effective surfactants.

The chemical composition of each product determines its corrosive cost. Grain merchants and feed manufacturers need to be conscious of this cost when choosing between alternative mould inhibitor products.

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Adesco is committed to helping grain processors to quickly and significantly improve competitiveness by reducing the cost of high quality grain production.

Adesco's innovative science-led solutions work with nature to reduce the cost of consistently producing higher quality grain with improved nutritional yield that is cleaner and more environmentally sound. Adesco offers a range of advanced products, measurement and application systems and ongoing grain performance programmes.

For more information on the Adesco Advantage Grain Management programme, email info@adesco.ie

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