Corrosion Analysis of Common Firearms Inhibitors.

Objective:
To determine which common rust preventatives work the best.

Conclusions:
The order of performance from best to worse is as follows:

Product	% Rust
Mil Comm TW-25B	10.10% (This is a Grease)
Slip 2000 Gun Wipe	15.64%
Eezox	21.02%
Slip 2000 CLP	29.20%
Barricade	35.80%
Sheath	38.75%
Breakfree CLP	49.57%
Inhibitor V-80	64.23%
Prolix	71.28%
Tuff Cloth	74.92%
Jet Lube 769	79.61%
Control	97.84%

Mil Comm TW-25B is a grease type preventative. It looked like a 'white grease' and is a little messy to handle. I suspect that it would be a good product for long-term storage of various metal products. Historically Eezox had been the number one performer but Slip 2000 products have shown excellent corrosion resistance performance. Recently, Birchwood Casey has changed the name of Sheath to Barricade. Samples of both were obtained and tested. Results show that Sheath and Barricade is the same product. The decision to rename the product was to update the products current image and make it more attractive to consumers. Breakfree CLP continues to follow the pack in performance and find's itself in the lower half of the product matrix in corrosion resistance. The results for Tuff Cloth were most surprising. Tuff Cloth is generally accepted in the custom knife community as a premier product for lubrication and corrosion protection. The results of this analysis show Tuff Cloth to be a rather poor corrosion inhibitor.

Equipment Needed:

- Triple beam balance
- Seawater salts (pet store)
- Cold rolled sheet steal, 0.010" 1010 shim stock
- Spray bottle
- Water
- Sample stand
- Plastic spoons to weight out salts
- Disposable gloves
- Cotton patches
- Brake cleaner
- Digital Image Analysis software
- Digital camera

- Camera tripod
- Safety glasses
- Rust preventatives
    - Slip 2000 CLP
    - Breakfree CLP
    - Slip 2000 Gun Wipe
    - Mill Comm TW-25B
    - Barricade
    - Inhibitor V-80
    - Tuff Cloth
    - Eezox
    - Prolix
    - Jet Lube 769 Lubricant and Penetrating Oil
    - Sheath

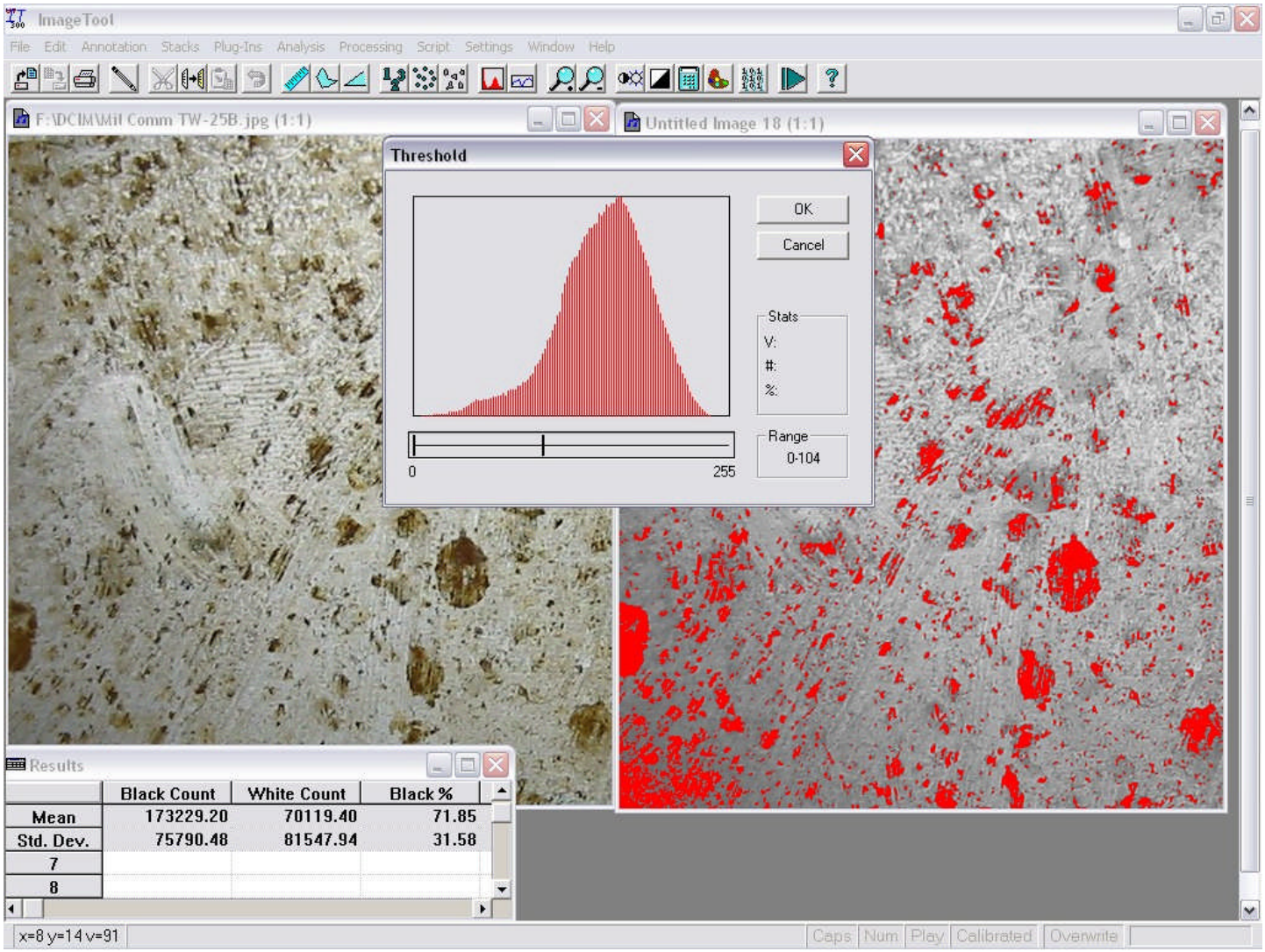
Experimental Design:
Weight out and mix seawater as recommended by the manufacturer. Transfer the seawater solution to a spray bottle.

Obtain cold rolled sheet metal and cut into 2 x 3"" (5.08 x 7.62 cm) squares. Wear disposable gloves (to avoid body salts, oils, or other types of contamination as well as personal protection) and safety glasses while degreasing the swatches with a solvent spray such as brake cleaner. Mark the swatches indicating the corresponding rust preventative. Record the corresponding marks. Apply rust preventatives to clean cotton patches and apply to swatches. Use a new clean cotton patch for each application while changing gloves for each application. Each sample was allowed to dry for 60 minutes.

Place each swatch on a sample stand. The purpose of the stand is to prevent galvanic corrosion associated with dissimilar metals touching as well as to promote airflow. The stand is made of a 2x6" piece of wood where a channel is cut ¾" deep on a 45 degree angle. The portion of the sample inserted into the stand will not be measured in the experiment due to salt pooling and moisture absorption by the wood. Samples placed outdoors are sprayed twice a day with seawater, once in the morning and once in the evening. Samples were exposed to sunlight, seawater, dust, wind, humidity, dew, and temperature changes. After 96 hours, samples were rinsed in warm water to remove salt deposits. After rinsing, samples were blotted and allowed to air dry.

Software programs are available which digitally analyze photograph or scans to record a variety of measurements. For our case, digital pictures of each sample were taken after the test was concluded. The digital picture was converted to a gray scale and a threshold variance was programmed to convert rust formations to black dots. Areas which were unaffected by rust remained white. The software then analyzes the black and white pixels to determine the percent rust on the specified surface area. This is recorded and reported.

An example of the digital image analysis technique is shown on the next page:



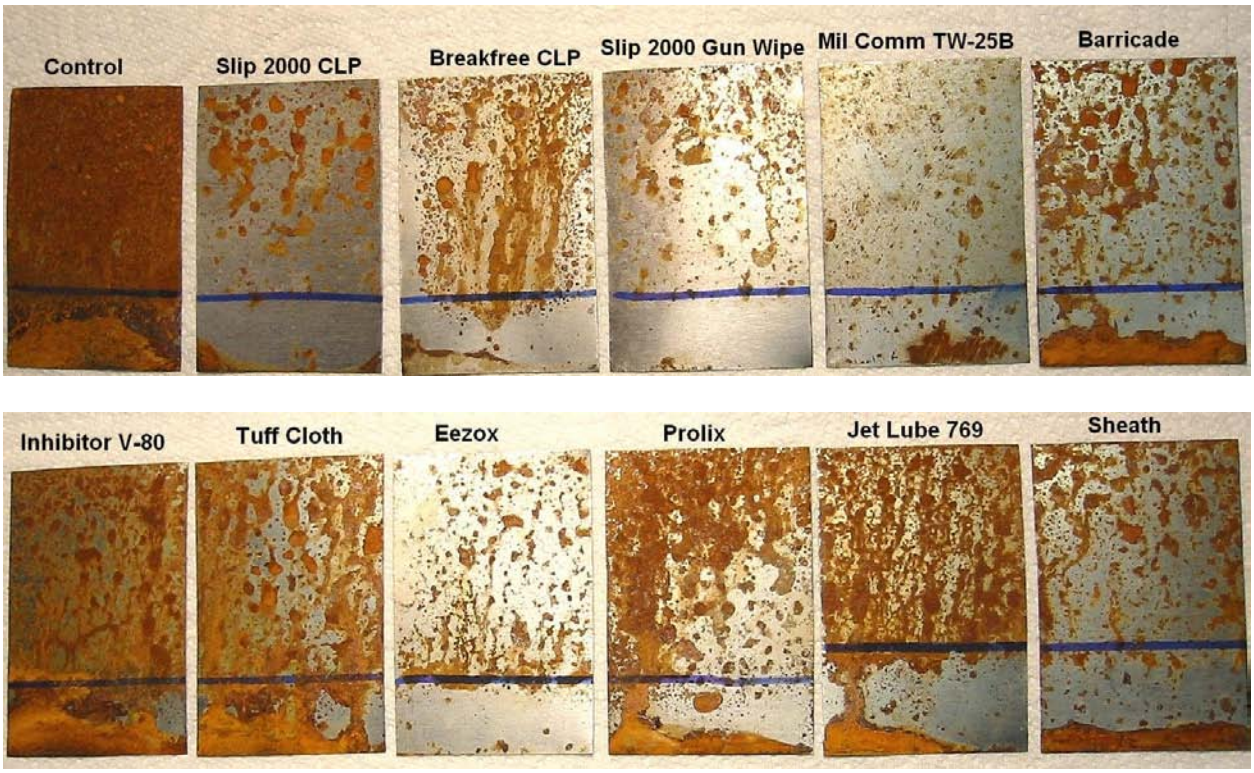
Results:

The test was started on June 4, 2006 and concluded June 8, 2006. Besides being sprayed with seawater, the weather data for the four-day test period is as follows:

This Week Tabular Data

Date	Temperature (°F)			Dew Point (°F)			Humidity (%)			Pressure (in)		Wind (mph)		Gust Speed (mph)	Precipitation (in)
	high	avg	low	high	avg	low	high	avg	low	high	low	high	avg	high	sum
June															
4	90	68	53	56	48	42	80	51	21	29.15	29.09	3	0	7	0.00
5	87	69	50	53	46	42	86	49	22	29.18	29.03	3	0	7	0.00
6	84	70	56	62	55	47	81	59	41	29.06	28.91	16	5	18	0.01
7	87	74	64	65	60	57	87	63	39	29.06	28.88	12	2	15	0.00
8	94	75	57	64	57	52	90	58	28	29.12	29.00	7	1	12	0.00

Photo documentation of the samples is as follows:



Surface area calculation results:

Product	% Rust
Control	97.84%
Slip 2000 CLP	29.20%
Breakfree CLP	49.57%
Slip 2000 Gun Wipe	15.64%
Mil Comm TW-25B	10.10%
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