



Additive ES

Additive ES is an aluminum etch additive designed to be used in conjunction with sodium hydroxide (liquid or dry) to provide an even matte finish on aluminum and its alloys. Following the operating instructions of the **Additive ES** will enable one to operate the bath on a non-dump basis. **Additive ES** prevents a hard scale from forming on heating coils or the bottom of the tank. This represents a significant cost saving in downtime, chemical consumption and waste treatment costs.

Note: Additive ES is a saturated solution and must be stored at temperatures above 70 degrees Fahrenheit to prevent the precipitation of active ingredients. If precipitation has occurred due to storage below 70 degrees Fahrenheit the solution should be warmed to 80 degrees Fahrenheit and mixed.

Operating Conditions

Initial Make-up: 3.9 – 5.9 % by volume (Caustic, 50% liquid caustic)
OR
4.0 – 6.0 oz/gal (Caustic dry)

Additive ES is added at 10 gallons per 100 gallons of 50% liquid caustic or 1.5 gallons per 100 pounds of dry caustic.

Immersion Time: 2 – 15 minutes
Operating Temperature:..... 100 – 160 degrees F
Equipment:Mild steel tank and heating coils
Ventilation: Required
Agitation:... Mild agitation is recommended to insure a uniform etch

TANK MAKE-UP PROCEDURE

Fill tank 2/3 full of cold water, and then add the full amount of caustic and **Additive ES** with agitation. Add the balance of the water and bring to the desired operating temperature.

EXAMPLE FOR A 100-GALLON TANK

Caustic, 50% liquid.....	4.9 gallons
Caustic, dry	31.2 pounds
Additive ES	0.49 gallons



To insure a uniform etch the work must be thoroughly cleaned prior to immersion in the etch tank. Soils, if not removed, will cause an unusual etch pattern on the surface of the aluminum. When selecting a pre-cleaner it is important not to select a silicated cleaner. Carrying silicates into the etch tank will ultimately result in a spotty etch surface. Hubbard-Hall's cleaners **Aquaease™ SAL**, **Aquaease™ PL 732** and **Aquaease™ 187 NE** are recommended.

Operating Parameters

The key to maintaining a non-sludging, never dump system is allowing the aluminum concentration to reach equilibrium. This occurs when the amount of aluminum dissolved equals the amount of aluminum drug out.

<u>Dissolved Aluminum</u>	<u>Free Caustic Concentration</u>
0-80 g/l aluminum	3.9 - 5.9% (volume) 4.0 - 6.0 oz/gal
80-120 g/l aluminum	5.9 - 7.8 % (volume) 6.0 – 8.0 oz/gal
120-150 g/l aluminum	7.8 – 8.8 % (volume) 8.0 – 9.0 oz/gal
150-180 g/l aluminum	8.8 – 9.8 % (volume) 9.0 – 10.0 oz/gal

Note: Should the aluminum content exceed 180 g/l, the bath should be decanted to 90 g/l.

Control Procedure

Chemicals Required: 0.5 N Hydrochloric Acid
Phenolphthalein Indicator
AddControl Test Solution (Hubbard-Hall's product)

Determination of Free Caustic and Dissolved Aluminum Content:

1. Filter the etch bath sample through #42 Whatman filter paper (keep some for the determination of free Additive ES testing).
2. Pipette 10 mL of the filtered etch solution into a 250 mL Erlenmeyer flask.
3. Add 10 mL of deionized water.



4. While stirring the sample, titrate with 0.5N Hydrochloric Acid until solution becomes cloudy as first endpoint (use a dark paper as background to observe).
5. Record the mL used as V_1 .
6. To the flask, add 3 drops of Phenolphthalein Indicator.
7. Fill the burette to the zero mark with 0.5N Hydrochloric Acid.
8. While stirring the sample, titrate with 0.5N Hydrochloric Acid until pink color disappears for 15 seconds.
9. Record the mL used as V_2 .
10. Calculate the free 50% caustic soda and dissolved aluminum as follows:

$$\% \text{ v/v Free 50\% Caustic Soda} = 0.267 \times V_1$$

$$\text{g/L free caustic soda} = 2.0 \times V_1$$

$$\text{g/L dissolved aluminum} = 1.35 \times V_2$$

11. If the bath is fresh (no dissolved aluminum), pipette a 10 mL sample into a 250 mL Erlenmeyer Flask. Add 10 mL deionized water and 3 drops of Phenolphthalein Indicator. While stirring the sample, titrate with 0.5N Hydrochloric Acid until pink color disappears for 15 seconds. Record mL used as V_1 . Calculate the %v/v of 50% caustic soda using the same equation as in step 10.

Determination of Free Additive ES:

1. Pipette 10 mL of the filtered etch solution into a 250 mL Erlenmeyer Flask.
2. Add 10 mL deionized water.
3. While stirring the sample, titrate with AddControl to a cloudy endpoint.
4. Allow the solution to stand for 5 minutes. If the solution turns clear, continue to titrate with AddControl until the cloudy endpoint. Repeatedly observe the cloudiness and continue to titrate with AddControl until cloudiness is stable for at least 5 minutes.
5. Record the mL used as V_3 .
6. Calculate the free Additive ES as follows:

$$\% \text{v/v Free Additive ES} = (1.3 \times V_3) - (1.51 \times V_1)$$

If a negative value or zero %v/v Additive ES is calculated, no free Additive ES is available in the bath. New addition is needed. If no endpoint in step 4 was observed after adding 100 mL of AddControl, Additive ES in the bath is in excess over total dissolved aluminum and no addition is needed.

Example 1:

The obtained V_1 , V_2 , and V_3 , are 0.3mL, 20.4mL, and 0.5mL, respectively.

$$\% \text{v/v Free Caustic Soda} = 0.267 \times 0.3 = 0.08\% \text{v/v}$$

$$\text{g/L Dissolved Aluminum} = 1.35 \times 20.4 = 27.5 \text{g/L}$$

$$\text{Free Additive ES} = (1.3 \times 0.5) - (1.51 \times 0.3) = 0.2\% \text{v/v}$$

4.92%v/v Caustic Soda (50%) and 0.3%v/v Additive ES should be added to the bath.

Example 2:



The obtained V_1 , V_2 , and V_3 , are 19.45mL, 17.70mL, and 21.10mL, respectively.

%v/v Free Caustic Soda = $0.267 \times 19.45 = 5.20\%v/v$

g/L Dissolved Aluminum = $1.35 \times 17.70 = 23.90g/L$

Free Additive ES = $(1.3 \times 21.10) - (1.51 \times 19.45) = -1.94\%v/v$

The free caustic soda is in the working range. The Additive ES is used up; therefore, $2.44\%v/v$ ($=1.94\%v/v + 0.50\%v/v$) of Additive ES should be added to the bath.

Additive ES can also be used for:

Water Softening

Additive ES may be introduced into an alkaline cleaner (soak, electro, spray) to “tie up” the iron, calcium or magnesium elements present in hard water. These elements can tie up soaps and some surfactants of a cleaner, which consequently impair cleaning and also present a rinsing problem.

USE CONCENTRATION

$\frac{1}{4}$ to $\frac{1}{2}\%$ (volume) of solution.

Additive for Alkaline Electrocleaner

Additive ES may be added to Hubbard-Hall steel electrocleaner to aid in smut or flash rust removal from steel fabrications. Additive ES appears to penetrate pores and more effectively aids in removal of scales and oxides from stamped and drawn work, thus resulting in a brighter finish.

Use Concentration:

3 to 5% (volume) of solution volume. The initial make-up concentration should be 4 or $4\frac{1}{2}\%$ (volume). If the tank walls and heating coils have a heavy scale accumulation or if the water used for the cleaners contain large quantities of calcium or magnesium.

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