# Product Supplement

# Lonox® L5611

Semi-Aqueous Stencil and Misprinted Board Cleaner

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## Lonox L5611

### Semi-aqueous Stencil and Misprinted Board Cleaner

Lonox L5611 is a concentrated solvent cleaner-defluxer containing a blend of organic solvents and inhibitors in a water base. It is multi-metal safe and can be used in spray-in-air in-line and batch washers, immersion agitation or ultrasonic systems and in stencil cleaning systems or manual applications for the removal of virtually all types of pastes and fluxes including rosin flux, low residue paste, no-clean flux, organic acid flux, lead-free flux, mis-printed pastes and uncured adhesives and as an under-side wipe.

Table of Contents


- Lonox Use Directions 3
- Lonox Generic Description 5
  - Chemical and Physical Properties 5
- Performance Properties
  - Substrate Compatibility 6
  - Soils Removed 7
  - Surface Tension 9
  - Rinsibility 9
  - Blender Foam Study 10
- Bath Maintenance Methods
  - Refractive Index 11
- Bath Life and Corrective Action Methods
  - Oil Loading 12
  - Suspended Solids/Particulates 12
  - Dissolved Solids 12
- Rinse Water Treatment
  - Acid-Alum Primary Treatment 13
  - Alum-Polymer Primary Treatment 13

## Lonox Use Directions

The Lonox product line of concentrated aqueous solvent cleaners is designed to be further diluted with water in most applications when used with mechanical washing systems. These products clean by solvent action and are manufactured with the highest cleaning quality standards available. They are biodegradable and completely water rinsable. Lonox L5611 is surfactant-free and leaves no residues. Rinsing is optional.

### Contaminants Affected:

Lonox is used to remove a wide range of organic and inorganic soils including rosin flux, low residue paste, organic acid flux, uncured adhesives, no-clean fluxes, tacky and lead-free fluxes in addition to general industrial soils, wax, marking pen, inks and greases.

These products were developed for enhanced cleaning performance on a broad spectrum of soils while extending bath life over traditional cleaners used in the electronics industry. Overall cleaning costs are reduced and waste generation is minimized.

### Parts Cleaned with Lonox:

Whatever your cleaning application, there are Lonox formulations designed to clean printed circuit assemblies, surface mount assemblies, stencils, tooling, electrical and electronic components, precision and optical parts and misprinted pastes and adhesives.

### Lonox Cleaning Systems:

Like many Kyzen products, the Lonox product line is designed for use in aqueous in-line spray machines, dishwashers and batch cleaners. They also work well in immersion and ultrasonic systems. Stainless steel and polypropylene are preferred materials for equipment construction. Refer to the Material compatibility section for further information.

Lonox products are typically diluted one part cleaner to two to twenty parts water (5-35%). In some applications they may be applied as received with no adverse effects. The wash temperature is usually maintained as low as ambient (100°F) up to 140°F for electronic assemblies and up to 120°F for stencils. One to three rinses are suggested for complete removal of all contaminants and cleaner residues. Parts may be dried with an air-knife, hot air drying oven or recirculating air as desired.

Lonox L5611 was specially developed for stencil cleaning and is best used for this application. It may be used from 7-100% and from ambient to 120°F. It works well with mechanical spray, ultrasonic or manual wipe applications and has proven effective on a broad spectrum of pastes and adhesives.

### Preparing the Equipment:

1. Check the compatibility of all substrates, elastomers and seals. Replace if needed.
2. Clean or replace all filters exposed to previous cleaner.
3. Check and repair all mechanical parts including nozzles, spray arms, eductors, etc.
4. Inspect all visible areas to insure all surfaces are clean and free of scale, soils and cleaner residues.
5. Once all tanks and plumbing are thoroughly clean, close drains and fill with water.
6. Run two to three full cycles to completely clean the entire system.
7. Drain all fluid from wash tanks, rinse tanks and filter cartridges. Verify that the final rinse is neutral pH, clear, free of debris and non-foaming. This will insure that all soils and cleaner residues have been removed.
8. Close all drains, fill the tanks with water and charge the cleaning chemistry to the recommended concentration. Start recirculation.
9. Once the recommended process temperature has been reached, cleaning may commence.

Care should be taken to minimize cleaner drag-out into the rinse solutions.

## Lonox Use Directions (Continued)

Bath Maintenance:

For maximum cleaning efficiency, bath concentration, temperature, or exposure time may be optimized as required. Maintenance methods are enclosed for your convenience. Refractive Index is the preferred method of control for this product.

To assist in controlling the bath, Kyzen offers automatic proportioning systems for “hands-off” control. These include a *PCS*, recommended for use with Aquanox. The *DOSITRON* is an alternate system. Your Kyzen representative can assist you in identifying the best unit for your application.

Disposal:

Where applicable, a properly maintained Lonox bath can last a long time. Bath Life Studies have shown these products to have excellent soil retention without adverse effects. Actual field results also show bath life of several months and longer.

Most Lonox rinse solutions are compatible with typical primary and secondary waste treatment processes. Typical process methods are included in the back of this booklet. The Municipal Sewer District covering the plant location will determine whether the rinse waters can be sewered.

Closed-loop water treatment for the rinse water is accomplished with specially designed reverse osmosis (RO) membranes and equipment. Carbon and resin technology may be used on occasion with cleaners designed for chemical cleaning and operation with wet chemical isolation.

Your Kyzen Representative is available to assist you throughout your cleaning process.

## Lonox Generic Description

*Lonox L5611 is a concentrated aqueous solvent cleaner/defluxer containing a blend of organic solvents and inhibitors in a water base. It can be used in most spray-in-air, immersion, ultrasonic, or manual applications for the removal of fluxes, pastes and adhesives in addition to general industrial soils and greases. Lonox was specially formulated with raw materials that are relatively people-safe and environmentally friendly.*

Typical chemical properties include the following:

| Parameter | 100% Concentrate | 10% Dilution | 0.25% Dilution |
|---|---|---|---|
| Clarity | Clear | Cloudy | |
| Color | Colorless | Off-white | |
| Odor | Mild citrus | Faint solvent odor | |
| Flash Point, °C (COC) | None to boiling | None to boiling | |
| Boiling Point, °C | 103 | 100 | |
| Volatile Organic Compound (VOC) gm/L EPA Method 24 | 822.3 | 83 | |
| Vapor Pressure, VOC Components, mmHg at 20°C | 0.07 | 0.06 | |
| Chemical Oxygen Demand (COD) ppm | | | TBD |
| Biochemical Oxygen Demand (BOD), 5-day, ppm | | | TBD |
| pH | 4-8 | 4-8 | |
| Specific Gravity | 0.932 typical | | |
| Weight/gallon | 7.78# | | |
| Refractive Index, ° BRIX | 45-55 | 5-10 | |
| MEQ to pH 8.3 | NA | | |
| MEQ to pH 4.0 | NA | | |
| Cloud Point, °C/F | ND | ND | |
| Alkalinity Ratio | NA | NA | |
| Surface Tension, dynes/cm, 5% | 28-38 | 28-39 | |

## Substrate Compatibility

*Chemicals may have adverse effects on substrates following short-term exposure during the cleaning process or following long-term exposure if contained as part of the equipment tanks, fixtures, plumbing, filtration, etc. Materials have been tested for compatibility under the following conditions: Immersed, unagitated at 100% and at 150°F for 48 hours, 2 weeks and 3 months. Specimens were examined for changes in weight, dimension, hardness and appearance. Based on these results the following suggestions are made regarding the use of Lonox and these substrates.*

Plastics and Elastomers:

| Brand Name | Generic Description | L5611 |
|---|---|---|
| Delrin™ | Acetal | R |
| Phenolics | Phenol | R |
| Teflon | Fluorinated Elastomer | R |
| Kalrez | Fluorinated Elastomer | R |
| Nylon | Synthetic Fiber | R |
| Kynar™ | Polyvinyl fluoride | R |
| Tefzel™ | Ethylene/tetrafluoroethylene copolymer | R |
| Polypropylene | Polypropylene | R |
| Acculam™ | Epoxy glass | R |
| XLPE™ | Cross-linked polyethylene | R |
| Alathon™ | High density polyethylene | R |
| Polyester-neat or filled | Polyester | NR |
| Viton A or B | Fluoroelastomer | NR |
| Adiprene™ | Polyurethane | NR |
| Polyurethane | Polyester/Polyether | NR |
| Aflas™ | Polytetrafluoroethylene | NR |
| Low density polyethylene | Polyethylene | R |
| Ultem™ | Polyether imide | R |
| Silicone Rubber | Silicone Rubber | T |
| CPVC | Chlorinated Polyvinyl Chloride | NR |
| Lexan™ | Polycarbonate resin | NR |
| Buna-S | Styrene Butadiene | NR |
| Buna-N | Styrene Nitrile Copolymer | NR |
| Ceramics | Composites | R |
| Glass | Glass | R |

Metallics:

| Substrate | L5611 |
|---|---|
| 2024 Aluminum- Bare | R |
| 2024 Aluminum- Alclad | R |
| 6061 Aluminum | R |
| Copper | R |
| 1018 Steel | R |
| 304 Stainless Steel | R |
| 316 Stainless Steel | R |
| Cast Iron | R |

R = Recommended
NR = Not Recommended
T = Test Before Use

## Solder Pastes, Tacky Fluxes and Adhesives Removed by Lonox

*When tested in an in-line washer at 50 psi with a 1-3 minute single pass exposure time, solutions ranging in concentration from 5-30% and heated from110 to140°F, removed fresh and aged re-flowed solder pastes, tacky flux, lead-free flux and uncured adhesives while leaving the solder bright and shiny.*

| The Following is a Partial List of Pastes, Fluxes and Adhesives Removed by L5611 | |
|---|---|
| ♦ Kester 244 | ♦ Aim NC253 |
| ♦ Kester 905LF | ♦ Aim NC297DX |
| ♦ Kester 256 Easy Profile No Clean | ♦ Aim NC293+ |
| ♦ Kester 256 RS | ♦ Aim 212 |
| ♦ | ♦ Aim 209DX |
| ♦ Kester TechForm TSF 6502 | ♦ Aim NC 251-TSC-4-LF |
| ♦ | ♦ Aim NC 254 LF218 |
| ♦ Indium SMQ92 | ♦ Aim NC 298 LF218 |
| ♦ Indium SMQ92J | ♦ |
| ♦ Indium SMQ51SC | ♦ |
| ♦ Indium Tac 10 | ♦ Alpha RMA 390 DH4 Solder Paste |
| ♦ Indium SMQ 230 | ♦ Alpha UP78M |
| ♦ Indium SWQ 51A | ♦ Alpha Omnix O-5000 Solder Paste |
| ♦ Indium NC-SMQ 81 | ♦ Alpha Omnix O-5002 Solder Paste |
| ♦ | ♦ Alpha IR721 |
| ♦ Qualitek LF888 | ♦ Alpha Omnix 310 LF |
| ♦ | ♦ Alpha 615 |
| ♦ | ♦ Alpha 620 |
| ♦ | ♦ Alpha K9185-21D |
| ♦ | ♦ Alpha Omnix 30902LF |
| ♦ | ♦ |
| ♦ | ♦ |
| ♦ | ♦ |
| ♦ | ♦ |
| ♦ | ♦ |

Soils Removed (continued)

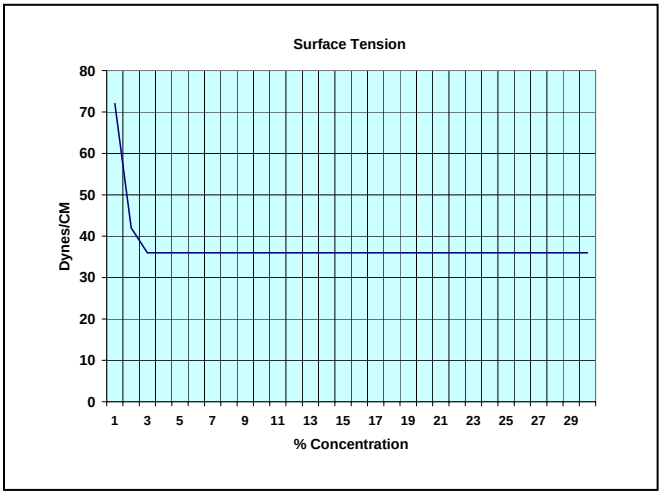
## Solder Pastes, Tacky Fluxes and Adhesives Removed by Lonox (Continued)

| The Following is a Partial List of Pastes, Fluxes and Adhesives Removed by L5611 | |
|---|---|
| ♦ Amtech RMA 223 AS | ♦ Florida Cer NC644 |
| ♦ Amtech NC559 AS | ♦ Florida Cer NC650 |
| ♦ Amtech BGA 223 AS | ♦ Florida Cer RA683 |
| ♦ Amtech RMA 223LF | ♦ Florida Cer NL-900 |
| ♦ Amtech SynTech LF | ♦ |
| ♦ | ♦ Promosol Ecorel Free 405 1 LF |
| ♦ | ♦ |
| ♦ EFD 370-E LF | ♦ |
| ♦ EFD 575 | ♦ |
| ♦ EFD ESP576 Eutectic | ♦ |
| ♦ EFD ESP277 | ♦ Multicore CR36 |
| ♦ | ♦ Multicore MX93 LF |
| ♦ | ♦ Multicore MP200 |
| ♦ Heraeus NCLR 6-412-A | ♦ Multicore RP15 |
| ♦ Heraeus RMA 6-411-A | ♦ OMG NC421 |
| ♦ Heraeus F 365 | ♦ OMG RN790 |
| ♦ Heraeus F 367 | ♦ |
| ♦ Heraeus F 369 | ♦ |
| ♦ Heraeus SC 3400 | ♦ Senju OZ279C |
| ♦ Heraeus F-10 | ♦ Senju 845 |
| ♦ Heraeus TF37 | ♦ Senju 278C LF |
| ♦ Heraeus TF36 | ♦ Senju 221 LF |
| ♦ Heraeus F620 | ♦ |
| ♦ Heraeus F369 | ♦ |
| ♦ | ♦ Senju 845 |
| ♦ | ♦ TSMC Eutectic WB Flux |
| ♦ | ♦ TSMC High Lead WB Flux |
| ♦ | ♦ |

The above list of soils is being expanded daily. If your soil is not listed above, contact Kyzen for updated information and assistance.

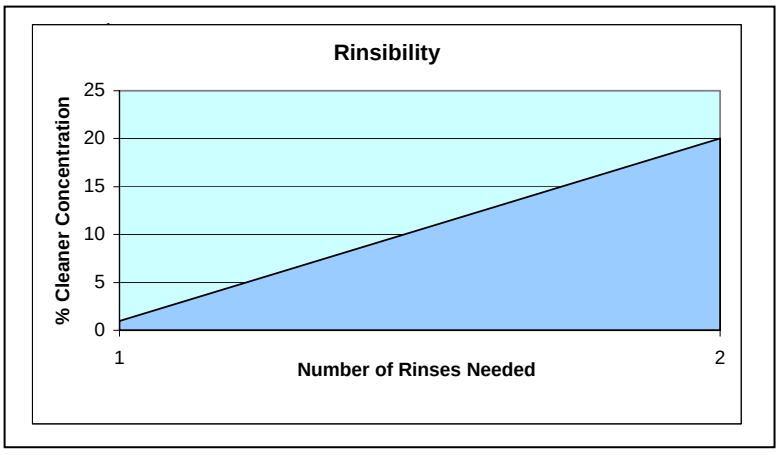
## Lonox Surface Tension

*Surface Tension measures the tendency of a liquid to "wet out" on a surface. Water has poor wetting properties with a typical surface tension of 72 dynes/cm. As shown below, aqueous cleaners use surface active agents, commonly called surfactants, to reduce the surface tension and enhance wetting. Formulated to function at the ppm level, note the immediate reduction in surface tension even low concentrations of cleaner have in a water solution.*



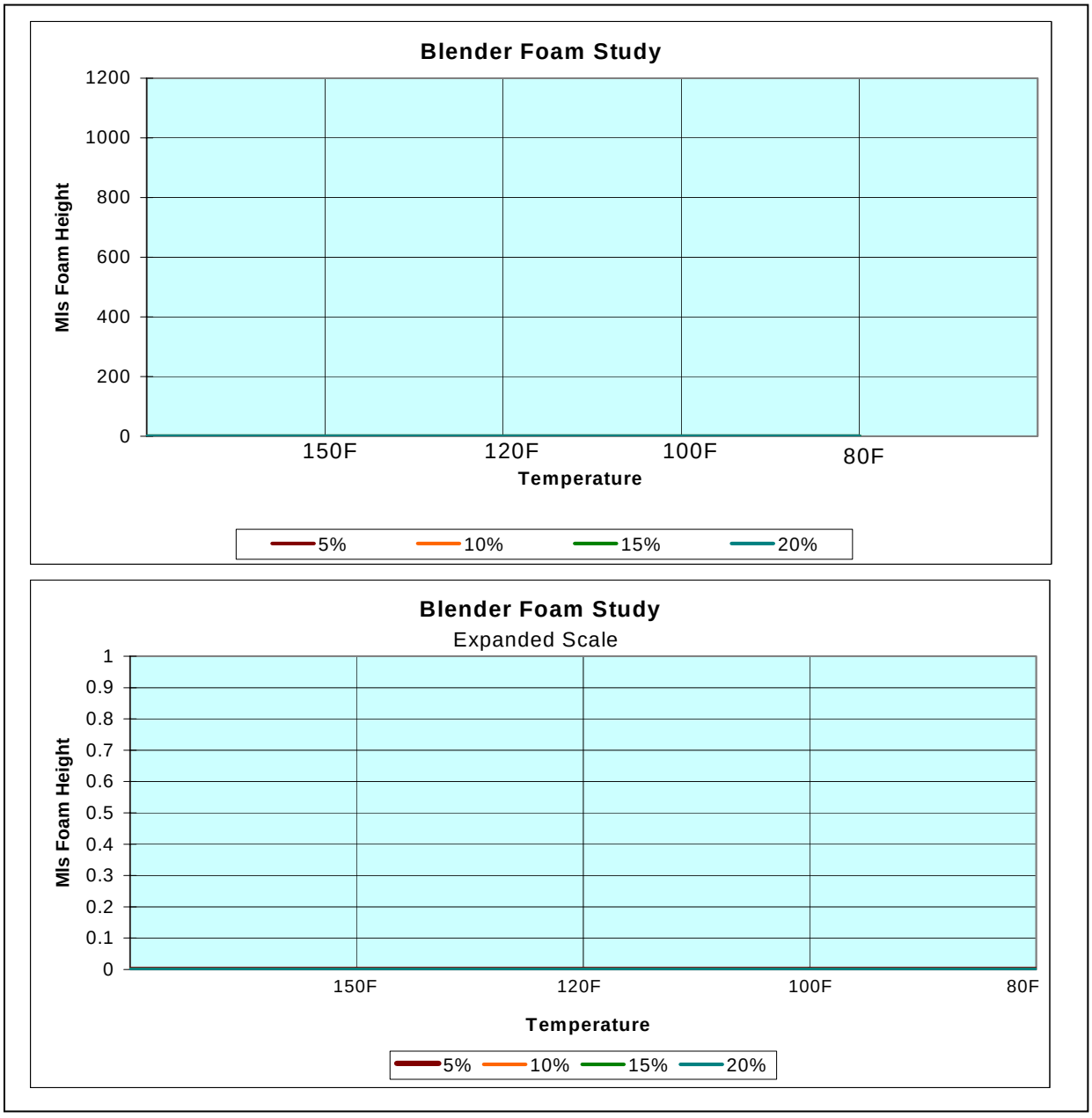

## Rinsibility

*The number of 7 second rinse stages required to obtain zero conductivity in the final rinse demonstrates the ease of rinsibility. As cleaner concentration is increased, additional rinse time, agitation or stages may be required. Lonox is very free rinsing and requires a minimal amount of rinsing for total residual removal.*



## Lonox Blender Foam Study

*Blender foam measurements depict the affect that concentration, temperature and shear have on the foaming properties of the aqueous cleaner chemistry. Two hundred mls of a dilute solution in deionized water is heated to the prescribed temperature, blended at high speed for 30 seconds and transferred to a 1000 ml graduated cylinder. The foam height is recorded in mls. Results are graphically illustrated below. Lonox L5611 showed no foam at concentrations up to 30% and at temperatures ranging from ambient to over 160F.*



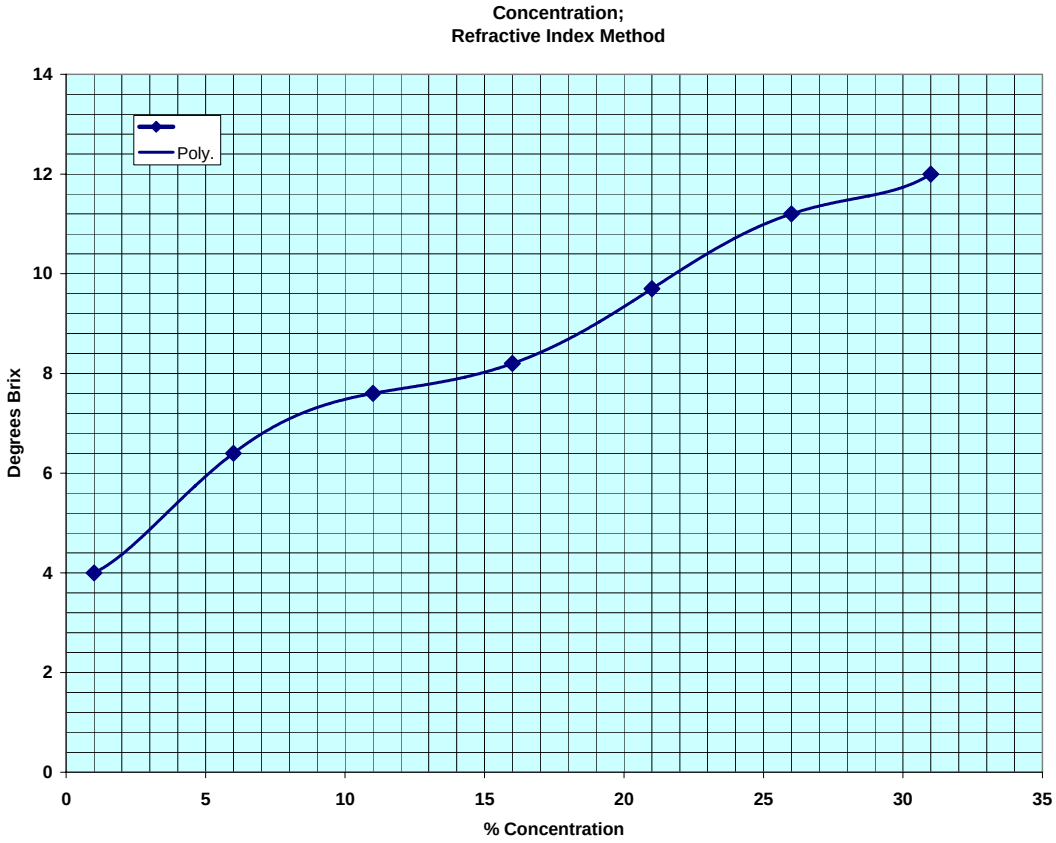
**Bath Maintenance Methods**
**Lonox Concentration: Refractive Index Method**

*This procedure defines the equipment and field method used to measure cleaner concentration based on refraction of light. Many flux and paste-type soils interfere with refractive index measurement. As soil load increases, this measurement will give artificially high results. The factor must be adjusted downward routinely as soil load increases or the concentration will be presumed higher than it actually is.*

Equipment: Refractometer, Brix Scale
Plastic droppers

Procedure:

1. Taking care not to collect any floating soils, using a dropper transfer a drop of well-agitated bath fluid onto the refractometer lens.
2. Hold refractometer up to a light source and read degrees Brix.
3. Calculate: Determine from chart below:




Note: Flux and solder paste can contribute to Refractive Index readings. As soil load increases, the above curve may be lowered to compensate for these soils. This is the most accurate method of concentration maintenance for this product.

## Bath Life and Corrective Action Methods

**Oil Loading**

*This procedure defines the equipment and method used to calculate the amount of non-emulsified soil in an aqueous cleaner bath.*

Equipment: 100 ml graduated cylinder

Procedure:

1. Take approximately 500 ml sample from a well-agitated cleaner bath.
2. Transfer 100 mls to the graduated cylinder.
3. Allow to sit undisturbed for 30-60 minutes.
4. Record the number of mls oil floating on the surface.

*Corrective Action:*
……3 mls or less, no corrective action needed unless soil redeposition is a problem.
……over 3 mls, filter or skim bath to remove floating oils.

**Suspended (Undissolved) Solids/ Particulates:**

*This procedure defines the equipment and method used to calculate the amount of suspended (undissolved) soils in the cleaner bath.*

Equipment: 100 ml graduated cylinder

Procedure:

1. Using the same sample as for oil loading above, record the mls sediment on the bottom of the cylinder.

*Corrective Action:*
……2 mls or less, no corrective action needed.
……greater than 2 mls, filter or bleed-off.

**Dissolved Inorganic Solids:**

*This procedure defines the equipment and field method used to measure cleaner contamination based on electrolyte content. These soils may lead to dendrydic growth, scale or subsequent product failure. Salts such as silicates, phosphates, calcium, magnesium, sodium, potassium, etc. contribute to inorganic dissolved solids.*

Equipment: Dissolved Solids Meter
Beaker or jar capable of holding 100 mls or more

Procedure:

1. Transfer one cup well-agitated bath solution to a clean beaker or jar.
2. Follow Manufacturer's directions on the proper use of the dissolved solids meter.
3. Calculate: Dissolved solids is a direct reading expressed in milliSiemens or microSiemens

*Corrective Action:*
……2X control solution or less, no corrective action is needed.
……greater than 2X control solution, bleed-off or recharge with deionized water and fresh product.

## Primary Waste Treatment of Rinse Water; Acid-Alum Method

*This process outlines the basic steps used in initial treatment of rinse waters using a standard acid-alum treatment method.*

Phase A: Separation of Unemulsified Oils

1. Allow the wastewater to stand undisturbed for 24 hours, or as long as possible.
2. Skim, overflow, vacuum or filter off the surface. (This oil can be hauled away, burned, or reclaimed according to local regulations.

Phase B: Oil Split: Separation of Oils and Organic Materials

1. Slowly, with mild agitation, add acid (citric, sulfuric or similar) to the diluted waste solution to reduce the pH to the range of 3.5 to 4.5.
2. Slowly, with mild agitation, add 1.5 gallons of 17% alum (aluminum sulfate) solution per 1000 gallons of acidified waste.
3. Allow the mixture to set undisturbed for 24 to 48 hours until there is clear separation with a top floating layer of organic and oil contaminants and a bottom hazy water layer.
4. Decant off the top layer by skimming, vacuuming or overflowing. Dispose of this material according to local regulations.

Phase C: Neutralization of Water Layer

1. To the lower water layer, slowly and with mild agitation add liquid caustic, either 50% sodium hydroxide or 45% potassium hydroxide, as needed to raise the pH to the range of 6.5 to 6.8. Take care not to exceed pH 6.9 or a portion of the aluminum slurry may become soluble.
2. Allow the neutralized waste to remain undisturbed for a minimum of 24 hours to allow the aluminum hydroxide slurry to settle to the bottom of the tank. This flock should contain any residual organics not removed in Phase B.
3. The flock can be removed as solid waste in accordance to local regulations or it can be reacted with sulfuric acid to form aluminum sulfate in the next phase of waste treatment.
4. The clear water layer can be recycled or be disposed of as plant effluent.

## Primary Waste Treatment of Rinse Water; Alum-Polymer Method

*This process outlines the basic steps used in initial treatment of rinse waters using a standard alum-polymer treatment method.*

Phase A: Separation of Unemulsified Oils

1. Allow the wastewater to stand undisturbed for 24 hours, or as long as possible.
2. Skim, overflow, vacuum or filter off the surface. (This oil can be hauled away, burned, or reclaimed according to local regulations.

Phase B: Oil Split: Separation of Oils and Organic Materials

1. Slowly, with mild agitation, add 1.5 gallons of 17% alum (aluminum sulfate) solution per 1000 gallons of acidified waste. Mix until it is completely dispersed.
2. Slowly with mild agitation, add cationic polymer at one gallon per 1000 gallons of wastewater or according to the manufacturer's recommendations.
3. Allow the mixture to set undisturbed for 24 to 48 hours until there is clear separation with a top floating layer of organic and oil contaminants and a bottom hazy water layer.

Phase C: Disposal

1. Decant off the top layer by skimming, vacuuming or overflowing. Dispose of this material according to local regulations.
2. The clear water layer can be recycled or be disposed of as plant effluent.