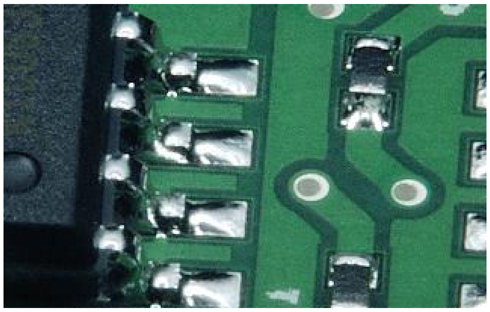
Product Supplement

Aquanox® A4625

Aqueous Cleaner for Lead-Free Flux Residues



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Product Supplement

Aquanox A4625

Aqueous MEA-free Electronics Cleaner

Aquanox A4625 is a concentrated MEA-free aqueous cleaner containing a blend of organic solvents, nonionic surfactants, alkalinity builders and organic and inorganic inhibitors in a water base. It is multi-metal safe and is specially designed for use in in-line washers, immersion agitation or ultrasonic systems. It also may be used 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, and mis-printed pastes.

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Aquanox Use Directions

The Aquanox 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. The low level surfactancy, in the ppm range, enhances cleaner wettability, water rinsibility and also promotes media filterability of the wash and rinse solutions.

Contaminants Affected:

Aquanox 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. In addition to this product, Kyzen offers a broad spectrum Aquanox product line that is designed for use in all types of aqueous cleaning processes.

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.

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.

Bath Maintenance:

For maximum cleaning efficiency, bath concentration, temperature, or exposure time may be optimized as required. Maintenance methods are enclosed for your convenience. A special dropper test kit is available to monitor bath concentration in the field when indicated as the preferred method for maintenance. Refractometers are also available through your Kyzen Corporation Sales Representative.

To assist in controlling the bath, Kyzen offers automatic proportioning systems for “hands-off” control. These include the fully automatic *Kyzen PCS*, ant the semi-automatic *DOSATRON.* Both are recommended for use with Aquanox aqueous products. Your Kyzen representative can assist you in identifying the best unit for your application.

Disposal:

When an Aquanox bath solution is properly maintained, prolonged bath life can be expected. A Bath Life Study has been conducted on this product and found to correlate with the long bath life generally experienced by many Aquanox users of several months and longer. Actual field experience has shown that this chemistry, when properly maintained, may last indefinitely. Most often the bath is changed out due to mechanical reasons rather than chemical failure.

Most Aquanox 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. Final rinse closed loop operations are the norm, with industry standard carbon and resin systems. In special circumstances, full closed loop water treatment for the rinse water is desirable and is accomplished with reverse osmosis (RO) membranes and equipment introduced by Kyzen to the industry over a decade ago.

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

Aquanox Generic Description

Aquanox A4625 is a concentrated aqueous alkaline cleaner containing a blend of organic solvents, nonionic surfactants, alkalinity builders and organic and inorganic inhibitors in a water base. It may be used in most in-line spray-in-air, immersion, ultrasonic, or manual applications for the removal of tough fluxes and pastes in addition to general industrial soils and greases. Aquanox was specially formulated with raw materials that are relatively people-safe and environmentally friendly.

Typical Chemical and Physical Properties

Parameter	100% Concentrate	10% Dilution	0.01% Dilution
Clarity	Clear		
Color	Light amber, darkens with age		
Odor	Mild		
Flash Point, °C (TCC)	100		
Boiling Point, °F/C	338/170		
Volatile Organic Compound (VOC) gm/L EPA Method 24	942.1	94.2	
Vapor Pressure, VOC Components, mmHg at 20°C	0.05		
Chemical Oxygen Demand, (COD), mg/L			228.4
pH	10.3-11.3	9.0-10.0	
Specific Gravity	0.92-1.00		
Weight/gallon	8.0		
Refractive Index, ° BRIX	48-68		
MEQ to pH 8.3	0.5-1.5		
MEQ to pH 4.0	0.9-1.9		
Alkalinity Ratio	1:1.4		
Karl Fisher Water, %	1.58		
Non-volatile Residue (NVR) %	2.0		
Surface Tension, dynes/cm		25-35	

Substrate Compatibility

All chemicals have the potential to adversely effect substrates and equipment. Kyzen conducts short term exposure tests on substrates typically found on electronic assemblies. Additionally, Kyzen conducts longer term 2 week and 3 month exposure on the materials of construction typically found in cleaning systems such as tanks, fixtures, plumbing, filtration, etc. Specimens were processed through three cycles in an in-line washer at 12% and 150°F for short-term exposure. Specimens were examined for changes in weight, dimension, hardness and appearance. Based on these results the following suggestions are made regarding the use of Aquanox and these substrates.

Plastics and Elastomers:

Brand Name	Generic Description	A4625
Delrin™	Acetal	R
Acrylic	Acrylic	NR
Nylon	Synthetic Fiber	R
Lexan™	Polycarbonate resin	T
Polystyrene	Polystyrene	R
Polyurethane	Polyester/Polyether	R
PVC	Polyvinyl Co-polymer	R
Black Rubber	Black rubber	R
Pure Gum Rubber	Gum rubber	R
Neoprene		R
Phenolics	Phenol	R
Teflon	Fluorinated Elastomer	R
Kalrez	Fluorinated Elastomer	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
Viton A or B	Fluoroelastomer	NR
Low density polyethylene	Polyethylene	R
Ultem™	Polyether imide	R
Silicone Rubber	Silicone Rubber	R
CPVC	Chlorinated Polyvinyl Chloride	R
Buna-S	Styrene Butadiene	NR
Buna-N	Styrene Nitrile Copolymer	NR
Ceramics	Composites	R
Glass	Glass	R

Metallics:

Substrate	A4625
2024 Aluminum- Bare	T
2024 Aluminum- Alclad	T
2024 Aluminum- Anodized	T
Black Anodized Aluminum	T
3003 Aluminum	T
6061 Aluminum	T
7075 Aluminum	T
7075 Aluminum- Alclad	T
Copper	R
1018 Steel	R
304 Stainless Steel	R
316 Stainless Steel	R
Steel, Galvanized	R

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

Solder Pastes, Fluxes and Adhesives Removed by Aquanox

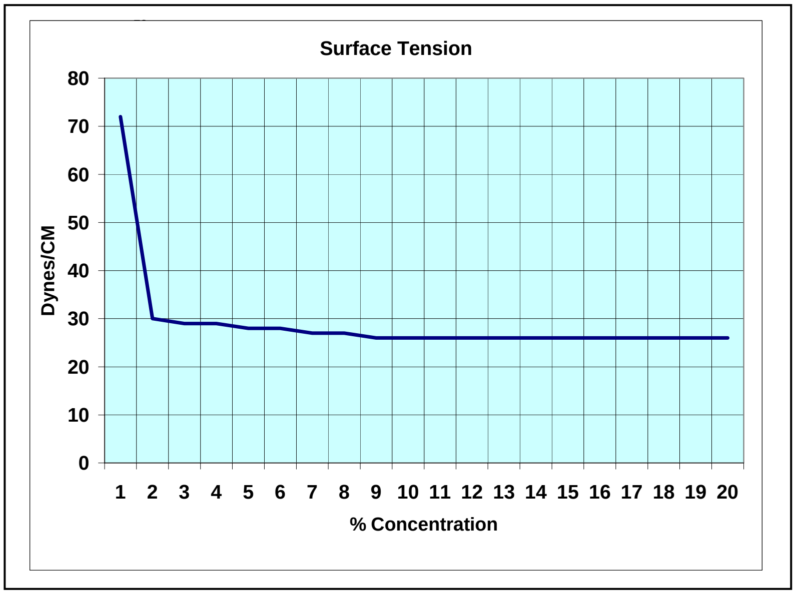
When tested in an in-line washer at 50 psi with a 1-3 minute single pass exposure time, solutions ranging in concentration from 5-30% and heated from110 to140°F, removed fresh and aged re-flowed solder pastes, tacky flux, lead-free flux and uncured adhesives while leaving the solder bright and shiny.

Fluxes, Pastes and Adhesives Removed			
♦ Aim NC297DX	♦ Amtech SynTech-LF	♦ Heraeus F365	♦ Kester 9603SC Epoxy Flux
♦ Aim NC293+	♦ Amtech RMA223	♦ Heraeus F620	♦ Kester TechForm TSF 6502
♦ Aim 212	♦ Amtech NC-559-LF	♦ Heraeus F541	♦ Kester TechForm TSF 6521
♦ Aim 209DX	♦ Amtech NC559 AS	♦ Heraeus F3369	♦ Kester TechForm TSF 6522
♦ Aim NC251-TSC-4LF	♦ Amtech BGA 223 AS	♦ Heraeus F367	♦ Kester TSF 6590
♦ Aim NC254 lf218	♦ Amtech N/C 95WF	♦ Heraeus SC 3400	♦ Kester TSF 85A1
♦ Aim NC 298 LF218	♦ Amtech RMA 223AS	♦ Heraeus F-10	♦ Kester 2235
♦ Aim WS-477Y6	♦ Amtech NWS4200	♦ Heraeus TF37	♦ Kester 229
♦ Aim 368	♦ Amtech SynTech	♦ Heraeus TF38	♦ Kester 244
♦ Aim 254/SAC305	♦	♦ Heraeus TF69	♦ Kester 951
♦ Alpha RMA 390 DH3	♦	♦ Heraeus TF36	♦ Kester 959
♦ Alpha RMA 390 DH4	♦ EFD ESP576 EU	♦	♦ Kester Wave 2331-ZX (WS)
♦ Alpha UP78M	♦ EFD ESP277	♦ Indium SMQ71	♦ Kester Wave 2222-VF (WS)
♦ Alpha 609	♦ EFD 277-E LF	♦ Indium SMQ RQE	♦ Kester 185
♦ Alpha WS709	♦ EFD 370-E LF	♦ Indium SMQ51SC	♦ Kester 186
♦ Alpha 7LV Tacky Flux	♦ EFD 477-E LF	♦ Indium SMQ51A	♦ Kester 197
♦ Alpha 376	♦ EFD 576-E LF	♦ Indium SMQ92	♦
♦ Alpha Omnix O-5100	♦ EFD 275	♦ Indium SMQ92J	♦ Multicore NC421
♦ Alpha Omnix O-6106	♦ EFD ESP277	♦ Indium SMQ51SC	♦ Multicore MF 101
♦ Alpha SAC 350	♦ EFD 575	♦ Indium SMQ230	♦ Multicore MF 200
♦ Alpha EF 2202	♦ EFD ESP576 Eutectic	♦ Indium SMQ 65	♦ Multicore MF 300
♦ Alpha EF 3215	♦ EFD ESP477	♦ Indium TAC 7	♦ Multicore MFR 301
♦ Alpha EF 4102	♦ EFD 6-411-A	♦ Indium TAC 10	♦ Multicore CR39 LF
♦ Alpha EF 9301	♦ EFD 6-412-A	♦ Indium TAC 20	♦ Multicore DEV E/U/1762
♦ Alpha IR721	♦	♦ Indium TAC 20B	♦ Multicore CR32
♦ Alpha 611	♦	♦ Indium TAC 23	♦ Multicore CR36
♦ Alpha 615	♦ Florida Cer NL-900	♦ Indium 9.72	♦ Multicore X33-04
♦ Alpha 620	♦ Florida Cer FC515	♦ Indium NC-SMQ81	♦ Multicore MP100
♦ Alpha K9185-21D	♦ Florida Cer NC644	♦ Indium SMQ71	♦ Multicore RP15
♦ Alpha 102-1500	♦ Florida Cer NC650	♦ Indium FC-NC-LT-B	♦ Multicore MP200
♦ Alpha RF800	♦ Florida Cer RA683	♦ Indium SMQ75	♦ Multicore X33-04
♦ Alpha NR300A2	♦	♦ Indium 5.1AT	♦
♦ Alpha NR330	♦ Heraeus 640	♦	♦ OMG WS300
♦ Alpha 373	♦ Heraeus F620	♦	♦ OMG NC421
♦ Alpha WS375	♦ Heraeus F541	♦	♦ OMG RN790
♦ Alpha Lonco SLS65C	♦ Heraeus F3369	♦ Kester 256	♦ OMG RN781
♦ Alpha Omnix 310 LF	♦ Heraeus F367	♦ Kester 256 Easy Profile	♦
♦ Alpha Flutin 1532	♦ Heraeus SC 3400	♦ Kester 256 RS	♦ Senju OZ533A
♦ Alpha Omnix 30902 LF	♦ Heraeus F-10	♦ Kester 229	♦ Senju OZ279C
♦ Alpha Omnix 310	♦ Heraeus TF37	♦ Kester TSF 6590	♦ Senju 337
♦ Alpha Telcor Plus	♦ Heraeus TF38	♦ Kester SP253	♦ Senju 385
♦ Alpha 338PT	♦ Heraeus TF69	♦ Kester 450B	♦ Senju 278C LF
♦	♦ Heraeus TF36	♦ Kester HF1189	♦ Senju 385LF
♦	♦ Heraeus F365	♦ Kester EM907	♦ Senju GRN 360

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

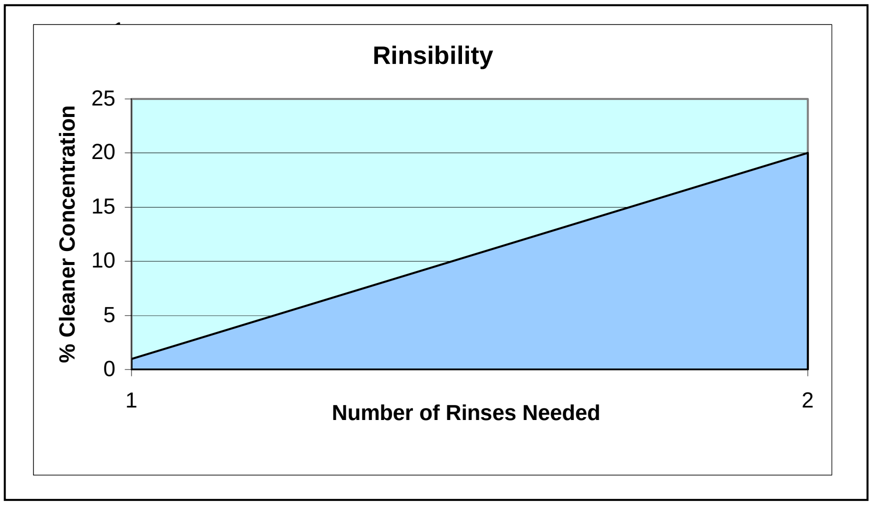
Aquanox Surface Tension

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.



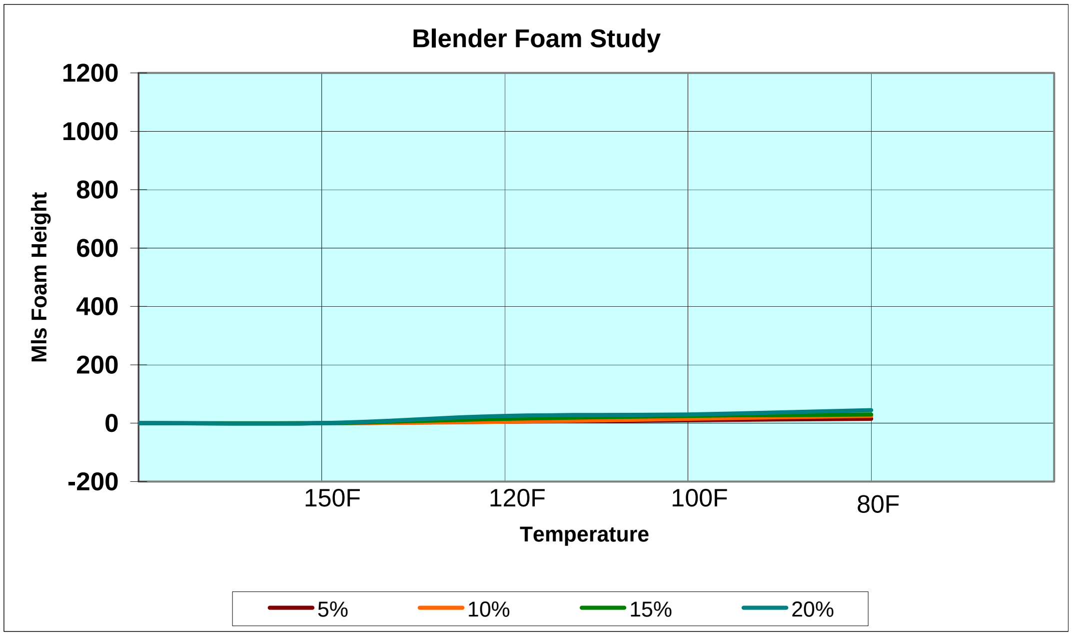
Rinsibility

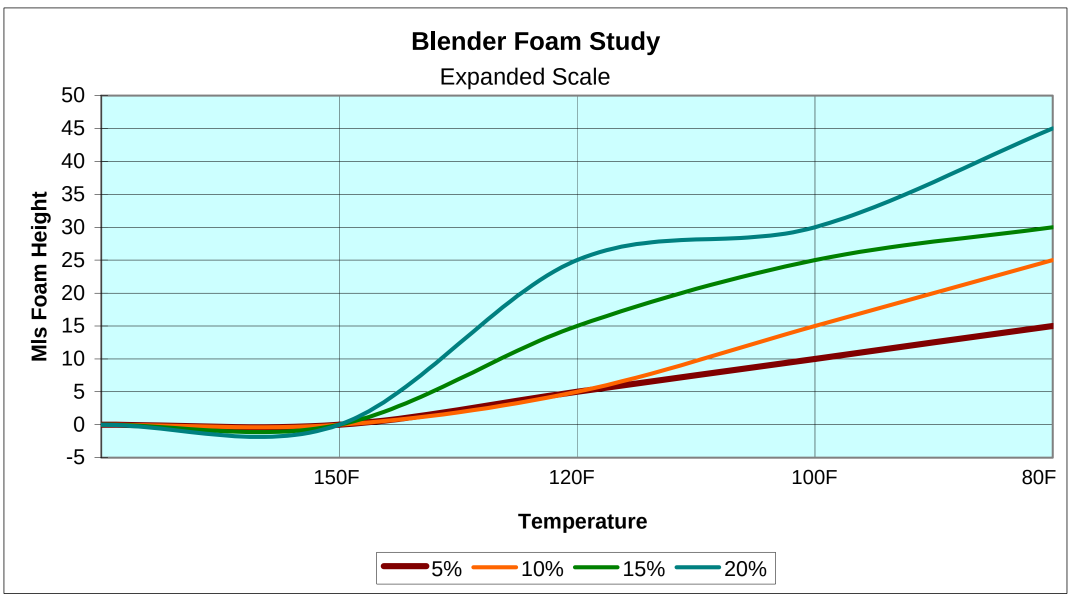
The number of 7 second rinse stages required to obtain zero conductivity in the final rinse demonstrates the ease of rinsibility. As cleaner concentration is increased, additional rinse time, agitation or stages may be required. Aquanox is very free rinsing and requires a minimal amount of rinsing for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



Aquanox Blender Foam Study

Blender foam measurements depict the effects 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. Aquanox showed low or no foam at concentrations up to 30% and at temperatures ranging from ambient to over 160F.





Ionic Contamination Analysis

Test Specimens:

Standard FR-4 epoxy-glass laminate test boards, covered with green solder mask and an unknown surface finish, were prepared and submitted to an independent laboratory for analysis in accordance with IPC-TM-650, method 2.3.28 using a Dionex Ion Chromatograph equipped with Chromeleon software. Each assembly was evaluated for ionic cleanliness.

Specimen Preparation:

The test boards were handled with ionically clean powder-free gloves. Upon receipt, each assembly was immediately placed in clean, Kapak™ 504 heat-sealable pouches to prevent any contamination. A sterile extraction solution of 25% deionized water and 75% isopropyl alcohol (IPA) was added to the minimum volume needed to cover the board. A blank control was selected from fresh deionized water/IPA mixture. The boards were then placed in a hot air oven for extraction of ions for approximately two hours at 80°C ± 5°. The cooled extraction solution was measured for volume, sealed and labeled for analysis. The extracted boards were removed from the bags, baked for 24 hours and returned to the customer. A one-milliliter sample taken from each extraction solution was injected into the Dionex system with an isocratic pump.

Results:

Sample	Vol (ml)	Area (in2)	Di;lution Factor	Fluoride Fl	Chloride Cl ug/in2	Nitrate NO3 ug/in2	Sulfate SO4 ug/in2	Bromide Br ug/in2	Phosphate PO4 ug/in2	Organic Acids
Blank	20	101.5	0.20	nil	nil	nil	0.05	nil	nil	nil
A4625	30	70.13	0.43	nil	0.31	0.19	nil	0.04	nil	0.60

Conclusions:

The test assembly is ionically clean based on our recommended guidelines for no clean and water-soluble flux materials.

IPC J-STD 001: "Surface Insulation Resistance (SIR) Fluxes Testing"

Test Specimens:

Concoat's SIR TB.2 test board processed with Indium SMQ92J solder paste and cleaned in Kyzen's Aquanox A4625 cleaning fluid:

- One control sample
- Five printed with Indium SMQ92J and cleaned with A4625.

Preparation:

<u>Cleaning Equipment:</u> In-line spray-in-air washer

<u>Cleaning Chemistry:</u>

Product:	Aquanox A4625
Concentration:	Not specified
Temperature:	150F
Conveyor Speed:	2 FPM
Rinse:	DI Water at 140F

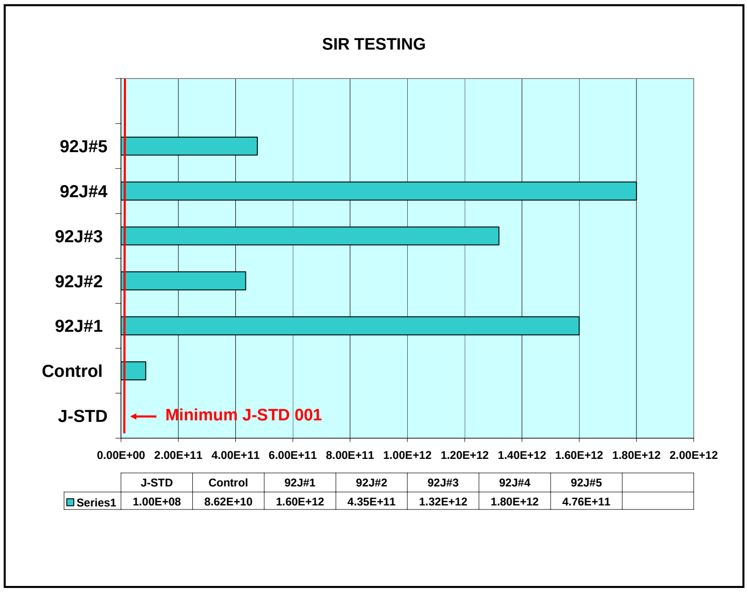
Methodology:

The boards were processed by Rockwell Collins (a Kyzen Partner) using Indium's SMQ92J solder paste. The paste was reflowed in an 11-zone oven using nitrogen inerted atmosphere. They were cleaned with Aquanox A4625 in an in-line washer. The cleaned parts were wired and placed in a standard Humidity Chamber at 85C and at 85% relative humidity. Resistance was measured at 24, 96 and 168 hours.

Visual inspections were completed at 10X using back lighting. When visual anomalies were noted, the magnification was increased to 60X with top lighting to obtain a closer and clearer view of the anomaly. Observations were recorded and photographs were taken.

Data Discussion:

1. The SIR data is graphically illustrated. Results are given as resistance in ohms.
2. IPC-TM-650, 2.6.33B requires boards maintain a resistance value at or above 1.0E+08 ohms during 96 and 168 hour test periods. Any board measuring below this standard is considered failing.
3. Any board exhibiting dendritic growth that spans more than 25% of any trace spacing is considered failing.
4. None of the test specimens failed using the above test criteria.



Conclusion:

1. No evidence of corrosion or metal migration is evident on any test specimen.
2. Per J-STD 001 minimum criteria, all test specimens pass.
3. Kyzen's Aquanox A4625 gives added benefits to improving the cleanliness and performance of boards processed with Indium SMQ92J.

Bath Maintenance Methods

Aquanox Concentration: Titration Test Kit Dropper Method

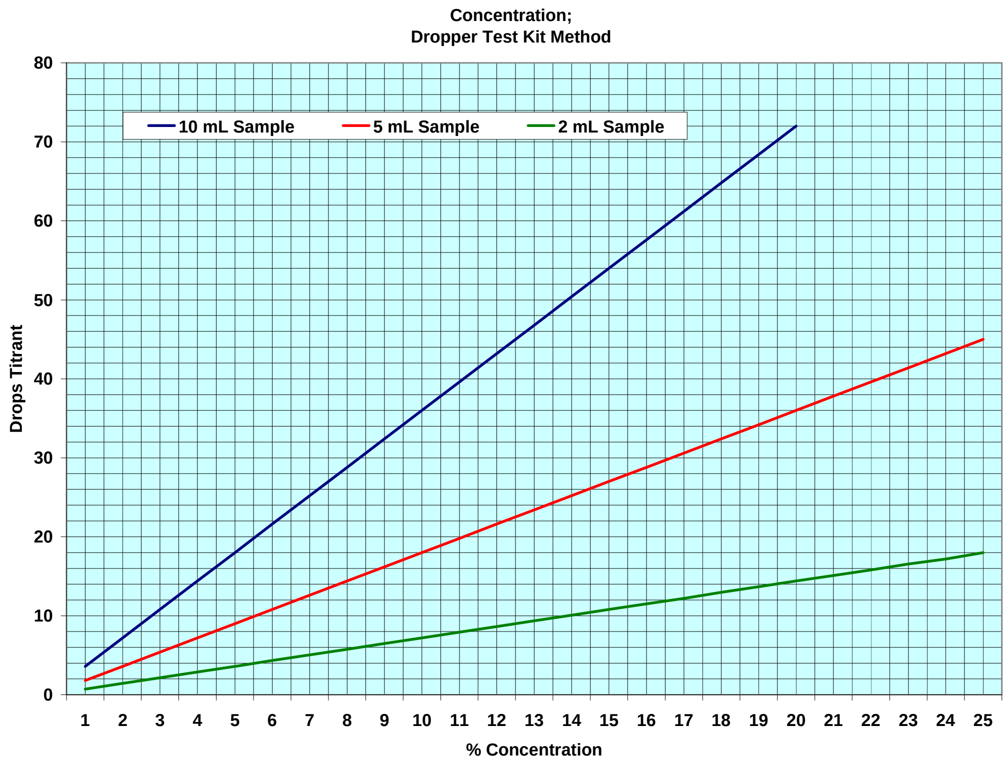
This procedure defines the equipment and preferred field test method needed to measure and maintain bath concentration. A Test Kit is available from Kyzen Corporation, Nashville, TN.

Reference: Kyzen Standard Operating Procedure KM-034

Concentration Range	5-10%	5-10%	10-25%
Sample Size	10 ml	5 ml	2 ml
Indicator	Phenolphthalein	Phenolphthalein	Phenolphthalein
Titrant	0.5N Acid	0.5N Acid	0.5N Acid
Factor	0.28	0.55	1.38

Procedure:

1. Using a cup, take about 500 mls cleaning solution from a thoroughly agitated tank.
2. Using a graduated cylinder or syringe, transfer sample to an Erlenmeyer flask.
3. Dilute to the 50 ml mark with water as desired to make the endpoint easier to see. Volume is not critical.
4. Add 2-10 drops indicator as needed to get good color development. Solution will turn pink.
5. While swirling, hold acid titrant bottle exactly vertical and add dropwise until pink just disappears. (pink color may return after a short while).
6. Record the number of drops titrant used.
7. Calculate: % Concentration = drops titrant X factor or see chart below:



Bath Maintenance Methods;

Aquanox Concentration: Burette Titration, Colorimetric Method

This procedure defines the laboratory equipment and method used to more precisely measure bath concentration versus a dropper test kit method.

Reference: Kyzen Standard Operating Procedure KM-035

Equipment: Analytical balance, graduated cylinder, syringe or pipette
Beaker or Erlenmeyer flask, 125 ml or equivalent
Burette, 25 or 50 ml with 0.1 ml graduations
Magnetic stirrer with Teflon magnet (optional)

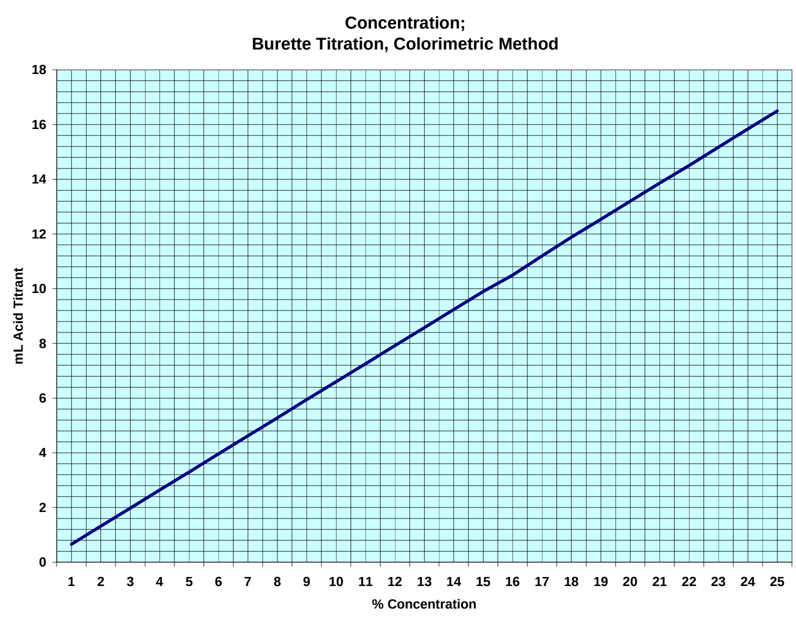
Reagents: Phenolphthalein Indicator
Deionized water
0.10N (HCl) Acid titrant

Procedure:

1. Transfer 5.0 ml well-agitated sample to a clean beaker or flask. Add deionized water for volume as desired. Volume is not critical.
2. Add 2-10 drops Phenolphthalein Indicator. Solution will turn a pink color.
3. While mixing, titrate with 0.10N acid until the pink color just disappears. (The pink color may return after a short while.)
4. Record the number of mls acid titrant used. (Subtract the initial burette reading from the final reading.)
5. Calculate: % Concentration = mls titrant X average factor*

** To generate the average factor to be used in this calculation, proceed as follows:*

a. Make up three known concentrations by adding a measured amount of Aquanox to a measured amount of water.
b. Follow steps 1 through 4 above.
c. Calculate the factor for each standard solution by dividing the known concentration by the mls acid titrant used.
d. Determine the average factor by dividing the sum of the factors by the number of prepared solutions, or use the Kyzen generated factor of “1.5 “.



Bath Maintenance Methods;

Aquanox Concentration: Burette Titration, Potentiometric Method

This procedure defines the laboratory equipment and method used to more precisely measure bath concentration using a pH meter versus a colorimetric method. This is the most accurate method for concentration maintenance of this product.

Reference: Kyzen Standard Operating Procedure KM-035

Equipment: Analytical balance, graduated cylinder, syringe or pipette
Beaker or Erlenmeyer flask, 125 ml or equivalent
Burette, 25 or 50 ml with 0.1 ml graduations
pH Meter and Probe
Magnetic stirrer with Teflon magnet (optional)

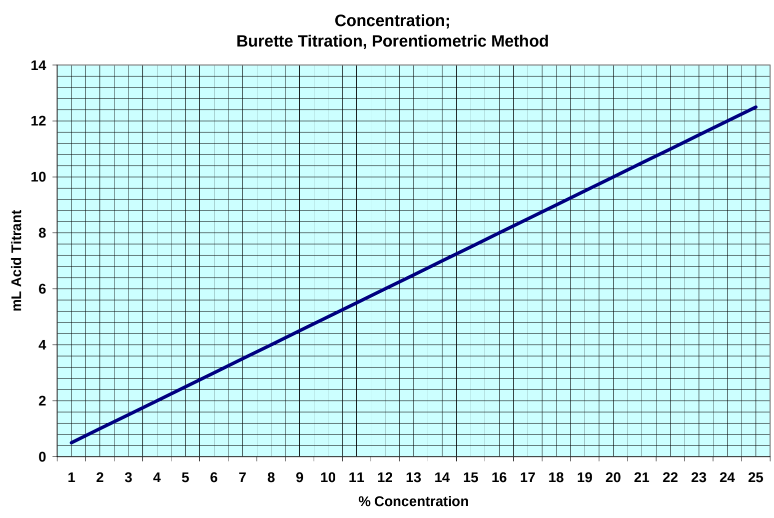
Reagents: pH Buffer Solutions, 7 and 4
Deionized water
0.10N (HCl) Acid titrant

Procedure:

1. Transfer 5.0 mls well-agitated sample to a clean beaker. Add deionized water for volume as required to adequately immerse probe. Volume is not critical.
2. While mixing, titrate with 0.10N acid to pH 8.3. Record the number of mls acid titrant used. (Subtract the initial burette reading from the final reading.)
3. Calculate: % Concentration = mls titrant X average factor*

   ** To generate the average factor to be used in this calculation, proceed as follows:*

   (a) Make up three known concentrations by adding a measured amount of Aquanox to a measured amount of water.
   (b) Follow steps 1 and 2 above.
   (c) Calculate the factor for each standard solution by dividing the known concentration by the mls acid titrant used.
   (d) Determine the average factor by dividing the sum of the factors by the number of prepared solutions, or use the Kyzen generated factor of "1.5 ".



Bath Maintenance Methods;
Aquanox 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.

Reference: Kyzen Standard Operating Procedure KM-039

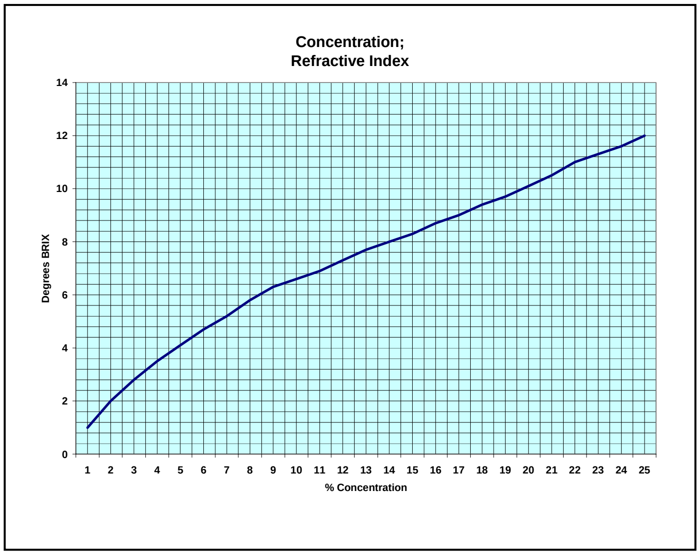
Equipment: Refractometer, temperature compensated, Brix Scale
Plastic droppers

Procedure:

1. Take a grab sample using a 200 to 500 ml beaker or container. The best place to sample is from the sample port from the manifold of the wash tank. If there is no sample port, thoroughly mix the sump to obtain a representative sample. The sample must be taken from the approximate midpoint of the tank; use of a long-handled sampling cup is suggested to avoid direct contact with your arm or hand.
2. The sample fluid may separate. To obtain a representative sample in the sample pipette, constantly stir the sample while withdrawing contents into the pipette. (To obtain a well mixed sample, make multiple draws and discharges of test fluid to insure the sample is well mixed.)
3. Immediately transfer the sample to the glass prism by flooding the sample over the prism and sides of the unit.
4. Quickly hold the refractometer up to a light source and read degrees Brix from the line formed by the bending of the light in the meter. Note the reading.
5. Wait for one minute and repeat step 4. If the reading is higher, its due to temperature differences. Note the second reading. If different from the first, repeat again after another minute. Repeat as many times as is necessary to obtain two consecutive readings. Record the reading.
6. Determine % Concentration on the Table or chart below.

A4625 Numeric Table

Brix	Conc. %
4.1	5.0
4.4	5.5
4.7	6.0
4.9	6.5
5.2	7.0
5.4	7.5
5.7	8.0
5.9	8.5
6.1	9.0
6.3	9.5
6.5	10.0
6.7	10.5
6.9	11.0
7.1	11.5
7.2	12.0
7.4	12.5
7.6	13.0
7.8	13.5
7.9	14.0
8.1	14.5
8.3	15.0
8.4	15.5
8.6	16.0
8.8	16.5
8.9	17.0
9.1	17.5
9.3	18.0
9.5	18.5
9.7	19.0
9.9	19.5
10.1	20.0



Note: Flux and solder paste can contribute to Refractive Index readings. Many years of field experience have validated the effectiveness of refractive index to control most Aquanox products. The wide operating window provided by the Aquanox technology tends to minimize the induced error that the soils create over time. As soil load increases, the above curve should be adjusted to reflect the predictable soil levels your cleaning process will experience. While titration is more precise, particularly with a bath that has been in use for an extended period of time, refractive index has proven to be an effective and reliable method for bath maintenance and control.

Bath Life and Corrective Action Methods

Alkalinity Ratio

This procedure defines the laboratory equipment and method used to measure soil loading and chemical consumption of an aqueous cleaner bath.

<u>Reference:</u> Kyzen Standard Operating Procedure KM-032

<u>Equipment:</u> Analytical Balance, graduated cylinder, syringe or pipette
Beaker or Erlenmeyer flask, 125 ml or equivalent
Burette, 25 or 50 ml with 0.1 ml graduations
Magnetic stirrer with Teflon magnet (optional)

<u>Reagents:</u> Phenolphthalein Indicator
Bromophenol Blue Indicator
Deionized water
0.10N (HCl) Acid titrant

<u>Procedure:</u>

1. Transfer 5.0 ml well-agitated sample to a clean beaker or flask. Add deionized water for volume as desired. Volume is not critical.
2. Add 2-10 drops Phenolphthalein indicator. Solution will turn a deep pink color.
3. While mixing, titrate with 0.10N acid until the pink color just disappears. Note: a faint pink color may reappear after 30-60 seconds.
4. Record the number of mls acid titrant used. (Subtract the initial burette reading from the final reading.) This titration represents "Free Alkalinity".
5. Transfer a second 5.0 ml sample to a clean beaker or flask. Add deionized water for volume as desired. Volume is not critical.
6. Add 2-10 drops Bromophenol Blue indicator. Solution will turn a deep blue color.
7. While mixing, titrate with 0.1N acid until solution turns a pale yellow-green color.
8. Record the number of mls acid titrant used for this second titration. This titration is referred to as "Total Alkalinity".
9. Calculate Alkalinity Ratio: Total Alkalinity ÷ Free Alkalinity

<u>Corrective Action:</u> The theoretical alkalinity ratio of A4625 is 1:1.4.

……if alkalinity ratio is 1.5 to 3.0, add A4625 concentrate as required to maintain recommended concentration.
……if alkalinity ratio is greater than 3.0, evaluate cleaning efficiency. If cleaning performance has fallen off, dump and recharge with fresh product.

Oil Loading

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

<u>Equipment:</u> 100 ml graduated cylinder

<u>Procedure:</u>

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.

<u>Corrective Action:</u>

……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.

Bath Life and Corrective Action Methods (Continued)

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.

Optional 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.

Optional 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.