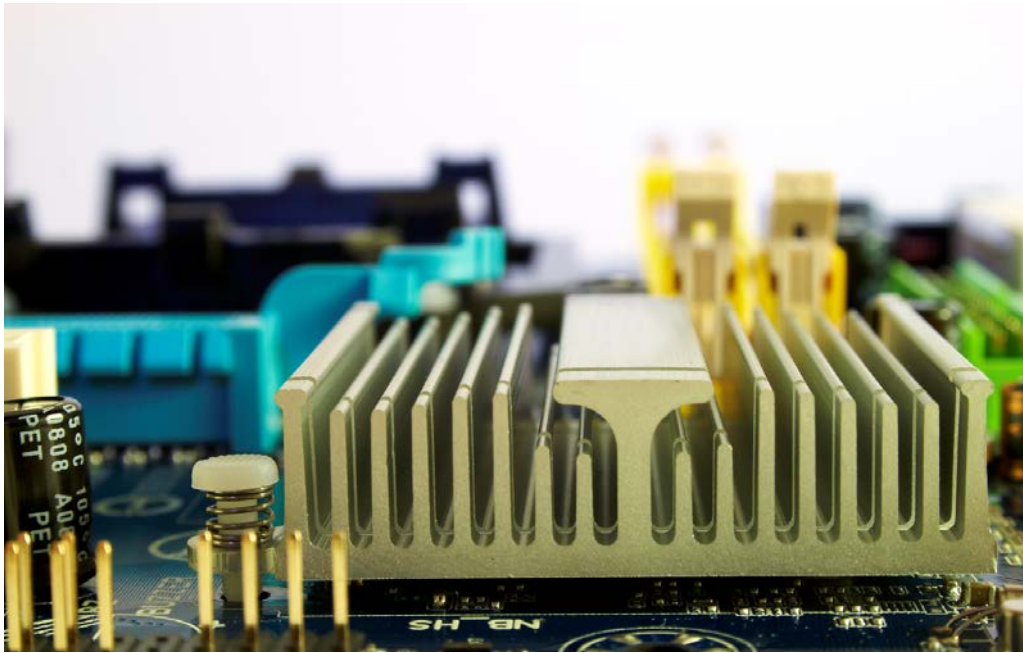


AQUANOX[®] A4651US

Low pH Ultrasonic Immersion Cleaner

AQUANOX A4651US is a low pH aqueous cleaning solution designed exclusively for use in ultrasonic immersion cleaning systems. A4651US will provide brilliant solder joints with no sump side additives and cleans exceptionally well on the latest flux formulations.



The information contained herein is based on available data from reliable sources and is accurate to the best of KYZEN Corporation's knowledge at the time of this publication. KYZEN makes no warranty, expressed or implied, of merchantability or fitness for a particular purpose, course of performance or usage of trade. The user is solely responsible for determining the suitability and completeness of such information for their particular application and for adopting appropriate safety precautions. Physical properties listed within are typical values based on samples tested and should not be construed as guaranteed analysis of any specific lot or as specifications for the product. Other factors may involve additional safety or performance considerations- refer to the KYZEN product Safety Data Sheet (SDS) for complete safety information. This data is not to be taken as a warranty or representation for which KYZEN assumes legal or financial responsibility.

Copyright© 2020 | KYZEN Corporation | All rights reserved

TABL E OF CONTENTS

| | |
|--|-----------|
| Product Description | 2 |
| Chemical and Physical Properties | 3 |
| Product Use Directions | 4 |
| Compatibility Information: Substrates and Equipment | 6 |
| Bath Maintenance and Monitoring | 8 |
| Shelf-Life, Product Color, Storage and Handling | 9 |
| Environmental Considerations | 10 |

Appendix

| | |
|--|--|
| Procedure(s)- Bath Maintenance and Monitoring | |
|--|--|

PRODUCT DESCRIPTION

AQUANOX A4651US is a batch cleaning product specifically designed to remove flux residues from printed circuit assemblies while reducing the cavitation threshold. The engineered cleaning solution creates a strong affinity for post soldering flux residues using a combination of water loving and oil loving properties. The low surface tension and recommended operating temperature range (50-65°C) creates lower ultrasonic pressure amplitudes needed to achieve uniform cavitation.

AQUANOX A4651US effectively cleans most lead-free and tin-lead no-clean, rosin-based, and water-soluble reflowed flux residues on production assemblies. Dependent on the flux type, A4651US can be used "as is" or diluted. For most applications, AQUANOX A4651US is run at dilution rates in water of 15-30% concentration. Wash time is a function of wash temperature and ultrasonic frequency energy.

Selecting the proper frequency for a particular application is critical. As components decrease in size, higher frequency levels provide milder scrubbing intensity and less potential for part damage. Sweep frequency changes the speed and magnitude of energy by allowing energy bursts along with soak periods. The combined effects allows for both chemical and mechanical energies needed to remove residues under bottom termination components. These effects improve cleaning performance on highly dense assemblies.

AQUANOX A4651US is engineered with a mixture of oxygenated and polar organic reactive solvents. Functional additives are added to protect metallic surfaces from chemical attack, surface tension reduction to improve wetting and penetration under low gap components, and reduce foam propagation. The features engineered into A4651US make for a highly effective ultrasonic cleaning product. The product has a wide material compatibility window on boards, components, labels and metallic surfaces.

CHEMICAL AND PHYSICAL PROPERTIES

This KYZEN product is environmentally responsible and operator safe, when handled in accordance with good industrial hygiene and safety practices. Table 1 summarizes important chemical and physical properties of this product.

| Table 1: Typical Chemical and Physical Properties | | | | |
|---|-------------------------------|-------------|--------------|-------------------------|
| Parameter | 100% Concentrate | 5% Dilution | 30% Dilution | Special Values |
| Clarity | Clear | | | |
| Color | Light straw, darkens with age | | | |
| Odor | Mild | | | |
| Flash Point, °C (TCC) | None to boiling | | | |
| Boiling Point, °F/C | 209°F / 98°C | | | |
| Volatile Organic Compound (VOC) gm/L EPA Method 24 | 467 g/L | 23.35 g/L | 140.1 g/L | ≤ 64.2 g/L ¹ |
| Vapor Pressure, VOC Components, mmHg at 20°C | 0.17 mmHg | | | |
| Chemical Oxygen Demand, (COD), mg/L (ppm) | | | | 124 ² |
| pH | 10.0 – 11.0 | | | 9.7 ³ |
| Specific Gravity | 0.995 – 1.015 | | | |
| Weight/gallon | 8.3 lbs | | | |
| Refractive Index, ° BRIX | 38 – 48 °Brix | 2.5 °Brix | 15.0 °Brix | |
| MEQ to pH 8.3 | 0.30 – 1.30 | | | |
| MEQ to pH 4.0 | 1.10 – 2.10 | | | |
| Alkalinity Ratio | 1 : 2.0 | | | |
| Non-volatile Residue (NVR) % | 1.78% | 0.009% | 0.53% | |

¹ A4651US is classified as a Semi-Water Based (SWB) cleaning agent and will comply with the 300g/L VOC limit per China Regulation GB 38508 when used at the indicated concentration.

² Value measured at 0.01% dilution.

³ Measured at 10 g/L dilution.

PRODUCT USE DIRECTIONS

AQUANOX A4651US is designed to be used in ultrasonic and spray-under-immersion batch cleaning machines. In general, wash concentration, wash temperature, ultrasonic impingement, wash time and rinsing are five key elements of process optimization. KYZEN recommends the following process parameters for applications using A4651US:

1. **Wash Concentration:** For lead-free no-clean and rosin based flux residues, a concentration range from 10-30% is recommended. For organic acid flux residues, a concentration range of 5-10% is recommended. If the residues are badly charred, a higher concentration level may be needed.
2. **Wash Temperature:** For most lead-free no-clean, rosin, and organic acid flux residues, a wash temperature range of 55-65°C is sufficient.
3. **Ultrasonic Impingement:** The mechanical effect of ultrasonic energy is highly effective in dissolving the contaminant and displacing particles. Soil removal requires that the cleaning agent come into contact with soil. Cleaning solution temperature is critical in maximizing cavitation intensity. Changes in temperature lower viscosity and solubility of gaseous bubbles in the liquid medium, and vapor pressure. For electronic assembly cleaning, higher frequency in the range 68-80kHz provides more cavitation sites and milder intensity while providing the energy needed to penetrate and remove residue under components.
 - a. **Degassing Requirements:** Degassing is term used to describe the removal of dissolved gasses from a liquid in an ultrasonic cleaning tank. Dissolved gasses will reduce the effectiveness and power of an ultrasonic cleaner since these gasses provide a cushioning effect on the ultrasonic waves generated. However, the dissolved gasses within the fluid are largely removed in the first few minutes of ultrasonic activity. Therefore, in most cases, ultrasonic cleaners can be used immediately after changing cleaning fluids. When an ultrasonic cleaner is activated after a fresh batch of cleaning fluid has been added, one will notice a huge veil of very fine bubbles rising to the surface from every area of the cleaning fluid. The audible sound generated by the ultrasonic system is also deadened at this time, and the system does not produce the typical sound that the ultrasonic cleaner will produce when the fluid is degassed. Once the veil of bubbles rises to the surface, sound begins to increase in volume, and ultrasonic surface activity begins to generate. At this point, the ultrasonic cleaning system is capable of ultrasonic cleaning.
 - b. Once a fluid is degassed by ultrasonic activity, or heating of the cleaning fluid, it does not need to be degassed again. Therefore, degassing is only an issue when cleaning fluids are exchanged with new fluid.
4. **Wash Time:** Determining the optimum wash time is a function of the residue properties, component density and geometry, Z-axis gap height and cleaning equipment. Wash time in the range of 10-15 minutes is adequate for most applications.

5. **Rinse:** Good quality deionized water is the preferred rinse medium. Water in the 1 to 5 megohm-cm region will be satisfactory for most operations. The temperature of the rinse water should be as high as possible, but comparative with parts and process. Ideally, in an in-line multi-tank wash process, if you have a cascade flow of 1/2gpm to 4gpm of DI water (final rinse to course rinse) this would be the easiest method, provided you can handle the discharge requirements.
- a. DI water is generated using a combination of the following tanks.
 - Carbon Exchange Tanks - Carbon is the most often used form of water treatment to remove taste and odor components of water. In addition, carbon removes chlorine and chloramines upstream of membrane-based systems.
 - Cation Exchange Tanks - Cation resin captures the positively charged ions in your water such as calcium, magnesium, potassium and sodium.
 - Anion Exchange Tanks -Anion resin removes negatively charged ions from process water such as chlorides, nitrates, carbonate, bicarbonates, sulfates, and silica.
 - Mixed-Bed De-ionizers - These beds, mixed with 60% anion resin and 40% cation resin, provide the highest water quality possible. This product is ideally suited for the bio-tech, semiconductor, and pharmaceutical industries.
 - b. The resistivity of the feed water into final rinse stage of the washer is fine at the 1 to 2 megOhm range measured **at the source**. Or a TDS (Total Dissolved Solids) of 0.4 mg/l as recommended by IPC standards. Once it reaches the actual rinse tank however this number is always measured lower.

AQUANOX A4651US works best when the cleaning agent is added to the wash tank using a dosing injection system, such as the KYZEN Chemtroller. When the wash tank calls for water make-up, the dosing systems add A4651US at the desired concentration levels.

REACH and RoHS compliance certificates are available for download. [Click here](#)

COMPATIBILITY INFORMATION - SUBSTRATES AND EQUIPMENT

All chemicals have the potential to adversely affect substrates and process equipment. As such, the effects of short-term exposure for substrates common to parts and assemblies and the effects of long-term exposure for materials of equipment construction must be considered. *Tables 2, 3 and 4* summarize known compatibility recommendations regarding the use of this product with specific substrates.

TABLE LEGEND

| | | |
|-----------------------|----------------------------|---------------------------|
| R- Recommended | NR- Not Recommended | T- Test Before Use |
|-----------------------|----------------------------|---------------------------|

Table 2: Plastics and Elastomers

| Brand Name | Generic Description | A4651US |
|--------------------------|--|---------|
| 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 | Polychloroprene | R |
| Phenolics | Phenol | R |
| Teflon | Polytetrafluoroethylene | R |
| Kalrez | Perfluoro-Elastomer | R |
| Kynar | Polyvinyl fluoride | R |
| Aflas | Tetrafluoroethylene and Propylene | T |
| 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 |

COMPATIBILITY INFORMATION - SUBSTRATES AND EQUIPMENT

Table 3: Metals and Alloys

| Substrate | A4651US |
|--------------------------------|---------|
| 2024 Aluminum- Bare | T |
| 2024 Aluminum- Alclad | T |
| 2024 Aluminum- Anodized | T |
| Black Anodized Aluminum | T |
| 3003, 6061 and 7075 Aluminum | T |
| 7075 Aluminum- Alclad | T |
| Silver | T |
| Gold | R |
| Copper | R |
| 1018 Steel | R |
| 304 and 316 Stainless Steel | R |
| Titanium | R |
| Steel, Galvanized | R |
| Tin-Lead Based Alloys | R |
| Tin-Copper Based Alloys | R |
| Tin-Silver-Copper Based Alloys | R |
| Bismuth-Tin Based Alloys | R |

Metals, elastomers and plastics can vary greatly in quality. These compatibility recommendations are based on testing of commonly available materials. If your process uses materials that are of lesser quality than those tested by KYZEN, differences in compatibility may be noticed.

Table 4: Equipment

When considering long-term exposure for materials of equipment construction, the following materials are generally compatible with chemistries used for inline and batch cleaning systems: (listed in order of resilience)

| Type | Compatibility |
|------------------------------|--|
| EXHAUST | <i>Stainless Steel, Polypropylene, PVC or Galvanized Steel</i> |
| PUMP SEALS, O-RINGS, GASKETS | <i>Teflon, Teflon encapsulated or EPDM (EPR) Note: Viton is not recommended.</i> |
| PLUMBING LINES | <i>Stainless steel or Polypropylene</i> |
| CURTAINS | <i>Polypropylene or Reinforced Silicone (red)</i> |
| WINDOW / DOOR SEALS | <i>EPDM or Silicone (red)</i> |
| RTV | <i>Dow Corning 732 or similar high grade</i> |

BATH MAINTENANCE AND MONITORING

When a KYZEN bath solution is properly maintained, prolonged bath life can be expected. The results of a bath life study conducted with this product confirm the extended bath life experienced by many KYZEN users. Expanded process baths can be a significant and expensive waste stream for facilities. Numerous factors can degrade bath performance, including depletion or imbalance of bath chemistries and buildup of contaminants from drag-in or other sources. Process bath life can be extended through simple process control and contaminant reduction techniques, resulting in significant waste reductions and cost savings.

KYZEN recommends REFRACTIVE INDEX to monitor bath concentration.

KYZEN recommends NON-VOLATILE RESIDUE (NVR) to monitor bath life.

NOTES AND COMMENTS

- Recommended procedures for bath life maintenance and monitoring are appended to this supplement.
- **SPER® Scientific** and **Atago® Pocket Pal-1** refractometers, including full procedures for using these refractometers, are available for purchase through your KYZEN Representative.
- Flux and solder pastes can contribute to Refractive Index readings. Many years of field experience have validated the effectiveness of refractive index to control most KYZEN products. The wide operating window provided by KYZEN technology tends to minimize the induced error that soils create over time. As soil load increases, refractive index charts should be adjusted to reflect the predictable soil levels in your cleaning process. KYZEN's **Bath Profile Kit** can help determine if an adjustment is needed by analyzing wash bath samples collected over the life of a SUMP charge. Please contact your KYZEN Representative for more information.
- KYZEN's Bath Profile Kit / PN# F00206 can help determine NVR and physical properties trends by analyzing six (6) wash bath samples collected over a determined time frame. Please contact your KYZEN Representative for more information.
- A Single Sample Wash Bath Analysis / PN# F00212 is also available to test physical properties and NVR.
- The Mettler-Toledo HE53 Moisture Balance Analyzer and its supporting items can be purchased direct from Mettler-Toledo or an authorized distributor.

SHELF-LIFE, PRODUCT COLOR, STORAGE AND HANDLING

SHELF-LIFE

Retain samples are taken from every product batch and kept for a minimum of five years. Additionally, randomly selected retain samples of key products are maintained indefinitely. KYZEN determined the shelf life of our aqueous and non-aqueous products by closely monitoring the quality of product samples stored in these retain samples over time. The results of this study provided valuable information on the stability of our products over time.

With few exceptions*, KYZEN products are acceptable for use up to FIVE (5) years, when packaged in sealed containers of five gallons or greater.

Conversely, it is more difficult to predict the long-term integrity of a product in containers holding less than five gallons, as well as unsealed containers of any size. Smaller product containers and unsealed containers are more susceptible to contamination and evaporation, which preclude extended expiration dates. Capping opened containers when not in use can minimize contamination and evaporation. Exceptions to shelf-life are clearly documented on product-specific Certificates of Compliance.

PRODUCT COLOR

For all KYZEN products, *color does not indicate product quality*; therefore, color is not used as a quality control parameter or specification for final product evaluation. KYZEN products are made from a blend of raw materials, some of which are organic solvents derived from agricultural materials. After 30 years of collecting data on KYZEN products containing these raw materials, studies have shown that these materials can contribute to color variances in concentrated and diluted product, as well as slight color variations over time. These same studies confirm that while *color changes may occur, product quality is unaffected*. To assure product quality, KYZEN evaluates each lot of these raw materials to verify integrity before blending.

STORAGE

Store this product in the original container at temperatures between 5-50°C / 41-122°F indoors, or out of direct sunlight. Most products have a freezing point much lower than water and a very high boiling point; therefore, most KYZEN products do not require any special handling to address temperature changes. KYZEN conducts freeze/thaw studies on all products to determine if product quality is affected by such factors and completes further testing if necessary. Following best practices always use the oldest inventory first and keep your stock rotating. *Exceptions to storage temperature requirements are clearly documented on product-specific Certificates of Compliance.*

HANDLING

This product is environmentally responsible and operator safe, when handled in accordance with good industrial hygiene and safety practices. Refer to the Safety Data Sheet (SDS) regarding safe handling practices with this product. It is always good practice to wear safety glasses or goggles and Nitrile gloves whenever handling AQUANOX.

ENVIRONMENTAL CONSIDERATIONS

KYZEN products are generally compatible with common primary and secondary waste treatment processes; however, the addition of soils removed during the cleaning process can significantly escalate environmental concerns. These environmental considerations vary widely depending on the cleaning machine and the operating parameters of your particular cleaning process. As such, the selection of the cleaning agent must incorporate the inherent impact on air emissions, water discharges and waste generation from your facility. Each of these three environmental mediums may require a permit depending on the usage rate and existence of other air emissions, water discharges and waste generation at your facility.

What are KYZEN's responsibilities for proper disposal?

- The United States OSHA Hazard Communication Standard requires suppliers to provide a GHS compliant Safety Data Sheet (SDS) for all products.
- KYZEN is responsible for providing known information on toxicity testing, health hazards, waste disposal, safe work practices, protective equipment, material reactivity and flammability, etc.
- Note: All information needed to properly classify a product for disposal, wastewater treatment or discharge into a wastewater stream can be found in the product SDS, specifically in Sections Three (3), Nine (9), Twelve (12) and Thirteen (13). Therefore, KYZEN does not disclose proprietary, non-hazardous product constituents for this purpose.

What are the end user's responsibilities for proper disposal?

- It is the user's responsibility to seek guidance and rule interpretation from appropriate authorities before applying for any required permits. This is usually accomplished by providing a copy of the product SDS, supplied by KYZEN, to local authorities. Because local regulations are often more stringent than federal regulations, it is imperative for the user to consult with local regulatory agencies before starting a waste water discharge, or introducing new chemicals or chemical processes to an existing permitted waste water discharge stream.
- The three regulatory agencies that a user must review are federal (national), state (regional), and local. Each company must meet the minimum federal standards. The state regulations may be the same or even more restrictive than the federal. Finally, the local community's regulations will be at least as restrictive as state regulations.
- The discharge of any wastewater stream, both by total flow and by chemical make-up must conform to national, regional and local regulations in all nations. Such regulations vary from very strict limits with little derogation to relatively flexible conditions. Many nations, particularly in Europe, have very strict legal requirements dictated on a national scale, covering many aspects of waste water quality. Other nations have less comprehensive regulations, covering only the more important considerations. Local authorities may offer derogations to national legislation if the local treatment plant is able to handle the otherwise out-of-tolerance waste.

The end user is ultimately responsible for compliance with all applicable regulations.

KYZEN is the industry leading provider of environmentally friendly cleaning chemistries and processes and contributes this knowledge and experience to a number of industry publications. For more detailed information on environmental considerations, please reference Section Nine (9) of the *IPC-CH-65B Guidelines for Cleaning of Printed Boards and Assemblies, July 2011*.

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

KYZEN Technical Support

1-800-845-5524

www.KYZEN.com

Materials furnished under all KYZEN orders are manufactured in accordance with KYZEN Corporation specifications. KYZEN maintains documentation of conformance to these specifications, which is available for review upon request. All raw materials used in KYZEN products are obtained from suppliers on KYZEN's Approved Vendor List (AVL), pursuant to ISO certified standard operating procedures for raw material quality control.

Refractive Index Procedure

This procedure provides an overview of the method used to measure the cleaner concentration based on refraction of light (refractive index).

APPARATUS

Refractometer, Brix Scale, 0 – 10°Brix or 0 – 80°Brix (as appropriate)

REAGENTS AND MATERIALS

Bath Sample
Plastic Dropper

HAZARDS AND PRECAUTIONS

For specific safety information, reference the Safety Data Sheet for the product you are testing.

PROCEDURE

- A. Taking care not to collect any floating soils, use a dropper to transfer a drop of the well-agitate bath fluid onto the refractometer lens.
- B. Hold refractometer up to a light source and read degrees Brix.
- C. Determine the concentration by using the chart included at the end of this supplement. Posting this chart in a conspicuous place can serve as quick and helpful reference for your operators.

NOTES AND COMMENTS

SPER® Scientific and **Atago® Pocket Pal-1** refractometers are available for purchase through KYZEN. Full procedures for using these refractometers are also available. Please contact your KYZEN Representative for more information.

AQUANOX[®] A4651US

| °Brix | %Conc | °Brix | %Conc |
|-------|-------|-------|-------|
| 0.5 | 1.0 | 8.0 | 16.0 |
| 1.0 | 2.0 | 8.5 | 17.0 |
| 1.5 | 3.0 | 9.0 | 18.0 |
| 2.0 | 4.0 | 9.5 | 19.0 |
| 2.5 | 5.0 | 10.0 | 20.0 |
| 3.0 | 6.0 | 10.5 | 21.0 |
| 3.5 | 7.0 | 11.0 | 22.0 |
| 4.0 | 8.0 | 11.5 | 23.0 |
| 4.5 | 9.0 | 12.0 | 24.0 |
| 5.0 | 10.0 | 12.5 | 25.0 |
| 5.5 | 11.0 | 13.0 | 26.0 |
| 6.0 | 12.0 | 13.5 | 27.0 |
| 6.5 | 13.0 | 14.0 | 28.0 |
| 7.0 | 14.0 | 14.5 | 29.0 |
| 7.5 | 15.0 | 15.0 | 30.0 |

Non-Volatile Residue (NVR) Procedure

KYZEN recommends Non-Volatile Residue (NVR) testing for soil contaminant as a tool for bath life monitoring of certain KYZEN products. A sample of a used wash bath is placed into an aluminum weighing dish and dried at 105°C / 221°F for a minimum of four hours. The residue that remains in the dish is allowed to cool in a desiccator and is re-weighed. The weight of the bath residue is then compared to the residue of a virgin sample of the cleaning product at the same concentration and dried in the same manner.

APPARATUS

Forced Air Oven set at 105°C / 221°F
Aluminum weighing dish
(See Tip Number 1 'Tips for Successful Use' at the end of the procedure)
Analytical Balance
Desiccator

REAGENTS AND MATERIALS

Transfer pipettes
Virgin sample of the product to be tested

HAZARDS AND PRECAUTIONS

For specific safety information, reference the Material Safety Data Sheet for the product you are testing.

STATISTICAL CONTROL

Samples should be analyzed in triplicate. The average of the three analyses is reported.

CALCULATIONS

$$\%NVR = [(c-a)/b] \times 100$$

a = Initial weight of the aluminum dish, b = Initial weight of the sample, c = Weight of weighing dish and residue after heating

$$\% NVR \text{ resulting from soil contamination} = \%NVR \text{ of sample} - \% NVR \text{ of virgin sample}$$

PREPARATION

- Set the forced air oven to 105°C / 221°F for a minimum of two hours to allow the temperature to stabilize.
- Place the aluminum weighing dishes to be used into the forced air oven at 105°C / 221°F for a minimum of one hour to dry.
- Place the dried weighing dishes into a desiccator and allow to cool.

PROCEDURE

- Place a cool weighing dish on the analytical balance. Record the weight (*this is weight 'a'*).
- Tare the balance and add approximately 10 grams of sample to the weighing dish². Record the weight of the sample to the nearest 0.0001g (*weight 'b'*).
- Place the dish in the oven at 105°C / 221°F for a minimum of four hours³. Remove the dish to a desiccator and allow to cool.
- Weigh the cooled dish on the analytical balance and record the weight to the nearest 0.0001g (*weight 'c'*).
- Repeat Procedure steps A through D a total of three times for both the sample and the virgin product.

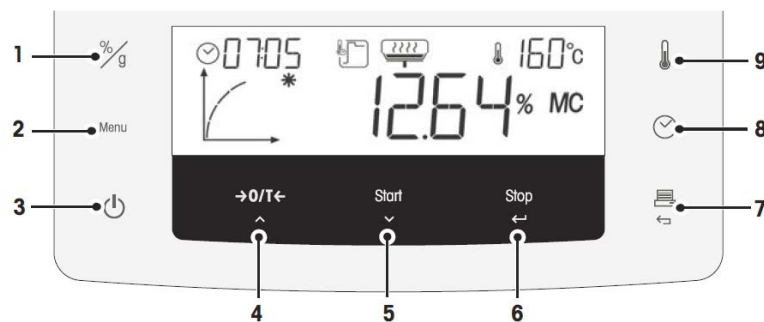
TIPS FOR SUCCESSFUL USE

- A beaker or ceramic dish can be used in place of the aluminum pan; however, these must be compatible with the cleaning product and able to withstand the required oven temperatures.
- The amount of sample used for testing is not critical, but must be weighed accurately.
- A dirtier bath will require longer than 4 hours to completely dry. To ensure that your sample is completely dry, return the sample to the oven for 30 minutes after taking the first weight. Cool in the desiccator and reweigh. Continue this until there is less than 5% change in the weight.

NVR Measurement by HE53 Moisture Analyzer Method KYZEN[®] AQUEOUS PRODUCTS

This Application Note provides instructions on how to use the Mettler Toledo HE53 Moisture Analyzer to measure the Non-Volatile Residue (NVR) of KYZEN[®] Aqueous Products.

1. Follow instructions in Section 4 of the *HE53 Operating Instructions* to appropriately setup the moisture analyzer and prepare for measurement.
2. Program the moisture analyzer to the settings below to begin the measurement procedure.



- a. Press Menu 2 . Use the Up 4 and Down 5 arrows to select **PROG** and press Stop 6 . Again, using either of the arrows, select **RAPID** and press Stop 6 . This selects the RAPID DRYING MODE.
 - b. Press Thermometer 9 . Adjust temperature, using arrows, to **120°C** and press Stop 6 .
 - c. Press Clock 8 . Use arrows to select **TIMED** and press Stop 6 . Use arrows to adjust to **1 hour** then press Stop 6 .
 - d. Press %/g 1 . Use arrows to select **%DC** and press Stop 6 . The results will be displayed in % DRY CONTENT.
3. Place the empty sample pan in the sample pan handler and place the sample pan handler in the draft shield. Ensure that the tongue of the sample pan handler lies in the slot of the draft shield.
 4. Place the provided Glass Fiber Pad in the sample pan. *Note: the pads are designed for single use and a new pad should be used for each test in ensure accuracy of the test.*
 5. Close the heating module and press O/T 4 to tare.
 6. Open the heating module cover and add approximately 2 grams of sample directly to the Glass Fiber Pad in the sample pan.
 7. Close the heating module and press Start 5 . The **%NVR** results will display on the screen when finished.

Condensation may collect and pool in the chamber- this is normal. Follow instructions in Section 9.1 of the HE53 Operating Instructions to clean and thoroughly dry equipment between each use.

W-824055 | REV B | Aqueous Products NVR H53 Method