

N e w s & V U E S

By Phil Culpovich

GOOD NEWS FOR WASTE ETCHANT RECYCLING...

Many good things have happened in our industry since the last newsletter I sent out regarding the collection and processing of your waste (spent) cupric chloride etchant.

First, I am happy to announce that the crisis situation that forced a temporary halt in the acceptance of spent cupric chloride at the Santa Fe Springs, CA Phibro-Tech facility has been resolved. Not only did they work out the logistics of handling more spent etchant, but they are now actually looking for more. I have been discussing this issue with many at Phibro-Tech including Dave DiMargo and Marty Lieberman. Marty wanted me to be sure to let everyone know that, as the leading agent for handling spent etchants in the USA, they are fully committed to their customers and have not only resolved the crisis but have increased their ability to handle more etchant. The increases are as follows:

Union City, CA – Finished early 2000
Garland, TX – 20% additional capacity
Sumpter, SC – 20% additional capacity

I also spoke with Joel Bzura from Old Bridge Chemical Company. Joel informed me that they not only have an expansion of an additional 150,000 gallons per month coming on line in the next few weeks but that they are planning additional 100,000 gallon expansion afterwards to be completed by next Spring. Joel said that he sees continued growth in the cupric chloride market as more companies are producing finer line PCBs and that the popularity of the etchant produced by the Vis-U-Etch™ 5 system is continuing to make great strides forward. Joel also said that Old Bridge will take etchant from other countries too.

The telephone numbers for Phibro-Tech and Old Bridge are as follows:

Phibro-Tech: 201-944-6000

Old Bridge Chemical Company: 732-727-2225

Also, be sure to remember as I mentioned in the last newsletter, we keep a list of contact information for alternative waste treatment companies so that getting rid of your waste etchant should not be any problem at all.

...AND A GREAT NEW IDEA FOR WASTE ETCHANT!

Just in case you were wondering what happens to waste etchant after it leaves your facility, the waste is processed and usually ends up as wood preservative, animal feed, fertilizer or other items not related to PCBs or lead-frames, etc. It is not really waste because it is not thrown away!

Knowing about the final products that waste etchant usually becomes, it occurred to me that the copper PCB makers send out in their waste was leaving the industry, never to return. This was a concern to me and brings me to the point of this article.

A few weeks ago, I met with Ray Cardenas of Encycle in Texas. Ray was reading my last newsletter regarding waste etchant and became aware of exactly where the best feedstock for their unique process for handling waste was coming from.

Ray informed me that the waste etchant they process is actually turned into a smeltable copper product. That's right, metal copper again! This is really good news for the longevity of our industry because that copper can now find its way back to the copper foil, anodes and other metal copper items we need to manufacture PCBs and lead frames, etc.

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It is great to find out that this process has closed the loop for copper but I also mentioned that the waste produced by your Vis-U-Etch™ 5 created the best feed stock for the Encycle process. This is because the parameters of our cupric are exactly what is required to optimize the Encycle process. Specifically, copper content above 200 grams/liter (ours averages 220 and is generally in the range of 200-250), as little free acid as possible (ours is $\leq 0.04N$) and as much sodium as possible (ours is sodium saturated). NO OTHER SYSTEM COMES CLOSE! If Encycle was only handling our waste etchant, their process costs would be lowest and this translates into REAL cost savings for our customers.

Due to location issues, the savings may be higher or lower. The best thing to do is to contact Encycle directly and see what they can do for you.

The next part of this article is a reprint of the summary that Ray Cardenas of Encycle provided us to inform our customers:

Encycle and Recycling Spent Cupric Etchant

Encycle is a wholly owned subsidiary of ASARCO, a major copper metal producer, and has been in the waste recycling business for the last 12 years. Encycle converted a former ASARCO hydrometallurgical plant that produced high-grade zinc into a recycling plant specializing in the processing of copper and nickel bearing liquids and solids.

Encycle is a fully permitted RCRA recycling facility in Corpus Christi, TX, and has a NPDES salt-water discharge. The salt-water discharge is especially useful in managing wastes that contain sodium, chlorides, and sulfates. A spent material that has proven to be a good fit with the

processing capabilities of the plant is spent cupric etchant.

Encycle is able to receive tanker truck and railcar quantities of spent cupric etchant, process the material through its hydrometallurgical facility and produce a smelter-grade copper product that can be fed directly into the one of the ASARCO smelters. Caustic is the principle reagent used in the Encycle process.

Due to Encycle's process consistency, standard economics can be offered to the customer. Some spent etchants are more economical to process than others are. As an example, the chemistries that produce low acid, high copper concentration etchants are the most economically for Encycle to process.

Encycle has been processing spent cupric etchant since 1997 and has recently expanded its existing capacity. As the supply of spent cupric etchant continues to grow, generators must look to other recycle alternatives.

The contact information for Encycle is:

Ray Cardenas
Encycle/Texas, Inc.
Tel: 949-515-7649
Fax: 949-515-7650
E-Mail: RayCar95@aol.com

ETCHER, CONTROLLER, CHEMISTRY – THE RIGHT FIT

In a previous newsletter and in our owner's manual, we describe the importance of essential items in the etcher that govern etch rate and etch factor.

In order to achieve the best etch rates and etch factors consistently, the etcher, controller and chemistry must all work together properly. All

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three should be considered at the same time when setting up your etch line. This is not to say that improvements in one area are not helpful but rather the best outcome can be easily achieved if all three are considered together before purchase and set up.

At Oxford V.U.E., Inc. in the USA, we don't make etchers or chemistry. We do make one of the most popular cupric chloride controllers sold today, the Vis-U-Etch™ 5. And the popularity doesn't stop after the sale. Of all VUE 5's sold over the last four years, over 97% are still in use with the original customers. There are many reasons why the Vis-U-Etch™ 5 is so popular and loyalty is so strong among customers. That being the case, it is still amazing how often the etcher, controller and chemistry are considered separately for purchase without regard to their interrelated functions.

As a recommendation, if you are considering the purchase of a new etch line with a Vis-U-Etch™ 5 attached, let us know before you make your final decision on the etcher. By providing us with the etch chamber configuration, we can give you a much better idea of what kind of results to expect in conjunction with your Vis-U-Etch™ 5. We can also emphasize how each characteristic of the etch chamber affects etch rate and etch factor. This would certainly be preferable to know in advance rather than finding out later that some important details were overlooked.

Regarding chemistry, we have worked with several chemical companies and Vis-U-Etch™ 5 distributors to provide you with the best blend of chemicals for optimum performance. It is important to keep in mind that our distributors and recommended chemical suppliers have a vested interest in keeping your equipment performing properly. If you purchase your chemistry from someone else, there is no way for

us to know what you are getting or how it will affect your operation. The results could be costly down time and lots of aggravation.

Our distributors and chemical suppliers keep an eye on your operation along with us and we communicate with each other regularly to ensure the highest level of customer satisfaction. You pay pretty much the same amount for chemistry no matter which company you buy it from because of competition. That being said, doesn't it make sense to get your chemistry from a company that actually coordinates with the equipment manufacturer to ensure your success?

ETCHER SUMP CAPACITY

Most etchers made today have no options when it comes to sump capacity. The interesting part is that sump capacity can have a significant impact on etchant stability and even chemical efficiency.

The stability issue is really easy to see. For example, let's say you have an 80-gallon sump in a small etcher and you add 100 ounces of copper. Now let's compare that to an etcher with an 800-gallon sump adding the exact same amount of copper. If you do not add any regeneration chemistry to either sump, there will be a noticeable difference in the condition of the etcher with the 80-gallon sump because although the amount of copper added is the same, it is spread out in much less etchant. This creates a more noticeable downturn in the condition of the etchant compared with the 800-gallon sump because there is much more cupric chloride available for etching in the 800-gallon sump.

In order to convert the cuprous chloride formed by adding the copper to either the 80-gallon sump or the 800-gallon sump, you require the same amount of regeneration chemistry to be added to either for regeneration back to cupric chloride. The difference in regeneration stability

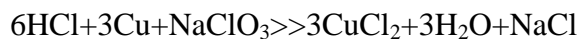
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is that the larger sump spreads the chemistry over a larger volume creating more stability just like adding the copper to a larger volume was more stable because there is still much more cupric chloride left in the larger sump.

Most companies don't have any trouble understanding how the stability increases with a larger sump size but how can having a larger sump save money in chemical costs?

Let's start by understanding what is taking place chemically during the etching and regeneration process. During etching, the cupric chloride (CuCl_2) comes in contact with exposed copper (Cu) and forms two cuprous chlorides or $2(\text{CuCl})$. Since CuCl is dead etchant we need to find some chlorine ions (Cl) to attach with every CuCl to return it back to CuCl_2 . In the Vis-U-Etch™ 5 process we use a combination of hydrochloric acid (HCl) and sodium chlorate (NaClO_3) to release the Cl ions needed within the etchant. The chemical equation is as follows:



In order for this to happen throughout the entire sump, time is needed for the reagents to find each other and finish the process. This lag time for NaClO_3 also helps regarding the stability issue compared with hydrogen peroxide (H_2O_2) oxidizer. OK, so this is a great chemistry lesson but how does having a larger sump save more chemistry?

Let's follow the steps:

1. When regeneration chemistry is added to the sump, the level of etchant increases and the excess is either allowed to overflow into a waste etchant tank or pumped into the waste tank through the Vis-U-Etch™ 5 or another system.

2. The amount of regeneration chemistry needed to convert the CuCl formed by adding the 100 ounces of Cu is still the same in a large or small sump.
3. Adding that same amount of regeneration chemistry to a smaller sump causes a faster rise in the level of liquid in the sump, so overflow into the waste tank happens faster.
4. With the faster overflow of etchant into the waste tank from the smaller sump, it is inevitable that more unreacted HCl and NaClO_3 will find their way into the waste etchant tank.
5. Therefore, more regeneration chemistry than should have been necessary is required to finish converting the CuCl back to CuCl_2 .

Following these steps shows how a smaller sump can be more wasteful of chemistry.

So what can I do considering I don't have much choice for etcher sump size? The best recommendation is to add a slave tank into the etcher circulation loop to increase etchant capacity. All that is required is to be sure that the circulation pump is still capable of moving the entire sump capacity within 4-5 minutes.

At Oxford V.U.E., Inc., we like to help with all aspects of your etching situation to ensure your success. If you are planning to make any changes, upgrades or add a new line, give us a call so that we can give you our input. If we can provide any information that gives you better results, you'll be better off and so will we.

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ETCHER VENTILATION

Due to the higher copper content provided by the Vis-U-Etch™ 5 system, it is important to watch the Baumé (specific gravity) of the etchant. This can best be monitored using a continuous reading baumé inspection tube attached to the etcher. This is also one of the least expensive and most beneficial items to monitor your etchant condition.

Under normal conditions, the Baumé of the etchant remains stable and low enough (40°-43° @ 125°F/52°C) not to be a problem.

In order to maintain a stable Baumé *proper* ventilation of the etcher is required. The amount of airflow through the etcher vent must be kept to a bare minimum to prevent excessive moisture loss through evaporation. Since the etchant controlled by your Vis-U-Etch™ 5 typically has very little odor, strong ventilation is only required when a mechanical failure or calibration problem causes a strong release of chlorine gas.

If the etcher is allowed to run for extended periods without any copper additions, moisture loss through evaporation will cause an unwanted rise in Baumé and can result in solids forming in the etchant. If there is also strong ventilation present, an increase in Baumé and potential for solids is accelerated. Since both acid and oxidizer are mostly water, etching panels and the subsequent replenishment of etchant chemicals provide all the water necessary for stable Baumé.

After the last panel exits the etcher, determine how long it will be before more panels will be etched. If the time is more than ten minutes, turn off the etcher. If you have a panel sensor system, this would be easy to accomplish automatically.

The best way to prevent water loss from the etchant is to install a condensing coil or coils in

the ventilation pipe(s). The drain from each condenser *must* be returned to the etchant sump. The reason for this is simple. Any moisture that collects in the condenser comes from the air passing through it. This air is coming from the inside of the etch chamber where you have hot etchant evaporating water. By having the condenser coil in the ventilation pipe with the drain returning to the etchant sump, you end up returning virtually all the water that has evaporated from the etchant. When set up this way, the Baumé remains rock stable without the need for a baumé controller.

As an example of this, we had one customer with an etcher sump of approximately 1000 gallons. They have three main etch chamber vents and one post etch vent. All vents had condensers but the drains went into the waste treatment pipe instead of returning to the sump. A complaint was made that they had to manually add up to 240 gallons of water per day to the etchant to keep the Baumé stable, thus requiring a Baumé controller. We instructed them to return the drains from the condensing coils to the sump and that would correct the problem without the need to purchase a separate Baumé controller. The response was, "OK, that would help *but 240 gallons per day?*" Initially, the three main vent condenser drains were returned to the sump. Afterward, instead of requiring 240 gallons of water per day be added the amount was reduced to 15 gallons every three days. This was truly amazing to them and quickly led them to redirect the remaining post etch vent drain back to the sump. From then on, there was no more need or talk of requiring a Baumé controller.

Need a Baumé hydrometer inspection tube for your etcher? We can supply a complete kit that can be added to any etcher. Call for details.

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CUSTOMER SERVICE: TRADE SHOWS, VISITATION, IPC



Fuji Kiko Booth, JPCA 2000

One of the great pleasures of working with our customers and network of distributors is that we get the chance to visit with them around the world. This is an integral part of our philosophy



SMT PCB Korea 2000 - Kang Lee / Phil Culpovich

at Oxford V.U.E., Inc. Maintaining a close friendship after the sale is really the key to the continued success of our customers and ourselves. The best way to learn about the needs

of customers is to visit with them and actually see what they see. To the more than one thousand people receiving this newsletter, trade shows and customer visitation enable us to provide everyone with a clearer understanding of the processes we use.

What's even more amazing and what I am personally grateful for, is that I have had the opportunity to actually get to know most of you by working closely together during sales meetings, installations and later visitation. Besides working together, building these



IPC 2000 Oxford V.U.E., Inc. – Special Guest Dr. Karl Dietz From Dupont

relationships make everyone's lives more enjoyable. I would personally like to thank all of you for these opportunities.

Another important aspect of trade shows is the selection of training/standards forums available. These forums are a great way to learn the latest technology and have your questions answered by the leaders in our industry.