

IPC Expo – 2002 – Long Beach, California – “Explore The Possibilities”

It doesn't seem possible but another year has come and gone. For most in the electronics industry, 2001 was a year that everyone just wants to forget. Fortunately, 2002 looks like things will improve because the level of electronics purchasing has significantly exceeded the level of electronics manufacturing for many months in an effort to reduce inventories of finished products. What this all means is that even if the economic recession continues at its current level, electronics manufacturers will have to increase production just to keep up and this is some really welcome news for those that have been seriously affected by last year's business downturn.

With the expected increase in electronics production will come a need for new manufacturing products and services. The best place to see this is at the upcoming IPC Expo 2002 www.ipcprintedcircuitexpo.org. Enclosed with this newsletter you will find an invitation to visit Expo 2002. We will be in **booth 977** which is along the right hand wall of the convention center as you come into the main entrance.

Be sure to stop and see us to find out the latest advances in the Vis-U-Etch™ 5 system for controlling cupric chloride and the VUE-Ferric™ for controlling ferric chloride.

If you have never used a Vis-U-Etch™ 5, come find out what 140 others have chosen providing them with the only cupric etchant that smells like heated salt water, NOT

chlorine or hydrochloric acid, the most stable etchant of ALL systems and the lowest running cost of all systems because of its maximum chemical efficiency giving you the highest quality from any etcher.

Light Transmission, ORP, Normality...What Does It All Really Mean?

Any time a newcomer makes their way into an industry, they get hit with all kinds of new terms and acronyms. Most people don't want to feel inferior by asking what it all means so they try to find out discreetly as the necessary requirements arise. There is also a similar inferiority complex that occurs whenever we are put in charge of a new procedure or process and we are supposed to be instantly wise even if we have never done this before. Sure, most important jobs come with some training but all too often the training is not enough or requires answers to more questions after the training is finished.

At Oxford V.U.E., Inc., we have made customer training and continuing service and information after the sale our top priority. The reason we do these newsletters is to keep everyone up to date on what's happening and to make sure that anyone who uses our products feels confident with their operation. Whenever there is a question or comment, anyone can feel comfortable knowing that they can call us at any time and get an answer because we don't just answer questions and comments, we actively seek them out.

OK, but the title of this column...

The purpose of this article is to provide a better, more accurate knowledge of these terms and how they are related.

Light Transmission – This is the method that is employed in the Vis-U-Etch™ 5 to control the proper additions of hydrochloric acid and sodium chlorate based oxidizer to copper etching solution which transitions from cupric chloride to cuprous chloride and then back. Often times, the Vis-U-Etch™ 5 is referred to as a “colorimetric” controller but this is actually a misnomer. There are color changes that take place in the cupric etchant but changing color is not how light transmission works.

A more accurate term would be “turbidimetric” controller. A turbidimetric controller looks at the clarity or lack thereof to control chemical feeds. This change from clear to not clear is referred to as turbidity. This is how the Vis-U-Etch™ 5 works. We use the term “light transmission” because a beam of light is passed through the etchant as it enters the controller to determine whether it is clear or not (turbid). If the etchant is clear, it means that a sufficient amount of acid and oxidizer have been added to the etching solution to fully regenerate cuprous back to cupric and to eliminate any hydroxides that have formed.

If the etching solution entering the controller has lost its clarity (become turbid), it is because it has formed either hydroxides which are cloudy or cuprous which is an insoluble opaque. If there are cloudy hydroxides present, adding hydrochloric acid will correct this because hydroxides are a combination of oxygen and hydrogen (OH) and they require an additional hydrogen (H) to make clear water (H₂O). This extra H is found in the hydrochloric acid (HCl). If cuprous chloride (CuCl) is present, you need an extra chlorine (Cl) to form transparent cupric chloride

(CuCl₂). Although the Cl also comes from the HCl, the HCl does not split apart unless oxidizer is added which, in our case, is sodium chlorate (NaClO₃). It is the O₃ part that combines with the H of the HCl to form water (no more hydroxides), freeing the Cl to combine with CuCl to form CuCl₂.

ORP stands for Oxidation Reduction Potential. This can be measured with an ORP probe if desired. ORP is the ability of the etchant to regenerate or “re-oxidize” the cuprous chloride back to cupric chloride. When using an ORP probe, the value is shown in millivolts (mV). The threshold voltage for the etchant to be able to convert cuprous chloride back to cupric chloride is 520mV. Below 520mV, the etchant can not regenerate and will eventually stop etching completely if the ORP is not brought above 520mV for a sufficient time to start converting the cuprous chloride back to cupric chloride. This is a tricky situation because the actual ORP of the etchant is really the result of a combination of oxidizer and acid which releases chlorine, converting the cuprous back to cupric and then seeing how much potential is left over. In other words, even though ORP is typically used for making oxidizer additions to the etchant, the amount of available hydrochloric acid and the amount of cuprous to be regenerated will determine the final ORP reading.

Too high an ORP reading is a problem because now too much chlorine gas is released to be used in the cuprous to cupric reaction. The resulting excess of chlorine gas ends up in the etching machine atmosphere and generally into the etch room atmosphere as well. This is evidenced by the strong chlorine smell which even in small amounts can be hazardous to your health if exposure is frequent, constant or becomes excessive.

ORP probes are considered to be a weak link in the control of etchant because they are a "sacrificial" probe due to the degradation that occurs from contact with the etchant. This degradation is a constant process that occurs over the life of the probe. ORP probes can be cleaned and recalibrated periodically before replacement but still contribute to excessive chlorine releases and wasted chemistry. The excessive chlorine gas releases and resulting unstable etchant show up as higher running costs, lower and varying etched product quality, shortened etch room equipment life and unhappy etch room people.

Normality refers to the amount of extra or "free" hydrochloric acid present in the etchant. A value of $1N$ would indicate an excess of 35 grams of hydrochloric acid per liter of etchant. $2N$ indicates 70g/l, $3N$ indicates 105g/l, etc. The higher the free acid concentration, the lower the etchant stability and etched product quality and the higher the running cost. Having $0N$ would be ideal but is not attainable 100% of the time because the free acid concentration rises during the addition of hydrochloric acid.

The probes used to determine acid Normality are referred to as conductivity probes because they measure the electrical conductivity of the etchant based on the amount of excess acid present in conjunction with the conductivity of the copper (cupric chloride) solution. The only way to get a reading from a conductivity sensor that is measuring the free acid concentration is to raise the free acid concentration to a conductivity level that is higher than the copper reading. It is for this reason that systems relying on conductivity *require* wasteful excess acid that cause safety, quality and stability problems.

Light transmission compares with ORP/Normality system readings by operating at $\leq 0.04N$ and 560-580mV average ORP.

With light transmission, an evident chlorine smell only occurs above an ORP of 680mV which does not occur during everyday operation and should not occur even when there is a system fault because of built-in safeguards. Most ORP/Normality systems have noticeable chlorine releases at around 550mV ORP which is common because of the unreliability of the ORP probes coupled with the always present excess hydrochloric acid and its smell.

Saving Money In Tight Times

It always seems that during lean economic times there is no shortage of people coming up with money saving schemes that turn out to be false. The real trick is to get the ones offering such schemes to show all the information and to do your research before falling into any of these traps.

Real ways to save money should have all the cards laid out on the table. In our last newsletter, we came up with a new optical Baumé Limiter because people wanted to save money. Companies did not see as much a functional need for the Baumé Limiter as much as they were just looking to save money. This is easy for the customer to see for themselves because they are provided with all the tools necessary to decide if it is worthwhile by calculating those savings using their own information. No sales hype, just straight-forward information. For example, the customer is given the price of the Baumé Limiter and how it is connected. They can then calculate how much etch rinse water no longer goes to waste treatment or the spent etchant tank. Since it is already known by the customer what the costs are for treating/eliminating this rinse water and the cost of the Baumé Limiter is known, the customer can really see for themselves if this is cost effective or not. We know it is in the largest percentage of cases but

we don't need sales hype to prove it. The customers know for themselves.

A recent example of phony sales hype was presented to one of our long time customers by a large chemical competitor. The customer was promised that they would save approximately US\$20,000.00 per year by switching away from the Vis-U-Etch™ 5 system and using an ORP/Normality type system. The first problem is that the customer's *total* operating cost for the etching operation is about \$22,000.00 per year which makes the offer completely ridiculous to begin with. The second problem is that when using actual data from the customer that compares copper etched versus chemical consumption and its costs, switching to the higher acid ORP/Normality system would cause a minimum *increase* of \$3,200.00 per year in operating costs. This is based on the lowest recommended acid Normality associated with the controller they recommend. If the higher end of the acid Normality range was set, the cost increase would even be higher.

Another sales method that is gaining ground in popularity is the package deal. One price pays for all Develop/Etch/Strip (DES) chemistries and dry film or some combination of these. On the surface this sounds simple and quick. Look at the reality though. When you go shopping, do you go to the store and say, "I need these ten items, give me a single price for all of them." Of course not! You want to know the price of each item individually in order to see which prices are a good deal and which prices are not. The funny part is how many people in business get sucked into these deals because they are easy and don't require a lot of effort on the part of the buyer. Also, the real headache comes months later when you figure out that you have been spending more money to etch the same amount of copper. The problem now is that you are locked into a

contract that puts more money into the pockets of the company that took you for a ride.

Here's another way to look at it. When you go to buy a car, do you ask the dealer to show you what they have or do you tell the dealer what you are looking for? This sounds silly because you always ask them to show you what you want, not what they are trying to push on you. This being said, let's think about who created these hidden cost package deals in the first place – the companies selling them. Last time I heard, companies are in business to figure out the best ways to maximize *their* profits, not yours. All businesses are started and run for the purposes of making money (unless they are stated as a non-profit corporation or organization). So why do so many people rely on their vendors to tell them what is a good deal?

A few suggestions to see if what you are being offered is good or not would be to have the vendor show you both packaged pricing and individual pricing. This way you can see what is being quoted and compare it with what you are already paying. You can also see what items they have reasonable pricing on and what items they don't. If they don't want to offer individual pricing, ask why. The first thought that comes to mind is, "What are you trying to hide?". Lastly, if there is a big difference between the package price and the individual price for all items, what is the reason?

Help For The Electronics Industry

WOW! 2001 sure has been a devastating year for the electronics industry. Almost every company that has anything to do with electronics manufacturing is seriously concerned about the future of our industry and their own survival. It doesn't take much to find bad news as there is plenty around. But the

question really boils down to, "When will things turn around and get better?". There's plenty of speculation but when push comes to shove, does anyone really know?

It helps to understand why the slowdown occurred as well as learn what to do to correct the situation. There were several elements that drove the phenomenal growth and sales of the late 1990s and 2000. These were mainly the advances in the personal computer market and related Y2K worries, the coming of age of the cellular phone market and the explosive growth of Internet companies. All these items are heavily dependent on PCB and electronics manufacturing.

Let's look at these items one at a time. First, we'll start with the personal computer market. In 1999 with the new millennium approaching, many individuals and companies were concerned that the older computer systems and related software they relied on were not going to function properly when 2000 came or that they would fail completely. We, of course, now know that the vast majority of the dire predictions did not materialize but what did happen was that computer sales went through the roof. Since then, there hasn't been any real perceived need to upgrade or buy new computers. There have been some major advances in the speed of microprocessors, memory, video/graphics and so on but most consumers haven't felt a real need for any of these improvements. Most applications like word processors, e-mail and spreadsheets run fine on PCs made within the last 2-3 years.

So, what can we do in the area of personal computers to improve sales? Actually, there are many things that we can do ourselves to help. There are well over 1,000 people that will see a copy of this newsletter that work in various parts of electronic manufacturing. Let's not wait for the outside world to start

buying our computers, we can help ourselves by buying computers or upgrading the ones we have. Even if the company that you work for does not make the particular items you buy, you are still helping the industry as a whole. Remember, if your competitor is busy making more computer related parts, they won't be as interested in competing with you bidding on the jobs you are doing.

Although the big gift giving holiday of Christmas has past, birthdays and Valentine's Day are often other times that many people buy and exchange gifts. Make it a computer or something else electronic and help our industry.

If you know someone in the software business, let them know that more people upgrade when the software being written requires more computing power. Adding more features to programs not only appeals to new customers but generally requires more power to run them. Suggest to the software people that it is in their best interests to add more features as a way to ensure job security. A good example of power hungry applications is graphics editing software for making professional and home movies. More computing power is needed and this helps our industry. You get the idea.

Let's move on to cellular communications. A few years ago, cell phones didn't really work very well and were constantly replaced with newer models. Now, most people are happy with the phones they have and have no reason to switch. The expected number of cell phone subscribers has also been largely realized so it is not likely that we will see a boom here but if you don't like the phone you have, buy a new one. Calling rates have dropped considerably so it is a good idea to buy one if you don't already have one. A good point came out of the tragedy of the World Trade Center in New York. While there were many failures of hard-

wired phones in the area due to a loss of electrical power, etc., the cell phone network remained mostly functional and actually saved many lives by allowing people to keep in touch during the crisis. If any kind of emergency comes up, it is becoming more of a necessity to have access to personal mobile communications. Cell phones won't replace hard-wired communications but they are necessary as a supplement.

Another aspect of mobile communications that should not be overlooked is the availability of cellular service. It is pretty well known that cell service is not the greatest in many rural areas but that doesn't necessarily mean that you get good service even in densely populated areas. I know because I live in a suburb of Los Angeles, California and our local service is terrible. What can we do? Complaints to the cell carrier for lack of adequate service go into a program that helps determine where to build new cell towers. The more complaints from an area, the more likely you will get a new tower. If you are not happy with cell service in your area, tell the cell carrier. This will encourage them to invest in new towers sooner, resulting in more sales of electronics. Remember, you are being charged the same whether they build a tower in your area or not and getting a new tower is to your benefit anyway.

Now it's on to the Internet. In it's infancy, people seemed to look at the Internet as the answer to all things. Now, many have backed off because of security concerns and confusion over economic viability. The Internet is still a great way to find information about almost anything. It is also fantastic for booking travel plans and purchasing things that you don't have to see before buying.

OK, so how does this help the electronic industry? The more we use anything electronic, including the Internet, the more

electronics must be purchased to make it function. Search engines run on electronic equipment that must be maintained and upgraded as necessary to keep up with demand. The more we use them, the more electronics must be purchased to keep up.

While no one expects that the electronics industry will come roaring back anytime soon, we should all do our part to try and support our industry. When governments see the need to help out a local industry, they ask you to do your part to support that industry by purchasing their products. The electronics industry is no different. If you are trying to figure out what to spend your money on, make it something electronic and help out both yourself and our industry.

NEWSLETTER TOPICS

I always worry about two things regarding these newsletters: What topics will be covered and will the readers find them useful?

Customer visitation is invaluable when it comes to learning what is currently happening. I usually start writing each technical article after visiting one or more customers and working with them to learn something new, solve a problem or improve a process or processes.

If you have an idea or ideas that you would like to see in a future issue, please call or send your e-mail request to me at: pculpovich@oxfordvue.com.