WORKING WITH **MODERN TECHNOLOGY EPOXIES**

A Safer Way To Work

BY DAVE GIDDINGS

After reading 'Working with epoxy resins; a few hints and tips' in the January 2015 edition of Australian Amateur Boatbuilder I thought we would make sure you receive the full story of working with epoxies. The article was focused on working with old technology epoxies. Many of the 'common problems with using epoxies' that the article highlights only occur when using an old technology epoxy. Therefore, it is important to note that not all epoxies suffer the issues described. There is a clear distinction between old and modern technology products.

FIGURE ONE : **Classic symptoms of chemical sensitivity.**

At BoatCraft Pacific, they have relied on the most modern technology when developing products for the user. This has eliminated issues such as amine blush and reduced problems like mixing ratios. Moreover, using modern technology products ensures minimal potential harm both to users and to the environment. This means their products are safer for both amateurs and professionals alike.

The team at Drive Marine Services are passionate about ensuring old technology products are replaced by modern technology products wherever possible. This is driven by my own personal experience, fresh out of school I had to use old technology chemicals and solvent based paints when working on ships in the Navy. Still, to this day I am suffering the consequences of sensitivity to chemicals. Luckily for me, I can use Bote-Cote and Aquacote with no indication of sensitivity. Unfortunately, many professional and amateur boat builders still use epoxies based on old technology as I believe they do not appreciate there is *a safer way to work.*

People can become hypersensitive and in some cases extremely ill if inappropriate chemicals are used in the work area. Research has revealed that fumes and vapours from production and repair processes can lead to people experiencing eye, skin and respiratory system irritation, nausea, headaches and dizziness. In some cases, the vapour can cause serious lung disease and increase the risk of asthma and possibly cancer. If people who become sensitive to chemicals and solvents continue to use them they can end up with serious deterioration of their central nervous system. In addition, solvents can lead to asphyxiation and explosion in poorly ventilated areas.

A typical symptom of becoming sensitive to solvents and chemicals are shown at figure one. Things to look out for are itchiness, red and swollen skin along with respiratory issues. I regularly get the story of "I have been using epoxy for 20 years and never had a problem". Anyone thinking this way is living in a fool's paradise because sensitisation creeps up on you. Remember, the effect of these chemicals never leaves your body and sooner or later they usually catch up with users if you play with them for long enough.

When working with any type of epoxy always wear gloves and never use acetone or other solvents to clean epoxy off your skin as it makes it easier for the molecules to penetrate your skin. Use a citrus based hand cleaner or white vinegar to clean yourself. However, when using modern technology epoxies in many cases, most people will not need a P2 respirator rated for chemicals as long as you are working in a well ventilated area. We strongly recommend that users should wear protective safety glasses at all times. Also never use a heat gun to spread the epoxy as it will cause the epoxy to vaporise and increase the presence of vapours. To be safe wearing a P2 respirator and protective clothing is vitally important when working with old technology epoxies. The modern technology products minimise WHS issues, allow you, your family and friends to work safer and not be affected by secondary exposure.

When working with any type of epoxy always wear gloves and never use acetone or other solvents to clean epoxy off your skin as it makes it easier for the molecules to penetrate your skin

If using the old technology products, all users should wear disposable overalls as the vapour will readily cling to clothing and promotes the sensitisation several hours after leaving the work environment and can have a detrimental effect on others due to indirect exposure.

We cannot, of course, guarantee that no user will ever suffer sensitisation when using Bote-Cote epoxies. Individuals' biological responses vary greatly, and there are certainly a very few individuals out there who will be uncommonly sensitive. What we can say with certainty is that there have been many users who have suffered badly from old technology products, who have changed to Bote-Cote and have been able to complete their projects without further health difficulties.

All of this may leave you a little confused and asking why two products that deliver similar results are so different to work with. The explanation is quite simple ... TIME.

In the same way the introduction of airbags, ABS braking and seatbelts have meant cars are a whole lot safer now than they were in the 1970's.

Bote-Cote having been developed in the late 1980's is a lot safer than those epoxies developed in the 1960's and 1970's. The developments in chemical science meaning there are many benefits when using a modern technology epoxy, including:

- Safety
- No amine blush
- Easier to use
- Better flexibility
- Less work

Safer

Epoxy resins are the most versatile of structural adhesives because they can be cured with many different hardeners and additives to provide a wide variety of properties. This makes them useful in the home, by the hobbyist and industry. Hardeners (curing agents) affect cohesive strength, hardness and durability of an epoxy. Many of the older formulation epoxies use TriethyleneTetramine (TETA), DETA or similar hardeners as a key ingredient in the hardener. While this achieves many desirable properties, this type of formulation is based on old technology. It has a high vapour pressure that means it readily evaporates

and so is difficult to avoid breathing the vapour and thus delivering a substantial dose of the vapours into your system when working with these products. Hence, the necessity to wear a P2 respirator.

In contrast, Bote-Cote epoxy products use modern technology based on modern low toxicity amines that have a much lower vapour pressure and are less inclined to vaporise. This is because the molecules are much larger in size. They evaporate a great deal less and thus you breathe a lot less of the vapour when working in a well ventilated work environment. Also being based on larger molecules they are not readily absorbed through the dermis. This also minimises the chance of affecting the user by penetration through the skin. Brian Jones who instructs and supervises high school students in building the Bellinger Canoes at Tuncurry High School moved from using old technology epoxy to Bote-Cote to ensure the students were working with the safest products available with the last batch of canoes shown at figure two. As a side note Brian supervised the building of 42 canoes between January 15, 2014 and January 16, 2015. Not bad for a retired school teacher.

FIGURE TWO : **High School students' canoes at Forster 2014.**

We have an easy way to help people work out whether they are playing with new or old technology epoxies. Basically anything which is 3:1, 4:1 or 5:1 ratio will probably be based on old technology. Have a smell of the hardener (be careful it can really affect you if you have a good whiff) and if there is a significant ammonia, onion or chemical smell it is likely to be full of old technology chemicals.

Another way to tell if the epoxy is old technology can be if they are classed as Dangerous Goods due to the nasties in the hardener. The older technology hardener chemicals are quite corrosive and so must (or in some cases should) be declared as Dangerous Goods class 8. Dangerous Goods class 8 cannot be sent by general couriers, by air or through the post. Sadly some manufacturers do not seem to be properly declaring the classification of their hardeners so this cannot be relied upon. It must be revealed in their Safety Data Sheets, so ask for them and make sure they send you both the hardener and resin SDS. Dangerous goods items are expensive to freight. Whereas, Bote-Cote hardener, being modern technology and not a Dangerous Goods class 8 corrosive, can be sent using Australia Post or general freight which will result in a significant saving on cost of freight.

No Amine Blush

As Bote-Cote was developed using modern technology chemicals it does not exhibit amine blush. The older formulations, and especially the 5:1 formulations, exhibit amine blush especially when used in cold or humid conditions. This is a waxy layer that appears on the surface of the cured epoxy that must be scrubbed off before the epoxy can be sanded for re-coating or painted. Even though some of the more expensive epoxies sold in Australia do blush, it is the use of the cheaper materials in formulating the epoxy that causes it. If you use a blushing epoxy, you will be forever worried whether one coat will separate from the coat under it because the blush was not fully removed.

Easier to Use

Bote-Cote mixes at a ratio of two (2) parts resin to one (1) part hardener. This has an immediate benefit to the user of being easy to achieve the correct ratio when mixing. As the other article highlighted many older formulations are 5:1 ratio which means a tiny error in the hardener (which would make it 4:1 or 6:1) is a huge percentage error that will cause weak epoxy or worse – it will not cure. The 2:1 ratio means you can do away with sweating over the digital scales or losing count with mixing pumps and just 'eye ball' it in the mixing cup. Saving you time and stress.

Better Flexibility

Basic epoxy is extremely rigid, so much so that it cracks when flexed. Bote-Cote has been formulated to be a little flexible. This way, when the coated timber bends, the epoxy does not crack.

Less Work

Bote-Cote contains a small amount of thixotropic agent. This reduces the tendency to produce runs and makes it easier to achieve the required film thickness with fewer coats. Additionally, Bote-Cote includes an insect repellent. Don't you hate those insects landing in your new coating and doing the breast stroke across your nice finish. Bote-Cote users have less trouble with insect swimmers.

The bottom line is, comparing epoxies is a whole lot simpler than you may have originally thought. It's like comparing red and green apples, only one type tastes good. Don't be a thrill seeker, play it safe and take advantage of the modern technology advantages described above.

The advantages of modern technology have even been extended to replacement of dangerous solvent based two-pack polyurethane paints with

FIGURE THREE : **Rolled finish using Aquacote water based polyurethane marine paint.**

non-toxic water based polyurethanes, having better than equal weathering and wear performance to their old technology precursors. Figures three and four show a typical roller-applied paint job using BoatCraft's Aquacote water based polyurethane. No need for moon suits, respirators and masks for this job, anymore! Not only that you can achieve a high quality gloss finish by rolling and not having to worry about overspray and the inherent risks of playing with solvents as water is your thinners.

FIGURE FOUR : **Dolphin 12 built using Bote-Cote and finished using Aquacote.**

If you require further information on working much safer with epoxies and polyurethane paints, contact the team at DRIVE Marine Services on 02 9533 5470 or email at Bote.Cote@optusnet.com.au

Remember – 'There is no such thing as a silly question'. In addition, there is a wealth of information and examples of customers projects using Aquacote and other BoatCraft products at www.BoatCraftNSW.com.au