



# Dust free trimming, finishing and repairs made simple?

FEATURE

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**A few years ago if someone offered me extracted tools, saying that they could provide dust free trimming and finishing operations, I would have looked at them skeptically and thought to myself ‘really? I don’t think so’. A few years on and now I am the one on the receiving end of the incredulous looks and skeptical responses. That is until a short demonstration shows dust free operations are possible. Trying to convey in text what can be easily demonstrated in practice isn’t so easy, but it helps if we tackle the issues head on.**

The majority of composites that are processed are either carbon or glass thermosets, so let’s focus on these. Irrespective of the type of trimming and finishing operations and extraction used, the dust produced is highly abrasive. Contamination of any running equipment will just lead to high wear rates, be it bearings, gears or drive chains. When it comes to electrical equipment, carbon fiber dust is



Extracted 3 inch diamond disk cutter.

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conductive and can lead to shorting. Some believe that these issues are usual when dealing with composites, whereas others are unaware that equipment failures and increased maintenance are related to the process. When it comes down to the protection of personnel, inhaled dust is the key concern.

This is where our story started a few years ago. As a training and consultancy provider to the composites industry, we needed to better address the dust generated during our trimming and repair courses.

We thought ‘if we look hard enough, there will be an off the shelf solution that will make our life easier’. Many of our customers at the time were using air fed face masks and full coveralls to protect personnel performing the operations. However, breathable air can be problematic if not maintained properly and if the operator is protected, what about the work area and others within it?

Like most composite companies, we often end up modifying tools to suit our needs. As this was such a long term issue we assumed someone would have the solution readily available. No chance!

What we found were tool, extractor, abrasives and cutter manufacturers all provided solutions to parts of the problem, but they didn’t interact with each other and complete solutions were not readily available.

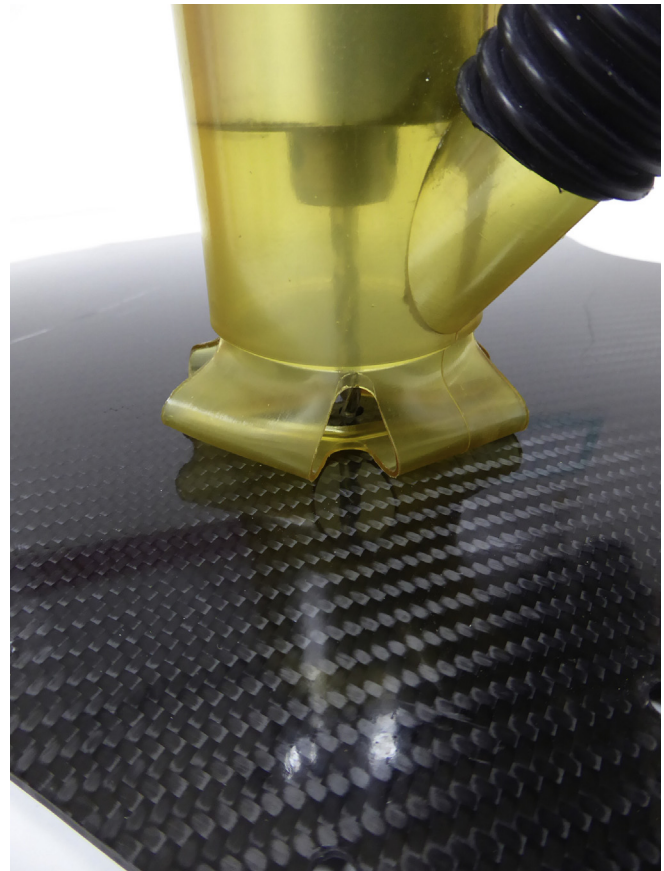
However, a number of manufacturers wished to work with us to address the problem, as it turned out that no company supplied extracted equipment specifically aimed at the composites industry. Before we knew it, we were conducting extensive equipment trials, having tools modified to meet our needs and using them in-house and on our courses. Customers then started to ask ‘Where



Free hand trimming with extracted air router.

can we buy these?’ and we now find ourselves selling equipment for trimming, finishing and repair of composites ‘dust free’.

Starting from first principles, ceramic materials (carbon and glass) and hard/brittle thermoset resins are best cut and trimmed by grinding the material away, as toothed/sharp edges tear the material and blunt quickly. Grinding of these materials results in dust projected from the grinding head which can become either a projectile or airborne. Projected material is easy to deal with, it’s heavy and based on trajectory, size and weight, will only travel a set distance before hitting the ground. There is very little risk of breathing in this material if it is aimed away from the operator. However, very small particulates, once thrown up into the air, can easily become suspended and are then airborne. Airborne dust is the main concern as it can be considered as possibly contaminated air. Although we worry about what we see as being the problem, it’s what *is* there that *we cannot see* that we really must address. Synthetic dust is not good for us, for example glass dust is an



Extracted air router with special fluted diamond cutter – The flutes pick up dust from the opposite side of sandwich panels.

irritant and some resins are hygroscopic, so we need to do something about it.

To overcome the issue, many companies resort to large extraction units connected to CNC machines, or booths/downdraft tables for manual trimming. The reality is that 80–90% of local exhaust ventilation (LEV or in simpler terms, extraction) doesn’t work because it is not used correctly. If you have this type of extraction in operation and the enclosure has a cloud of dust ever present, there is insufficient air movement to remove the dust from the air. Regardless of enclosure size, there must be sufficient clean air entering the enclosure at the rate it is being extracted, to ensure adequate airflow. To clean air via filters, the air must flow over the filter fast enough to carry the contamination, but slowly enough to capture it. If there is insufficient airflow across the cutting/grinding operation, stagnation occurs resulting in loss of extraction performance.

When it comes to on-tool extraction, the same is true; there must be sufficient airflow across the cutting/grinding head and through the shroud and extractor unit to capture the airborne dust generated. The problem here is that different tools and extraction shrouds require different levels of vacuum volume and pressure, but most extraction is fixed and not variable. For installed high vacuum systems this results in some tools performing well while others generate high levels of noise, sometimes even whistling at high pitch, making for a noisy, unpleasant work environment. Fixed speed extraction units may suit one tool, but then become very limited in further applications. The solution is to have an

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