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The Future of Spray-Up

By Wolfgang Unger

Innovation comes slow in the composites fabrication industry. Few want to be first. As much as I dislike to be told what to do by the government; the truth is that many of the improvements have been triggered by government mandate. Spray-up is still the best and the worst way to make fiberglass parts. In many cases it is the only practical method, especially for limited production runs, or if the parts are very large and complex. Since the process has been around a very long time, unfortunately not many people give much thought to improving it. It's easier to complain about OSHA,EPA, labor and material costs, rather than working on solutions. Human nature resents change; one manager told me bluntly that he was not interested in any new systems, since his boss would take the credit if it worked, and he would be fired if it didn't . When proposing a new method or material,the # 1 question I get asked is :who else is doing it? Don't get me wrong,, there are many open minds in this industry, and they make it all worthwhile

• *The use of re-enforcing fillers and recycled fibers*

When using fillers, many mistakes are made because cost per pound is the predominant issue in most peopleís mind. The real cost in fabrication should be evaluated in terms of cost per INSTALLED cubic inch. The most common fillers, calcium carbonate and calcium sulfate, do not contribute much to cost reduction; but at least the latter provides fire retardancy. On the other hand there are many materials that improve quality and/or reduce costs; but these are seldom considered because of that per-pound-cost mentality. When OEMs see a per pound cost of $12/lb for plastic Micro Spheres ,they think it is horrendous, I you take the time to figure it out, it is actually very reasonable. One percent by weight of plastic micro spheres can increase volume by thirty percent , additionally it will reduce component weight, reduce labor, improve impact properties, and reduce water absorbtion. Perhaps most importantly, in these environmentally vigilant times, it will also reduce VOC emissions. There are also natural fibers which can substitute for a percentage of expensive glass at one third the cost, with the added benefit of absorbing the styrene ,keeping it in the product and out of the air.

Another way to reduce waste and emissions is to reuse fiberglass trimmings, which now mostly end up in landfills and generate ever increasing disposal costs. .

One system uses recycled fibers mixed in resin some other materials and additives ,and sprayed with special equipment. This system will take as much as sixty percent recycled fiberglass. A simpler method is adding it as a dry material to the resin. stream. Here the maximum amount which can be used is about twenty-five percent. The benefits of recycling are disposal cost reduction, considerable laminate property improvements, especially in impact and fatigue, which should be very interesting to most boat manufacturers.

We are doing consulting business over most of the world, and we find that many times we can

use a low cost local material. In Egypt we can use sand; we also use sand in Yugoslavia and other places. There are organic materials available in some places of the world which we incorporate in the fiberglass with out any detriment to performance, but reducing cost and weigth.

• *Sandwich Construction*
Something else which is not sufficiently utilized is sandwich construction. There is very seldom any need to have a half inch laminate. In many cases, using two eighth inch laminates with a low weight, and/or low cost core can perform the same or better.

• *Gelcoat Alternatives*
One of the solutions of the styrene problem would be to eliminate gelcoat (which accounts for roughly half of the VOC"s) ,by replacing it with a thermoplastic skin. Let me add here that I believe that the health risks of styrene are overblown; however the risk to the atmosphere has not received adequate attention.

Eliminating gelcoat would also increase the speed of production; reducing roll-out of the laminate witch in itself releases much VOC's' in the air. Replacing gelcoat with a formed acrylic skin improves the product because of acylic's UV resistance characteristics, an acrylic skin will keep its gloss, and is easy to repair if damaged, since it is thicker. Mold turnaround for an eighteen foot boat, now at about six to eight hours in the mold, would be reduced to about two hours. Ninety percent of the repair work and touch-up that has to be done in producing gel coated parts would be eliminated; this has been proven in the whirlpool/bathtub and spa industry which is virtually all acrylic now, and has solved almost all its problems of blistering, osmosis and chalking. Genmarís new VEC process is certainly the most ingenious; the concern is that in the long term it might result in an even more highly concentrated industry; which is not necessarily good. It might reduce innovation in design, and eliminate small scale producers, unless spray-up manufacturers open their minds to innovation. Irvin Jacobs is one farsided industry leader who has taken big risks in support of new technology.

• *Innovations*
Forming a thermoplastic sheet and then reinforcing it will work for boats under forty feet. For real big yachts, gel-coat,or at least a base coat will be hard to replace. Then again it is possible to use a barrier coat containing glass fibers. This can be applied over the gel coat as soon as the gel-coat has started gelling. The skin coat can be cured in ten minutes, which allows for the built coat to be done rapidly. This also eliminates a lot of rework to repair surface defects. For painted parts,it can replace gelcoat.

There is also a need to give more attention to training ,which I think is as important as the willingness to invest in machinery or equipment.
There are two innovations I can envision:
The first is a combination of the VEC process with a thermo plastic skin.
Secondly, a combination of spray-up and vacuum infusion can be used. By using micro spheres the resin demand can be reduced by up to thirty percent, depending on the strength required. Generally ,a half percent loading with micro spheres does not diminish the strength of the laminate, since it improves resin flow , eliminates resin rich areas and voids.

• *Summary*

As regulations get tougher, resin infusion and RTM will become more efficient. Unless these companies which practice spray-up improve their methods, the process will be marginalized to prototyping and one- up construction. On the bright side I know that the process can be modified to get under twenty PPM VOC emissions without to much difficulty. It already has been shown that roll-out can be reduced which allows faster gel times, thus reducing emissions. The new generation of spray guns with low pressure and very little atomization,are are a step in the right direction. And by using the right fillers and reinforcements, VOCs can be reduced even more. Most of the remaining fumes can be captured at the source rather than exhausted to the atmosphere. In other words, the solution is in using good old American ingenuity, not in moving the production off-shore. This by the way is becoming more difficult, because other countries donít want their environment ruined either. At this time i am doing more ecological work in South America and Asia than in the United States. Reducing roll-out helps with the labor problem. In some cases we have reduced labor by sixty percent and process time by seventy percent. This also reduces mold investment and frees floorspace.

The future of spray up is not as bleak as many people believe, material and equipment manufacturers have made much progress in the last few years; with cooperation between material suppliers, equipment manufacturers and builders, more can be achieved.

To paraphrase Winston Churchill: Itís amazing what can be accomplished if you donít care who gets the credit.

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