The Composites Letter

www.vacmobiles.com BETTER VACUUM SYSTEMS FOR BETTER COMPOSITES Issue 12

Vacuum systems for tough times

Recognizing that now is not the time for expensive bells and whistles, our recent focus has been on developing simple and reliable vacuum systems which deliver high quality vacuum for composites applications without fuss and at reasonable cost. For 2010, the 20/2 vacuum system we introduced in 2007 has been toughened up and made even easier to use. We are also close to releasing a modular family of bigger brothers for the 20/2 – called the SVM series. Our RT19 resin trap is going modular, too. With the release of the SVM series and the modular RT19 resin trap, we will be able to offer an unsurpassed range of heavy duty vacuum equipment which will meet virtually any vacuum need in composites without having to buy more than is required to do the job.

Composites industry super sucker! Vacmobile SVM series coming soon... See page 4

More choices for RT19 resin trap. See page 8

Win an absolute gauge!

Our big new machines are called the SVM series. Correctly guess what the initials SVM stand for and go in the draw to win an absolute pressure gauge - a very useful tool if you are serious about vacuum. Entries close on 14 August 2010.

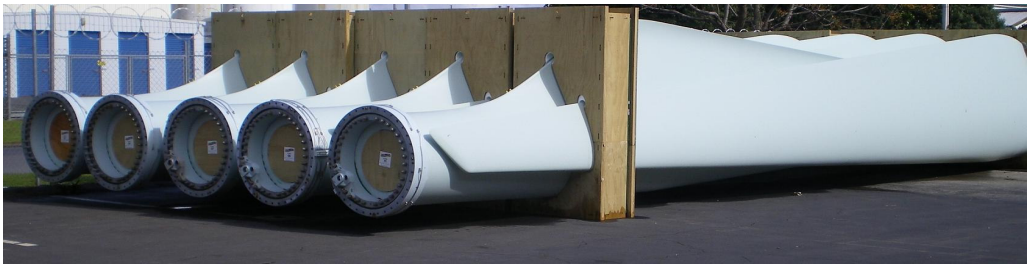
Email your entries to info@vacmobiles.com

Vacman's tip of the month See page 7

In this issue

Better training for better quality and more profitable composites

When seen on U-Tube, the infusion of small flat panels using a converted refrigeration compressor and an unshielded glass jar for a resin trap looks deceptively simple (and dangerous!). In the real world of commercial composites, the process isn't that simple and many details must be correctly implemented before the bag can be stripped from a void-free part, with minimal resin wastage, no rework and definitely without injuries from imploding resin traps! Getting the details right either takes experience or training and even the experienced usually benefit from being exposed to new materials, equipment and methods in the rapidly evolving composites industry. With the aim of improving the vacuum processes in composites, we asked Chris Rose of Island Composites to present his views on training. Chris specializes in introducing composite processes to large scale manufacturing facilities and his comments may be found on page 2.



Better training for better quality and more profitable composites

By Chris Rose, Island Composites

For over 25 years I have worked within the composites industry globally. For the past 10 years I have specialised in technology transfers for companies such as GE Wind Energy and delivered training programs for the manufacture of wind turbine blades. Over the past 5 years the wind industry has grown considerably. Training has been a critical part of the industry's development, as blade manufacturers have commenced operations in regions where the composites industry has not existed previously. Large buildings taking up quarter mile blocks are evident in areas of the USA from the Dakota's through Iowa and Nebraska to name just a few states. These start-ups grow quickly. Within 18 months up to 500 staff can be employed working 3 shifts, seven days a week to keep up with blade demand. In areas new to composites the training of new staff must be a key part of the start-up process. At companies such as MFG (Gainesville, Texas and Aberdeen, South Dakota), internal trainers have been assisted by independent companies such as my own, as independent trainers can often add fresh insights to the training process. Composite understanding can start with a basic introduction to fibreglass, cores and resin and how the materials may be integrated to form the light weight structural product necessary for large scale wind blades. My course progresses onto correct material handling and placement and the use of resin and consumables. Hands on infusion and wet-lay-up follow, along with basic composite repair. Progression is quick from making test panels through to full size production blades – typically 40 metres (131') in length. In my view, training should not stop with the hands-on staff. Special attention needs to be given to QC/QA and engineering, as a practical understanding of composites cannot always be gained by reading literature and undertaking degrees! A typical in-house training program covers:

- Material handling
- Infusion and bonding
- Trim and finish
- Coatings
- Quality inspection
- Basic and advanced repairs
- Production write–ups
- Engineering and production support.

On a green-fields site, such a training program can be expected to take about 3 months, with some further time required to develop additional specialist hands-on skills such as trimming and complex repairs. Given good communication between the trainer and the company, the training program provides a good opportunity for the performance of key staff, such as leading hands and shift supervisors, to be independently assessed. Training can also cover important areas such as the hazards specific to the materials used and general health and safety in a composite manufacturing facility. Unless a start-up company already has considerable in-house composites manufacturing experience, the employment of an independent trainer should be considered prior to start-up so that advice can be sought on areas such plant layout and equipment selection.

The writer, Christopher Rose, appears third from left. Photograph courtesy of the Molded Fiber Glass Companies, USA.

From wide ranging experience a good trainer will know what works and what doesn't! As examples, two critical equipment selection areas from my personal experience have been vacuum systems and dust containment. These items of equipment must be robust, user friendly and completely dependable when making high value parts. For these critical areas, I would recommend Vacmobile vacuum infusion systems (*of course! Editor)* and Nederman dust extraction equipment. Both manufacturers have shown durability and consistency of quality over many years.

From aerospace to marine and wind energy, I am convinced that pre-start-up advice, followed by structured training is a cost effective way to avoid the high cost of scrap parts and to significantly shorten the ramp-up time to full production. This applies to both green-field start-ups and transitions from wet-lay to infusion. In-house structured training programs will reduce manufacturing costs, improve quality, reduce product liability costs and deliver improved health and safety for the workforce.

For more information, contact:
www.island-composites.com
www.moldedfiberglass.com
www.nederman.com

"Luck is what happens when preparation meets opportunity."
Seneca—Roman Philosopher

R2D2 now making composites in over 30 countries

More than one of our customers around the world refers to his Vacmobile 20/2 as R2D2. We are not quite sure what the connection is, but we assume they find their 20/2 a useful little fellow to have around! Anyway we are pleased to report that our R2D2's, sorry Vacmobile 20/2's, are now in use in more than 30 countries. Since we didn't begin exporting until 2007, we are gratified with the rapid acceptance of our innovative vacuum systems for composites. Applications have been as diverse as radio controlled model hawks (for scaring birds from airports), to large wind turbine blades, Americas cup race winning yachts and high performance naval patrol craft. Consistently positive feedback from users confirms that the Vacmobile 20/2 is an exceptionally tough little workhorse, delivering great vacuum up to 7 days per week in composite shops around the world.

If any reader has another pet name for his/her 20/2, please let us know...

FEDEX makes the world a small place for Vacmobiles — 3 working days delivery to most countries

We appreciate that New Zealand is a physically a long way from the bulk of our customers but, from a time perspective, we aren't really that far away at all. Here's an example. We received an order for a Vacmobile 20/2 from Sanford Vocational School, in Maine, USA, on Friday, April 30th. We assembled the machine to their specification on Friday afternoon and completed predelivery testing over the weekend. We packed the machine on Monday morning and dispatched it via FEDEX on the afternoon of Monday, May 3rd. The machine was delivered to the school at 10 am on Wednesday May 5th. While this transit time is fairly typical to most parts of the world, the school's comment on the delivery time was, "Delivery of this machine was quicker from you than most companies I deal with so.... thank you!"

"Delivery of this machine was quicker from you than most companies I deal with so.... thank you!"

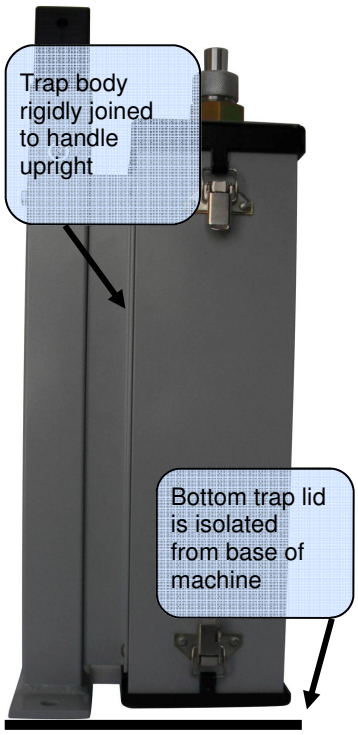
Moral of this little story: if you are a potential Vacmobile customer but are concerned about our remoteness, please don't be – with our FEDEX delivery service we are not much further away in time than across town!

Vacmobile 20/2 – better than ever

We introduced the Vacmobile 20/2 at the IBEX boat show in Florida in late 2006 and commenced exporting the machine early 2007. The initial response was pleasing but even more satisfying has been the significant proportion of early customers who have come back to buy additional machines. We have also been pleasantly surprised at the size of the parts made with single 20/2's. Experienced infusers now routinely use the machine on bag areas over 100 m^2 (1,075 ft^2) and some bags as large as 200 m^2 (2,150 ft^2). While happy that our first machines have performed well, we have seen ways to make improvements and the 2010 model of the Vacmobile 20/2 includes the following enhancements:

A tougher mounting for the resin trap

The resin trap body is now supported off the main handle upright. This is a much sturdier design and the bottom cap latches cannot be strained by impacts on the trap body. Please see photo below.



Please also note that we have an upgrade kit for earlier machines which achieves the same effect. The upgrade kit is available free on request. Just email info@vacmobiles.com, advising your machine's serial number and your delivery address.

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Ultra low cost leak detection

Can't afford an ultrasonic leak detector to locate vacuum bag leaks? Just throw in a teaspoon of sugar before sealing up the bag and watch where the ants crawl in …

PS.
Don't take this seriously!

(Continued from page 3)

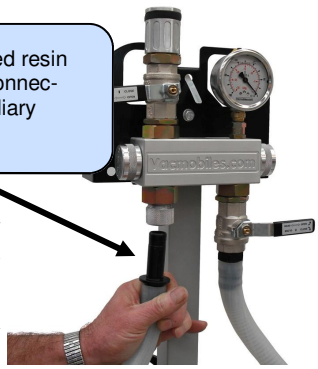
Vacmobiles 20/2—better than ever

An optional solid glass lid for the resin trap

Accepting that the catchpot capacity in the 20/2 machine is relatively small at 2 litres (4 US pints), the new glass lid is good for peace of mind when the machine is used to infuse larger parts. In conjunction with valves or clamps in the vacuum lines to the resin trap, it is now possible to see the resin level and empty the catchpot if need be during the course of an infusion, with minimal disruption to the process if the valves/clamps are correctly sequenced.

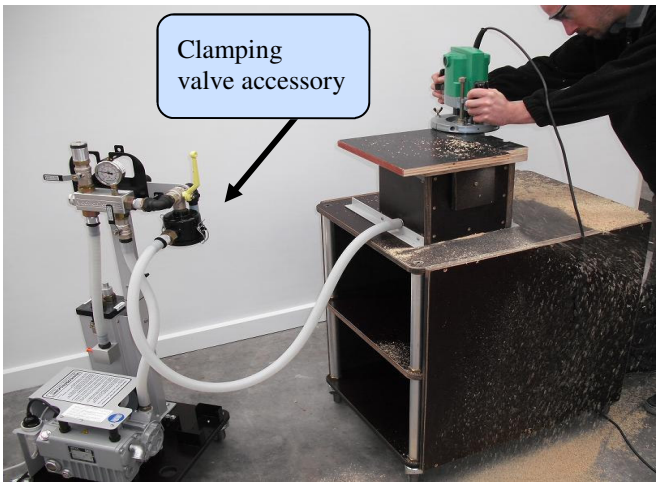
An O-ring sealed connection between the main control manifold and the resin trap

This is easier to use and seals more reliably than the camlock connection previously used. It is a modified version of our 19 mm (3/4") O-ring sealed gland and it can also be a convenient vacuum connection for a 19 mm (3/4") vacuum line to a remote mounted resin trap.



Improved clamping valve accessory

This is used for vacuum clamping or holding applications where it is useful to be able to quickly apply or release vacuum. For example, when you wish to securely hold a part while having 360^0 access to all edges for copy routing.



New modular Vacmobile SVM series — the super sucker for big infusions & RTM Light

Single 20/2 machines have successfully infused bags as large as 200 m^2 (2,150 ft^2). However, we have had several requests for a larger machine, ideally with 2 independent pumps and a larger resin trap. While multiple 20/2 machines can easily be applied to large resin infusions or pre-pregs, a bigger machine could be more appropriate where large and/or high value infusions are the norm, as in plants making large wind blades, or boat hulls. Combining the requirement for a bigger system with the lessons learned from development of the 20/2 machine, we have designed a new modular vacuum system. This can have either 1 or 2 pumps - of various capacities - and 1 or 2 of our RT19 resin traps. The new series of machines are known as the Vacmobile SVM series. The basis of the series is a sturdy mobile docking station. One or two vacuum pumps can be slotted into the bottom level of the machine and 1 or 2 resin traps slotted into the upper level. Both pumps and traps can be quickly fitted or removed at any time – without tools - making pump servicing quick and simple.

The docking system also allows remote location of the resin trap(s) which might be convenient when working on large parts. The docking station and pumps can be left at floor level and the resin trap – complete with its vacuum controls - can be elevated close to the point of use.

With twin vacuum pumps and 1 or 2 resin traps, the SVM machine will be ideal

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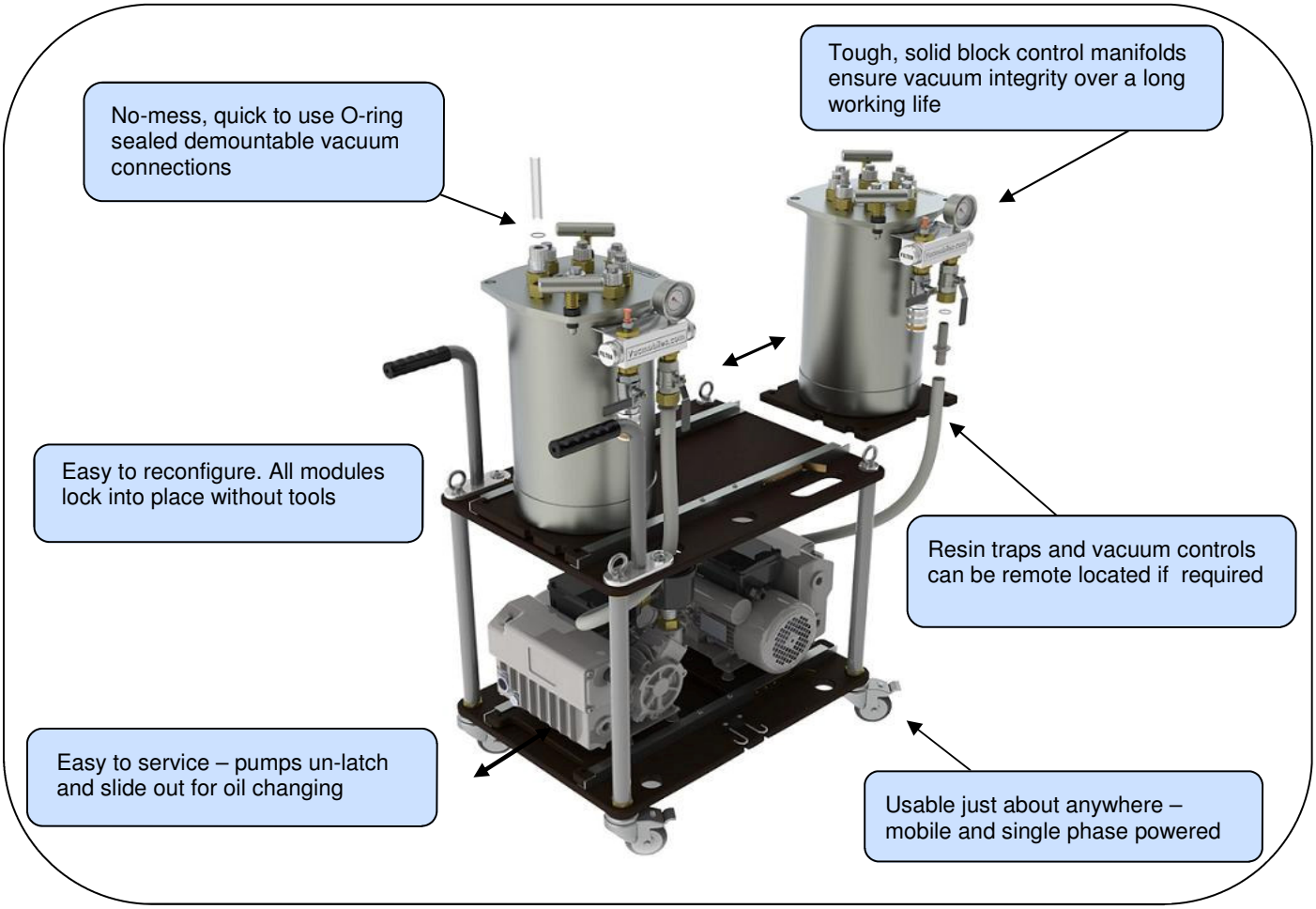
Vacmobile SVM Series

for large scale infusions and will offer a maximum pump capacity of 56 m3/h with single phase 50 Hz power, or 39.5 cfm with 60 Hz power. This is approximately 3 times the capacity of the 20/2 machine. With a 2 pump/2 trap SVM system, each resin trap can be individually controlled to run at its own vacuum level. The twin pump/twin resin trap machine will therefore also be ideal for large scale RTM Light applications. Please refer to illustrations on page 6 for examples of various module combinations.



Vacmobile SVM series benefits

- Modular design – select what you need for your process and part size
- With twin pumps, pump redundancy is built-in for critical projects
- Suitable for large scale resin infusion and RTM Light (with twin pumps/twin traps)
- Simple pump replacement and easy access for servicing – just slide and lock (no tools required)
- Trap(s) can be remote mounted and vacuum controls move with the traps – again, no tools required
- Up to 16 O-ring sealed connections possible – ideal for manifolding a large number of vacuum lines
- Rugged construction and excellent vacuum integrity over the long haul
- Mobile, compact and runs off single phase power. Use just about anywhere and be ready to go within minutes
- Cost effectively priced in relation to versatility and vacuum performance.

Production examples of SVM series machines should become available early September.
Order now for soonest delivery.

(Continued from page 5)

SVM Configuration examples

1 pump and 1 resin trap

2 pumps and 1 resin trap

2 pumps & 2 interconnected resin traps

Database for surplus Vacmobile 20/2

From time to time, we get asked by training schools and keen hobbyists if we have any used machines available at a reduced price. Rather than get involved in the used machinery market we would prefer to facilitate the sale of used Vacmobiles by directly introducing prospective buyers to customers who have surplus machines, or to customers who would like an opportunity to sell their current machine and upgrade to the latest model Vacmobile. Any customer with a Vacmobile 20/2 wanting to sell or upgrade should email info@vacmobiles.com.

A door-to-door vacuum cleaner salesman goes up to a new house. He knocks on the front door. A lady opens the door. Before she can say anything, he runs inside and dumps cow pats all over the carpet. He says, "Lady, if this vacuum cleaner doesn't do wonders cleaning this up, I'll eat every chunk of it." The lady of the house smiles and says, "You want ketchup on that?" The salesman says, "Why do you ask?" She says, "We just moved in and we haven't got the electricity turned on yet."

Pump service reminder
(Applies to most oil sealed rotary vane vacuum pumps – not just Vacmobiles)

As with human beings, all oil sealed rotary vane vacuum pumps respond well to a bit of love and care from time to time and we recommend the following service program. Pump service shouldn't take much time nor be expensive if performed every 500 operating hours – or whenever the pump oil gets noticeably discoloured.

Routine service

Run the pump at maximum vacuum for at least 1 hour to get it up to maximum temperature.

While the pump is still running, use a compressed air gun to blow dirt and dust from the pump and motor external surfaces, especially at the motor fan end, where the dust tends to accumulate – but don't poke the air gun

nozzle into the moving motor fan! Now turn the pump off and disconnect the power cord. Lock the castors outwards as shown and elevate the handle end of the machine on a wooden block, stack of books or similar. A block height of 150 to 200 mm (6" to 8") will be fine.

Undo the oil drain plug and drain the oil into a shallow container which can safely hold at least 0.5 litre (1 US pint) of oil.

To loosen the drain plug on machines equipped with the PVR EM20/B vacuum pump, you will need a 22 mm (7/8") AF wrench or socket. For machines equipped with the Becker U4.20 pump, you will need an 8 mm (5/16") Allen wrench. The drain plug on the Becker pump can be tight.

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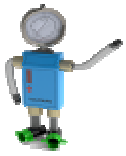


Vacman's tip of the month. What is absolute pressure?

More and more composites professionals are including an absolute pressure gauge in their tool kit. Although often called a precision vacuum gauge, an absolute gauge actually works the opposite way to a vacuum gauge. The conventional dial type vacuum gauge measures the pressure difference below the atmospheric pressure surrounding the gauge. In contrast, an absolute pressure gauge measures the actual pressure above the absolute zero of pressure. Using the absolute zero of pressure as a reference leads to far more accurate readings at the vacuum levels of interest for high quality infusion and pre-preg laminating. This is because the absolute zero of pressure is a fixed point of reference regardless of any environmental factor. In contrast, the atmospheric pressure reference point of the dial type vacuum gauge varies surprising widely with changes in weather conditions and much more widely with changes in altitude.

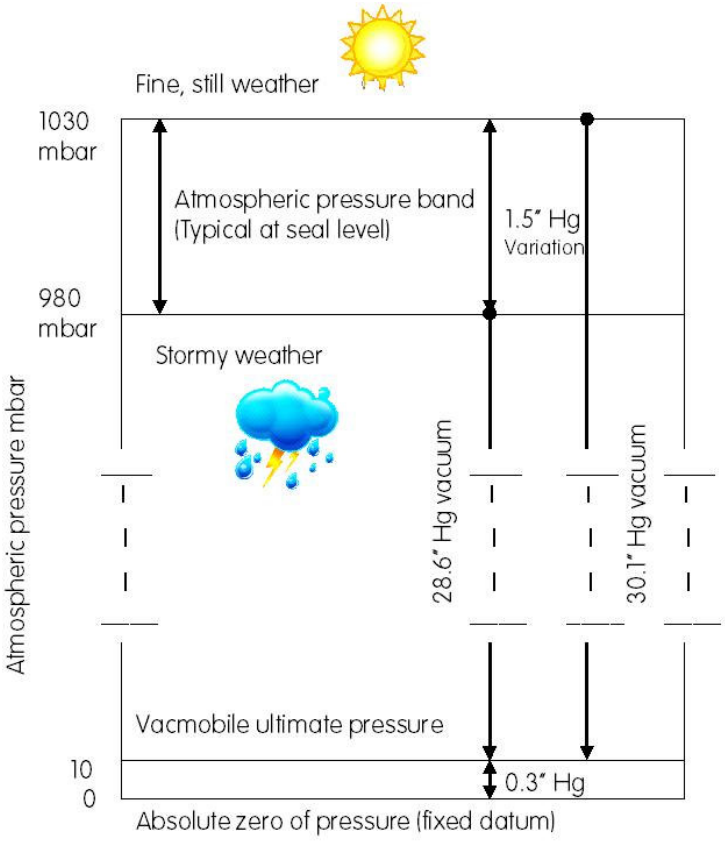
There are several measurement units used for absolute pressure, but a very handy one for the composites industry is the millibar (abbreviated mbar). The mbar is one thousandths of a bar, or about one thousandths of atmospheric pressure at sea level on an average weather day.

Average atmospheric pressure at sea level is approximately 1013 mbar. In practice, atmospheric pressure at sea level will vary from about 980 mbar to about 1030 mbar, but pressures below 900 mbar have been recorded in the eyes of cyclonic winds and over 1080 mbar has been recorded under very still and cold conditions. At the summit of Mount Everest atmospheric pressure averages about 300 mbar.

> Incidentally, absolute pressure gauges are excellent barometers – every serious fisherman should have one!

Why is this important to the composites industry? The reason is that a good quality oil lubricated vacuum pump suitable for high quality vacuum infusion or pre-preg work will achieve an absolute pressure in the range of 10 mbar to 20 mbar above the absolute zero of pressure at the pump. It is not uncommon for this type of pump to achieve absolute pressures in the bag in the range of 20 to 30 mbar. If we want to confirm that a bag has been evacuated to this degree of vacuum, the gauge used needs to be accurate in this region. This is asking the impossible of a conventional vacuum gauge which will experience inaccuracies of at least ±25 mbar from weather variations alone, plus variations due the accuracy of the mechanism within the gauge – typically between 1 and 3% of full scale, perhaps another ±30 mbar. It will be apparent that a vacuum gauge with a total accuracy of ±55 mbar is not an appropriate instrument for measuring an in-bag vacuum of 10 to 30 mbar. With reference to the diagram and ignoring the effect of inaccuracy arising from the gauge mechanism, it can be seen that on a "good" day the vacuum pump will achieve a vacuum of 30.1" Hg and on a "bad" day it will achieve only 28.6" Hg. In fact, the pump is not having good days and bad days – it's the weather that is causing the changed reading. You will see that the variation between a good day and a bad day is 1.5" Hg, which is far more than the 10 mbar (0.3" Hg) we are trying to measure.

For accurate in-bag vacuum measurement (I should say pressure measurement!) you need to use an absolute pressure gauge. This is typically an electronic digital instrument such as our GDH200 gauge, one of which we are offering as a prize this month. (See front page.). Another complicating factor and another reason for understanding the meaning of absolute pressure is the effect of moisture retained in composite materials. I'll talk about this in a future issue newsletter, if our editor allows any more of this boring technical stuff, or you can email Vacman at info@vacmobiles.com for information about water vapour in composites.



RT19 resin trap goes modular, too

Our RT19 resin trap has proven to be a very effective resin trap. The 12 litre (3.1 US gallon) disposable catch-pot makes cleaning easy, while the clear glass (not acrylic) view-port in the lid provides peace of mind when infusing. The O-ring sealed vacuum connections on the trap lid provide quick and reliable vacuum seals (without need for mastic!) and its on-board vacuum regulation valve and vacuum gauge allow complete vacuum control at the resin trap. Inevitably, all these features come with a cost that is not always warranted. In future we will assemble the RT19 resin trap from a wider range of component options, starting with a basic steel lidded resin trap with an O-ring sealed side port vacuum pump connection but without base, castors and the glass view-port in the lid. The most complete specification version will include base and castors, full control manifold, glass view-port in the lid and up to 8 O-ring sealed vacuum connections (in mixed tubing sizes if required). Note that even the simplest options include the heat resistant disposable catchpot and the O-ring sealed tubing connections, as we consider these critical elements of an effective resin trap. Examples of the range of assembly possibilities for the RT19 resin trap are illustrated.

Basic steel resin trap lid with up to 4 O-ring sealed tubing glands, but without glass view-port

Trap body with compact side port. With pump isolation valve, air bleed valve & gauge, but without vacuum regulation valve.

Machined aluminium lid with up to 8 O-ring sealed tubing glands and 75 mm (3") glass view-port (protected on both sides with disposable clear PVC shields. Easy-to-use "Twist –Lock" handles built into lid.

Trap body with full control manifold, including vacuum regulation & gauge.

Most basic trap body with 19 mm O-ring sealed pump connection port. No pump isolation valve, vacuum regulation valve or vacuum gauge & no base or castors Ideal supplement for Vacmobile 20/2

Full specification RT19

(Continued from page 6)

Pump Service Reminder

For PVR pump use 22 mm (7/8") AF wrench

For Becker pump use 8 mm (5/16") Allen Wrench.

To loosen the plug, give the end of the wrench a sharp tap with a hammer, as shown. Do NOT use an extension pipe on the Allen wrench, as excessive torque may rupture the rubber vibration isolators.

After draining the oil, remove the temporary block from under the handle end of the machine. Clean and replace the drain plug. For the pump models fitted to the Vacmobile 20/2, refill the pump with 0.5 litre (1 US pint) of oil. The recommended oil for operation between 10^0C and 40^0C (50^0F to 100^0F) is Shell Tellus 68 or direct equivalent. Tighten the oil filler plug.

More extensive service

A more extensive service will be required if one of the following applies:

- Machine running time has reached 2,000 hours
- The motor overload switch turns the pump off unexpectedly (but first check that electrical supply voltage is normal and power cord in good condition and not excessively long)
- The oil discolours rapidly after an oil change.

The more extensive service requires the oil mist separator to be replaced. This is a fine filter in the exhaust box of the pump. For instructions applicable to the particular pump model fitted to your machine, please refer to the instruction manual supplied with the machine, or visit http://vacmobiles.com/service1.html or email info@vacmobiles.com for further advice.

Other pump service at this time includes cleaning or replacement of the gas ballast filter (also described in the instructions) and a general inspection of the pump, including the cleanliness of the oil sight glass and the condition of the pump's rubber feet.

… Parting words from Tennessee Williams

A vacuum is a hell of a lot better than some of the stuff that nature replaces it with.

About Vacmobiles.com

The Composites Letter is published by Vacmobiles.com Limited. The company is based in New Zealand, which has a well developed composites industry, especially for marine applications. Vacmobiles.com is dedicated to the design and manufacture of world leading vacuum systems for the composites industry, and its team has more than 20 years experience with the application of vacuum to composites. As a major user of FEDEX, the company is able to offer an excellent delivery service world-wide. For most countries, Vacmobile systems can be assembled to customer requirements and delivered into store within 1 week of order.

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