

Ramon "Ray" Alban on How To Test Wind a Rubber Motor

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Ray Alban in England is one of the more amusing writers around when it comes to describing his modeling adventures or giving advice to those who ask questions. He's informed, and he's entertaining. He loves his adventures with his fellow "Rubber Bandits". Many of those "Rubber Bandits" are good friends to various SCIFs. So here's an entertaining piece from Ray answering a fellow who wanted to know if there was a formula detailing the number of turns per inch you could put in a rubber motor.

Ray disillusioned him gently. I'll let Ray take it in his own words from here. "Hi Marcel, I assume that you ask the question because you either don't want to break a motor or you want to fly your model at the ragged edge of its flight envelope. Rubber is so variable that you could get caught out by a table suggesting "X" turns for (say) a 45 inch, 16 strand motor of 1/4 inch width only to find that you get a batch of rubber that is a little thicker and it stresses out sooner than expected, and you burst an otherwise perfect motor, which just needed less turns, and you get to form your own splinter group in the process. (Ed. Note: Carl Bakay wrote an extensive article on his experience with a 10 pound box of Super Sport rubber and found a considerable variation in strength of each pound.)

So try this. Don't worry about the maximum turns. YET! Set up your new motor in a winding stooge (sans model) and with a marker peg on the ground to indicate the length of the model fuselage. Lubricate the motor well and with your full winding gear attached including torque meter, stretch out the motor as far as you dare.

2 times is cowardly 3 times is ok but won't give the best result. 4 times is most people's "fear factor" point. 5 times is brave but possible. 6 times is foolhardy. 7 times doubles for a vasectomy operation. (i.e. stretch to 2-7 times the unstretched length, Ed.)

Be Brave!! As you walk backwards start winding and keep winding steadily at your chosen stretch limit until the motor starts to pull you in. That is the tipping point and will approximate to a little over half the possible turns you can get on this motor. Be sensitive to this level of PULL.

Walk in very slowly, winding without hesitation and just allow the motor to dominate the proceedings, pulling you in steadily. Don't stop coming ~ don't come in too fast. Let the motor tell you what to do. Be sensitive to it. When the prop/winding hook reaches the marker peg the motor will be ROCK HARD and you have also reached the (your) maximum. You are allowed to indulge in two methods of stress relief. Prayer and heavy breathing.

Now divide the number of turns by the length of the unwound motor in inches and - Bingo - turns per inch. Some observations/warnings: Be prepared for the odd breakage, but if the motor is WELL lubricated it should not, because you did not let it. (you let the motor do the talking, it was well lubricated and you did everything SMOOTHLY)

It's best not to do this test inside the model but use a blast tube if you do. Because you used a torque meter, note the torque at full turns. This is a good indication when you wind a similar motor that you are at, or approaching the maximum. Also when you have a model trimmed to handle a particular level of torque, banging in more torque will lead to problems and more splinter groups. It may be that you prefer not to do this test. Nobody will hold that against you, but think of the fun you are missing." Well Ray polished that question off in his usual fine style.

But then he got a second question: *"But the motor has been pulling me in the whole time! How do I tell when it has started to pull me in? Is this a subjective judgment? A wild eyed guess? An hallucination?"*

Well a question like that to Ray is like a "gopher pitch" for a big league hitter. When he sees, it's he's going for the wall! Qouth Ray, "I don't believe so! With a 16 strand 1/4 inch motor you will know when it starts to pull you in. Be Brave, stay out there and you will just know when the motor really pulls. The same deal with a 10 gram coupe motor you just know, 'cos it does. Mind you I weigh 260 lbs so the motors have a rough deal.

Next question, *"When is one turn short of breaking?"* Ray's answer? "When is one turn short of breaking? Just before the rubber breaks, it crystallizes and becomes rock hard. You can judge by squeezing the rubber. Just when the last molecule crystallizes is hard to judge, but maybe very hard is hard enough. I believe that my most common cause of broken motors in the past has been due to poor lubrication, and the basis of my observation is when I fully stretch a NEW motor I use a wetter lube and some of the moisture has disappeared when it is returned to normal length. I use soft soap and glycerin mixed in water as my lube, so it's real easy to thin down the lube with some water. Where has the moisture gone, No, not evaporated, but ABSORBED into the porous microstructure of the rubber. It's a subtle loss but it is observable and I have this theory that the wet lube carries with it the lubricating properties of the soap and glycerin and all those internal rubber molecules are helped in rubbing along together. AS WELL AS externally too.

Think about it this way. If you pile a load of turns on a dry-motor it will break long before it goes rock hard. The main cause is chafing; the secondary cause is lack of external lube and if you want to extend the number of turns why not try for some internal lubrication too. Some lubes don't thin so easily. For example, castor oil and silicon - methinks - would be inclined to stay on the surface as might lanolin. None of the above is proven science, just empirical observations."