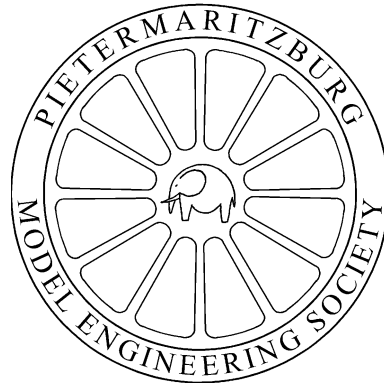


# *Maritzburg Matters*

November



2018

PIETERMARITZBURG MODEL  
ENGINEERING SOCIETY



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**Club Meetings-** **General Meeting:** Third Monday of each month at 19H45 at Halley Park. Visitors welcome  
**Running Day:** First Sunday of each month  
**Committee meetings:** First Monday of each month  
**Work Day:** Saturday following the General Meeting

**Web Page-** [www.pmes.co.za](http://www.pmes.co.za)

**Facebook-**  Find us on Facebook (Pietermaritzburg Model Engineering Society)

**GPS co-ordinates-** 29.5833° S, 30.4167° E

No responsibility is taken by the Society for any subject matter in this Newsletter other than official Society notices.

One more running day till Christmas, I can't believe how quickly this year has gone! At the last running day we pulled one passenger less than the previous month, quite a good record for passenger hauling this year so far. Fortunately some of our visitors are starting to park in the outside parking area as the inner seems to be filling up more than in the past, this is a much more convenient solution. The areas behind the tunnel seem to be becoming much more popular for the picnickers, this is also a much preferred solution as the numbers of picnickers also seem to be increasing. We have not allowed any cars into those areas, this seems to be the best option. The area beyond the bridge is still under-utilized and is, to me, the most attractive area, potential users would have to carry their bits and pieces a little further, maybe this needs to be encouraged?

We have ordered the bricks to begin the station paving project, keep your ears open for the calls for volunteers!! The new boiler for Brutus is on the make, hopefully this won't take too long, a few details still to iron out.

Another project that has hit the projects awaiting list is that of the new compressor house. We have moved all of the flammables from the workshop to the new fuel store, many thanks to Dave Tanner, Ray Teichmann and other assistants for the very efficient completion of this project. This then leaves the compressors that need to be moved, the workshop will then be able to take its final configuration and allow for a much safer and ergonomically efficient workshop in which we hope more people will take part. There have been a few small changes made already!

Our Christmas Dinner is scheduled for Saturday 1<sup>st</sup> December at 5.30 pm for 6.00 pm. This will be the same as last year with a sheep on the spit with salads and bread rolls. There is no cost to members, but please ensure that you have your names on the list by the November general meeting, this is essential for catering purposes!! Last year's event was the best yet, the mutton was to die for!

During this past year we have been very successful in attracting new members, this is where the strength of any club lies ..... members are the

heartbeat, not buildings, etc...! As usual, we are looking for comments and suggestions to make the Club more attractive to us, as well as to prospective members, please let's have some!

## **Understanding grinding wheel fundamentals**

Joe Sullivan

The grinding wheel is a cutting tool, in a grinding wheel, the abrasive performs the same function as the teeth in a saw, but unlike a saw, which has teeth only on its edge, the grinding wheel has abrasive grains distributed throughout the wheel.

### **Abrasives—Grits and Grains**

Grinding wheels and other bonded abrasives have two major components - the abrasive grains that do the actual cutting and the bond that holds the grains together and supports them while they cut. The percentages of grain and bond and their spacing in the wheel determine the wheel's structure. The particular abrasive used in a wheel is chosen based on the way it will interact with the work material. Each abrasive type is unique with distinct properties for hardness, strength, fracture toughness and resistance to impact. Aluminium oxide is the most common abrasive used in grinding wheels, it is usually the abrasive chosen for grinding carbon steel, alloy steel, high speed steel, annealed malleable iron, wrought iron, and bronzes and similar metals. Each abrasive type carries its own designation, usually a combination of a letter and a number, these designations vary by manufacturer.

Once the grain is known, the next question relates to grit size. Every grinding wheel has a number designating this characteristic. Grit size is the size of individual abrasive grains in the wheel, higher numbers translate to smaller openings in the screen the grains pass through, lower numbers (such as 10, 16 or 24) denote a wheel with coarse grain. Higher numbers (such as 70, 100 and 180) are fine grit wheels. They are suitable for imparting fine finishes, for small areas of contact, and for use with hard, brittle materials.

### **Buying Bonds**

To allow the abrasive in the wheel to cut efficiently, the wheel must contain the proper bond. The bond is the material that holds the abrasive grains together so they can cut effectively, the bond must also wear away as the abrasive grains wear and are expelled so new sharp grains are exposed. There are three principal types of bonds used in conventional grinding wheels. The

type of bond selected depends on such factors as the wheel operating speed, the type of grinding operation, the precision required and the material to be ground. Most grinding wheels are made with vitrified bonds, which consist of a mixture of carefully selected clays. Grinding wheels made with vitrified bonds are very rigid, strong and porous, they remove stock material at high rates and grind to precise requirements, they are not affected by water, acid, oils or variations in temperature.

The strength of a bond is designated in the grade of the grinding wheel, the bond is said to have a hard grade if the spans between each abrasive grain are very strong and retain the grains well against the grinding forces tending to pry them loose. A wheel is said to have a soft grade if only a small force is needed to release the grains. It is the relative amount of bond in the wheel that determines its grade or hardness.

Hard grade wheels are used for longer wheel life, and for jobs with small or narrow areas of contact. Soft grade wheels are used for rapid stock removal, for jobs with large areas of contact, and for hard materials such as tool steels and carbides.

#### Tying It All Together

A number of factors must be considered in order to select the best grinding wheel for the job at hand. The first consideration is the material to be ground. This determines the kind of abrasive you will need in the wheel. For example, aluminium oxide or zirconia alumina should be used for grinding steels and steel alloys. For grinding cast iron, non-ferrous metals and non-metallic materials, select a silicon carbide abrasive.

Hard, brittle materials generally require a wheel with a fine grit size and a softer grade. Hard materials resist the penetration of abrasive grains and cause them to dull quickly. Therefore, the combination of finer grit and softer grade lets abrasive grains break away as they become dull, exposing fresh, sharp cutting points. On the other hand, wheels with the coarse grit and hard grade should be chosen for materials that are soft, ductile and easily penetrated.

The amount of stock to be removed is also a consideration. Coarser grits give rapid stock removal since they are capable of greater penetration and heavier cuts. However, if the work material is hard to penetrate, a slightly finer grit wheel will cut faster since there are more cutting points to do the work.

Another factor that affects the choice of wheel bond is the wheel speed in operation, do not exceed the safe operating speed shown on the wheel on its blotter. This might be specified in either rpm or sfm.

The next factor to consider is the area of grinding contact between the wheel and the workpiece. For a broad area of contact, use a wheel with coarser grit and softer grade. This ensures a free, cool cutting action under the heavier load imposed by the size of the surface to be ground. Smaller areas of grinding contact require wheels with finer grits and harder grades to withstand the greater unit pressure.

### Care And Feeding

Grinding wheels must be handled, mounted and used with the right amount of precaution and protection.

They should always be stored so they are protected from banging and gouging. The storage room should not be subjected to extreme variations in temperature and humidity because these can damage the bonds in some wheels. Immediately after unpacking, all new wheels should be closely inspected to be sure they have not been damaged in transit. All used wheels returned to the storage room should also be inspected.

Wheels should be handled carefully to avoid dropping and bumping, since this may lead to damage or cracks. Wheels should be carried to the job, not rolled. If the wheel is too heavy to be carried safely by hand, use a hand truck, wagon or forklift truck with cushioning provided to avoid damage.

Before mounting a vitrified wheel, ring test it as explained in the American National Standards Institute's B7.1 Safety Code for the Use, Care and Protection of Grinding Wheels. The ring test is designed to detect any cracks in a wheel. Never use a cracked wheel.

A wise precaution is to be sure the spindle rpm of the machine you're using doesn't exceed the maximum safe speed of the grinding wheel.

Always use a wheel with a centre hole size that fits snugly yet freely on the spindle without forcing it. Never attempt to alter the centre hole. Use a matched pair of clean, recessed flanges at least one-third the diameter of the wheel. Flange bearing surfaces must be flat and free of any burrs or dirt build up.

Tighten the spindle nut only enough to hold the wheel firmly without over-tightening. If mounting a directional wheel, look for the arrow marked on the wheel itself and be sure it points in the direction of spindle rotation.

Always make sure that all wheel and machine guards are in place, and that all covers are tightly closed before operating the machine. After the wheel is securely mounted and the guards are in place, turn on the machine, step back out of the way and let it run for at least one minute at operating speed before starting to grind.

Grind only on the face of a straight wheel. Grind only on the side of a cylinder, cup or segment wheel. Make grinding contact gently, without bumping or gouging. Never force grinding so that the motor slows noticeably or the work gets hot. The machine ampmeter can be a good indicator of correct performance.

If a wheel breaks during use, make a careful inspection of the machine to be sure that protective hoods and guards have not been damaged. Also, check the flanges, spindle and mounting nuts to be sure they are not bent, sprung or otherwise damaged.

#### System Analysis

The grinding wheel is one component in an engineered system consisting of wheel, machine tool, work material and operational factors. Each factor affects all the others. Accordingly, the shop that wants to optimize grinding performance will choose the grinding wheel best suited to all of these other components of the process

#### **Are you an active member?**

Limerick Motor Club

A poem published in the 1998 Circuit of Munster Programme

Are you an active member, the kind that would be missed  
Or are you quite content that your name is on the list?  
Do you attend the meetings and mingle with the flock  
Or simply stay at home to criticise and knock?  
Do you take an active part to help the work along  
Or are you well satisfied to only just belong?  
Do you ever take a stand for things you think are right  
Or do you leave the work to just a few and talk instead of fight?  
Think it over member you know what's right and wrong  
Are you an active member or do you just belong?

## Maritzburg Engines

We can be very proud of how our Engine project has progressed, there are examples all over the world built by all ages. At the last running day we were delighted to see the first engine completed by an aspiring female engineer! Our congratulations to Connie Suddaby on the completion of her engine, a great effort under any circumstances!!



## Club Notices

- The next **General Meeting** will be a presentation by Graeme Crookes on his recent visit to the Midlands Model Engineering Exhibition in the UK. This will be on **Monday 19<sup>th</sup> November** at 19H45 in the Clubhouse.
- Please don't forget to put your names on the list for the **Christmas Dinner** which is on **Saturday 1<sup>st</sup> December** at 5.30 pm for 6.00pm. There will be some wine and beer, please bring your own if you want something different. There is no charge!!