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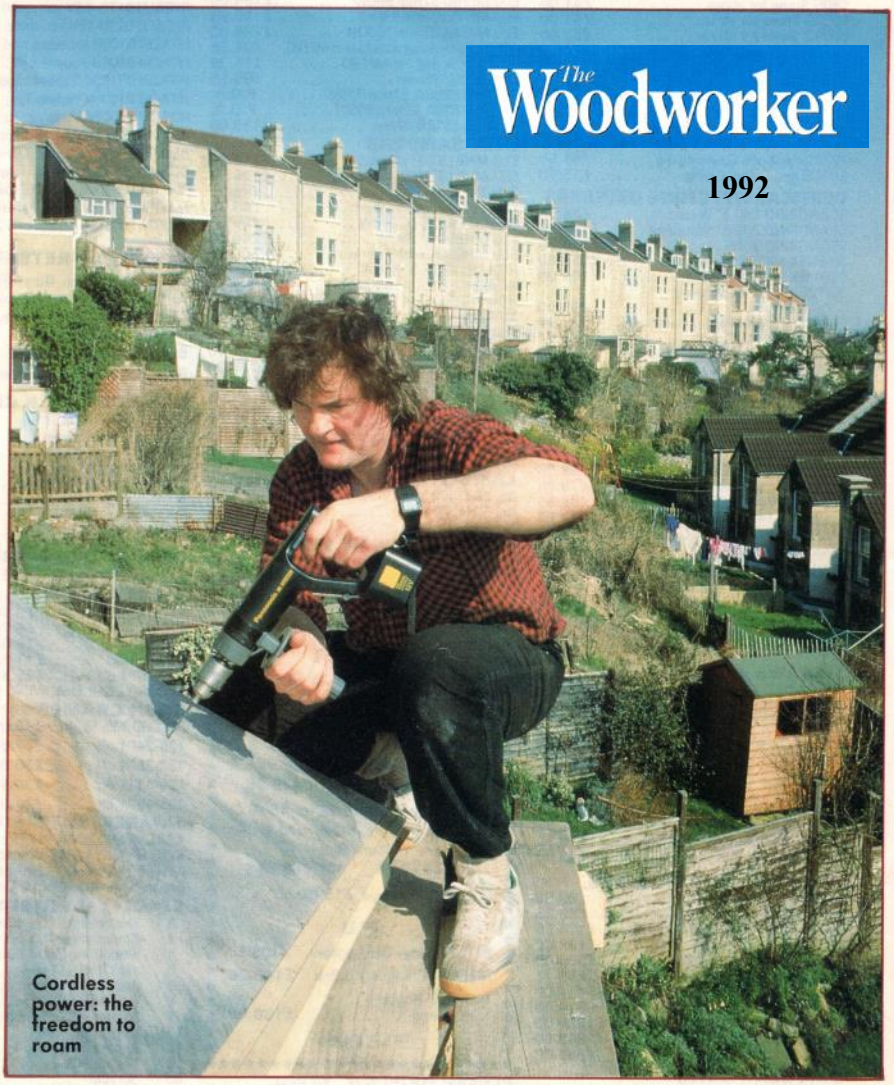
In the first part of this investigation of cordless power tools *Jeremy Broun* examines their rise in popularity and some of the recent developments



Cordless power: the freedom to roam

CORDLESS REVOLUTION

Cordless power-tools are doing for woodworkers what Fast Food did for the High Street over a decade ago. In a word it's called convenience!

The convenience of picking up a power-tool without having to plug it in has brought a new freedom to woodworkers. It could be that the cordless power-tool is turning a full circle, representing the original hand-tools without the sweat; you simply pick it up off the bench and use it, or pack it away in your toolbag and take it to wherever the task has to be done, and do it. It's as easy as that! It is modern technology all wrapped up without the cable to trip over, and the restriction of power point locations.

I cannot help but marvel over the miracle of cordless technology when perched 40ft high, drilling through roof rafters with a cordless tool, not having to worry about tripping over the cable or whether it's going to rain. Not only are cordless tools more convenient but the low voltage is safer than mains operated ones and they are quieter in operation. For the more down to earth woodworker it is interesting that often the cordless drill is picked up in preference to the mains powered one for many tasks. In large scale industry (such as the Automotive Industry) the use of cordless tools has been steadily increasing in recent years so it is by no means novel technology.

The convenience and effectiveness of cordless tools is reflected in their meteoric rise in popularity. Black & Decker have revealed that in 1989, about 20 per cent of all their portable power drills sold in Britain were cordless. By 1990 the cordless drill's market share had risen to 27 per cent. But looking only at professional power drill sales, cordless drills are accounting for 50 per cent of the market.

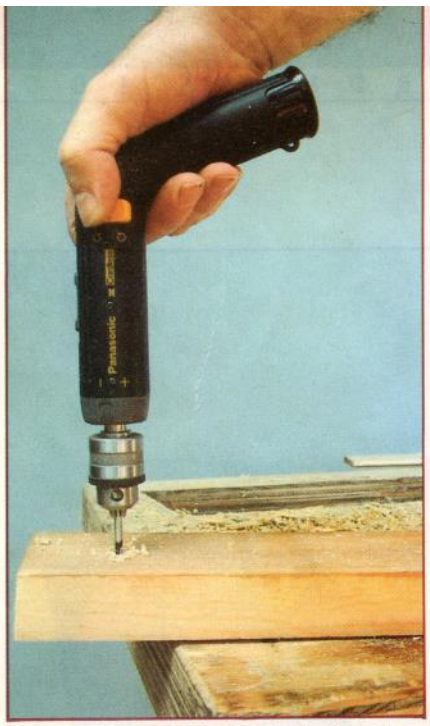
I have sampled a range of cordless tools, chosen mostly at random from the manufacturers' catalogues, broadly representing the

market spectrum. Adding to these the few cordless tools I already possess, and one or two tools 'hot off the manufacturing press' I shall endeavour to introduce the technology and give a broad appraisal of the tools. This should serve as a useful background for readers intending to buy relatively expensive tools.

Cordless tools tend to be more expensive than their mains powered counterparts, but if looked after should last for several years, even on the original battery. The technology has certainly come of age and whereas battery powered tools can never compete in power with mains operated ones, their increasing sales have made them the fastest developing aspect of woodworking technology today.

The early cordless tools were drills with heavy integrated batteries, with slow overnight (trickle) charging facilities; perhaps 16 hours or so. When the batteries were spent (after, perhaps 250 re-charges) the entire drill had to be thrown away. Today cordless tools represent virtually the whole range, drills, screwdrivers, jigsaws, glue guns, sanders, grinders etc... The batteries are generally clip-on (although on some DIY models they are still integral) and therefore replaceable, allowing spares to be carried and inter-changeability with other tools by the same manufacturer.

The heart of the cordless power-tool is the battery, in particular the charger and this is where much development is focused. At this point I feel bound to say that the nickel-cadmium re-chargeable batteries are not environment friendly, and when you buy a cordless product it is your responsibility to dispose of it carefully when it is fully spent. This may mean returning it to the dealer or manufacturer, but certainly not incinerating it or throwing it out with other household waste that ends up in a shallow landfill. This is environmentally catastrophic.



Lower voltage drills are best suited to pilot drilling and acting as light screwdrivers

Cadmium is a heavy metal and it is known to attack the central nervous system. There are millions of these batteries now littering the environment with the potential of the contents leaking into the water table. Perhaps soon there will be battery banks as there are bottle banks. Already some manufacturers are offering incentives for safe return of batteries, so that they can recycle or dispose of them safely.

Cordless tools use multiples of a standard 1.2 volt nickel-cadmium battery cell, ie. 2.4, 3.6, 4.8, 7.2, 9.6, 12 and 24 volts. Taking the drill for instance, the voltage can range tenfold from 2.4 to 24 volts. Obviously the latter is much more powerful, but it could be self-defeating, lugging a heavy duty drill with its power pack up a ladder when a smaller drill is more convenient, quite apart from the cost. In most cases a 9.6 volt or 12 volt drill will be powerful enough for serious woodworking, such as repeated drilling and screwdriving operations without rapid discharge of the battery. If you have a particular task in mind it may be that a 2.4 volt drill will perform quite adequately, although as a general rule the lower voltage drills are best suited to small diameter pilot drilling and countersinking. Heavy duty drills can drill bigger holes and more of them! It really is a case of horses for courses, and is further complicated by the duration of some woodworking operations, such as power sanding.

Sanders are operated for much longer periods than drills. Drills are generally subjected to harder work, with variables such as the nature and density of the material; from soft deal to hard oak, even metal and concrete. Manufacturers give useful (or arguably useless!) statistics regarding the holes a cordless drill is capable of drilling, but no performance figures relating to the function of other cordless tools is available.

Superfast chargers may be more expensive but they are now sophisticated, using pulse technology for balanced charging

I think it is fair to say that in practical terms you are likely to get substantial life out of the tool before the original battery is spent, perhaps several years. The average DIY drill is used for a matter of minutes per year. Of course professional use is significantly more, but even then the actual period of continuous operation is deceptively low. It is very difficult to weigh up economy with convenience.

Apart from the voltage of the battery, the re-charge time is an important feature of the cordless tool and this is down to the chargers. Charge times currently range from about 12 hours to 5 minutes. DIY cordless chargers can take around three hours, whereas the one hour charge rate has become the professional standard. Fast chargers and coffee break chargers reduce this to 15 minutes or a top up charge for 5 minutes. To my simple mind, 'boost' charging a car's lead-acid battery, to get the car started, tends to pickle the battery, reducing its life. Today's PAG-ACS fast-charger

Most power-tools now have a cordless version, with manufacturers jumping on the convenience bandwagon (far left). Detachable batteries have further enhanced the versatility of these tools

Not only have batteries and chargers become the focus of power-tool research and development, but smaller and more efficient motors are having to be produced

technology involves intelligent and pulse-charging micro-chip controlled sensing and monitoring devices, which sense the amount of charge left in the battery, prevent heat build up (the main enemy to battery longevity), and detect lazy cells, thus maintaining balanced charging. All this costs and the pulse or superfast charger is considerably more expensive than the standard three and one hour chargers. Carrying spare batteries could be a cheaper option to fast charging and all chargers rely on a power point anyway. However, one of the claims for the new intelligent pulse-chargers is that they extend battery life by as much as three times. So the choice is between the very high initial cost of a fast charger and a couple of batteries, or a cheaper slower charger and several batteries which will have to be replaced earlier.

An important feature of re-chargeable batteries is their memory and the need to properly 'cycle' the battery, draining it thoroughly before recharging. It is common practice to put a battery on charge when it still has some life in it. The charger tops up the charge, but subsequently charges only to that top-up percentage, for example 90 per cent of 90 per cent. This frequently accounts for an apparant lack of appetite of the power-tool. It can be cured by occasionally totally draining and fully charging the battery a couple of times (cycling). I prefer to drain batteries then allow them to cool down before re-charging. This greatly enhances their life when using standard chargers. If the tool has been lying idle for some months it is likely the charge has partially drained, so it is a good idea to regularly use these tools.

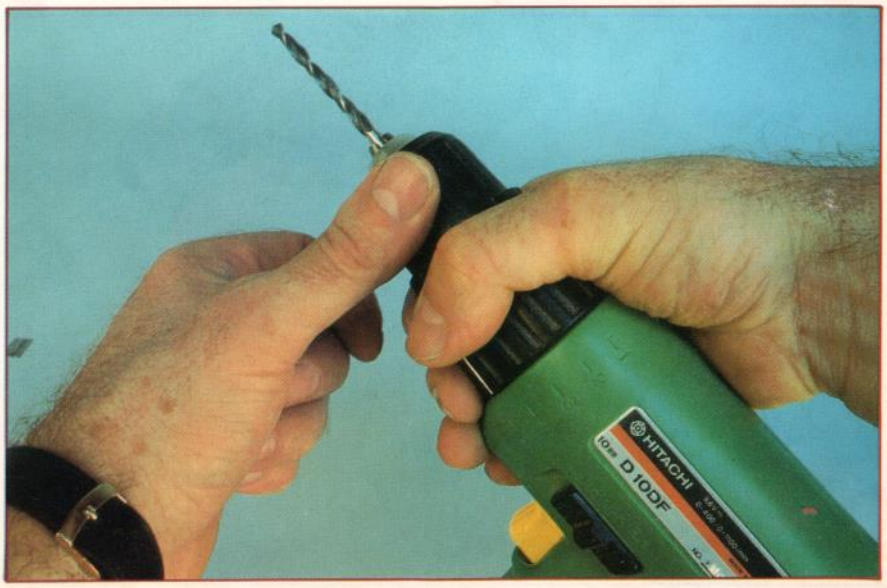
The smart or intelligent chargers tend to take over the user's responsibility, detecting the amount of charge needed and eliminating any memory problems, but as stated previously they are many times more expensive than the standard chargers. It is important to read the manufacturer's manual regarding the charging of batteries and their general care.

A much overlooked aspect of power-tool performance is efficiency – the difference between rated input and output wattage. Manufacturers tend to state only the input wattage especially on mains powered tools, but it is the power at the cutting edge that counts. As compactness is an important design feature of cordless tools the all round efficiency of the tool is crucial, and that is why I tend to perceive cordless tools as being very much state of the art. The motors are compact and powerful, some using rare earth magnets. The gearbox may incorporate planetary gears, which are also compact and efficient. The castings are lightweight and tough, made of glass re-inforced polycarbonate plastic.

The all-metal geared chuck is quickly being superseded by the keyless chuck. I cannot believe this minor revolution has actually come about in response to the frustration of woodworkers worldwide who lose the chuck key in the sawdust on the workshop floor! Certainly the keyless chuck is a joy to use, so quick and easy; the jaws can be spun open to change from a small pilot drill to a larger drill.

In the next issue I shall be giving my findings on the diverse range of cordless power-tools sampled, with a few performance statistics, including a simple drill test. In the meantime, put your batteries on charge! ■

● Jeremy Broun is a designer, and the author of several books including the recently published *Electric Woodworking*.



Even the old chuck key is being made redundant, with the emergence from the workshop sawdust of the keyless chuck. This is now an increasingly prevalent feature of cordless drills and further enhances their convenience and portability