Rolling with the times

Sandwiched somewhere between heavy equipment and small plant, compaction equipment is available in numerous configurations for a variety of tasks. From hand-held rammers to the behemoth 26-ton Bomag BW 226DI-5 BVC or the Hamm 3625 HT VC 25-ton vibration crusher single-drum rollers, there is a solution for all industries and requirements.

Compaction equipment can be divided into two distinct categories – those for light soil compaction and those for heavy soil compaction. In general, light-compaction machines are preferred by the rental companies whereas end users such as construction and roadbuilding companies, invest more heavily in the heavyweight machines.

Light soil compaction equipment

Ideal for use in smaller or confined areas such as trenches, there are two main types of light compaction equipment: rammers and vibratory plate compactors. Rammers, which can be hand or machine operated, deliver high-amplitude blows at frequencies of 500 to 750 per minute to compact cohesive soils. The machine weight varies from 30 kg to 10 tons.

Vibratory plate compactors produce low-amplitude, high-frequency vibration which is best suited for compacting granular soils with 4 to 8% fines. These machines can weigh from 100 kg up to 2 tons and have plate areas of between 0.16 m^2 and 1.6 m^2.Vibratory plate compactors are available in two variants: forward travel plates, which are ideal for smaller areas and depths of up to 30 cm; reversible plates travel in forward and reverse directions and are heavier, for increased compaction force.

Heavy soil compaction equipment

Perfect for use in larger areas on different types of soils and on asphalt, concrete and gravel, these rollers are available in smooth wheeled (metal drum) and rubber tyre models.

Smooth wheeled rollers are further divided into static and vibrating versions. Smooth wheel rollers are most suitable for consolidating stone soling, gravel, sand, hard core, ballast and surface dressings. They are not suitable for consolidating embankments and soft sub-grades, but are better suited than any other plant for compacting silty and sandy soils and with fewer passes. When the moisture content is a little more than optimum it will compact more easily.

Tandem (duplex) rollers have one wheel at the rear and one wheel in front and three wheeled rollers have two wheels at the rear and one in the front. The performance of smooth wheeled rollers depends on the load per centimetre width (derived from the gross weight of the drum it transfers to the soil) and the diameter of the drum. A smooth wheeled roller provides 100% ground coverage.

In vibrating smooth wheeled rollers, the drums vibrate by employing rotating or reciprocating mass and are used for compacting granular base courses as well as for asphaltic concrete work. They are fitted with one or two smooth surfaced steel wheels of 0.9 to 1.5 m in diameter and 1.2 to 1.8 m wide. They allow compaction to be performed up to greater depths and their output is higher than conventional rollers.

Pneumatic rubber tyred rollers, weighing between 6 and 285 tons, have wheels on both axles. provide uniform pressure throughout their area of contact These wheels are staggered for compaction of soil layers with uniform pressure throughout the width of the roller and achieve coverage of approximately 80%.

Generally pneumatic tyred rollers are used in pavement subgrade works for both earthwork and bituminous works. They are suitable for compacting cold laid bituminous pavements, soft base course materials or layers of loose soil. They are also suitable for compacting closely graded sands, and fine-grained cohesive soils at moisture content approaching their plastic limits.

Industry challenges

Plant magazine spoke to four leading industry players about the challenges in the local compaction industry.

According to Brad Emmett of Hire-All the depressed economic climate has definitely resulted in a slowdown in the award of tenders from both government and the private sector. “We are seeing fewer new projects, yet more players in the market, with associated undercutting of prices by a number of the new entrants.”

Fellow rental industry colleague, Colin du Plessis of Talisman Hire, agrees and adds that rental rates have not been tracking the increased cost of ownership.

Calvin Fennell, business development manager at Wirtgen South Africa, says: “The roller market at the end of 2017 (371 units) is sitting at below the sales of 2010 (381 units). With a high of 592 units in 2013, the market has shrunk YoY by an average of 11%. The industry is sweating its assets and replacement programmes have been delayed or put on hold.”

The downturn has affected the way that end users from construction companies approach the ownership versus rental alternatives. Emmett points out that a number of these companies geared up when projects were more plentiful and added workshops and mechanics to maintain the equipment. Now, faced with a reduced order book, they are entering the rental market to cover their investment.

Du Plessis says that the company predicts that the rental market will continue to grow and the end-user ownership market will decline. “Equipment rental companies will be the largest owners of compaction equipment in the future and they will continue to stock the most reliable, and newest equipment technology in both petrol and diesel versions.”

Arguments for the rental versus purchase option continue unabated with both sides promoting their own business model. However, Johan Hanekom, BOMAG product marketing manager at OEM Bell Equipment, believes that there is an easy distinction. “Typically, the plant rental companies would be stocking and renting out smaller compaction equipment, with lower specs, while the larger high-spec heavy-compaction equipment would be purchased by end users such as construction and roadbuilding companies.”

Du Plessis adds that smaller compaction equipment is typically high in maintenance due to the vibration generated by the equipment in order to effectively compact soil and asphalt and it is therefore a far better option to rent this equipment than to own it.

Cost of maintenance can also be linked to the choice of petrol or diesel engines. The general consensus is that while the cost of maintaining a petrol-driven compactor is lower, there are other factors to consider when selecting one option over the other. A moot issue with larger compaction equipment, since they are all fitted with multi-cylinder diesel engines, the smaller plate compactors, reversible plate compactors, rammers and ride-on rollers (up to 2.50 ton) often come in a choice of petrol or diesel engine.

“Single- and multi-cylinder diesel engines are more expensive to purchase and maintain that petrol engines, but they have a longer life-span. In addition, multi-cylinder diesel engines consume less fuel than petrol engines. Some mining customers insist on diesel engines for safety reasons and ease of refuelling on site. Single-cylinder petrol engines consume a similar amount of fuel to their diesel counterparts, and since petrol engines are cheaper to purchase and maintain, they are the number one choice for many smaller equipment applications,” says Du Plessis.

Diesel fuel, which is syrup-like compared to watery petrol, packs more of a punch in terms of energy per unit of weight than petrol per litre. So even if it sometimes costs more than gasoline, it contains more potential energy, so less diesel is required in terms of fuel to accomplish the same amount of work (in this case, driving distance) as petrol.

The high compression ratio of diesel engines allows for better efficiency compared to petrol engines but this high compression ratio also requires more robust parts, which in general are considered to add longevity to the life span of the engine.

What about environmental concerns around diesel engine emissions? According to Hanekom, it would seem that the stringent emissions regulations that govern the manufacture of engines overseas are not a pressing factor in South Africa. Indicative of this is the fact that while Tier 4 diesel engines are the norm in Europe and the Unites States, most of our compaction equipment in South Africa uses Tier 2 or Tier 3 engines.

“It all comes down to the fuel quality that is available in our markets. If fuel quality can be improved, and guaranteed, more environmentally friendly engines will be imported,” Fennell points out.

“Interestingly, the City of Joburg is currently on a drive to ‘go green’ and in line with this have requested we provide a quotation for a LP gas-operated tamper. This option would be ideal for use in trenches where people are working in close quarters,” says Hanekom.

While diesel engines emits approximately 15% more greenhouse gases than petrol engines, multi-cylinder low-revving diesel engines consume far less fuel than petrol engines and it could therefore be argued that they are in fact more environmentally friendly.

A market in flux

Over the past five years there have been a number of significant changes within the compaction market in South Africa. From a plant rental company perspective, the market is being flooded by opportunistic companies with dubious stockholding, couple with limited serviceability capabilities and reduced equipment reliability key. Similarly, in the OEM market, a number of providers of low-spec machines have entered the fray, muddying the waters for the well-established OEMs who base their sustainability on high-quality, durable machines that are backed by a complete support system.

On a more positive note, the technology has vastly improved with the introduction of advanced petrol and diesel engines that consume less fuel, thereby moving closer to compliance with international environmental regulations. Vario control on rollers uses GPS coordinates to obtain the location of the roller and records the number of passes made and the compaction effort. Hanekom adds that the introduction of oscillating rollers sees the advent of a different type of excitatory system which provides a kneading effect, as opposed to an impacting effect on surfaces.

When compared to the international market, the consensus is that since we import most of our machines from overseas, the markets are rather similar. “There is local manufacturing sector in South Africa with respect to certain classes of equipment and while they are competitive in terms of quality and price, they are nevertheless hampered by lower volumes and exchange rate fluctuations,” says Du Plessis.

He continues that in South Africa pedestrian (walk-behind) rollers are still very popular, as opposed to the overseas markets where these rollers have been replaced by reversible plate compactors and ride-on rollers. This he believes is due to the fact that reversible plate compactors are more cost effective with a better performance to price ratio. The overseas market, similarly promotes the use of reversible plate compactors, but with the add-on of remote control operation. This allows them to be placed in a trench, while the operator controls the compaction effort from above, thereby increasing the safety benefits.

Fennell says that with regard to sales, single-drum rollers make up approximately 56% of the market, with tandem rollers making up 36% and pneumatics the balance. Within the total market the single-drum 10-12 ton market makes up about 40% of all rollers sold and the 2-3 ton tandem roller market contributes 20%. “The 10-12 ton single-drum rollers are the most widely used soil compactors in the construction and plant hire industry with 49% going into construction and 31% into plant hire. This is indicative of the kind of work that they are doing, which is layer-works related to infrastructure development.”

He adds that South Africa is very small on the global market and as such product development in Europe is done around European/USA statutory requirements as well as operator input. The customers in these countries are far more sensitive to operator comfort, ease of operation, using specific machines for specific applications and are also far more embracing of technological advances.

Conclusion

If one’s organisation specialises in concrete, asphalt or foundation work and the ground conditions tend to be the same from jobsite to jobsite, equipment ownership makes the most sense. However, there is a vast amount of compaction equipment available on the local market so it really is a case of buyer beware. End users should align themselves with a reputable OEM who has a track record of durable equipment with an adequate stockholding of components and a technical aftermarket support facility.

If compaction equipment use is more sporadic, then it is probably better to look at the rental route, as not only does this remove any concerns around routine maintenance and repair, but it provides hirers with access to newer machines, using the latest technology. Again, it is advised that due diligence is performed and that hirers seek out a rental company that can discuss best-fit for their particular application.