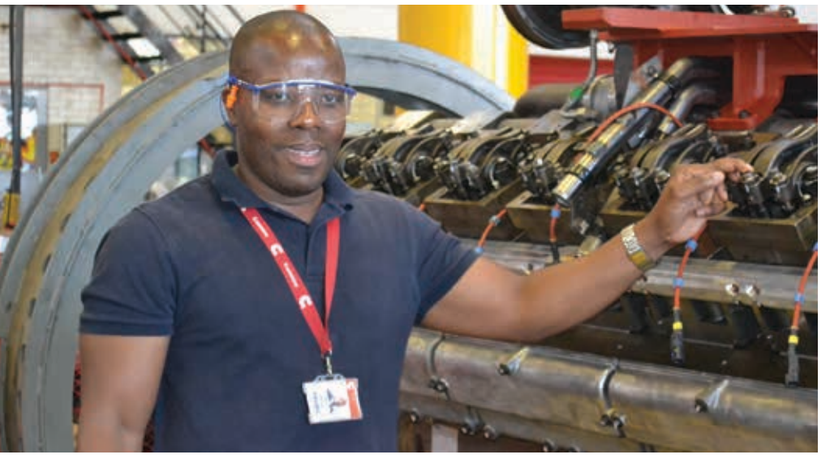
Zero hour high horsepower engine remanufacturing

Cummins Southern Africa has transformed its Kelvinview engine service centre in Johannesburg into a fully-fledged Cummins Master Rebuild Centre (MRC). *MechChem Africa's* Peter Middleton tours the facility and talks to its leader, Patrick Mohale.



"Our Master Rebuild Centre strategy has, at its starting point, a concept called 'zero hour' remanufacturing. By that we mean that when used Cummins engines come to us for a rebuild, we restore them to their as-new condition," begins Mohale. "This also restores the engine's warranty to the same as it was when it left the factory," he adds.

"This facility started out as a service centre and repair workshop for warranty-linked servicing and customer breakdowns, but we are now also offering full zero-hour rebuild and engine exchange services. In line with Cummins' global strategy, all service exchange units come with a full zero hour warranty and every new Cummins engine is designed for three rebuilds of this nature, extending the natural life of the engine four-fold," Mohale reveals.

Describing a typical engine's life, he says that, as well as routine 500 to 1 000 hour services, engines generally have a major midlife service after 10 000 hours of operation. "A first MRC rebuild will be at around 25 000 running hours", which equates to nearly four years of operation for 18-hours every day.

"But service and rebuild intervals are being stretched and some sites are already trialling 30 000 hours between rebuilds, which, if successful, could save customers' changeover times, thus improving machine uptimes," he says, adding that this obviously depends on the engine's operating conditions. "Marine engines, for example, might be able to achieve this more easily, but in mining it is a tough ask because of the harsher and more varied conditions," he explains.

Exceptional durability is fundamental to the design ethos of all Cummins engines. Advanced engineering features such as ferrous cast ductile iron pistons, micro-finished camshafts, fully sealed wiring harnesses and Cummins' Prelub® engine protection system ensure outstanding levels of durability.

"But this commitment to durability goes beyond extending first engine life. Every Cummins engine is designed with a capability for multiple rebuilds with guaranteed 'as new' performance," Mohale continues. This is a major benefit in prolonging equipment life without costly equipment changes.

"The fourth pillar of our four-pillar model for mining is to offer 24/7 service support. To deliver this support level, for a given number of Cummins engines of every size in use, we retain a corresponding number of remanufactured exchange units. This enables us to respond rapidly to any unexpected failure or emergency on a mine," Mohale tells *MechChem Africa*. Initiated by investing in new engine stock, Cummins' Kelvinview MRC now rebuilds the returned engines as exchange units.

The engine range being supported at Cummins SA's MRC spans 15 litre, six-cylinder, 500 kW QSX15s to QSK78s, 78 litre, 60° V18, 2 500 kW engines installed in some of the largest mining haul trucks and excavators in the world. "There are different models for each engine size, though, so we routinely have many different engines on the shop floor at any given time," Mohale notes.

Describing the MRC process, he says that engines are first removed from their equipment by the operator's technicians or at the local Cummins branch before being delivered to Kelvinview. To minimise downtime, an exchange unit can be shipped in advance of this for immediate installation locally or onsite.

"The branch will generally inform us as to the action required, but for the certified MRC rebuild process, from teardown to final inspection, several hundred specified steps are involved, organised into three phases:

- Teardown, cleaning, component evaluation and inspection.
- Component sub-assembly and engine assembly.
- Testing, final 'dress' and painting, along with final inspection.

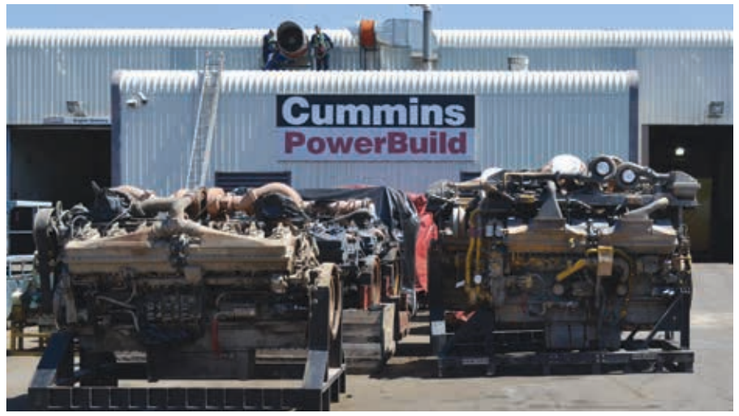
"We strip each engine down to the last bolt, checking for any damaged parts that will need to be replaced. After cleaning, the engine block is sent to a precision machining company. We use Metric Automotive Engineering in Johannesburg for this, one of South Africa's most comprehensively equipped heavy-duty diesel engine machining companies. Cummins engine blocks are designed to be re-bored if they are worn beyond factory specifications. Metric Automotive Engineering will machine the block to factory specifications, and new oversize liners will be fitted," Mohale explains.

Components such as crank- and camshafts can be reused, but we have to test them thoroughly to confirm their factory specifications," he adds.

From a skills point of view, he says that localisation is key. "We use qualified diesel fitters that have been locally trained through high level apprentice training programmes. They are all trade-tested red-seal artisans. We also have our own apprenticeship programme, currently with ten second year and ten third year apprentices enrolled and being mentored by our 13 fully qualified technicians," Mohale informs *MechChem Africa*.

While the Kelvinview MRC is still active in the repair and servicing side of operator-owned engines, "the strategy is to move towards doing 100% zero hour work". Recent investments include a 15-ton crane and eight jib-cranes, along with a Tug master mover for moving these large engines between assembly stations.

"We have also redesigned our processes, so that we now use five rollover stands with two fitters working on each engine to reduce individual workshop time per unit – as opposed to one fitter working on each engine. We have already halved the number of assembly days and we have fewer engines in the workshop at any one time. We also expect that further cost and time improvements will follow as we fine-tune this process," Mohale says.



The Cummins PowerBuild facility in Kelvinview, Johannesburg, started out as a service centre and repair workshop for warranty-linked servicing, but it is now a fully-fledged Cummins Master Rebuild Centre (MRC).

What is different about the MRC approach compared to traditional servicing? "No ordinary service or remanufacturing centre can guarantee the engine is 'as-new' after a rebuild, and we back this claim with a corresponding 'as-new' warranty," Mohale responds. "More importantly, the performance of the engine is also as-new. So the power, performance and fuel efficiency are restored. After a rebuild, the operator should not notice any deterioration in the engine performance whatsoever, even if using a rebuilt engine that has already completed 40 000 to 60 000 hours," he responds.

"We sell a service", says Mohale. "Through MRC and our service exchange programme, operators buy uptime. Repairing an engine can delay a mining or shipping operation if owners prefer to do it themselves. Our zero hours exchange programme radically reduces lead times. This approach is much more cost effective and convenient than either replacing failed equipment or attempting to self-service and 'nurse' an engine to the end of its life," he argues.

"By using the Cummins MRC, the maximum possible life can be extracted from each engine used, with minimum risk, maximum uptime and a best possible return on investment," Mohale concludes. ❑

Left: *The Cummins MRC has redesigned its processes to use five rollover stands with two fitters working on each engine. This reduces individual workshop time per unit.* ***Centre:*** *From a skills point of view, Cummins uses qualified diesel fitters that have been locally trained through high-level apprentice training programmes.* ***Right:*** *The Master Rebuild Centre strategy is based on 'zero hour' remanufacturing. Through a combination of new and restored components, restored Cummins engines leave the MRC in their as-new condition.*