

MAINTENANCE

On the upgrade

Today's cost-conscious mining houses and drilling contractors are asking themselves: to replace or to rebuild? Nia Kajastie looks into the options and what's involved in drill-rig rebuilds

An LMC rig – Boart Longyear's LM underground rig customised for coal – seen before and after rebuilding

Drilling rigs working on mine sites often represent large capital investments, and to safeguard these assets and guarantee optimal performance, a rigorous maintenance programme is essential. However, no matter how well maintained, drill rigs come with expiry dates, particularly the components doing all the hard work.

Once the machines reach the point where they are no longer cost-efficient to operate, the purchase of a new rig is one course of action, but many are going down the rebuild route. This is no surprise in an economic climate in which companies' capital budgets have been slashed and drillers are seeking cost-saving alternatives.

Essentially, rebuilding can provide drill-rig owners with like-new or almost-like-new performance without a large investment, as many of the machines' major components can be reused. Some drillers also build maintenance costs into their operation rates in order to be prepared for future repairs and rebuilding.

"According to a former driller, US\$17/hour was built into his hourly rate to cover the cost of maintenance and a portion of that was saved toward future rebuilding costs," recounts Eric Rice, regional sales manager at Rig Source.

Joy Global's global service excellence manager Tom Barnes adds that, in many cases, partial rebuilds are applied to extend operating intervals before major rebuilds, as well as to extend intervals between maintenance.

"A midlife rebuild before failure is generally a more cost-effective option than buying a new machine, especially if some of the major components can be reused.

"Remanufactured components are used when applicable to further minimise the cost without jeopardising quality," comments Martin Wallman, mining and rock-excavation services product manager, USA, at Atlas Copco.

Of course, there are a number of factors to take into consideration



Before



After

before heading down the rebuild road as it's not suitable in all circumstances. These factors range from the size, design and application of the rig to the location of the mine operation in question.

Gregory Scott, drill applications specialist at Caterpillar, explains: "All considerations must be put into the context of the specific operation. Customers with smaller fleets require premium products working constant duty cycles with a minimum of downtime for repair and replacement of major components, and they find that purchasing new equipment helps ensure they have drills with

performance ratings that can meet these demands.

"Customers with seasonal operations typically find that rebuilding their equipment gives them the highest return on their investment. Customers with larger fleets have the luxury to schedule downtime for repair/rebuild, but the entire enterprise needs to be taken into consideration when budgeting for this type of work."

Barnes adds: "Generally, the larger and/or heavier rotary blasthole drills are longer-lived and will provide better return from a rebuild since so many structures and com-

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ponents are repaired and reused.”

Updated technology is also a key consideration when it comes to upgrading rigs. It makes it a case-by-case decision as to whether it is worth rebuilding or time to renew the fleet.

“In some cases it makes sense to rebuild to incorporate some enhancements to the original version – adding some features that bring it closer to what a drill looks like out of the manufacturing plant today. We’re talking about things such as rod handlers and rod presenters, if they’re compatible.

“For example, our LF90D surface coring drill has a retrofit kit that allows us to put on a tilting head for rod handling,” comments Denis Hache, Boart Longyear’s North American business development manager for parts and services in North Bay, Ontario, Canada.

“So there are a lot of options, but just having the opportunity to do upgrades while you’ve got it torn apart and doing a rebuild is something that should be considered at the scope or quoting phase of an overhaul.”

CRUCIAL COMPONENTS

The specific parts and components that regularly need replacing or rebuilding depend on the drill-rig model and its working conditions.

“Normally the major critical components are replaced, such as the engine, compressor, cylinders, pump, axles, transmission, bucket and so on. Components that are still in good condition will be reused,” says Wallman.

Hache lists: “It’s the working components – whatever touches the pipe – that are the most susceptible to wear and will need replacing or rebuilding frequently. We’re talking especially about foot clamps, feed systems and rotation assemblies.”

For a large rotary blasthole drill, Scott explains, the rotary head gear box and drive motors see a lot of punishment – and are designed to reach approximately 10,000 hours.

“Obviously, pulldown and hoist cables plus wear guides for the rotary head assembly and travelling sheaves will wear based on duty cycle,” he says.

“The pump drive gear box will need overhaul/rebuild at roughly 10,000 hours, and we would expect that main pumps require rebuild or replacement as well. The compressor

itself is good to 20,000 hours, but the drive coupler and shaft seal will need replacement at approximately 10,000 hours. Undercarriage service intervals are directly tied to the ground conditions and operational demand put on the drill. Operations with a lot of point loading will wear down pads/rollers/rock guards, and operations with a high percentage of tramping will obviously see higher wear for rotating engagement components.”

So when considering a rebuild versus a replacement, the most expensive and wear-sensitive components need to be considered. For sonic drill rigs the sonic head is the most expensive component and represents approximately 20-30% of the cost of the rig.

Terra Sonic International’s business development manager Mike Scaringella states that the company’s TSi NextGen Sonic Oscillator has been designed to be replaced as a complete unit when rebuild is required.

“Other components that need to be replaced periodically include lever detents when they wear out, O-rings in hydraulic valves when minor hydraulic fluid leaks arise, water-pump seals and fluid level and temperature-sensing components when they fail,” he adds.

LONGER LIFE

The average lifespan of a drill rig can vary a great deal. It differs for different rig designs and models, and site conditions, maintenance routines and operator skills can all affect machine health and component durability.

Atlas Copco’s Wallman estimates that the lifespan can range anywhere from 15,000 hours up to 100,000 hours depending on all the above factors.

“Generally speaking, an underground drill rig can be expected to have a lifespan of seven to 10 years. Surface core drills, including sonic rigs and other geotechnical drills, should last anywhere from 10 to 15 years. A lot depends on how it’s used and maintained – much like a vehicle. A car that’s well-maintained and driven only 10,000 miles a year will last a lot longer than one that’s poorly maintained and driven into the ground,” Hache comments.

Scott says Cat drills are designed to operate 60,000 or more hours; typically, a machine will then be overhauled at 10,000 engine-hour



intervals, with a complete rebuild at 20,000 hours.

While Barnes reasons: “For drills designed for the highest compressive-strength applications, structures and associated machinery and components must be large in size and designed to withstand severe duty cycles and high shock and vibration.

“As a result of the heavy-duty design of these large electric drills, and due to the fact that owners tend to apply rigorous maintenance strategies and perform major and partial rebuilds to these large drill units, achieving 20+ years’ useful life is possible. For smaller, lighter-weight and more mobile units, which are applied to a variety of other applications, designs are typically diesel-powered, and owners and manufacturers typically target a lower useful economic life for replacement of the drill versus rebuild.”

The aim of rebuilding programmes is to extend a drill rig’s lifespan, and, in theory, it could be repaired and rebuilt to last forever; however, there comes a point when this is no longer cost-efficient.

“The rule of thumb is that the most someone would want to invest in a rebuild is between 65% and 85% of what a new rig would cost. Then there’s a question of the technology advancements that have come along since the rig was purchased,” explains Hache. ►

A Cat machine will typically be overhauled at 10,000 engine-hour intervals, with complete rebuild at 20,000 hours. Pictured here is the newest Cat rotary drill – the MD6420C

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Joy Global service team members visit a mine site in South Africa as part of planned maintenance on a P&H blasthole drill

According to Rig Source's Rice, you can essentially double the life span of a drill rig after a complete rebuild as long as you continue to maintain and service the equipment. "Ensure you can obtain stock parts from the original equipment manufacturers (OEM) for the rig to safeguard your investment," he advises.

Barnes says: "With a major rebuild utilising certified repairs from a Joy Global service centre, it is possible to extend drill life by approximately five years, but in some situations up to eight years."

The prolonged life of the drill rig is a benefit in and of itself, but after the rebuild, the rig owners also have the advantage of working with a familiar piece of machinery.

Their operation is already designed around it, meaning no retraining of operators and no modifications to existing operations are required, as might be true for a new machine.

In addition, using an OEM partner that specialises in the equipment ensures higher levels of safety, project management and quality performance.



Available services

MM asked a selection of OEMs and service providers to describe their maintenance and rebuild programmes.

ATLAS COPCO

All Atlas Copco machines come with a recommended maintenance plan that takes local requirements into consideration.

The manufacturer offers all kinds of service agreements, from its Care programme preventative service

agreements up to full-service agreements with certified technicians on site and full-machine rebuilds. All the offerings can be tailor-made to meet specific customer needs.

Atlas Copco rebuilds normally start with a RigScan audit. The audit programme can be used on any Atlas Copco machine at any time to determine the machine's condition. Based on the report generated from the RigScan, the customer and an Atlas Copco representative can define the scope of the rebuild. There are other shops that offer rebuilds, but, as an OEM, Atlas Copco knows its rigs and the latest upgrades and engineering specs.

"A rebuilt machine from Atlas Copco comes with the assurance that the machine is either rebuilt to the same standard as when the particular rig was new or, if preferred, upgraded to the latest standards," explains Wallman.

Planning is the key to a rebuild. It is

"It is possible to extend drill life by approximately five years, but in some situations up to eight years"

An Atlas Copco technician performing a RigScan audit before rebuild



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up to the customer to decide when the machine can be taken out of production. When the date and the scope of work are agreed on, all components and parts will be pre-ordered to minimise downtime.

The rebuild itself will take anywhere from two weeks to 10 weeks, depending on the scope of work. The total time of the rebuild depends greatly on the customer's requirements and length of time the machine can be out of service. For some models Atlas Copco can offer a bridge unit during the rebuild period to minimise lost production time.

BOART LONGYEAR

Boart Longyear's Essential plan includes scheduled preventative maintenance parts on qualified rigs. Optional Performance Protector is available and includes audit, calibration and training.

Because planned maintenance reduces unplanned downtime, increases rig productivity and the life of the rig, and saves precious time and money, Boart Longyear also offers the Essential +S programme. Essential +S includes the Essential plan plus Performance Protector, plus service labour.

Finally, for comprehensive parts and service support, the Essential +CS programme includes planned maintenance and service and also unplanned service support and parts.

All of the Essential maintenance programmes offer planned service intervals, detailed parts plans featuring genuine Boart Longyear parts, customisation to the customer's business model, reporting capabilities for information-based decision-making, and fully trained service technicians.

In addition to the repair-and-return programme, the company offers service exchange. For head assemblies and other high-consumption assemblies, it will have a remanufactured assembly already on the shelf. So when the customer needs one in a hurry, it has one ready to deliver.

The first step in the decision to rebuild is to get an estimate. Ideally, Boart Longyear will go on-site, but it can often work from photos to provide a visual estimate. Then, once the budget is approved and the equipment is in the workshop, a more thorough inspection allows it to develop a more precise quote.

Basically, anything that is damaged, worn or tied directly to safety should be replaced or rebuilt, but it really depends on the customer's appetite.

It may be as simple as getting the rig back up and running with a minimum amount of work and cost, or as extensive as stripping it down and building it back up from the basics. In that case the company will do a full sandblast and repaint the entire rig so that it looks like new.


The goal is always to get the rig

back in action as quickly as possible, but a rebuild can typically take anywhere from two weeks to three months.

CATERPILLAR

Caterpillar, via the Cat dealer network, provides a variety of maintenance and support plans based on customer needs and specific applications. These range from technical support/site administration, service contracts for preventative maintenance, repair and rebuild, to com-

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Above: ▶ Rig Source's rebuild of a Boart Longyear LF70 rig

Above right: some of Terra Sonic's customers have reported over 2,000 oscillating hours without having to repair, rebuild or replace their sonic head

"Not only were the drill rigs rebuilt, they were also mounted to a rubber-track crawler carrier to allow them to work in hard-to-reach areas"



plete maintenance and repair contracts (parts and service labour).

"The scope of a rebuild depends totally on the specific situation for the customer. The benefit of having a local Cat dealer presence is that they can help manage and coordinate with the customer to ensure a plan is developed that meets their individual needs," says Scott.

Caterpillar has also developed conversion kits and rebuild kits for competitor undercarriages. A conversion kit includes a complete undercarriage replacement to a premium Cat model.

A rebuild kit will retain the actual side-frame and will replace all of the undercarriage rolling and wear components. The kit contains premium hardware and heavy-duty Cat rollers, rock guards, sprockets, idler groups, pads, links and pins. This enables the customer to work the undercarriage at maximum efficiency at the lowest possible operating costs.

"The undercarriage programme has been very popular with owners of legacy Bucyrus rotary blasthole drills," adds Scott. These include Bucyrus undercarriage designs on the Cat electric 49HR / MD6640 and Intertractor undercarriages fitted to Cat diesel-powered drills: SKF / MD6290, SKFX / MD6240, MD6420 / SKS.

JOY GLOBAL

Joy Global provides a wide array of support options, ranging from full-service life-cycle management (LCM) contracts to transactional engagements at its service centres and through field services.

Owners of Joy Global's P&H

brand of rotary blasthole drill products are currently using a variety of plans, including full LCM. The company's maintenance plans are established using reliability-centred maintenance (RCM) philosophies that are applied to predictive and preventative maintenance.

Most P&H drill owners look for support from Joy Global services whether it be in the form of periodic technical support for the machine audit and planning phase, or whether it is a value-add or partnership-based engagement including full LCM contracts.

Joy Global applies a rigorous standard to all rebuilds, whether major or partial, which involves planning and scope development, quoting and contract finalisation, schedule release, project execution and close-out and review. All work is preceded by a full site and equipment safety audit and risk assessment.

The planning and scope development always involve a machine audit performed by factory-trained technical service representatives. Field services are then involved in site preparation, disassembly and removal of parts and components, field repairs and replacements, and ultimately reassembly and commissioning. Major rebuilds for drills can take several weeks to complete.

RIG SOURCE

Rig Source can customise its offerings to suit the customer's needs. It offers a full service shop with the ability to service rigs for scheduled maintenance in addition to complete rig rebuilds. The service provider's

experienced shop team has successfully completed a wide variety of rig rebuilds and most of its customers have sent multiple rigs through the shop.

For most drill rigs the process is: evaluate, disassemble, sandblast, inspect, repair, replace, repaint and reassemble. Then the unit is tested and sent back to the site. It usually takes four to six weeks for a small core drill, not including travel time.

"Rebuilding six Boart Longyear LF70 units is just one of our major core drill-rig success stories. Not only were the drill rigs rebuilt, they were also mounted to a rubber-track crawler carrier to allow the rigs to work in hard-to-reach areas.

"The customer found extreme value in our services and continues to work with Rig Source on a regular basis. They also take advantage of our large stock and wide variety of drill-rig parts that are readily available," says Rice.

TERRA SONIC INTERNATIONAL

Terra Sonic recommends a routine maintenance schedule for all of its sonic drill rigs. This includes conducting daily safety inspections of specified rig components and associated tooling.

Routine maintenance includes daily, weekly and monthly lubricating and fluid filter changes. All grease points and fluid levels are indicated on the rigs, and pictured diagrams give guidance to these locations.

Terra Sonic International provides the following rig repair/rebuild services:

- Sonic-drill head repair and REMEX programme for sonic head exchange;
- Sonic-drill breakout clamp replacement so that Terra Sonic tooling can be used on any sonic drill rig; and
- Complete rebuilds of all types of sonic drill rigs.

"The internal parts of the TSi NextGen Sonic Oscillators are serviceable only at our factory. When it is time to rebuild the Oscillator, TSi will supply a factory-remanufactured Oscillator under our REMEX remanufacturing-exchange programme.

"The factory-certified remanufactured Oscillator will provide the same performance, and have the same warranty, as the original TSi NextGen Sonic Oscillator," explains Scaringella. ▀