



Colombia's coal hub

Paul Moore travelled to Colombia's main coal mining region to see how Kal Tire has applied its global standards of safety, efficiency and staff development to Drummond's Pribbenow and Descanso operations

In Colombia, the major coal mines are in the north of the country and include the two adjacent operations of Pribbenow and Descanso in the Cesar Coal Basin near La Loma which are owned by Drummond Company; then the Cerrejon (owned equally by BHP Billiton, Anglo American, and Glencore) operation in La Guajira department which is further north again; and finally, two other operations close to Drummond that are owned by Prodeco (owned by Glencore) – namely Calenturias and Mina La Jagua (PLJ). Kal Tire currently has the tyre management contracts at Prodeco (since 2007) and Drummond (since February 2014).

There are two other coal mining groups that are much smaller – CNR has the El Hatillo and La Francia mines, located between Drummond and Prodeco, but currently the mines are stopped due to the lack of their own coal shipping port and some issues with environmental licences. Today the trucks (85 Cat 777 across both mines) and hydraulic excavators (including 13 Liebherr machines at El Hatillo) all stand idle awaiting a restart. EPSA was the mining contractor for earthmoving and coal production but CNR conducted the tyre services itself directly. Finally there are the smaller again and Canadian-owned Pacific Coal which has the Cerrolargo (600,000 t in 2014) and La Caypa operations (just over 1 Mt in 2014). La Caypa mining is conducted by contractor Masering; while at Cerrolargo a local company SIRA contract mines and deals with the tyres. These are all coal operations – beyond these there are only nickel operations – BHPB's

Cerromatoso, which looks after its own tyre operations (12 777 and 12 775); and the Puerto Libertador quarrying operation of Argos, where contractor EPSA runs a fleet of 12 777; and Kal Tire provides tyre repair services.

In the Colombian coal mines, as elsewhere in the world, the main tyre issues are with separations due to excessive heat on the tread as well as casing fatigue. The tyres run longer than in hard rock copper mines – up to 9,000 hours versus 5,000. The challenge is how to manage this heat build up and to plan for it in day to day tyre rotations as well as approaches to repair.

Drummond overview

The Drummond operations are on a huge scale – 2014 production stood at 26.4 Mt, up from 22.8 Mt in 2013. The two open pits are located at the middle of Cesar department in Colombia, and the overall operations cover a huge area of over 50,000 hectares, with a remaining mine life of between 30 to 40 years.

Due to the coal tonnages involved and the amount of overburden; as well as the scale of the mining operations in area terms, the Drummond mines have a massive fleet – in larger trucks this includes 236 Caterpillar 793s (104 of them at Descanso), mainly D models but also with a large number of Cs and some Bs. It also includes 14 Komatsu 830E trucks.

Drummond currently uses both Michelin and Bridgestone tyres. It operates separate truck shops for the main truck types, namely 777, 793

Kal Tire has introduced a number of improved work conditions procedures at Drummond, here barrier implementation during the inflation process

and 830E. Drummond does most of its own truck maintenance and service with its staff but Cat dealer Gecolsa also has a large team onsite; and there are also staff from Komatsu dealer MTM Tecpalsa.

The 793D/830E fleet hauls the overburden (830Es mainly on the flatter, longer hauls); with a large 777 fleet hauling coal (92 in all including B, C, D and F models) as well as seven 785s. Most of the overburden is removed by three draglines and loaded directly onto banks of large MMD feeders, which then load the trucks. There is also overburden removal and coal loading with a large hydraulic excavator fleet, which includes Komatsu PC8000s and Hitachi EX3600-6s; Cat/Bucyrus 495HR rope shovels; and a huge fleet of dozers, wheel loaders, graders, water trucks and other equipment. For example, there are 71 crawler dozers only of the D11 variant, and 25 980/988 wheel loaders.

The operation has its own dedicated port, Puerto Drummond, located between Cienega and Santa Marta on the Caribbean coast.

A unique tyre challenge

This all adds up to 1,500 large tyres on the trucks – 888 on the Caterpillar 793Ds alone. Over the whole mine and accounting for all the equipment, there are 4,784 running tyres. The average monthly tyre changes stand at 944.

But Kal Tire is well equipped for the task, with 96 people between the two sites, of which 75 are technicians. This includes six so called SENA apprentices; SENA being a Colombian state apprentice program, within which new workers can join a company for six months after which a decision will be made on whether to give them a permanent role. The Kal Tire team is led by Project Leader Jose Fragozo, under whom are three supervisors: Erlim Alvarado at Pribbenow and Gabriel Jiminez at Descanso; with the third being Jessica Solano, the safety and health supervisor. Under them come the fitters and technicians, along with planners and foremen, and other staff such as tyre handler operators.

Fragozo reports to Diego Garcia, the Kal Tire Colombia Managing Director, based in Barranquilla. When Kal Tire took over the Drummond contracts, after an exhaustive interview process, it opted to take on 31 of the old staff who along with new Kal Tire staff have since been taken through the Kal Tire LMS training program, in which there are 230 modules in all.

Garcia told **IM**: "When the activities started, big challenges appeared; one of the main ones was achieving the smooth integration of all the team members, they had a very different labour



Draglines are used to load MMD feeders with overburden at Drummond, which in turn load the trucks. This shows the feeders at the Descanso pit. The apron feeders allow the trucks to be loaded very accurately in terms payload; also the loading technique of the feeder ensures the load is well balanced in the centre of the truck bed, which helps reduce tyre wear

culture because they were coming in some cases from other companies. But thanks to collective hard work, the right training programmes, constant supervision, and continuous feedback and task observations, we are now performing very well, founded on our culture of safety, quality and productivity. These three pillars have been the key to development. Since starting at Drummond we have also implemented effective technical solutions in order to improve the quality, efficiency and sustainability of the process. Our target for the upcoming years is for it to become a global technical reference founded on the AIMS (Kal Tire's stated aims as a business), policies and business procedures of Kal Tire."

Kal Tire operates its business based on seven guiding principles known as 'The AIMS'. Aim #1 refers to: "...providing customers with a level of quality and value, of both service and products that exceeds their expectations and surpasses the competition." In Colombia, this has been serving the group well in that part of the world so far.

IM also spoke to Erlim Alvarado, the Pribbenow Mine Supervisor for Kal Tire. "As with any start up contract there were challenges – such as bringing on new staff that have not previously worked for Kal Tire and getting them to understand and adapt to Kal Tire's culture. Safe procedures are core for Kal Tire and we absolutely make sure we avoid potential dangers such as not closing off the airflow when fitting the lock ring with a hammer; storing tyres vertically; and getting too close to the clamp on the tyre handler. Also, Kal Tire records downtime for each and every tyre, while some in the tyre management industry only record total downtime for all tyres." Alvarado added: "Our strict policy on correct procedure doesn't

necessarily make the work go faster, but it most certainly makes the quality of work better and the work itself safer; and we have seen this at Drummond. A lot of it is down to little things like making sure we always wash and clean the tyres and wheels; as well as applying lubricants."

Since beginning the contract in February 2014,

Kal Tire has been running a series of training courses for its staff, including three per month in basic tyre knowledge, 13 in the use of tools and 15 on safe work procedures. Kal Tire took over from the previous tyre management system, where one company handled installation and the other repairs, making for a more complex situation, so standardisation was badly needed.

Kal Tire's presence is mainly in its two dedicated tyre maintenance areas located adjacent to the truck shops at both the Descanso and Pribbenow mines but it also has staff at the main fuel farms, as these are the best locations for doing tyre pressure checks and visual inspections of the trucks coming into the Kal Tire shops for regular tyre rotations.

Harry Prentt, one of the planners at the Pribbenow Kal Tire site told **IM**: "Safety has improved significantly with Kal Tire taking on the contract. There has only been one accident in a year, which was an injured hand due to an unexpected rim lock movement." But procedures have been put in place, such as the use of torque meters, to avoid these risks. Equally on interactions with the tyre handler, we have made sure there are no distractions in awareness between the operator and tyre technicians, particularly in cases where the worker may have to be close to the clamp mechanism." Kal Tire uses at Pribbenow a Cat 988 with IMT clamp.

For inflation and deflation, one innovation has been to put a barrier such as two scrap tyres in front of the tyre being inflated, so no-one can physically walk in front of it. For the inner rear tyres, both are deflated to 15 PSI before removal, while

some other tyre management operators may just keep one of them inflated. Likewise, trucks are never left running and/or with trays raised while they are being worked on.

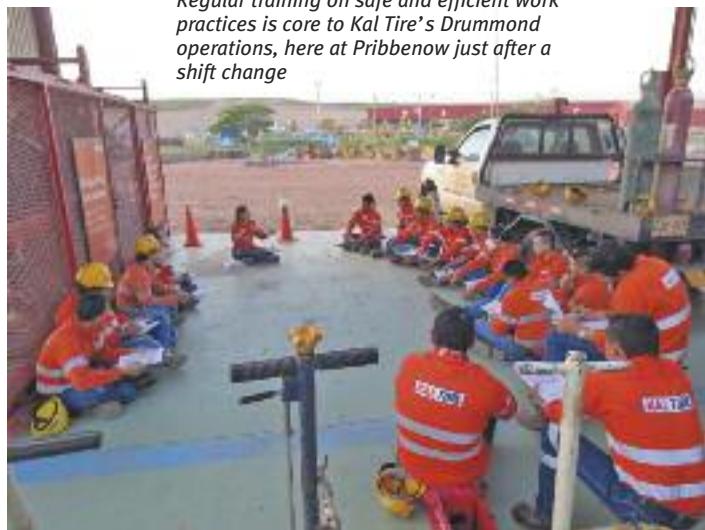
The inventory is also very well organised, we have divided all tyres by size, age and type, and all the rims etc. also organised more efficiently.

To date, since taking up the contract in February 2014, Kal Tire has repaired over 700 tyres. In the reports to Drummond, extra detail is given on all tyres that did not last more than 2,500 hours and reasons identified if possible. The goal now at Drummond is to have all new tyres run at least an average of 7,500 hours and a lot are now achieving over 8,000; which at over \$35,000 for a 57 in tyre is a big value saving for the mine.

Customer feedback

Gilberto Martinez, Assistant Superintendent, Mobile Equipment Maintenance at Drummond, summed up the culture and approach working with Kal Tire: "In the past, we had separate contractors for tyre repair and tyre fitting/management but under Kal Tire both are part of one contract. We are also seeing improved efficiencies and better access to technical information on a daily, weekly and monthly basis. They have also introduced standardisation of procedures and repairs, which we value highly, as do the tyre fitters as it makes their work safer and with less risk of injury. The work environment has improved and I can see that the employees take pride in their work. Kal Tire is achieving similar work rates that we saw in the past in terms of speed but combined with safety and at the same time giving us the reports on tyre performance that we need. On reports, for example we know every day what tyres have gone to the scrap pile and why. Monthly reports tell us in detail about the value we are getting in terms of repaired tyre performance life, comparison of tyre types,

Regular training on safe and efficient work practices is core to Kal Tire's Drummond operations, here at Pribbenow just after a shift change



number of repairs, relative levels of scrapped tyres; all presented in a clear way. In the past we had more basic data which didn't indicate the value we were getting from the repairs, but now we know this in detail. We can even access a lot of data ourselves, when we want and we feel like the data is ours. We are looking forward, for example, to be able to compare the second year of Kal Tire operations with year one, to see in detail the effect of all the improvements."

At the startup of this contract, Kal Tire looked to identify opportunities to improve job conditions to avoid potential work accidents or potential negative impacts on the environment. A number of actions were implemented, including introducing a new awareness of order and cleanliness with housekeeping and order days. Road safety plans were implemented, including driver profiles, defensive training, and individual driver monitoring and evaluation. In environmental issues, a solid waste program was introduced, along with a campaign to recycle tyres and use them as planters.

New contract efficiencies

Mayaguez is a major sugar cane producer in the southwest of Colombia near Cali, producing 2.5 Mt/y of cane on plantations covering 20,000 ha. It has a large fleet of wagons (177 in all) for harvesting, all of which are equipped with 620/75R26 tyres. The relevance to the mining sector is the nature of the contract Kal Tire has with the company, where Kal Tire retains ownership of all the tyres and tooling and provides the service staff, with the customer only paying per tonne of cane reaching the mill. This fee includes all tyre mounting, field service and management of tyres. Mayaguez just supplies to Kal Tire a building plus power and water. The contract is based on a minimum 2.3 Mt/y of production; with the fees reviewed every six months to account for inflation and any increases in new tyre prices. Director of the Harvesting Division, Mario Andres Renjifo comments: "The core business of Mayaguez is sugar cane production, not tyre management but Kal Tire are specialists. Under this contract we have seen better tyre performance, and the tyre cost has come down relative to our production, with up to 30% greater tyre life in some cases relative to before. Also we are seeing less downtime in field service of tyres and PSI control is better. Importantly for us we get monthly reports from Kal Tire on tyre pressures, the number of trucks on which tyres have been serviced, PSI inspection results, and downtime figures. The arrangement is a win win for both companies."

Improvements in work conditions include safer work platforms design and acquisition; new tyre stands to inspect and wash tyres; assembly base upgrades and standardisation; tyre stockyard standardisation; barrier implementation during the inflation process; device design and implementation to improve vertical tyre mounting processes; and a lock ring catcher design and implementation.

Special repairs such as extensions or/and patch overlapping are certified as acceptable using the Rema Tip Top standard and usually are done when the damage covers a big area of the tyre but there is not too much compromise of the structure.

Monthly and other reports

The mentioned reports are designed to give the customer a detailed tyre performance overview based on KPIs. They are divided into safety, maintenance indicators, scrap report, process improvement summary, and conclusions. Safety always comes first and includes so called RACI reports, which include every incident, near accident and any bad work conditions, with corrective actions in all cases. The workers generate these themselves under the mantra of "stop, analyse, act."

An example of a near accident might be a tyre handler operator that didn't notice a technician inspecting a tyre behind him. To encourage employees to generate quality RACI reports and to keep up to date with LMS modules, an employee of the month is chosen and given a cash prize. Alvarado comments: "All the team members were trained to identify and evaluate risk in order to unify concepts. From February to December 2014, 831 RACIs were reported, and 775 were closed during the same period, it corresponds to 93% of the total. It is important to mention that rapid follow-up of the action plans and the education of the team members that to make more and better reports has been the key to success in this program."

In maintenance terms, the reports give the percentage of planned front tyre changes per month, with at least five per week at each of Pribbenow and Descanso the aim, or up to 60 per month across the operations. The reports also give verification of pressure performance including the frequency of pressure checks, with the aim of checking every truck tyre four times a month, but Kal Tire has been achieving up to six or more. The percentage of pressure checks that



The area around Drummond has a number of other coal operations, where Kal Tire is also active. Prodeco trucks coal from its La Jagua operations to the coal-handling facility at its other mine at Calenturitas, where it is loaded into rail cars and transported to the port in Ciénaga. Kal Tire has the services contract at both these sites as well as supplying the tyres for the pictured on-road haul trains

recorded pressures in the optimal zone of 115-130 PSI. The pressure performance is even to the level of comparing performance of different technicians that carried out the inflation. The number of occurrences of low pressure readings is analysed to see if there are any repeated events, with position 4 being the most common low pressure position.

The time taken to change each tyre is also analysed. Across both mines the average is 2.5 hours but this is getting lower each month and can also be affected by equipment availability. Other reasons for additional downtime can include wet weather making road conditions difficult, all the tyre bays being occupied or additional washing of trucks.

The reports also give the available inventory of repaired tyres, and the number of tyres changed per month. To give an example in May 2015, the two mines achieved 377 changes of 49 in and 57 in tyres, not including 327 on light trucks and 87 on other equipment for a total of 793. In other months it has been as high as 1,140. Kal Tire also compares performance between its two sites – Descanso versus Pribbenow.

When tyre repairs can keep a \$30,000 tyre from being scrapped, they become a vital part of the operation. The quality of a repaired tyre life is plotted against the investment amount in the original tyre plus the amount recovered as a result of the repair.

Tyre performance is at the heart of the reports. Currently, the mine runs only Bridgestone and Michelin so it is useful to be able to compare the two, especially when new tread patterns and designs are introduced to see how they fare.



Kal Tire has a unique contract with sugar cane producer Mayaguez, in the southwest of Colombia near Cali. Kal Tire is paid per tonnes of sugar cane transported per month, but retains ownership of all the tyres and tooling. Similar approaches could be applied to the mining business in the future

Reasons for tyres being scrapped is an important aspect. To give an example, the main reasons for scrapping tyres in May 2015 in the case of Bridgestone were cut separations (27); bead damage (11) and sidewall cuts (7). Michelin tyres scrapped were mainly due to sidewall lamination. The positions of tyres that were scrapped the most is given – with positions 4 and 5 seeing the most as they take the most lateral forces. It is also possible to compare the Cat and Komatsu trucks to compare the relative rates of tyres scrapped by OEM and truck type.

As stated, new tyres are expected to reach 7,500 hours with anything above this considered as hours gained for the customer and added value.

Moving on to repairs, the most common repairs are to the sidewall and tread. Repaired tyres have a warranty of 1,000 hours, with monthly repairs varying such as 45 in May 2015 and 73 in March 2015, but again this comes down to the mine operational conditions, as Drummond is now operating less shifts due to issues with the coal rail transport. Repair technicians do a lot of training on how to use the latest equipment and tools for repair and the best procedures for excavating the damaged area, applying new rubber and vulcanising to make repairs last. Repair performance can also be reviewed by technicians.

When trucks come into the shop, a decision is made when tyres are removed to remount them (including to new rotation positions), repair them, send to the spares stock, or scrap them. Every tyre gets a damage report with photos taken and damage areas marked up. Even scrapped tyres are reviewed in detail to allow future comparisons and analysis. There are three ways that a truck can make its way to the tyre shop. Every truck scheduled to go to the main mine maintenance shop goes to the tyre shop first, then to preventative maintenance, then back to the tyre shop before returning to the pit. Trucks are also inspected in the mine at fuel farms, referred to as inspection islands, where

pressures are checked that they are optimum and where possible, wheels and rims are cleaned. Cleaning is very important and Kal Tire does it for all tyres changed as well as cleaning the stock inventory. A new project is to cover new inventory tyres with a polymer to slow down any time related loss of performance. The date the new tyre came in is recorded, and a first in first out system used so that older tyres get used first.

If there is an issue identified from visual inspection, the truck can be sent to the tyre shop. Finally, of course there are the scheduled rotations of tyres, with software showing the hours on each tyre and when it needs rotating, for example fronts that approach 2,500 hours will be flagged to rotate to the rear.

Mine audits are another important report type and are conducted by Kal Tire's field supervisors. They give conditions of haul roads, such as reporting any undulations, inclinations, nature of curves, standing water, road surface thicknesses etc.

Kal Tire carries out monthly SSS or Site Severity Surveys, looking at the condition of the mine roads, load zones and dumps. Kal Tire also deploys its VBox on some of the trucks, providing speed analysis, indication of lateral G forces, high slopes, braking forces and GPS location data. If a tyre was not performing well it is possible to look at the TKPH and see if the truck was overloaded or if it is down to another reason. In the future, Kal Tire hopes to introduce its TTT TPMS system to allow live pressure and temperature monitoring.

Employees and the Kal Tire family

Perhaps the best way of ascertaining the culture of Kal Tire aside from customer feedback, is to see what its fitters and technicians make of the company. They are already being recognised as earlier this year Kal Tire at Drummond was presented with the Tom Foord award, which is dedicated to the memory of Kal Tire's Founder, who started it all in Vernon, British Columbia. The citation reads: "It is Kal Tire's highest honour and is awarded annually to the team in each division demonstrating safety excellence, commitment to customer service, and superior performance in every aspect of our business."

IM spoke to a number of workers to hear about their experiences with the group since joining Kal Tire at Drummond. Fran Carlos Bernal,

Maintenance Technician stated: "I have four years of experience with tyres and one year four months with Kal Tire here at Pribbenow. It has been a good experience as it has changed my attitude to work. Though it remains a job with risks, the focus is now on teamwork not individual work, plus a goal to keep safe and healthy. Kal Tire has also made me see our value and the difference we can make. Kal Tire is progressive which will also help me to develop professionally. I am very proud of our Tom Foord award. Kal Tire has given me a lot of opportunities and I also give my full effort to the company."

Jeimer Carrillo, Repair Technician said: "I have 14 years of tyre experience and am happy now to be part of Kal Tire – this is a company very concerned with the safety and development of its technicians. It also feels very much like a family environment and when compared with other companies I have worked for I feel very comfortable and safe working for them. I am also proud that my work within Kal Tire has been recognised with the Tom Foord award."

Luis Fernando, Supervisor at Descanso said: "I have been with Kal Tire for five years. The company has given me the opportunity to develop my skills in work through training, both in Colombia and abroad. Drummond has not been an easy project but we have all given our maximum effort from the start and we have had a lot of training in processes and safety. The culture of the company is defined by Journey to Zero in Colombia and worldwide. I am happy we managed to receive the Tom Foord award after only a year of operation."

Finally, Kendry Quintero, Maintenance Technician said: "I belong to the tyre mounting team, having had 1.5 years with Kal Tire and three years in total in tyres. It has been a privilege to work within the Kal Tire family. My last company focussed only on production but we now focus on both safety and production and I consider safety to be the most important aspect. Kal Tire has helped me develop both as a tyre technician but also as a person."

Kal Tire has made safety a priority since the start of the organisation. However, in January 2014 they the company went one step further and introduced a global commitment to 'Journey to Zero'. For every Kal Tire operation across five continents, it has made a commitment to safety that states, 'Our goal is zero harm, every team member, every day'. Kal Tire Drummond is fully committed to its Journey to Zero program, and 100% of the team members have received training and continuous refreshment courses about this initiative, including monthly articles sent by the head office. During the first year of operation, a total of 243,252 man hours were achieved without any LTI. **IM**