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# CONTENTS

---



20

## 06 - Editor's Note

### History Revisited

10 - Hydraulics: Shaping the Construction Industry

### Market Update

12 - Bright Times Ahead

### Events

15 - Record bauma Attracts More than 620 000 Visitors

16 - First Truck & Shovel Digs In

### Cover Story

20 - Scania is Working Hard in Construction

### Feature Story

26 - G.F. Engineering has a Tip for You: Quality Pays Off



26



10



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# CONTENTS

---



40

## Tyre Tech

- 28 - Lik Thong Resources Keeps Your Tyre Turning in Construction Sites
- 30 - Tough Environments call for Tough Solutions – Toughread!

## Tech Talk

- 32 - Maximising Machinery Uptime to Meet Construction Deadlines

## Filtered for Performance

- 34 - Filters – Taking Care of Your Machinery

## Launches

- 36 - Volvo Trucks Presents Heavy-duty Electric Concept Trucks for Construction Operations and Regional Transport

- 37 - Headlights

## Truck Feature

- 38 - Sinotruk 47T Howo Dump Truck

## Trailer Tech

- 40 - Universal All-rounder: Semi-low Loader DOLL-Vario

- 42 - NEWS & NOTES



36



30

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This time our annual special is about a different subject matter. After four consecutive years publishing an Asian Trucker on trailers, we wanted to try our hands on something new. What you have in front of you now is the first ever edition of the magazine dedicated to construction equipment and the parts that are needed in and around them.

Previously, I have written about machinery used in construction sites before. However, that was just a page or two and it was tremendous fun to find out more about this I expected that there is much more lurking under the topsoil. And true enough, there

# Every Day they are Shovelling!

was plenty to discover. And we did not have to go very far. It turned out that many of our regularly featured companies do also offer solutions for the construction industry.

It so happened that the Scania AXL was demonstrated for the first time and naturally, that just had to be part of the cover story. Over the past two years, truck makers have increasingly spoken about autonomous vehicles being used in confined areas, such as mines, quarries or ports. And finally, we get to see such a vehicle in action. While it will take some time for the AXL to be available here, I managed to capture some action with one of Scania's clients, who took me to where they deploy their trucks in tough environments.

I wanted to learn more about these gigantic trucks that one sees in documentaries sometimes and thanks to people I met I have gotten some insights into this market segment as well. These extremely specialised vehicles are something entirely different from the trucks I normally write about and I hope that one day I can go for a test drive on them as well.

Cement mixers seem to be a good indicator of how well an economy is doing. Without them, cement needed for the construction of houses, bridges, tunnels and skyscrapers would not get to the construction site. Dongfeng is a good address to go to for your cement mixers and in our market update on them you can find out what makes them such a sound investment.

Hopefully, this edition will rouse some interest. I would really like to continue it for a few more years as I feel that there is a lot more that we can talk about. Naturally, if you are involved in the construction equipment business, I would like to hear from you as I am sure that there are interesting stories to be told.

Drive safe! Sincerely yours,

Stefan Pertz  
Editor Asian Trucker Malaysia



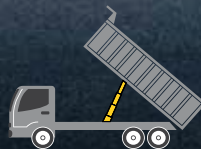
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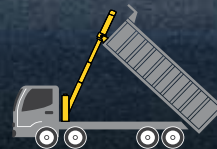
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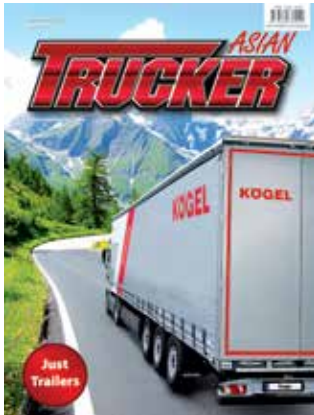
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# Hydraulics: Shaping the Construction Industry

*The innovations in hydraulics have evolved rapidly in the last 70 years and remain to be a huge impact on modern technological developments.*

It might serve as quite the surprise to find that hydraulics is what powers most of our construction vehicles today. In fact, no other industry has benefitted from hydraulics more than the construction industry has. It might not seem like it, but these aqua-powered construction vehicles range anywhere from your good ol' excavators and tower cranes, to your heavy-duty trenchers and loaders. Here we will look at how developments in hydraulics have made an impact on heavy construction vehicles and will continue to do so in the future.

## Rubble Beginnings

Construction vehicles were once upon a time—namely before the late 1700s—powered by steam, the method by which heat energy is added to water to turn it into its gaseous form, which thus creates pressure from the increase in gas volume. Steam engines, however, were not enough to supply large scales of power, and this technological pickle led to the development of the hydraulics system in construction, which proved to be the most efficient force multiplier.

It all started in the year 1882 when Sir W. G. Armstrong built the first hydraulic-powered excavator to serve in the construction of the Hull docks. While the vehicle was not a true hydraulic machine per se—it ran on water instead of hydraulic fluid, and relied on the limited strength of cables and winches which were used to operate the bucket while a hydraulic cylinder controlled a set of multiplying sheaves—it nevertheless established its position as the precursor to what we now know as fully loaded hydraulic machines, albeit its rather unsuccessful debut.

It was not until five years later that the first true hydraulic excavator achieved some recognition in the construction world. Built by the Kilgore Machine Company, the Direct Acting excavator operated on four direct-acting steam cylinders without cables or winches, and much unlike its predecessor, was able to withstand heavier loads due to its steel structure. The two levers controlling said cylinders allowed for the bucket to emulate the operator's hand motions,

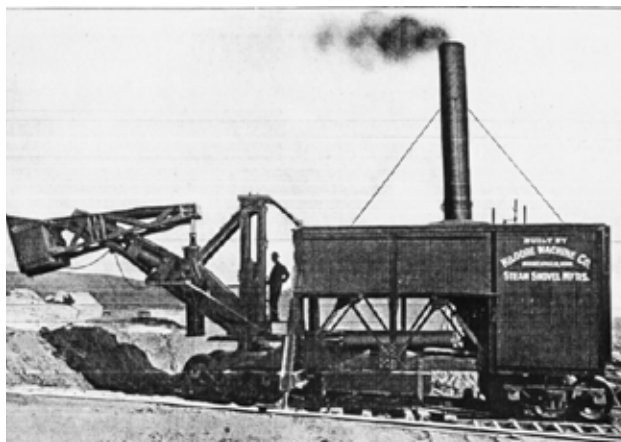


giving way to a range of motion in multiple directions of equal power. Impact damage was also efficiently reduced as the hydraulic system was able to cushion every stroke made by the cylinders. With its efficient digging power, coupled with a sturdy framework, the innovation of the hydraulic machine once again proved to be invaluable to the industry.

## Hydraulic Fluid Runs Thicker

In a time of technological advancement, hydraulic systems continued to gain popularity in the construction industry and began taking over other cable-operated vehicles and machines such as graders, dozers, and scrapers. Before improvements on the hydraulic system kicked off in the 1960s, construction design was simple and maintenance of the cable systems could be easily performed with your run-of-the-mill hammer, as claimed by Keith Haddock, National Director of the Historical Construction Equipment Association.

That said, Demag was the first manufacturer to entertain the idea of a fully revolving excavator, and, in



1954, went on to develop the Demag Hydraulikbagger B504, which came to be the world's first 360-degree hydraulic excavator. The hydraulic machine was controlled by rotating joints on its front end instead of flexible hoses, and its 42-hp three cylinder diesel made it capable of 2.5mph while carrying a half-yard of load. This set the pace for construction machines, as the B504 proved to be efficient while remaining agile and flexible.

With that, other manufacturers took note, and as the Swinging Sixties came, so did the fully swinging hydraulic excavators. "The development of hydraulics led to equipment that is much more productive, much more cost-effective and more durable. Starting in the 60s, there was a transition to hydraulics," said John Patterson, former CEO and president of JCB. It was in this decade that full-revolving excavators were developed by the likes of Komatsu and Hymac. As a consequence, the increase in labor productivity from this transformation of equipment design quickly contributed to the expansion of hydraulics.

### A Solid Future for Fluids


The construction world also saw more precision that came along with hydraulics, allowing for optimization of construction processes that required precise motions. These complex motions are made possible with multiple hydraulic actuators such as cylinders and swing motors. Today, we also see the increase in operating pressures ranging anywhere between 5 000 and 6 000 psi, a stark contrast from the 60s, when operating pressures were between 2 000 and 2 500 psi. As such, the focus of the technological improvements in hydraulics that shifted from power efficiency some 60 years ago, to operator precision in the current day, has resulted in both greater machine efficiency and machine precision.

And with the high tech era that we live in today, hydraulic systems have been combined with technology such as grade control and compensation, GPS navigation, and laser-positioning, to name a few, and this could only be made possible with the level of precision and accuracy that has been

attained though decades of technological advancement. The future of hydraulics does not stop here; developments are in progress to increase power density—an effort for manufacturers to use as little space and weight while maximizing power output—as opposed to just power, and as expected, construction equipment manufacturers are exploring the amalgamation of hydraulics with electronics, replacing the traditional mechanical control with electronic control. To top it off, construction vehicles are now programmed with multiple performance modes—just like any modern car we see today, the operator can choose to run the machine in "eco" mode for better fuel economy, or for a task that requires an extreme level of productivity, in "sports" mode, where one can ramp up power with an easy-to-adjust dial.

Load-sensing hydraulic systems have also proved to be highly efficient and productive, and if it were not for the switch from gear pumps to high-pressure piston pumps, hydraulic machines would not have been able to perform the way they do today. With load-sensing, pump flow can be monitored and adjusted to provide the exact pressure that is required by the actuators, as well as maintain a pressure drop that is constant.

Suffice to say that the construction industry has come a long way with the introduction of hydraulics, and with the ever-growing development in the area, hydraulics will continue to make its mark as more manufacturers experiment with the different modes of modern technological integration and refinement. Soon enough, autonomous machines will be commonplace in the field, where digital scans of the topography are inputted, and the machine performs its task to match the desired output. Simply put, the possibilities are endless, and it's safe to say that we are all excited for what's in store for the hydraulic construction world.

Sources: *Construction Equipment Guide*, Demac, *ForConstructionPros*, *Handlers Equipment*, Hyva, *MAC Hydraulics*, *Mobile Hydraulic Tips*, *OEM Off-Highway* 



# Bright Times Ahead

**E**xtrobright Concrete Sdn Bhd (hereafter known as Extrobright) is a company that manufactures ready mix concrete. The company has been established for almost 15 years. Having started in Damansara, they are one of the few concrete manufacturers in Klang Valley. They have currently expanded to four locations in Klang Valley and are planning on expanding to more locations in the near future.

"As concrete manufacturing heavily relies on market demand, the expansion plan by Extrobright directly translates to a high market demand in the near future. We have been invited to manufacture cement for some project sites in Klang Valley, so the business is growing. Trucks are the key to run the business. Without the trucks, we will not be able to deliver concrete to our customers," said Mohamad Yusaini Bin Nowani, Plant Manager at Extrobright.

Yusaini stressed, "You can process the concrete but if you do not have enough trucks to deliver them to the construction site, it will be useless. Especially so in Kuala Lumpur where there is heavy traffic, we require trucks that are

*The company relies on Dongfeng mixers to deliver concrete to its customers, near and far.*

more practical to ensure we stay competitive in the market. We do not need vehicles that incorporate advance technologies as the main purpose of our trucks is to ensure the concrete does not harden during delivery."

"With such a competitive market, customers have more options to choose. It is vital for us to stand out amongst the other 20 and service

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plays a huge role in that. You need to ensure deliveries are on time and there are enough trucks to do so. The volume that the truck can carry also matters.”

Having been in the industry for more than 20 years, Yusaini observed that most companies used to prefer smaller sized trucks. But the trend has changed recently. With the falling price of concrete, companies have resorted to taking various measures to lower operation costs. During the early times of his career, Yusaini said that the trucks could carry 5m<sup>3</sup> of concrete, but now they can carry 10m<sup>3</sup>. For example, for an order for 100m<sup>3</sup> of cement, 20 trucks had to be dispatched in the older days but now they only needed ten trucks.

Yusaini kindly explained, “Now that trucks can carry double the capacity of what they used to, you save time as well as workability on site. You no longer have 20 trucks waiting at the plant, clogging traffic. We also save on fuel cost in the long run.”

On the issue of truck maintenance, Yusaini shared that Extrobright takes maintenance very seriously. If not well maintained, operational costs can spike, thus result in losses. With the recent thinning of profit margin, maintenance plays a vital role in the day to day operation of the company. If a truck breaks down, it will incur losses to the company. If in the event of a breakdown, Yusaini can rest assured that the experts at Dongfeng will be able to provide assistance as quickly as possible.

Extrobright’s fleet of vehicles consists of approximately 75 trucks of which there are Hino, Nissan Diesel (now known as UD), Fuso and Dongfeng. The company used to purchase reconditioned Japanese trucks but decided to purchase new Dongfeng trucks in 2013. Extrobright considered many Chinese truck brands before deciding on Dongfeng, upon recommendation by Mastermac, their dealer of choice.

Extrobright initially purchased five units of Dongfeng mixers. After using the trucks for two and a half years, they were very satisfied with the user experience, spare parts availability, fuel consumption and after-sales service, they decided to purchase more Dongfeng trucks to make up its fleet of 18 Dongfeng trucks. The company recently ordered five more units to add to their fleet.

On the future plans of the company, Yusaini foresees that the economy will be better for the next year. “Many projects that are currently running are from the private sector. Now that some mega projects have been revived, I foresee more development and demand for concrete in the next year.”



# Record bauma Attracts More than 620 000 Visitors

With more than 620 000 visitors from over 200 countries, bauma 2019, the world's leading trade fair for construction machinery, building material machines, mining machines, construction vehicles and construction equipment, generated the best results in the exhibition's 65-year history. The number of visitors rose by about 40 000 over the total produced during the previous event in 2016. More than 250 000 visitors came from countries outside Germany. The top 10 visitor countries after Germany were: Austria, Italy, Switzerland, France, the Netherlands, Russia, Sweden, the Czech Republic, Poland and Great Britain. The trade fair also experienced a strong increase in attendance from overseas visitors. Significant gains in this group were produced by China, Australia and Japan. More than 5 500 visitors came from China alone. The number of exhibitors totalled about 3 700 from 63 countries – likewise a record. With its unprecedented 614 000 square meters of space, the largest bauma ever held was once again a bauma filled with records.

During the 2019 edition, exhibitors unveiled a huge number of innovations and new products to the trade fair's global visitors. Zeppelin/Caterpillar, for instance, introduced more than 20 world premieres. Business conducted at the exhibition was correspondingly good. Many exhibitors spoke of a high willingness to invest. The record-setting bauma also had a strong impact on order books as exhibitors generated the highest sales in the history of their participation at the trade fair.

## Innovation platform and economic engine

Thanks to the smooth operation of the exhibition and the consistently positive feedback by exhibitors, Klaus Dittrich, Chairman and CEO of Messe München, was more than satisfied



with the results of bauma 2019: "For the industry, bauma is by far the world's most important innovation platform and economic engine, something that we clearly saw this year. Particularly in these times of sweeping technological change that is being triggered by digitalization, bauma provides the industry with security and confidence. Thanks to the momentum in demand generated by the fair's seven days, companies will be able to calmly face economic slowdowns. bauma 2019 highlighted the opportunity and tremendous outlook of the industry as a whole."

Franz-Josef Paus, Managing Director of Hermann Paus Maschinenfabrik and Chairman of the bauma Advisory Council, described the trade fair's unique character this way: "With exhibitors from more than 60 countries and visitors from over 200 nations, bauma is an industry platform where technological variety, ingenuity and performance can be demonstrated to an immense international business audience."

## Exhibitors: "The most-successful bauma of all times"

For exhibitors, bauma 2019 was a complete success, as occasionally euphoric statements about it showed. Masa Managing Director Frank W. Reschke described it as "the most successful bauma of all times." Martin Herrenknecht agreed: "Every bauma is something special. But 2019 topped everything for Herrenknecht." Domenic G. Ruccolo, CEO of the Wirtgen Group, rated bauma 2019 as "the most successful in the history of the Wirtgen Group." Many exhibitors of bauma's partner country, Canada, were enthused as well. Melinda Zimmerman Smith of Serious Labs said bauma created "exciting opportunities that we didn't even know existed." What's more, bauma was "simply a whole lot of fun," she said. **F**



# First Truck & Shovel Digs In



Paul Moore, Editorial Director, International Mining



Chet Fong, RPMGlobal

When Paul Moore, Editorial Director, International Mining, welcomed delegates to the first Truck & Shovel Conference he stated, "This conference is the first load and haul event of its kind – one that is focussed on this topic, but which has a firm future mining emphasis. It is being held in the worldwide hub of Singapore, therefore tapping into the mining markets of Asia and Australasia and further afield, making it a truly global gathering." The plan is to hold this event every two years.

## Global Topics

Though held in Singapore, readers of Asian Trucker should rightfully ask what a conference about mining has to do with the trucking industry. There are many issues that the two industries have in common and topics were discussed that could be applied in many business areas.

One of the best examples of this was the presentation made by Jason Knuth, Senior Manager – Data Solutions, and Simon Van Wegen, Product Manager – Data Solutions, Komatsu Mining. After outlining the challenges the mining industry is facing – aging workforce, more difficult to extract minerals and declining prices – they talked about solutions that can address these challenges such as optimising maintenance processes, the integration of smart equipment and the value of data.

## Gaps in Products

In product development the gentlemen from Komatsu say they look for gaps in products and they make new products to fill the gaps and make them

*The first Truck & Shovel conference was held in Singapore and while the focus was on mining there was an abundance of information relevant to trucking.*

more efficient. They assess specific pieces of equipment, gather data and understand how the customer uses the equipment. Once this is done, they find ways to improve the design. They gave several examples such as Truck Frame Analysis where they have continuously improved the design and extended the life of the truck in the field.



David Pichanick, Austin Engineering

"We look at situations where time is being wasted. Shovel hang time is an area where improvement can be made. We analysed the situation and found the causes of this. From our study we realized that a visual guide was needed for the truck so the driver would know where to go so the shovel wasn't hanging, waiting for the truck to get in place. With this in place there was a 4.7% decrease in shovel hang time. That wasn't good enough for us. Through operator training we got that up to a 36.5% decrease in hang time. This meant that the trucks could do three additional loads per hour."



### Leadership Must Lead

Summing up the take aways from the specific situations they stated: To get real results leadership has to communicate a common goal. There must be diversity in the work force, and you have to have the right people in the right role and empower them. You must make sure that data is accessible to everyone so you can build insights from the data. Create data democratization rather than centralization of information. Use the data to get actionable results. You must leverage experience from outside your company to get maximum results.

They advise that companies should avoid being driven by technology but use technology to fit for a purpose. Utilize technology to implement highly valuable solutions. Be aware of what is already available, so you don't reinvent the wheel. Get user feedback that involves active sharing and collaboration.

### Solutions from Within

Chet Fong, Technical Specialist, RPMGlobal talked on using intelligent simulation to improve haulage operations. He states: "The Mining Industry has become hungry for solutions from within – how do we improve what we already do? Instead of relying on a step change to improve the bottom line, we turn to incremental improvements to grow. In the world of precision, math is king.

"By examining road networks, points of congestion, by looking at truck speed, stoppages and loading time you can optimise the number of trucks needed for a particular job. "

### Truck Design & Development

Director of Sales & Marketing, Pioneer Solutions, LLC, Christopher B. Althausen, spoke on mining truck design and development: challenges, hurdles and solutions. He set out to answer the questions: How should the project be started? What design methodologies and standards should be used? What are the best strategies for technological advancements, autonomy, electrification and safety? How should manufacturing, prototyping, testing, and support be planned, executed, and managed?

He focused on two foundational design elements critical for developing a new mining truck with competitive, low cost-per-tonne performance: (1) developing an efficient, whole-machine concept and (2) designing reliable structural components. He talked about breaking and control systems and the challenges in designing them.

**Don't Be a Testbed**

"Some companies prioritize an aggressive manufacturing schedule over design and engineering. They want to incrementally improve over time. They'll say don't worry if it breaks down, we'll fix it. You don't want to be a testbed. The results of rushing a product are: Low hour structural failures, heavy net machine weight and poor cost per tonne value proposition. If your trucks aren't of good quality, you will get a bad reputation.

Althausen advises that you develop a "whole machine concept. Make sure it is feasible. With options and configurations – how are they going to fit into the design. Evaluate all your options and get feedback from the users. Develop concepts then verify that they are feasible, then add more details." He noted: "A compact design is a lighter design."

He warned against mimicking another OEM's design. "You don't know what they went through to get there."

**Rugged Rexx**

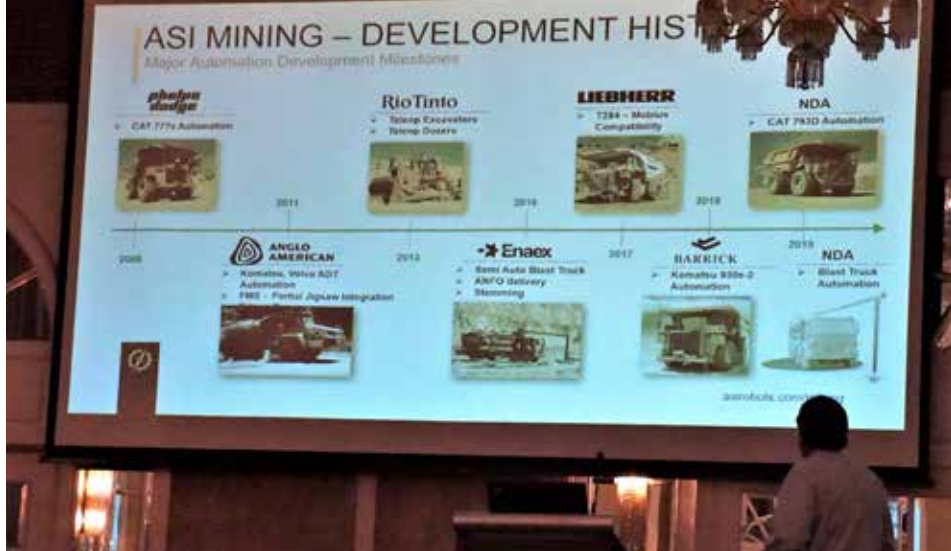
Virginie Hannah, Group Manager Innovation and Product Delivery, Bis Industries talked about the storm Bis has been causing in the open-pit haulage sector with its innovative Rexx truck. Fitted with 20 wheels, the machine combines the distance capacity of a traditional off-road haulage solution with the ability to go out of the pit.

"Bis has a culture of customer-driven innovation," stated Hannah, "with a strong focus on innovation in mine site haulage for reduced costs, improved productivity and better community and safety outcomes. Game-changing truck, Rexx was introduced to the market late last year."

**A Solution for Double Handling**

"The idea for Rexx came about when Bis leaders recognised a problem in double handling product when it was being moved from pit to processing. The solution was a 20-wheeled, long range, out-of-pit hauler that would combine the distance capacity of a traditional off-road haulage solution with the ability to go out of pit."

Bis says Rexx offers a range of competitive advantages, moving resources more efficiently and delivering greater profitability for customers. On



the topic 'Innovation in minesite haulage' Hannah talked about the process of developing Rexx. "Innovation is the DNA of the organization – and it starts at the top and it creates greater value for our customers."

To have successful innovation you need, according to Hannah, 1) alignment of innovation and the business strategy, 2) a company wide culture and support for innovation, 3) top leadership to be all in 4) a customer-first approach, 5) the right projects and 6) a wholistic approach to being the best.

**Mining Automation**

Drew Larsen, Director of Business Development, ASI Mining said Autonomous Mining is more feasible than you might think. The challenges of adapting AHS in surface mining are mixed fleets, older fleets, unsupported Fleet Management Systems, (FMS) Integration challenges and a lack of people and expertise.

Larsen says ASI Mining took a disruptive approach to developing OEM-agnostic. "OEM-agnostic will fit with any system. Retro fits can be done which allows for the future purchase of used vehicles. The FMS integrates with incumbent systems. Other projects are not scalable but OEM-agnostic allows us to integrate with other platforms."

**Tyres & Haulage**

Tony Cutler, Principal Consultant, OTR Global talked about the advantages of automation in his presentation on 'Factoring tyres into autonomous haulage'. One of the biggest advantages to automation is the reduction of labour. "You can reduce operators from three to four per truck to one. No catering is required for the workforce, there is no loss of time for shift changes so you can get 2 " hours more from the truck per day. You can get 1000 hours more per truck per year. There is no driver variability and reduced production because of tiredness. In addition, there is reduced component wear and safety is increased. Four hundred automated trucks



Rexx in action.

body in high-strength steel allows Metso customers to do just that. The one-piece liner was launched in April 2019 and is compliant with all truck brands. "The rubber absorbing liner reduces weight by 20 – 30% and allows up to 10% more payload. The liner helps lower fuel consumption and eliminates carry back. The sides will last 10 years and the bottoms five years."

Samuelson continued, "The V shape stiffens the body and you don't have to tilt so much before the material begins to flow. It lasts six times longer than steel linings. The modular design means less maintenance and more uptime." In addition to all that it reduces vibration and reduces noise by half.

### Outside the Box

Global Manager Market Development & Innovation of Austin Engineering David Pichanick's topic was 'Truck dump bodies: Thinking outside the box'. Austin Engineering says it is the world's largest non-OEM designer and manufacturer of mining dump truck bodies. The company has done this by adding value for the customer. They focus on optimising payloads and driving productivity. Knowing what the objectives of the customer are allows them to meet their needs.



Carl Samuelson, Metso Truck

have operated over 100,000,000ks without one serious incident."

"Tyres are one limiting factor. They have met their capacity. As companies can't make bigger tires, they have to use more on a truck. While there are many companies that make smaller sizes, there are only two that make the largest tires."


### Automation Challenges

There are problems with automated trucks. They rut the route because they all go exactly the same way. They are not good at identifying dips and undulations in the road which results in the serious application of brakes. When the truck and payload are beyond the tyre's capability it can result in problems. With no driver to identify a problem tyres have heated up and burned. It has happened where the tyre of an automated truck burns and damages the truck.

### New Truck Body

Carl Samuelson, Global Business Support Manager, introduced Metso Haul Truck Solutions and the new 'Metso Truck Body: Haul more with less'. "It is possible to lower OPEX while not only increasing both payload and revenue, but also improving working conditions for employees," Samuelson stated. He went on to explain how a one-piece, rubber-lined, and lighter-weight truck

Austin Engineering's new product is the ULTIMA Dump Body. The new customisable body has been designed from over 50 years of WESTECH and JEC dump body innovation. Utilising new technology in steels and engineering expertise, the Austin ULTIMA will be the new benchmark in future dump body design. The Austin ULTIMA can carry a greater payload and meet all OEM specifications and ultimately deliver the lowest cost per tonne in the world market.

Over the two days there were many presentations focussed entirely on the mining industry, but there was a great deal of information that was relatable to the trucking industry. 



# Scania is Working Hard in Construction

*Vehicles in Scania's construction range are rugged, robust and reliable. Known for their excellent manoeuvrability and handling, they're perfectly suited for hard work in the most challenging conditions.*

Scania construction vehicles are the choice for applications where high uptime is vital. When used in combination with appropriate services, they form a complete transport solution that can be used to boost the profitability of operators. Truck operators are able to work together with Scania to specify or tailor a vehicle that precisely matches their needs. The result is a truck that can be depended on for years to come, whether it is to be used off-road, as a tipper, in mining, concrete or in forestry.

## **Scania AXL, fully autonomous concept truck, without a cab**

Recently introduced to the public, the Scania AXL is turning heads as an innovative and leading vehicle, that showcases what autonomous vehicles will look like when they finally arrive at the workplace. While the purpose of the vehicle is evident, there are still many questions and we managed to have some of them answered.

## **What is Scania AXL?**

In what is another milestone in the development of heavy self-driving vehicles, a group of Scania experts in different fields have teamed up and developed a concept truck, which, even without the cab, has the company's modular system at the heart of the design.

As different industries look to streamline transport assignments and make them more sustainable, self-driving vehicles are increasingly being considered. Mines and large closed construction sites are examples of environments that are favourable for self-driving pilots since they are well-controlled locations.

"We already have self-driving trucks in customer operations. However so far, they have been with room for a safety driver who can intervene if necessary. Scania AXL does not have a cab and that changes the game



**AT:** Unlike others, you have opted for an autonomous truck that is using a tipper. This is an added function, which adds complication. Is this not a step too far?

**EF:** A tipper body is needed in mining operations and the AXL is therefore equipped to perform mining duties. The truck uses the tipper body to unload the cargo where the control tower has indicated. Having a tipper body does not add significant complexity. However, the tipper body can also be replaced with water tanks or any other body used in mining operations.

**AT:** How have you answered that MIT question about how an autonomous vehicle should react in case several parties could get into harm's way?

**EF:** The trolley problem has not been the focus of the AXL concept vehicle\*.

**AT:** How much more efficient is the AXL compared to tippers driven by humans?

**EF:** Right now, it is too early to compare manually operated vehicles with an AXL-fleet, simply because there is no AXL-fleet operating yet.

**AT:** Has sales commenced? What are the roll-out plans?

**EF:** There are no sales or roll out plans. The AXL is purely a concept vehicle to show our customers what the future may look like and for us to better understand the expectations and needs of customers in mining operations of the future.

### **\*The Trolley Problem**

The Trolley Problem: Suppose you are the driver of a trolley. The trolley rounds a bend, and there come into view ahead five track workmen, who have been repairing the track. The track goes through a bit of a valley at that point, and the sides are steep, so you must stop the trolley if you are to avoid running the five men down. You step on the brakes, but alas they don't work. Now you suddenly see a spur of track leading off to the right. You can turn the trolley onto it, and thus save the five men on the straight track ahead. Unfortunately, ... there is one track workman on that spur of track. He can no more get off the track in time than the five can, so you will kill him if you turn the trolley onto him (Thomson 1985, 1395).

significantly," says Claes Erixon, Head of Research and Development at Scania. "The development in self-driving vehicles has made great strides in the past years. We still don't have all the answers, but through concept vehicles like Scania AXL we break new ground and continue to learn at great speed."

In an exclusive interview with Asian Trucker, Eric Falkgrim, AXL Project Manager, gives us answers to questions that the market will surely want answered.

**AT:** The Scania AXL is one part of a system. What other components are needed to operate the vehicle?

**EF:** There needs to be a "control tower" to assign a mission to the vehicle and communications between the control tower and the vehicle itself. This "control tower" can be a laptop for example, which may not be delivered by Scania. Obstacle detection and route planning is performed on the vehicle side.

**AT:** How does that work in a practical application with several AXL in one compound? Is there a control tower, does someone still have to monitor the operation?

**EF:** Yes, there needs to be a control tower to assign missions to the vehicle fleet. Operators may also need to remotely operate vehicles if they encounter issues they cannot solve themselves.



### Additional Info on the AXL

- Scania AXL is a fully autonomous concept truck that doesn't feature a cab.
- The AXL is based on the G410B8x4NA running on biofuel HVO (Hydrotreated Vegetable Oil) but also includes Scania's signature modular system hence making it possible for the AXL to be fitted with any engine and configuration available at Scania.
- There are seven cameras as well as LiDAR sensors that use laser beams to sweep the surrounding in order to map out the environment. Radars are also located at the front, back, and at the sides of the AXL to capture environment data for processing. Processed data helps to map out the best route to perform the assigned task.
- The white line that can be seen across the front of the AXL is the Human Machine Interface (HMI) that functions as the "eye" of the AXL as it helps to connect workers on-site with the AXL providing workers with peace of mind in knowing that the AXL can recognise a person's position and can follow instructions on-site.
- Scania AXL is being piloted in the mining industry as autonomous transport solutions are already well established in the industry. Scania already has autonomous trucks in a customer operation (Rio Tinto at the Dampier salt operation in Western Australia). Also, mines are like closed industrial areas and have trained professionals in command of operations meaning they are well suited for automation. Autonomous vehicles can also make mining operations safer for people employed within the sector.
- The first live demo of Scania AXL was conducted on 2 October 2019 at Scania's demo centre in Södertälje during TRATON GROUP's Innovation Day.



Scania was also introducing the XT range, with additional technical specifications built to enhance the robustness of trucks that work in rough terrains, such as construction sites. These include a high air intake to supply the engine with the cleanest air possible in dusty environments and a tow pin with 40-tonne towing capacity in the front to enable the truck to be pulled out quickly.

In a variation of this, it has to be asked how an autonomous vehicle has to act in case people could be harmed as a result of the autonomous vehicle being in operation.

While we are waiting for the AXL, Scania's New Truck Generation vehicles have already been put to work here in Malaysia. It has taken some ten years to develop this new range. During the launch earlier this year, it was explained that Scania not just improved parts and components but designed them from scratch. As a result, the front axle was moved five centimetres forward, resulting in the driver's seat to be moved forward 6.5 centimeters and two centimetres further to the side. The A-Columns were moved backwards, and as a result, drivers now have a better view of what is in front of the vehicle.

The New Truck Generation by Scania continues to adopt Scania's unique modular system, where customers can customise their vehicle configurations according to their choice of cabs, engines and chassis. This system maximises spare parts availability and minimises downtime for vehicles needing repairs and replacements, allowing customers to benefit from incremental revenues.





### Scania Next Gen at Work

The XT range is a result of Scania's heritage, timeless engineering and extensive field testing, creating vehicles robust and reliable like no others. XT is powered by the widest range on the market, available on Scania's entire cab range and engine programme with endless configurations available to be tailored to suit your tough needs. Here in Malaysia, the truck has already been put to the task and companies involved in the supply of the construction industry are giving positive feedback.

STLS Group is one of Scania's customers. Steven @ Satish gave us some more details about why they are using the Swedish trucks and how these help improve profitability in

their operation. "In our current name, you will find the origins of the company. It stands for Sara Transport & Logistics Services, which is what the company was doing when it was founded." Steven's grandfather started the business in 1986 in Pahang. The first unit deployed by the company was a Japanese make. As a founder of the company, he was a driver himself.

### Growing Business – Changed Demands

In 1997, the business moved to Kuala Lumpur. Steven's uncle, Dato' Saravanan, Chief Executive Officer of STLS Group, was also driving a lorry and they decided to join forces in order to expand. The primary business of the company was the transportation of sand and aggregates. Seeing an opportunity for downstream expansion, in the early 2000s, the management team decided to venture into the quarry business. "We started mining sand in Tapah, where we still maintain a pit. However, we cannot depend on one pit only as we are delivering some 3 000 to 4 000 metric tons of sand per day." In addition to mining the sand, the company still transports aggregates. One of the key customers is Hanson Group, who has appointed STLS Group to handle their aggregate logistics for their two pits in Sungai Buloh and Hulu Langat.

The STLS Group currently has 66 trucks, out of which 10 units are Scania. "What I find interesting is that people claim that Scania trucks would be better suited for long distance haulage. However, we do not think that this is the



case,” said Steven. A variety of Scania models is deployed by STLS Group and according to Steven, there are no issues with the trucks, considering that the load is very heavy. What made the decision was the service offering. “Nobody could beat the service that Scania was offering.” With warranty for 240 000 kilometres, this means that STLS Group can focus on the job at hand, which is transporting sand and aggregates.

### Treat for the Driver


A truck would typically clock in between 15 000 and 20 000 a month, whereby the trips can be either relatively short with only 100 kilometres or up to 500 kilometres. Longer trips are from Ipoh, where limestone is loaded and carried to Kuantan. When coming back from Kuantan, STLS Group tries to have backhauls. As a result, trucks are exposed to different scenarios: short trips are heavy just one way and long trips are typically fully loaded both ways. “We opted for the XT as the value for this model was really attractive and we have all the trimmings in the cab, which is good for our drivers.” STLS Group’s trucks are coupled with trailers fabricated by Good Fortune Engineering and use HYVA hydraulic cylinders.

In fact, the Scania XT in operation at STLS Group is the first in Malaysia and it was picked up as a firm order at the official launch. The steel bumper, according to him, is the most important feature as the off-road parts of the trip are very bumpy. Drivers have reported back that the cab has a very good view from the driver position and that driving it is almost better than driving a car.



“Drivers said that this wasn’t just a step up, but a completely new driving experience, almost like driving a SUV. The sitting position and resulting unobstructed view was hailed as this is important in quarries, where there are no marked roads and others may just whizz about the place. To ease drivers into the cockpit, Scania trained them on the new model.

### Tough Conditions

When asked what makes the Scania XT a good truck for this type of operation, Steven explained that in a quarry, there are no paved roads and where the trucks have to drive it is always hilly. This type of topography puts a lot of stress on the vehicles, especially the braking systems. Highlighting the Scania Retarder, Steven said that the XT is just the right vehicle for this. Thanks to the retarder, wear and tear of brakes is kept to a minimum, thus resulting in lowered operational cost and increased uptime. Driving skills play a big role in the quarry and construction sites. Loading the truck is a simple and straightforward operation: a driver backs the truck up and using an excavator, the tipper trailer is loaded. However, once arriving at the destination, the driver needs to ensure that the unloading is done right. The trailer needs to be placed on an even surface whereby it can’t be slanting to one side when tipping. It is here where the comfort and features of the truck make the driving easy and the driver can concentrate on this operation. 



### Spotlight: Scania XT

Scania XT has a robust design that can be combined with all cabs and engines to take on the harsh working conditions in particular within the construction and mining industries. In addition, Scania XT is part of Scania’s modular system whereby XT customers are able to get tailor-made solutions that fit with their business requirements allowing the XT to perform different applications such as tipper, mixer, skip loader, flatbed with crane, and heavy haulage.

### Scania XT Features:

#### 1.Exterior

- Highly sturdy heavy-duty bumper that protrudes 150 millimetres in front of the cab coupled with the skid plate and headlamp protection mesh lend the XT a distinctive appearance that signals both strength and toughness. These features also provide extra protection against fairly heavy impact or collisions to the truck’s front.
- Easily accessible towing bolt that is classified for 40 tonnes is also available at the front in case the truck has to pull something out or should it need assistance when laden.
- Inspection step for easy access of cargo or body checking without having to step down from the cab. Also available are roof handle and extra handle inside the cab if needed.
- Exterior made with sturdy and heavy duty materials to provide extra protection while working in tough environment thus minimising downtime for repairs and parts replacements
- High air intake designed to supply the engine with the cleanest air possible, suitable for dusty environments and comes in two versions- standard and heavy duty

#### 2.Interior

- Driver’s position moved forward, lowered instrument panel and redesigned A-pillars improve direct visibility and provide spacious feel behind the wheel.
- Designed to also be dirt and dust resistant providing the driver with a safe and comfortable working environment.
- Dashboard comes in various executions and materials to fit customers’ operations.
- Plenty of storage options tailor-made after customers’ needs. Also includes smart storage space that can be accessed from both inside and outside the cab.

#### 3.Bodybuilder options

- Introduction of a new mudguard design for the second front axle. Height is adjustable in four positions to match different tyre sizes while maintaining the clearance to suit the body.
- The pre-punched top row holes provide great flexibility for the bodybuilder when mounting the bodywork, which ultimately save both time and cost while ensuring Scania’s high quality work.
- The Scania Bodywork Communication Interface enables a perfect integration between the chassis and the bodywork. Use the electrical I/O pins or CAN interface. I/O can also be expanded with additional nodes.
- Scania supplies clutch dependent and independent power take-offs between 400-2 000Nm for many different needs – engine-driven, clutch driven and gearbox-driven in two positions.

#### 4.Performance

- Wide range of engine configuration from 280 up to 730 horsepower, from the lightweight inline-5 engine all the way to the famous Scania V8.
- Scania Opticruise with different driving modes (Normal, Power, Economy, and Off-road) allows the XT to adapt to different kinds of operations in the most fuel-efficient way. Added a clutch pedal (Clutch on demand) which could be used when needed.
- Wide range of axles with robust and low weight design from single driven or tandem driven with single or hub reduction. Scania’s rear axles with hub reduction can master heavy gross vehicle- and train weights, and a wide selection of gear ratios and large-handed ground clearance to maximise traction and offer great driveability.



## G.F. Engineering has a Tip for You: Quality Pays Off

*When it comes to reliability in construction sites, according to the professional body builders at G.F (M) Engineering nothing beats quality, as found in the HYVA cylinders they use for their tippers.*

**W**hen arriving at the yard of the Ipoh-based body builder, some of their tippers already stood to attention for us to take some pictures. From the livery of one of the Hardox-bodied tipper we could already see that the tipping-force was strong with these trailers and that they will be a reliable product that the users will be enjoying for some time. We met up with Ho Kam Fatt, Business Development Manager of G.F. (M) Engineering Sdn Bhd to learn more about what makes a solid trailer. Employing some 40 people, of which 30 are fabricators, the builder has made its mark as a provider of quality trailers.

### What's in a Name?

The name Good Fortune Engineering, later depicted as G.F. Engineering was chosen by the first-generation business owners. Founded in 1980, the company has surely had its fair share of the good fortune. Ho joined the company in 2000. Smiling he said, "The good fortune has also meant a good future for us." The company, while a family business, has three directors. One is Ho's father in law, the second his father in law and lastly, Ho himself sits on the board

of directors. Initially, the company was founded by a group of friends that combined their respective skills. Today, the company sits on a plot of about four acres after having relocated to the industrial area at the northern end of Ipoh. "We had to buy additional land. Our business has been growing very well, as our name says." He took over the shares of one partner and now handles the marketing of the company. What sets them apart from others, according to Ho, is the fact that their tippers do not use a lot of structure, thus increasing the payload.

### Tipping Point

Initially, the company was focused on tanker trailers. However, in 2012, the directors decided to add tippers to the portfolio. The proximity to the port and the many operations extracting minerals and producing cement around Ipoh supported this move. "What makes us attractive is that we take a win-win approach. We actually use Hardox steel and smart

Ho Kam Fatt (l), Angie Ng of HYVA (m) and Kong kok Sing (r)



engineering. You would think that we are more expensive than others. But in fact, we want to be offering what we call a fair price." In line with the use of high-quality steel, G.F. Engineering also uses top quality cylinders from HYVA.

### Tip-Top Approach


When moving minerals or topsoil, the goods carried are heavy and the hydraulic cylinder is put to the test every time a trailer needs to off-load. Faster tipping is also crucial for any operator in construction sites. "What is important for us is the aftersales service. Very rarely do we have any problems with the HYVA cylinders. And if there really is, then we work together to find out what has happened." Typically, Ho says, it is an issue with overloading or wrong handling of the equipment that leads to a failure.

One thing that Ho highlights is the fact that regular maintenance is required in order for the cylinder and wet kit ( pump; valve; oil tank) to provide the longest lifetime. "We do offer that regular service. If done right, this service will prolong the time a cylinder can be used, thus giving a better return on investment." Ho also highlighted that HYVA is the only provider of cylinders that are located in Malaysia with its own warehouse and office. Hyva keeps stock of all components for the best possible service. When a new HYVA product is released, training for the builders' staff is being provided, ensuring that the products are being installed correctly and effectively. "Others may not have this support infrastructure as they are only dealers. And sometimes, the dealers go out of business and then you can't even fix a broken cylinder anymore, whereas I can just call HYVA and get immediate on-the-ground support," he explained. Should a cylinder break down, it also means the truck cannot be used to service customers. "What could be worse than having money, but not being able to get the parts you need!"

### Changing Approaches

From what Ho can see, there has been a shift in the approach in body building. "Back in the days, one would think that the thicker the steel, the better. Not so anymore. Today, it is about reducing the weight of the trailer so that the payload increases." HYVA cylinders are made with the approach of total quality. While others may be able to offer cheaper cylinders, they still don't provide the entire set. When fitting cylinders, the body builders would then have to source matching wet kits, piping, hoses and electric wiring. Not so with HYVA.

Ho recalls that customers have been asking for other brand cylinders. However, having tried to find the complete set of components, he managed to convince the buyer to use HYVA as it was impossible to find a full set of items needed to create a functioning set. "What we see though is that pricing is becoming more and more of an issue. While this is common, we cannot compromise on the quality we produce." While pressure mounts, Ho is unwavering in his approach to quality though. "You see, with a higher price also comes a better product. For instance, when a cap is broken, I can simply order one as they are the same for all the kits sold. Imagine, some producers have different part numbers for the same item, and you have to know what exact part you need."

Ho parts, commenting that there needs to be trust among all the players in the supply of transportation and that it is the components that make a reliable and trustworthy tipper. 





## Lik Thong Resources Keeps Your Tyre Turning in Construction Sites

*Tyres are often the most looked-over aspect of a vehicle, while they are crucial for the operation of off road vehicles just like their brethren on highways.*

**K**apar-based Lik Thong Resources was established in 2008 as a distributor of high-quality tyres. Besides truck and bus radial (TBR) tyres, the company also sells off-the-road (OTR) tyres. The company is committed to providing its customers the best tyre at a reasonable price which is why they have chosen to distribute tyres from Aeolus, a leading tyre manufacturer from China and one of the top 20 tyre manufacturers in the world.

Aeolus Tyre Co., Ltd (formerly Henan Tyre) was founded in 1965 and is a subsidiary of ChemChina. The company's headquarters and research and development centre are located in Jiaozuo/Henan in China. The production facility spans 1.3 million square metres and employs more than 9 000 employees. They are the OEM suppliers for LiuGong, XGMA, LonKing and many others.

The manufacturing facility operates in accordance to strict quality guidelines and is certified to the standards of ISO9001, TS16949 and ISO14001. All tyres from Aeolus' correspond to the provisions and guidelines of each country i.e; DOT, E-MARK, ECE, BIS in India, GSO for Gulf countries and IMMETRO for Brazil.

Tyre selection is one of the most important factors for an extended tyre life. Choosing the right tyre specification significantly improves tyre life and reduces vehicle operational cost. Different tyres offer different benefits based on its application and machinery.





out, they can injure people standing nearby and even cause property damage.

There are a few preventative measures heavy equipment operators can use to extend the lifetime of their OTR tyres. For example:

- 1 Not taking turns at high speed. This causes the tread to wear out quickly and can damage the sidewalls.
- 2 Avoid obstacles if possible. Even though construction equipments are meant to be tough, hitting a rock or object at the wrong angle can cause an OTR tyre to deflate or explode.
- 3 Check the tyre pressure daily. Keep in mind to only check pressure when tyre is cold as pressure will rise when tyre heats up.
- 4 Stop immediately if a tyre is flat. Driving a flat OTR tyre can cause damage to wheel and rim.
- 5 Be aware of state of vehicle. Tyres may be under or over inflated when vehicle is hard to turn or gain traction

### **Genuine Retailers**

Using fake tyres is never worth the risk. Unlike fake watches and designer bags, using a fake tyre presents a lethal threat to its user and its surroundings, which makes it ever the important to purchase tyres from trustworthy sources.

A report in Australia highlighted the seriousness of using counterfeit tyres where most of them were imported from China and sold through various sources, including online auction sites. Counterfeit wheels are prone to buckling or had chunks taken out. They might have hidden hairline fractures or lack proper internal support. Fake tyres do not get tested and do not go through quality control.

Lik Thong currently has a network of more than 60 dealers in Malaysia and is planning on adding more in the future. They only sell genuine products that they import directly from Aeolus in China so customers can rest assured that they are getting authentic Aeolus tyres. The company sells about 1 500 to 2 000 pieces of OTR tyres in a year. They are optimistic that sales will increase in the future now that some mega projects have been resumed. **F**

According to the United States Tire and Rim Association, Incorporated (TRA), tyre thickness for OTR tyres can be classified into three general types; regular, deep and extra-deep. Deep and extra-deep tyres are 1.5 and 2.5 times thicker than regular ones. The thicker treads have greater cut and wear resistance. Although thicker treads allow for greater wear and cut resistance, they generate and retain more heat. Application of the tyre should be thoroughly evaluated to ensure proper selection of tyres.

### **Tread Design and Its Usage**

- Rock Pattern is designed to prevent cuts caused by sharp rocks. Large ground contact area provides maximum wear resistance. One of the most popular tread patterns for OTR tyres.
- Traction Pattern is a directional tread design. Special emphasis should be paid when mounting on the rim. Drive and free rolling wheels tread design should face opposite directions.
- Block Pattern means it is a wide tread width and rounded shoulders. Under heavy loads, the block pattern's large ground contact area creates low ground contact pressure for good floatation properties. Well suited for use on soft, muddy grounds.
- Rip Pattern tyres show grooves running parallel to direction of travel and gives high directional stability. Mainly used on free-rolling wheels.
- A Smooth Pattern is designed for tyre rollers and it has no grooves. Used for compacting and levelling. Also used on loaders in underground mines due to high wear and cut resistance. Has two narrow grooves to measure tread wear. The Highway and Offroad non-directional tread design contributes to fuel efficiency and operating comfort for mobile cranes.

### **Tyre Care**

Tyres are often taken for granted. And that is especially true for commercial vehicle tyres be it TBR or OTR. Most operators try to stretch the usage for a little longer than it may be recommended to reduce cost. This however, is very dangerous especially when it comes to OTR tyres. Due to their sheer size and nature of usage, OTR tyres are under enormous pressure and when they blow



## Tough environment calls for tough solutions – Toughtread!

**T**yres can account up to close to a third of your costs of operating a fleet. It is important not only to have a good tyre policy in operating your fleet, but good retreading solutions too.

Retreading is obviously one of the best options available out there to improve your bottom line. This is the best known way to immediately see an impact in your tyre costs. This is because, good tyres are made to last, good tyres function to carry the horizontal weight of the vehicle while manoeuvring various obstacles. However, many people do not realise that a good tyre can actually be retreaded, and if handled properly, retreaded more than once.

Hence, if you look at it, buying a good tyre as a start, gives you the opportunity to utilize its "second life". In very good operations and management, it has been reported that tyres have been retreaded up to 11 times! This particular operator is sure to see significant savings in its operations. As an industry average, the cost of retreading is between 30-40 percent of what a good new tyre will cost and it is delivering similar mileage as a brand new tyre. In certain cases, it even outperforms a new tyre in terms of mileage.






In the construction field, terrains are rough: they are uneven and they are definitely unfriendly to a tyre. Since most of the wear comes from the tread surface, why not just replace the tread instead of a full tyre? It not only makes more financial sense, but it is definitely more environmental friendly too.

GIIB reports that their customers have been able to prolong their tyre purchase, they have optimized their operation costs per km by up to 21 percent. In addition to that, they have been able to ease cash flow for their business as they delay their new tyre purchase and other than fuel, driver salaries as well as tolls cost. All these benefits come with no sacrifice in performance or safety.

GIIB Group offers two solutions for the retreading business with the Supercool range treats catering to tyres up to 24 inches. They come in various designs for different terrain and operating conditions. From 24" and above, GIIB is having another offering: Toughread. This special series caters to very demanding applications as well as overweight vehicles and its durability and grip are outstanding.

High performance retreading has demonstrated and proven its reliability and performance. To prove this statement, GIIB invites you to see for yourself how it will add value to your operations and see how it directly adds to your bottom line. 



# Maximising Machinery Uptime to Meet Construction Deadlines

*The use of top grade lubricants has a significant impact on the performance of machinery used in construction. Shell let's us in on the secrets to running a successful operation using their lubricants.*

Managing a construction project is extremely complex and challenging. Unplanned construction equipment downtime is a nightmare for any project manager, as missing progress or delivery deadlines can have costly repercussions.

Yet, a study of the global construction industry by Shell, published in May 2018 found that 87 percent of construction firms have experienced such breakdowns in the last three years. This puts the spotlight on the importance of preventive maintenance on machinery to ensure timely delivery at each stage of a project.

"Machinery is definitely a critical element of project management as any breakdown will not only interrupt work activities on site but could be extremely costly as the contractor could end up paying the full penalty for delays amounting to 15 percent of the total contract amount. Project or site managers need to pay serious attention when it comes to machine integrity and its performance. This

### **Innovative lubricant solutions also play a part in preventive maintenance**

Shell plays an important role in minimising the risks of equipment breakdowns. Its proven portfolio of innovative lubricant solutions with extensive OEM approvals helps keep equipment performing at their best and projects on time and on budget.

A good example is the Shell Tellus range of high-performance hydraulic oils, which offers advanced wear protection so that equipment can be operated for longer at optimum levels with lower maintenance spend.


The Shell Tellus S2 MX, a new generation hydraulic fluid formulated with Group II base oil and new adaptive technology, has been tested in some of the harshest real-life operating environments that included high loads, high temperature, humidity and dust levels; and steep and uneven terrains.

A Miri-based construction company working on a major infrastructure project wanted to increase availability of its fleet of excavators and lower maintenance costs. The switch to Shell Tellus S2 MX 68 paid off almost immediately. The company managed to extend the hydraulic oil drain interval from 1 000 to 3 000 hours and drastically reduce the downtime and maintenance cost per excavator. As a result, it managed to save about RM166 000 a year.

A Bintulu-based heavy equipment rental company that experienced repeated breakdowns with its excavators also found their answer in Shell. Upon switching to Shell Tellus S2 MX 68, the excavators' hydraulic oil drain interval was extended to three months while burst hoses and pump failure were rarely reported. The reduced downtime and breakdown repair costs enabled the company to enjoy an annual savings of more than RM962 000.

Although it is renowned for its premium lubricants with proven performance, what really makes Shell stand out is the excellent technical support that it extends to its industrial and business-to-business (B2B) customers.

In each instance, Shell was able to deploy some of its valuable technical services to help overcome challenging technical issues by identifying the root causes. These included its Shell LubeAnalyst equipment and lubricant condition health-check service as well as the Shell LubeAdvisor support service that helps customers choose the right lubricant for the right application.

Shell's objective has always been crystal clear – to provide a one-stop solution package to help businesses enjoy worry-free daily operations, which help in cost reduction. It is no surprise why Shell has been the top lubricants supplier in the world for the past 13 consecutive years. 



might constitute a small portion of the entire project cost but could cause unwanted delays in the schedule, especially when there is a large portion of on-site installation works," said Ir Derick Chia, Committee Member, Project Management Technical Division, The Institution of Engineers, Malaysia (IEM).

He cited the example of an incident at a biomass power plant project that he was handling. The mobile crane broke down during the critical installation stage of the boiler and work was suspended for three weeks to wait for replacement parts.

A strong advocate of preventive maintenance, especially on critical machines such as cranes and excavators, he recommended the following steps to minimise equipment breakdown:

1. **Establish an inspection checklist** – This helps clearly define the scope of work to be done and ensures systematic inspection to be carried out; and
2. **Set the frequency for maintenance activities and ensure proper records** – Any maintenance activity; be it daily, weekly or monthly, should be properly documented in the form of maintenance record or log book for easy tracking and reference.



# Filters – Taking Care of Your Machinery

Construction machinery requires extremely robust filters to be able to operate effectively and efficiently on a day-to-day basis. That is why all leading construction machinery manufacturers attach great importance to filter robustness right through the development of their filter systems.

MANN-FILTER provides this matching OE quality as a standard. With all filters from MANN-FILTER, engines and assemblies will always operate reliably and wear-free in difficult conditions – just like they did on day one.

## PERFECT MAINTENANCE IS WHAT COUNTS

Good, regular maintenance can be planned. In accordance with the machine manufacturer's instruction, OE quality filters should be used every time the machinery is serviced. Not only does this save time, it also ensures optimum performance of the machinery up until the next service.

## TYPICAL CONSEQUENCES OF DELAYED MAINTENANCE

**Air filters** prevent dirt from being sucked in with the intake air, thus minimizing wear on the engine. Delayed maintenance will result in

- Engine power loss
- Increased fuel consumption
- Higher emissions

**Oil filters** filter away undesired substance from the engine oil which contributes towards a longer engine life. With a clogged filter, the safety valve opens in order to ensure the continued lubrication of the engine. The results:

- oil is not adequately filtered, causing wear on the valves, bearings and engine components

**Hydraulic filters** protect the hydraulic system against unnecessary wear.

- Inadequately filtered oil causes wear in the hydraulic system

**Main fuel filters** ensure precise particle separation to prevent wear on the high-pressure pump and the injection nozzles, while the Fuel Prefilter systems ensure perfect water separation to enhance and extend the durability of the fuel-injection system.

- Increased wear in the injection system – such as in pump, nozzles, pressure valves – due to inadequate particle and water separation.



**Cabin air filters** ensure a comfortable cabin environment.

- The driver's concentration on the machinery can be reduced as a result of an uncomfortable cabin environment.
- If the air in the cabin is not adequately filtered it could also cause respiratory problems for the driver as unfiltered air contains airborne particles, such as PM2.5, pollens and odorous substances.

**Crankcase ventilation systems** ensure oil separation for the crankcase ventilation and regulation of crankcase pressure. Delayed maintenance will result in

- Potential damage to the turbocharger and charge air cooler due to oil on the clean side of the filter
- Reduced engine performance and higher fuel consumption due to reduced turbocharger/charge air cooler performance

### Powerful double for stationary applications

The experts at MANN+HUMMEL developed the single-stage ENTARON CD for stationary applications in compressors, generators and engines and therefore for machines with operating conditions with low to medium dust loads. The significantly reduced flow resistance leads to a low energy consumption. As a free-intake housing filter it does not require any piping because the air is sucked in axially through the over. Hence, the installation costs are low.

The ENTARON CD expands the MANN+HUMMEL portfolio of single-stage air cleaners in the area of two to eight cubic meters per minute. The ENTARON HD 4 VAC is the right choice for operating conditions with high dust loads.

#### ENTARON CD 4




For operating conditions with high dust loads the two-stage ENTARON HD 4 VAC is the perfect match. It was designed for use with vacuum pumps. Typical applications, for example, include vacuum lifting devices and other negative pressure systems. The ENTARON HD 4 VAC is characterized by pressure tightness down to a negative pressure of 500 millibar with an ambient temperature of 21 degrees Celcius and due to its robust design suitable for long periods of service. The air cleaner is sealed by an additional, green shaped gasket.



#### ENTARON HD 4 VAC

#### Easy Installation

The air cleaner is easy to install. This is ensured by its design which is based on the Red Dot award-winning ENTARON HD 4. The long, slim shape of the air cleaner only requires a small amount of space, approximately a third of the space required by other air cleaners with a comparable performance. In this respect, the air cleaner makes no compromise when it comes to filtration performance. The ENTARON CD also offers excellent flexibility with two mounting options available for the housing. The standard method uses through-holes and there is also a configuration with threaded inserts possible on request. When the filter has to be serviced, the procedure is uncomplicated: you don't need tools for this! 





# Volvo Trucks Presents Heavy-duty Electric Concept Trucks for Construction Operations and Regional Transport



A reduction of the overall climate impact of the transport sector is possible by using heavy electric vehicles in regional distribution. The majority of goods distribution by truck within the EU is regional.

“In Europe there is an enormous number of trucks used for regional goods transport that have an average annual mileage of 80 000 km. This means that increased use of electric vehicles for regional distribution would result in significant climate gains, provided the electricity is fossil-free,” says Lars Mårtensson, Director Environment and Innovation, Volvo Trucks.

**H**ow can the environmental and climate impact of heavy goods traffic be reduced while the demand for transport continues to increase? Volvo Trucks, having recently started sales of electric trucks for urban transport, believes that electrification can become a competitive alternative also for heavier trucks. To explore and demonstrate the possibilities, Volvo Trucks has developed electric concept trucks for construction operations and regional distribution.

“We see great potential for heavy-duty electric trucks for regional transport and construction in the longer term. With our concept trucks, we aim to explore and demonstrate different solutions for the future while evaluating the level of interest in the market and in society. To increase demand for electrified trucks, the charging infrastructure needs to be rapidly expanded, while stronger financial incentives must be created for hauliers who act as pioneers by choosing new vehicles with a lower environmental and climate footprint,” states Roger Alm, President Volvo Trucks.

Heavy duty electric trucks can help improve the work environment for drivers and construction workers thanks to low noise level and zero exhaust emissions during operation. The latter will have a significant and positive effect on air quality in cities with many ongoing construction projects. Due to the lack of noise disturbance, these trucks also make it possible to perform transport operations for more hours per day which opens up new possibilities for streamlining operations, for instance in large construction projects and for transports in and around cities.

Volvo Trucks’ plan for electric heavy-duty trucks for construction and regional distribution is to start by having selected customers in Europe pilot a small number of future electric vehicles. More extensive commercialisation will follow at a later point.

“The speed of electrification will depend on a number of factors. On the one hand, an extensive expansion of the charging infrastructure is needed, and on the other hand it’s necessary to ensure that regional power networks can deliver sufficient transfer capacity in the long term. Financial incentives are necessary to induce more hauliers to invest in electric vehicles. Transport buyers can also contribute by offering longer contracts and being more willing to pay for sustainable transports. Many haulage operators have very small margins, so every new investment must be profitable,” explains Martensson. **T**



# Ghosted Trucks!

*Stefan Pertz shines a light on a truck segment that many people would like to keep in the dark – ghost trucks!*

Ever since I started writing about trucks, and became aware of these pariah, occasionally I would hear people talk about them, in hushed tones. And they would never be referred to favourably. They have always been looked down upon. These are vehicles that seemingly nobody likes. While they are all around us they do not abide by the same rules as most vehicles. Yes, the Lori Hantu. The Ghost Trucks. Outcasts of an industry that has many clichés and issues to deal with.

Now, why, just why, are people not in awe of these machines as they are when a European truck maker launches a new version of a heavy hauler? Is it because these trucks don't need to be road legal? Or is it because they don't need to be registered? I have also seen some of these vehicles, real Frankensteins. Trucks are put together from parts of various vehicles, sometimes even mixing brands. Many remark that these trucks are a somewhat delicate matter as there doesn't seem to be any hard data on how many there really are in any one country. True to their nature, they are ghosts as they don't appear in statistics.

But are they really scary? Are these the poltergeists of the trucking industry or are they just vehicles that have special rules applied to them? As far as I can see, these trucks still need to address the basic need of the operators. They need to be efficient and effective, turning a profit. Such trucks also need to satisfy the needs of the driver: they need to be safe. Construction sites, by nature, require personnel to be extra cautious and the drivers of trucks on site are to be even more alert. The lack of roads and signs might make it just a bit harder to operate in such conditions. These trucks also need to be designed with serviceability in mind. Since they work harder than their road-going brethren, they might need to be serviced more often.

One thing I have to admit though, is these trucks are not very pleasant to the eye. Not that they really have to

be, but what is wrong with a bit of love when developing them? I am sure that there are ways to give such trucks a nicer cabin with a little more comfort. After all, this is also the workspace of someone that will be in it for hours on end. There has already been a movement whereby other equipment has seen some beautification. Excavators started looking yummy a few years back and the design of them became no longer just about the functionality.

In particular, the aftermarket suppliers seem to dislike these silent heroes of the construction industry. If you are a regular reader of Asian Trucker, you would know how many trucks fleet owners have, when they have new trucks delivered and even which brands they have in their fleet. This is all different with the Ghost Trucks. They are out there, but where? One dealer of trucks for construction sites did not even like the idea of being interviewed for this magazine about them. And this lack of information makes it hard for the aftermarket to address the needs of this segment. Surely, every maker of replacement parts will be able to provide what is needed to keep the trucks in construction sites running.

If anything, I would like to know more and (ghost) write more about these vehicles. I am sure that there are some real unsung heroes out there bouncing around a muddy construction site, turning it into a stunning property development or airport. I also hope that the rest of the industry would take to making this industry segment as sexy as the rest of it. After all, there is nothing illegal about trucks that are built to meet specific requirements and that are exempted from some rules as these simply don't apply. **F**



# Sinotruk 47T Howo Dump Truck

**T**he 47-tonne Sinotruk 6x4 Howo Dump Truck remains to be the titleholder for the most popular dump truck in Malaysia. The highly appraised vehicle has won the hearts of many due to its compactness and durability, while remaining heavy duty during operation. As the market leader for dump trucks, the 47T variant has accounted for more than 90% of the dump truck population in the local market for the past four years, having conquered quarry and sand mining operations.

## House of Cargo

The 47T remains undefeated as the preferred dump truck in Malaysia, as Sinotruk manufactures all its main parts, namely the engine, transmission, front and rear axle, chassis, and bucket, pioneering itself as the only manufacturer

of construction vehicles in China. This suggests that Sinotruk can be counted on in its aftersales services for spare parts, leaving no stone unturned.

## Do Not Be Fooled by Size!

They always say, 'Bigger is Better,' but the 47T has dumped that truth to the ground. Even with its smaller size, the 47T is able to manage a loading capacity of up to 30 000 kg without sacrificing balance. The width of the vehicle, paired with the width of the bucket (2 500mm and 2 300mm, respectively), ensures increased stability for medium scale construction work.

With that in mind, the truck has a minimum ground clearance between the floor and the front axle of





314mm, making it easy for any operator to manoeuvre it over uneven grounds. The wide usage of the 47T in quarry operations is also attributable to its ideal wheelbase, which is 3800mm (distance between front tyres and middle tyres) + 1350mm (distance between middle tyres and rear tyres). This allows for the vehicle to remain stable during unloading, without decreasing ground clearance.

### Top Dump Performance

Starting from 2018, Sinotruk revamped the 47T by changing the length of the bucket from 5 800mm to 5 600mm, making the vehicle cost-optimal for maintenance. The highlight, however, is how the bucket takes its form in the U-shape with a slanted backdoor, adhering to European design standards. Coupled with its true-to-life bucket thickness of 14mm at the bottom and 12mm on the sides, the 47T cargo is not only light weight but also high strength, making heavy loads look like a piece of cake.

With its WD 615.47 engine powered by Tier 2 diesel (ideal diesel quality in Malaysia), the Sinotruk power machine has the total engine horsepower of 371hp, making it capable of a maximum speed of 75km/h at full capacity. The vehicle's jack cylinder, the FC191 borrowed from Hyva, can bear up to 80 tonnes worth of load due to its larger diameter, which is more than enough for most dump trucks. A thicker diameter of the jack cylinder, however, denotes a bigger and more solid lifting device, which can ensure a longer life span for the vehicle and a lower downtime cost.

With better fuel consumption and better cost efficiency, the Sinotruk 47T Dump Truck proves to not only be functional in its daily operations, but also reliable for the duration of its lifespan, and more. **▀**



*Kirschner & Zechmeister GesmbH recently commissioned a particularly flexible semi-low loader from the DOLL Vario series. A special focus was placed on creating surfaces for the transport of a wide range of construction machines.*

#### **High payload and easy load securing**

Finally, the specifications were implemented in the form of a four-axis Vario semi-low loader with a 3 700 millimeter telescopic push-out. With 21 tons of saddle load, four ten-ton axles (technically up to 12 tons) and an optimized dead weight of only about 16.5 tons, the individually configured S4H-GR3S18 offers more than 40 tons of payload. In order to stay below four metres in height even with tall machines, the semi-low loader has a low running surface with only 600 millimetres of loading height and up to 5 100 millimetres of telescopic length. The conversion from the flat loading surface to the stepped running surface is also very flexible and time-saving with aluminium loading rails. In the case of the telescopic push-out being slid in, the rails used serve as a low-loading platform and in the case of the telescopic extension being used as an extension of the lowered running surface.

With a well-thought-out load securing package, including swivelling lashings for up to 13 400 daN traction, the driver can quickly secure the various construction machines. Rubber floors

## **Universal All-rounder: Semi-low Loader DOLL-Vario**

Since the beginning of May, a tailor-made semi-low loader of the type DOLL Vario S4H-GR3S18 has been supplementing the fleet of Austrian Kirschner & Zechmeister GesmbH. Gerhard Fischbach, technical director of the company, outlines the requirements: "At the top of the specifications was the possibility to load all our own construction machines and, if necessary, to load more. The flexibility required in this process is self-sufficient in terms of our machinery: The range of our machinery ranges from wheel loaders to graders to 30-tonne chain excavators." The 49-year-old was particularly impressed by the fact that DOLL has included the entire machine park in the planning of the trailer: "The designers took a close look at which machines we have and how they are to be loaded in detail. Accordingly, all features and additional options have been adapted to the semi-low loader."



between the axles, at the rear and on the hydraulic ramps provide additional safety when loading the wheel and tracked vehicles.

**Maximum agility and ease of use**

A high manoeuvrability is guaranteed by a hydraulic forced steering on the last three axles with up to 45 degrees steering angle. The first rigid axle is liftable, which reduces tyre wear when partially loaded or empty. With the axis raised, the turning circle is also reduced. A great relief for the driver is also the automatic straightening in the case of straight-line exits, which can be operated by radio remote control as well as the steering. If more ground clearance is required before obstacles or, conversely, a lower overall height before low passages, the driver can control the air suspension from the cab. A total of 180 millimeters stroke (-70/+110 millimeters) are available. The driver can also operate the lift axle function comfortably.

A three-layer coating with spray galvanizing ensures maximum corrosion protection and thus a long service life. At this point Gerhard Fischbach once again takes up the specifications and in particular the associated time factor: "It was important to us not least to get a replacement for a retired, 14-year-old semi-low loader relatively quickly. In this respect, too, the order processing of the new Vario was a very good fit."

**About Kirschner & Zechmeister**  
 Founded in 1921, Kirschner & Zechmeister GesmbH is a fourth-generation family-owned company.



The beginnings with horse-drawn carriages and first trucks were followed from the mid-1950s by the production of precast concrete parts, since the end of the 1980s on the basis of fully automatic production lines. The commissioning of modern recycling, processing and sorting plants, a container service and the ready-mix concrete division "Beton4you" mark further milestones. Today, the entire range of services extends from the trade-in building materials and the extraction of raw materials in our own gravel pits, to a large machine park for earth movement and demolition, to the operation of more than 30 vehicles from 10-tonne vehicles to special transporters.

**Specifications DOLL VARIO S4H-GR3S18**

Total length	: 12 960 mm
Sattelplattformlänge	: 3 960 mm
Length low bed	: 9 000 mm
Length telescopic	: 3 700 mm
Wide low bed	: 2 550 mm (extensions in the outer frame 2 x 225 mm)
Saddle height, loaded (+/-40 mm)	: 1 240 mm
Total weight, technical (80 km/h)	: 61 000 kg
Kerb weight (+/-2%)	: 16 500 kg
Payload, technical (80 km/h)	: 44 500 kg
Chassis	: BPW steering axles with air suspension (180 mm stroke), 1st axle rigid, 2nd-4th axle hydraulically forced-steered with ABS, AGS and ECO-Plus hub system; Tyres 245/70 R 17.5; 10 t axles (technical 12 t)

## Komatsu Announces Plans to Deploy 37 Autonomous Trucks at Vale’s Carajás Mine



Powered by Komatsu’s AHS “FrontRunner” technology, the initial deployment is expected to start this month, with the goal of operating 37 trucks autonomously by 2024. To support a successful transition to autonomy, Komatsu opened an AHS training center near the mine in August of this year that provides operations and maintenance training to upskill local people on the new technologies being introduced at the mine, in support of human resource development.

“We are honored to be part of the ongoing wave of technological innovation at Carajás, supporting Vale’s commitment to sustainability and helping make the mine a reference in environmental terms,” said Masayuki Moriyama, President of Komatsu’s Mining Business Division. “We look forward to our continued work together to support the skill growth of local workers and ensure a successful deployment that is designed to increase the safety and productivity of this operation.”

To support the Brazilian resource company Vale in its drive to leverage technology to reduce impact on the environment and enhance health, safety and operational efficiency, Komatsu (President and CEO: Hiroyuki Ogawa) is excited to announce plans to deploy 37 of its 930E ultra-class electrical dump trucks as part of an Autonomous Haulage System (AHS) at Vale’s Carajás iron mine.

With this latest deployment, Komatsu continues to expand its AHS business in South America. Komatsu customers globally are now leveraging AHS at 10 mine sites in four countries. **F**

## Preparations are Progressing at Full Speed for bauma CHINA 2020

With around one year to go before the start of the trade fair, preparations for bauma CHINA are progressing at full speed. The 10th international trade fair for construction machinery, building material machines, mining machines, construction vehicles will be held from November 24 to 27, 2020 at the Shanghai New International Expo Centre (SNIEC). Any companies wishing to register can still do so up until the end of February.

### More companies already signed up than this time two years ago

Since it was launched back in 2002, bauma CHINA has developed into the largest and most important industry event in the whole of Asia. 3,350 exhibitors from 38 countries and regions showcased their companies and products to over 212 000 visitors from Asia and all over the world at the previous event in November 2018. It already looks like bauma CHINA 2020 will also occupy the entire exhibition space available, a total of around 330 000 m<sup>2</sup>. “The current registration figures

are significantly higher than they were at this point in time for the previous event in terms of the number of exhibitors and the amount of exhibition space that has been reserved,” says Exhibition Director Maritta Lepp.

### Topics and developments

bauma CHINA will continue along the path already laid down by bauma in Munich in terms of current topics and innovative developments: Digitalization and automation are the main drivers of development in the construction machinery industry. As such, smart and low-emission machines and vehicles with integrated digital solutions will feature heavily at bauma CHINA. A leap in terms of technological development is also expected as a result of the further tightening of emission standards for unroadworthy diesel vehicles, which China has announced will be introduced at the end of 2020. Construction machinery which meets the new standards will be showcased at bauma CHINA and corresponding updates will be provided for older machinery. **F**

# Continental to Strengthen its Technical Customer Service with New Customer Solutions Engineer



Jörg Wörner is Continental's new Customer Solutions Engineer for earthmover tires in the Commercial Specialty Tires (CST) area. His arrival boosts the technical customer service operation in the EMEA region, which is instrumental in Continental's drive to focus directly on customers.

Wörner brings with him more than 30 years' experience in the tire business: he worked at Michelin Reifenwerke AG & Co. KGaA from 1987, including nearly 15 years as a customer service engineer in earth mover and industrial tires. He

succeeds Matthias Engelhardt, who took charge of German operations at Commercial Specialty Tires this spring.

## Technical customer service: consulting, warranty management and performance monitoring


At the same time as bringing in Jörg Wörner, Continental has gradually expanded its technical customer service activities further. With customer solutions engineers on all continents and in all regions of the world, the company is strengthening its direct contact and discussions with customers over the long term. The central pillars of technical customer service include technical consulting and services aside from just tire performance, continuous monitoring, and ongoing improvements to product performance in close collaboration with the company's R&D arm and Warranty and Complaint Management. 

## Bis launches Razor, the Cutting Edge Underground Grader

Bis, a leading provider of production services to the resources sector, is continuing to innovate with the invention of an underground grader for the coal sector, which has been designed to be safer, more productive and agile. Aptly named Razor, the cutting edge machine has been developed by Bis' Tomago based Underground Services team, with the grader the first in a pipeline of new innovative products that Bis has planned for the sector.

Bis Chief Executive Brad Rogers said Razor harnessed the talent and experience of the Bis team and reflected the company's commitment to partnering with its customers: understanding their needs, then developing bespoke solutions that add value to their operations. "Razor has

been designed with miners, for miners and is born from our deep understanding of the coal industry. We own the nation's largest underground hire fleet as well as a capable and experienced underground workforce in our UGM business, with operations across New South Wales and Queensland," Mr Rogers said.

Bis General Manager Mark Doyle said the grader has more tractive effort, increased power, is safer for the operator and has been designed for more uptime. "The concept for Razor started within underground by looking at existing machines and talking to grader operators to understand how we could design a better product – all the way from performance to changing the cab ergonomics to improve comfort," Mr Doyle said 

### Snap Poll

Would you want us to feature a little bit of lifestyle content?

Please, NO! - 80%

Concerts / Art Exhibitions - 20%

Passenger cars - 0%

Luxury Watches - 0%

Fashion - 0%

Airlines - 0%

Hotels - 0%

The voting for this poll has ended

## Hyundai Construction Equipment Signs a Strategic Partnership with China National Machinery Industry Group



**H**undai Construction Equipment (president Ki-Young Kong) will enter into the motor grader market on the basis of a strategic partnership with the leading state-owned China National Machinery Industry Group, Sinomach Changlin.

On November 5, Hyundai Construction Equipment announced that the company recently signed a sales contract with the China National Machinery

Industry Group, Sinomach Changlin for mid- and large-sized motor graders. And it also announced that it will export the products to major emerging markets such as Southeast Asia, Latin America, and Africa from April 2020.

Under the agreement, Hyundai Construction Equipment has added motor graders to its existing 6 models including excavators, wheel loaders, skid loaders, forklifts, backhoe loaders

and rollers, bringing a total of 7 models. And it is expected to greatly increase sales.

The motor grader introduced by Hyundai Construction Equipment is a kind of road equipment such as rollers and bulldozers. It is used for making the ground of roads even and hard. The motor grader, which has been partnered this time, has 4 models with 130 horsepower, 170 horsepower, 190 horsepower and 220 horsepower, and has signed a supply contract for 5 years until the end of 2024.

An official of Hyundai Construction Equipment said, "Motor graders are globally demanded at 10 000 units, and their target markets are emerging markets. We expect that the demand will increase gradually after 2018. The expansion of the product range will be a major opportunity for Hyundai Construction Equipment to become a global comprehensive construction equipment maker." **T**

## Volvo Paves the Way for Indonesia's First Elevated Road



**T**he Indonesian road construction company, PT Multi Karya Cemerlang, is using a P5320B ABG paver from Volvo Construction Equipment (Volvo CE) on the Jakarta Cikampek elevated toll road project in Indonesia.

Once completed, the 36.4-km toll road will be the only elevated one in Indonesia. Built on top of an existing toll road, the project aims to reduce traffic congestion and improve distribution of goods and services to and from Jakarta to the rest of the country.

Anggoro, project manager from PT Multi Karya Cemerlang, said a challenge on the Jakarta Cikampek project is workers operating the pavers right next to heavy traffic at all times. Plus, PT Multi Karya Cemerlang has to coordinate with other contractors on the project so it was vital for the company to select equipment that would pave reliably and efficiently.

"The P5230B ABG has proven it is easy to use and high performing," Anggoro said. "Our operators say the screed control is amazing. Plus, it's easy to understand every function on the machine just by looking at the display, which speeds up project completion and reduces downtime."

On site since August, the P5320B ABG paves asphalt on top of the concrete foundation as part of the elevated toll road project. Working seven days a week for an average of eight hours daily, the paver lays up to 400 tons of asphalt daily and is expected to remain on site until December 2019. By then, the paver is expected to lay some 34,000 tons of asphalt.

The P5320B ABG is a tracked sensor paver with a paving width range of 2.5 m to 7 m and can deliver a paving output of 600 tons per hour. Powered by an 88 kW Volvo engine, the paver delivers high performance with minimal noise and low fuel consumption. The paver also features load-sensing hydraulics that perfectly matches hydraulic output to all components. **T**

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