

Keeping it clean

Aluminium smelters present challenges of heat and fine dust, which can clog up filters and accelerate wear in machine components. The climate and environment of the Middle East are challenging enough for working around the clock, with temperatures up to 50°C during the day. Trucks have to be reliable, rugged and robust if they are to work dependably in normal circumstances – but add to that the higher ambient heat and airborne dust particles that are part-and-parcel of everyday life in an aluminium smelting plant and lift trucks have to be made especially resilient. The first signs can be quite simple but they give an indication of the issues to be faced. Mohamed Abdulrahman Al-Bahar worked with Dubai Aluminium to diagnose the problems and come up with cures.

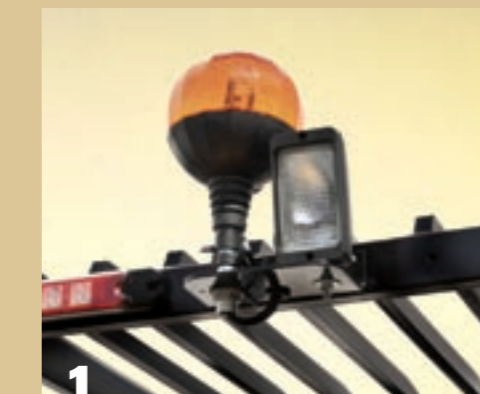
“In this high demand application trucks need to be durable and rugged. They have to be made specially resilient.”

“We received a report from a smelter plant telling us that the rotating warning light on an eight-tonne lift truck we had supplied had melted,” said Daniel Gambba-Jones, Technical Manager of Cat Lift Trucks for the AME region. “We gave them an LED beacon that utilises a different lens material, and it fixed the problem. Al-Bahar now install simple and easy to replace front and roof polycarbonate screens and lamp guards to prevent damage – a fitting that’s now offered as a factory CSM option.”

Electric shocks

Would that all such problems were as easy to solve. Al-Bahar’s smelter customers use only diesel-powered lift trucks in their core areas for a number of reasons but the nature of the industrial process is one of them.

“Aluminium smelter pots use extremely high power anode and cathode arrangements to smelt alumina and turn it into metal aluminium ingots,” said Gambba-Jones.



“The electro-magnetic fields (EMFs) around the potlines are very intense. They’re strong enough to wipe a credit card or stop a watch and electrical powered units generally don’t like it.” And so, while it may be normal to use electric units in most internal industrial applications, they are not appropriate for aluminium’s specific process.

There’s another reason for avoiding electric power and it is to do with the raw material itself. Alumina is extracted from bauxite ore and it arrives at the smelter in the form of powder – a very fine powder, at that: individual particles can be just microns in diameter. It is a fine dust and, as such, the slightest puff of breeze will carry it into the atmosphere, where it hangs around and seems to be determined to make life as difficult as possible, for people and machinery.

“The dust gets into the engines, the brakes and pretty much everywhere,” he explained. “Our customers were finding they had to service and overhaul their vehicles very frequently.”

“First, it is conductive, so that’s another reason the customers don’t use electric trucks,” said Gambba-Jones. The reasoning →

Main image. The climate and environment of the Middle East is challenging with temperatures ranging from the 40C during the day to approaching freezing at night.

1. We got a call from a smelter plant telling us that the rotating warning light on an eight-tonne lift truck we had supplied had melted, so we gave them an LED beacon and it fixed the problem.

2. “The dust gets into the engines, the brakes and pretty much everywhere. Our customers were finding they had to service and overhaul their vehicles very frequently.”

Something as simple as the application of grease to an exposed working part can make all the difference between reliability and downtime headaches – but you have to know what you’re up against. **Mohamed Abdulrahman Al-Bahar, Cat dealer in the United Arab Emirates**, talked issues through with its clients and came up with solutions that deliver the goods in extreme working conditions, Daniel Gambba-Jones told *Ruari McCallion*.



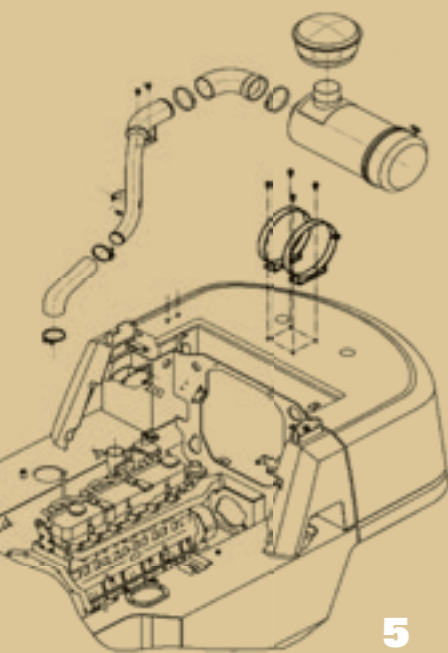
3. The standard air filters were getting clogged quickly – they were getting completely choked in a couple of days.
 4. The new air filters are mounted on the counterweight where they were very visible and easily accessible
 5. The solution was to install air filters that are three to four times the standard size, in series with a clear pre-cleaner vault.

→ is very sound; it is not a good idea to carry anything that generates electricity into an atmosphere susceptible to the slightest electrical charge, whether static, inductive or conductive. But that aspect is well-understood and relatively easy to deal with; simply use the right equipment. The greater problem turned out to be the dust's penetrating power.

Dust issues

The dust gets into the engines, the brakes and pretty much everywhere," he explained. "Our customers were finding they had to service and overhaul their vehicles very frequently." Al-Bahar representatives and engineers from Cat Lift Trucks visited the premises of Dubai Aluminium on many occasions and undertook some extensive investigations and discussions of the company's fleet of three and four-tonne diesel lift trucks. "The air filters were getting clogged quickly – they were getting completely choked in a couple of days." The solution for them was to install air filters that are three to four times the standard size, in series with a clear pre-cleaner vault, both mounted on the counterweight where they were very visible and, importantly, easily accessible.

"That measure extended the filter service interval and provided a better margin for lapses in operators' daily maintenance," he continued. While the book on OEE (operating equipment effectiveness) says that operators should be involved in routine maintenance, the reality is that this went beyond monitoring the oil level and other simple checks and the drivers simply cannot be relied upon to do it every time. By mounting a plastic chamber in a clearly visible position, the build-up of dust can be easily spotted by anyone and dealt with before it causes problems. Anything that can be done to extend working time is important. The hydraulic system was also being affected by dust and also had to be modified.



"In the hydraulic system, oil comes back into the reservoir tanks as fast as it is sucked out – but it still needs to breathe," said Gambba-Jones. "Dust gets into the oil in the standard set-up. What we have introduced is a breather filter that prevents dust being taken in. We also introduced a dust seal for the hydraulic gear pump, which reduces wear and increases the component's lifetime." This particular issue was also affecting the transmission and becoming a major headache for the aluminium companies. The dust didn't just pollute the oil; given time, it gave it some characteristics of grinding paste, which then did what grinding paste does and ground the contacting surfaces down. Even where there was no fluid present, dust particles were causing big problems with abrasion.

Just a shot of grease soothes the service headache more effectively than a packet of Neurofen.

"There is a universal joint with a sliding shaft arrangement between the engine and gear pump. As the dust accumulates, the constant raking motion wears the spline down," he said. "We listened to what the customer was telling us and realised that just sealing the unit would not be a complete cure – even a small amount of aluminium powder getting into the unit would cause damage." There was another issue to deal with: the fact that the spline joint is inside the bodywork and difficult to access. "What we did was to design a greasable universal joint. With an external nipple, it becomes easy to grease the joint and extend its working life. The design has now become standard equipment due to the benefits it offers for many other applications." Just a shot of grease soothes the service headache more effectively than a packet of Neurofen.

Filtration and rubber boots

Elsewhere in the trucks, torque converters are now protected by filters, in conjunction with the standard strainers. Even checking oil levels can risk dust pollution, so the installation of an external filter has become standard for Dubai Aluminium. For the external working parts, the life of seals and rods in the mast tilting mechanism have been extended by the addition of rubber sealing boots.

"We don't have the same 'grinding paste' problem with the masts as they can be accessed and cleaned quite easily, unlike the universal joint," said Gambba-Jones.

There were other issues that weren't

directly related to aluminium dust. The nature of the working environment, which includes outside as well as internal work for the lift trucks, puts a lot of strain on non-mechanical components. A number of other modifications have been made to Cat lift trucks operating in the challenging working environment in the Middle East, including the provision of solid pneumatic tyres, which give the shock absorption of pneumatic components and, at the same time, overcome the problem of punctures. Altogether, Al-Bahar's analysis and development of solutions was extensive but it was well worth it.

The whole episode shows that experience counts – and helped to win an uncontested order for eight new trucks for Dubai Aluminium.

"The company has a mixed fleet, including more than 20 Cat lift trucks. It had encountered problems with electrics, EMF and machine durability," said Gambba-Jones. Al-Bahar and the Cat Lift Trucks team investigated the issues and devised solutions that deliver significant longer-term cost savings, through extended equipment life and reduced downtime. The whole episode shows that experience counts – and helped to win an uncontested order for



eight new trucks for Dubai Aluminium, and a contract for 48 trucks for Emirates Aluminium. "Our work with aluminium smelter applications in Europe and the Middle East helped us to provide a machine suitable for the environment, But we couldn't have done it without close co-operation from our dealers. They put in so much hard work in supporting their clients and working alongside us to develop the right solutions for the customers." ■

Article feedback is welcome: Ruari@eurekapub.eu

6. Part of the order of eight new trucks for Dubai Aluminium

Events Calendar

Date, Event, Location, Website	Overview
2-4 February LOGICON 2010 Brussels, Belgium www.wbresearch.com/logiconeurope	LogiCon 2010 - Cheaper, Faster, Smarter Supply Chain Management The 14th annual industry event for FMCG and Retail Supply Chain and Logistics Professionals.
3-4 February LOGISTIK & SERVICE Austria 2010 Wels, Austria www.easyfairs.com/EN/show-806	LOGISTIK & SERVICE Austria 2010 will be held at Messezentrum Neu. It will serve as a platform for visitors to collect new ideas and information and to find innovative solutions on Integrated logistics, Transport - Cargo Handling - Warehousing - Logistics, Logistic techniques, Services in the field of logistics, Education and Research.
9-11 February CeMAT Middle East 2010 Dubai, United Arab Emirates www.cemat-me.com	The display sectors at CeMAT MIDDLE EAST comprise all aspects of intralogistics, including forklifts and other industrial trucks, materials handling accessories, rack systems, warehouse systems, packaging, loading equipment, cranes, auto-ID systems and software. .
23-26 March SITL Europe Paris, France www.sitl.eu	SITL Europe offers the entire national and international community involved in the transport of goods and of logistics services, a unique access to the complete range of products and innovative services aimed at supply, distribution and the supply chain of tomorrow.
7-8 April TRANSPORT & LOGISTIEK Brabantallen, 's-Hertogenbosch, The Netherlands www.easyfairs.com/EN/show-809	TRANSPORT & LOGISTICS presents a comprehensive overview of new trends and developments within the transport and logistics market in an accessible, modular show structure – on a human scale.
26-27 May DISTRIBUTION, LOGISTIK & MATERIALH Malmö, Sweden www.easyfairs.com/EN/show-818	In 2010 there will be a stronger focus on stock management, which is the reason why the fair is now called DISTRIBUTION, LOGISTIK & MATERIALHANTERING Öresund (Distribution, Logistics & Materials Management).
25-28 May S.I.L. 2010 Barcelona, Spain www.silbcn.com	After 10 editions, SIL has become the greatest Logistics and Transport event in Spain and the most important one in Southern Europe. Each edition of SIL has received good feedback both from exhibitors and visitors.