

BMS 2023

EXCITING NEWS FROM
BMS GROUP OPERATIONS
AROUND THE WORLD

The logo features a large '70' on the left, with the '7' composed of three parallel diagonal lines and the '0' as a thick, rounded ring. To the right of the '0' is the word 'BMS' in a large, bold, white sans-serif font. Below 'BMS' are the words 'YEARS' and 'ANNIVERSARY' in a smaller, green, all-caps sans-serif font, stacked vertically.

70 BMS

YEARS
ANNIVERSARY

**SETTING A NEW
RECORD AGAIN**

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**IT NEVER BECOMES
ROUTINE**

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**BMS GROUP
UNPLUGGED**

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This magazine is the eighth of its kind on BMS Group activities around the globe. Photo front page: In July 2022, BMS Heavy Cranes Australia Pty. Ltd. began an 18-month scope of work on four bridges in the East Zone of the West Gate Tunnel Project in Melbourne, Australia.
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FROM A SMALL DANISH BUSINESS TO THE WORLD'S 5TH LARGEST CRANE COMPANY

Welcome to the 2023 issue of the annual BMS magazine, which highlights some of the projects BMS Group has been involved in during the last year.

In all markets and all companies, including our international division, 2022 was a year with a very high level of activity, and we were involved in large and complicated projects. However, it was also a very challenging year, with rising prices, lack of equipment, fire destruction of one of our workshop buildings in Denmark, problems with having and later removing many cranes in Ukraine, as well as the closure of activities in Russia. This has been extremely costly, especially while making significant investments in cranes aimed explicitly at our activities in the wind turbine industry.

A lot suggests that 2023 will also present challenges and difficulties. Still, we will do everything in our power to constructively find solutions for the benefit of our business partners, our employees, and our companies.

Nevertheless, 2023 is also a year to remember, as it marks the 70th anniversary of BMS.

BMS (Byggeriets Maskin Stationer A/S) was founded by the Danish Government in 1953, as part of the European World War II Recovery Program. In the following decades it grew steadily until around 2007, when the Enggaard family took over all of the company. Since then, BMS Group has developed further, and through mergers and acquisitions, it has grown to be the world's 5th largest crane company.

I hope you will enjoy reading about some of the projects that BMS Group has carried out and get a sense of the variety of tasks we do, but also what we stand for.

We look forward to doing business with you.

Best regards,

Jens Enggaard
CEO



SETTING A NEW RECORD AGAIN

// DENMARK
// TRANSPORT

In 2019, BMS Group set a new record when we transported components for a Vestas wind turbine. And in 2022, we were the ones who broke that record – now with the transport of even larger Vestas parts.

The transport was carried out by Torben Rafn A/S, in close collaboration with BMS A/S, BMS Krangården, and BMS Heavy Cranes A/S. It included a tower in six sections, nacelle, hub, and other main components, as well as what is among the longest blades in the world (115.5m). It is all part of a Vestas V236-15MW wind turbine installed at Østerild Wind Turbine Test Field in north-western Denmark.

It was an extremely wide transport, over a distance of more than 20km, from the Port of Hanstholm to Østerild.

For transporting the towers, we used a MAN 41,640 8x4/4 truck with a heavy hauler with a total loading surface of 51 x 3m. For the nacelle transport, two MAN 41,640 8x4/4 trucks with a special construction, enabling a total weight of 1,000t, got the job done. They towed a 16+16 axle Goldhofer THP/SLS heavy hauler with a total loading surface of 24 x 6.3m.

The heavy hauler rolled on 256 wheels, and counting the trucks, the total number reached 280.

The hub was transported using a Volvo FH16-650 truck with a 12-axle Goldhofer THP/SL heavy hauler, with a total loading surface of 18 x 3m. Finally, the blades were transported by a MAN 41,640 8x4/4 truck with a 9+11 axle Goldhofer THP/SLS heavy hauler. The heavy hauler's length was 71.6m, while the total length of the transport was 130.75m.

As always, when transporting prototypes, a number of things needed to be clarified across many people, but the collaboration with Vestas and their suppliers again worked flawlessly. This was also the case internally between the different teams of BMS Group.



Timewise, this was a long project. Planning began around the turn of the year 2020-21, and the last parts were transported in December 2022.

WHEN THREE CULTURES WORK CLOSE SIDE BY SIDE



Preem was established in 1996, as a result of a merger of Texaco stations throughout Sweden and OK Petroleum stations in southern and western Sweden. Today, Preem is Sweden's largest fuel company accounting for 80 per cent of the Swedish and 30 per cent of the Nordic refinery capacity. Preem refines nearly 18 million m3 of crude oil annually, corresponding to 15 per cent of Sweden's total energy consumption. However, about two-thirds of the products are exported.

// SWEDEN // OIL & GAS

At times, a task can be so extensive that it is necessary to involve extra forces to be able to handle it. An excellent example of this is a recent assignment at Preemraff Lysekil, which is among Europe's most modern and environmentally efficient refineries.

Even when Preemraff Lysekil, located about 75km northwest of Gothenburg in Sweden, is running at full capacity, it is necessary to stop the plant periodically to inspect, clean, and possibly repair critical components. This requires up to 500 welders, fitters, and technicians – and BMS as the crane supplier.

The agreement with Preem AB was concluded in the autumn of 2021, and over four weeks in September and October 2022, we carried out the main activities relating to a carefully planned service inspection.

Most days, we worked from 7 a.m. to 6 p.m., but at least six BMS cranes were operating around the clock six days a week – one of them, in fact, seven days a week. At the peak of this project, we had 24 cranes on-site, including a 250t crawler crane, truck-mounted cranes, mobile tower cranes, and mobile cranes from 70t to 250t. In total, about 40 BMS employees were involved.

As we wanted to avoid drawing too much on resources locally, our Swedish company BMS Kranar AB first

allocated the cranes that could be requested from other parts of Sweden, after which equipment and personnel from Danish BMS A/S and the partly BMS-owned company, Crane Norway, were added.

It is always exciting when several cultures meet for an intense project. This requires an extra effort to ensure a good team spirit throughout the process, as well as ensuring linguistic understanding across Swedish, Norwegian, and Danish, with some English words in between. On the job at Preemraff Lysekil, we succeeded not only in lifting the customer's multifaceted tasks, but also to promote a healthy unity among all employees.

HELPING DENMARK'S LARGEST INFRASTRUCTURE PROJECT ON THE WAY

WHAT BEGAN AS VARIOUS MINOR AD HOC TASKS FOR BMS GROUP DURING THE SUMMER OF 2020, HAS DEVELOPED INTO ACTUAL CONTRACTS WITH SEVERAL OF THE CONSORTIA INVOLVED IN DENMARK'S LARGEST INFRASTRUCTURE PROJECT: THE FEHMARN BELT TUNNEL.

// DENMARK
// INFRASTRUCTURE

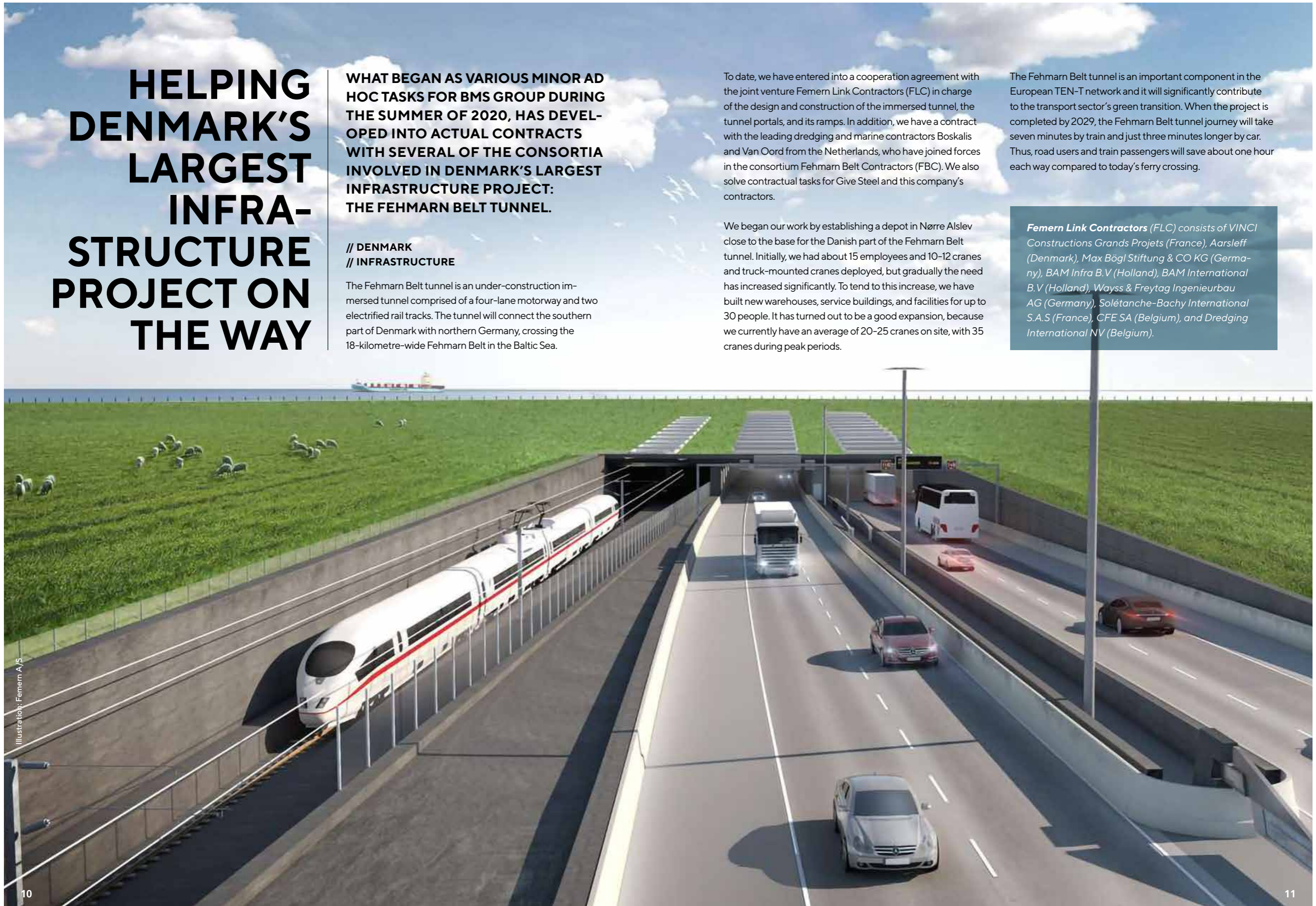
The Fehmarn Belt tunnel is an under-construction immersed tunnel comprised of a four-lane motorway and two electrified rail tracks. The tunnel will connect the southern part of Denmark with northern Germany, crossing the 18-kilometre-wide Fehmarn Belt in the Baltic Sea.

To date, we have entered into a cooperation agreement with the joint venture Femern Link Contractors (FLC) in charge of the design and construction of the immersed tunnel, the tunnel portals, and its ramps. In addition, we have a contract with the leading dredging and marine contractors Boskalis and Van Oord from the Netherlands, who have joined forces in the consortium Fehmarn Belt Contractors (FBC). We also solve contractual tasks for Give Steel and this company's contractors.

We began our work by establishing a depot in Nørre Alslev close to the base for the Danish part of the Fehmarn Belt tunnel. Initially, we had about 15 employees and 10-12 cranes and truck-mounted cranes deployed, but gradually the need has increased significantly. To tend to this increase, we have built new warehouses, service buildings, and facilities for up to 30 people. It has turned out to be a good expansion, because we currently have an average of 20-25 cranes on site, with 35 cranes during peak periods.

The Fehmarn Belt tunnel is an important component in the European TEN-T network and it will significantly contribute to the transport sector's green transition. When the project is completed by 2029, the Fehmarn Belt tunnel journey will take seven minutes by train and just three minutes longer by car. Thus, road users and train passengers will save about one hour each way compared to today's ferry crossing.

Femern Link Contractors (FLC) consists of VINCI Constructions Grands Projets (France), Aarsleff (Denmark), Max Bögl Stiftung & CO KG (Germany), BAM Infra B.V (Holland), BAM International B.V (Holland), Wayss & Freytag Ingenieurbau AG (Germany), Solétanche-Bachy International S.A.S (France), CFE SA (Belgium), and Dredging International NV (Belgium).



ONE OF THE LARGEST ONSHORE WIND FARMS IN THE WORLD



// AUSTRALIA // ONSHORE WIND

In November 2022, BMS Heavy Cranes Australia Pty. began working on a project that will be one of the largest onshore wind farms in the world. Depending on the weather conditions and the final project size, the construction process will most likely take 18 to 24 months.

Located approximately 200km south-west of Brisbane in Queensland, the MacIntyre Wind Farm Precinct is a cooperation between Acciona Energía, a subsidiary of the Spanish multinational conglomerate Acciona, and CleanCo, the Queensland Government's newest renewable energy generator.

The MacIntyre Wind Farm Precinct will have a total capacity of 1,026MW (megawatts) and it is expected to be operational in 2024. From this point on, the complex will help greening the electricity mix of Queensland to meet the state's decarbonisation commitments and climate change mitigation strategies.

The wind farm is planned to consist of 162 Nordex Delta 4000- N163/5.7 wind turbines with a tip height of up to 230m.

BMS Heavy Cranes' role in the project includes all offloading, pre-assembly and main installation of the wind turbines. For this, we use three Liebherr LG 1750 SX lattice boom mobile cranes with auxiliary cranes and a Liebherr LTM1750 mobile crane, with auxiliary cranes and various cranes for pre-assembly.

Based on the good relations between our companies at a global level, mutual trust and respect characterised the negotiations and cooperation with Acciona Energía on this project as well. We have hired Professional Wind Services (PWS) for the installation part, and here an excellent relationship has also been built over several years, which is essential for us to be able to take part in such a comprehensive subcontracting agreement.



With 30 years of experience, Acciona Energía is the biggest global operator exclusively dedicated to renewable energies, with no links or legacy related to fossil-fuel technologies. The company generates clean energy in many technologies, including wind, solar, thermal, hydro and biomass. With more than 11.2 GW of total installed capacity globally across 16 countries, the company produces clean energy equivalent to the consumption of 7.6 million homes. Acciona Energía is based on a company founded in Spain more than 100 years ago.

3D MODELLING SOLVES COMPLEX TASK

The Avedøre Power Station, in south of Copenhagen, is one of several Danish power plants that supply both electricity and heat. It is a multi-fuel plant, which uses wood pellets and straw as its primary

energy source. The wood pellets are shipped from the Baltic countries, while the straw comes from local farmers and it is a residual product previously burned in the fields.

The Avedøre Power Station supplies approximately 200,000 households with district heating while supplying green electricity to three times as many homes. The first part of the plant was commissioned in 1990, and the second in 2002. The following year, wood pellets were used as fuel for the first time – and from 2023, coal will no longer be in use at the power station.

// DENMARK // ENERGY

In connection with an upgrade, a new exchanger was to be installed to convert surplus high-pressure steam to district heating.

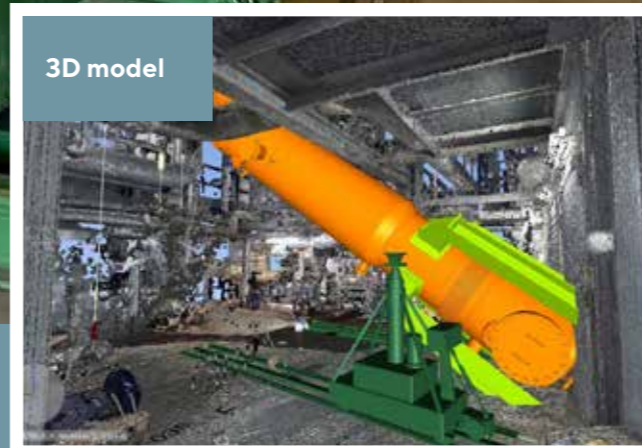
During the inspection before the lifting job, BMS Copenhagen found a margin of only 5-10cm to other installations. In addition, the exchanger, with a weight of 18.6t and dimensions of 9x2x3m, was so extensive that the beams of the building would not be strong enough to withstand the lift. Adding to this, there was a minimal lifting height.

At first glance, it seemed like a very complex task, but then the customer told us that a 3D scan of the existing system and

a 3D model of the new exchanger had been produced. This opened entirely new possibilities, because working in 3D is a strong competence at BMS Engineering. In a team effort, our engineers and the Jacking & Skidding Department from BMS Copenhagen developed an untraditional solution: the entire installation for lifting at the top of the load was moved to the next floor. The customer agreed to drill a small hole in the concrete deck, just above the exchanger's future location, so that an 11t chain with a hook could be hoisted down to the floor below. This way, a steel structure could be established that better distributed the load on the building – without loss of lifting height.

3D modelling proved extremely useful because it clarified how the exchanger could best move through the jungle of pipes and other equipment.

3D model



Real life



IMPROVING THE AIRPORT STRUCTURE OF THE WORLD'S LARGEST ISLAND

// GREENLAND
// INFRASTRUCTURE



The purpose of a coherent airport structure in Greenland is to improve transport connections, increase the number of direct flights and airlines, reduce travel costs and time spent, and reduce CO2 emissions from domestic flights in Greenland.

Kalaallit Airports International A/S, owned by the Government of Greenland (66.6 percent) and the Danish State (33.3 percent), is responsible for the development and operation of the airports in Nuuk and Ilulissat.



A new airport structure is currently being implemented following a decision by Naalakkersuisut, the Government of Greenland. It will relocate transatlantic flights from the main air transport hub Kangerlussuaq to Nuuk and Ilulissat – with Nuuk as the new primary airport in Greenland. The capital Nuuk is Greenland's largest city, while Ilulissat is the third largest.

As part of the new structure, the airports in Nuuk and Ilulissat are being

expanded. For Nuuk, the work includes a new runway of 2,200m to replace the current 950m one, in addition to a new terminal area, a new passenger terminal, and a new control tower. The expansion is expected to be completed at both sites by the end of 2023.

The Danish company Åbybro Maskinfabrik A/S chose BMS Lifts to assist with the installation of landing lights for the new Nuuk airport. For this task, which took over six weeks in 2022, we chose

a Palfinger P750 75m truck lift, which was shipped to Greenland with Royal Arctic Line. However, before this could happen, BMS Engineering prepared a lifting plan for the shipping company, which handles operations in the 13 biggest harbours in Greenland. Thus, Royal Arctic Line knew precisely how to lift the truck on and off the ship.

Thanks to good cooperation with Nuuk Transport A/S, BMS Lifts had access to workshop facilities on-site.

WHAT WOULD YOU DO?

// DENMARK
// INDUSTRY



A gravel pit is an open pit mine for the extraction of large amounts of gravel close to the earth's surface. After removing the topsoil, gravel and sand can be extracted for concrete, construction aggregate, and other industrial mineral uses.

What would you do if you were the owner of a gravel pit and, due to environmental requirements, had to move it 12km to a new address where you could continue to extract gravel from the underground?

The obvious thing would be to contact Skaks A/S, which is one of Denmark's largest companies in cranes and special transport. Since it was established in 1973, Skaks has built extensive experience and has a very efficient, specialized, and modern fleet for crane work, special transport, and machine relocation.

In 2021, Skaks became part of BMS Group, but like the transport company Torben Rafn A/S, it has continued under its own well-established name. Skaks works for most gravel pits in Denmark and northern Germany, where the company has gained considerable expertise in an area where there is no manual for solving the specific tasks.

In the above-mentioned 12km gravel pit relocation, a Liebherr 250t and a Liebherr 400t crane were used. Specifically, the move included a 45t sand miner of 38m length and 6m width, and an 83t sand wheel (8m length, 8m

width, and 10m height). In addition, a smaller miner weighing 43t (18m length, 6m width, and 6.4m height) was moved too.

Skaks also handled a large sorting plant, where a self-propelled modular transporter (SPMT) had to be used, as the 87t heavy unit was transported in a challenging terrain with large gradients. The last piece of the puzzle included moving 300m conveyor belts divided into sections of 20-40m.



EXPANDING THE WIND POWER CAPACITY IN THE FAROE ISLANDS



The Faroe Islands advance toward having all electricity needs powered through renewable energy by 2030, and the six V117-4.2 MW Vestas turbines of the Torshavn project take the sustainable electricity production in the Faroes from 40 to 67 percent.

BMS Group was also involved when the until recently largest turbines – Enercon E44-900KW with a hub height of 45m – were erected in 2020.



// THE FAROE ISLANDS // ONSHORE WIND

Anyone who has been to the Faroe Islands knows that the wind can go from quiet to storm within a very short period of time. When you add dense fog with virtually zero visibility, it is evident that it can be a very challenging task to erect six Vestas V117-4.2MW wind turbines with a hub height of 91.5m. This was precisely the challenge that awaited BMS Heavy Cranes A/S when Vindrøkt Sp/f was to install a 25MW onshore wind project just outside Torshavn, the capital of the Faroe Islands.

Usually, our customer is the wind turbine manufacturer. However, in this case, we worked directly for the end customer Vindrøkt, a special-purpose vehicle owned by the Faroese compa-

nies Røkt and Effo. Even though Vindrøkt owns three Vestas V47-660KW wind turbines installed in 2003, they had no experience with the new type of much larger turbines. This meant that BMS Heavy Cranes was responsible for the entire process: from sea transport of towers from Spain and other components from Denmark, inland transport in the Faroe Islands, and the installation itself. Our task was, therefore, not only to supply a crane for the installation, but to act as the customer's advisor in the dialogue with Vestas and other suppliers, including assistance in the design of crane sites, logistics and crew planning, as well as, choice and handling of equipment.

The customer's very entrepreneurial and positive approach to such a large, and in reality, unknown challenge made this a fascinating task. All parties had to think in new ways and see opportunities rather than obstacles. Working directly for the end customer instead of being somewhere further down the line also made the involvement and decision-making process very direct, with a short distance between idea and action.

During the planning phase, the customer visited the Åby-Alebo site in Sweden, where we installed similar Vestas turbines. Here, the customer could observe the shape and size of the components and follow the work with the handling in connection with

transport, unloading at the crane site, preparation, and installation.

In the Faroe Islands, we delivered a Liebherr LTM1750-9.1 mobile crane and other equipment from BMS Krangården. The crane was configured for a total lifting height of 100m and 75t capacity. Assisting cranes were supplied by a local company, who we had also worked with in the past.



MAKING MELBOURNE'S WEST AN EVEN BETTER PLACE TO LIVE, WORK AND PLAY

WITH CLOSE TO 5,000,000 INHABITANTS, MELBOURNE IS THE SECOND-MOST POPULOUS CITY IN AUSTRALIA. ITS MAJOR FREEWAYS MOVE MILLIONS OF PEOPLE AND ESSENTIAL GOODS EVERY DAY, AND THE WEST GATE FREEWAY IS ONE OF THE BUSIEST, CARRYING MORE THAN 200,000 VEHICLES DAILY.

// AUSTRALIA // INFRASTRUCTURE

The 10-lane West Gate Bridge from 1978 is at full capacity, and a single incident can bring the traffic network to a standstill. In addition, trucks in the west have no alternative but to use local roads to get to the port. Therefore, the Victorian State Government and the toll road operator Transurban have partnered in a public-private partnership to construct the West Gate Tunnel Project. Delivering the project in a Design and Construct capacity is CPBJH JV, a Joint Venture between Cimic Group's CPB Contractors and John Holland.

In July 2022, BMS Heavy Cranes Australia Pty. Ltd. began an 18-month scope of work on four bridges in the East Zone of the West Gate Tunnel Project, with a Liebherr LG 1750 lattice boom mobile crane with specific heavy lift configurations.

On Bridge 60, we installed 13 steel portals, each weighing up to 300t. The job mainly consisted of single lifting at a short radius, during the overnight closure of the main roads. It also included four dual lifts with a Liebherr LTM 1750, which posed many challenges, given the requirement for a

a crawler crane. As the LG 1750 is an outrigger machine, we were able to provide a solution where the crane could straddle these gas lines, hence sitting closer to the load instead of increasing the crane size and sitting back further from the load.

Some portals for Bridge 60 were so heavy that they required a short 12m move of the crane between shifts to achieve the next lift. We were able to utilize the "moving with equipment in place" charts from Liebherr and, in close cooperation with the client's geotechnical engineers, drive the crane at a high axle load after only removing the rear counterweight. This meant the relocation could be completed within one shift, ready for the following night's work.

As for Bridge 61, we installed 18 Steel Trough Girders weighing up to 115t. Here, the LG 1750 was chosen over a 350t crawler crane with superlift, as it could complete these lifts in a main boom configuration, with a 250t counterweight on the SP superstructure extension and 16m x 16m outrigger span. Once again, we had the advantage of lower ground bearing pressure and the ability to pinpoint the locations of the outriggers, to avoid bad ground and underground services.

On Bridge 72, we installed 22 Steel Trough Girders weighing up to 200t, while on Bridge 80, the task was the installation of 24 Steel Trough Girders weighing up to 240t.

Bridge 80 poses an extreme challenge as the work location is on the edge of a river with live traffic, railway, and overhead powerlines all nearby. Due to the LG 1750 having outriggers rather than tracks, the client can pile foundations on the edge of the creek bed, 30m down to the rock, for the outriggers to be placed directly on top.



This project is ongoing and it will be interesting to see the impact of this new bridge on the city's daily life.

The project will give Melbourne a second freeway link between the west and the city, providing a much-needed alternative to the West Gate Bridge and a vital second river crossing.

20 per cent dual lift factor being added to the load on each crane, according to Australian Standards. Since the setup was atop two main gas lines for the City of Melbourne, the LG 1750 was chosen in lieu of

COMPACT LOADS, LONG LOADS - WE'LL TAKE CARE OF IT

// GLOBAL
// EQUIPMENT

SELF-PROPELLED MODULAR TRANSPORTERS - OFTEN REFERRED TO AS SPMTs - ARE A SPECIALITY FOR BMS KRANGÅRDEN, WHEN THE COMPANY IS INVOLVED IN HEAVY TRANSPORT TASKS. CURRENTLY, WE OPERATE MORE THAN 200 AXLE LINES SPREAD OVER THE ENTIRE WORLD, AND OUR FLEET KEEPS EXPANDING.

The SPMTs consist of modules with a number of axle lines. Each module with a minimum capacity of 45t per axle line can be fitted with its own engine and steering system, and the modules can be connected head-to-tail, as well as, side-by-side to create a large platform on wheels.

Often used for on-site transportation over a relatively limited distance, the SPMTs typically move massive objects, such as bridge sections, oil refining equipment, engines, and other ele-

ments too large or heavy for trucks. Combinable in length and width, the SPMTs are compact and manoeuvrable, which makes them the perfect choice when working within a confined space.

Usually, our SPMTs have a grid of computer-controlled axles, allowing them to turn, move sideways or spin in place. The axle telescope independently keeps the load in place, both horizontally and vertically, when transporting the cargo over uneven terrain.



BMS Krangården's SPMTs are primarily from the German manufacturer Goldhofer AG, who are known for their trailers, semitrailers, non-driven heavy-duty modules, and SPMTs. What started as a forge in 1705 is now a global company developing robust and intelligent solutions for on- and off-road heavy-duty and oversized cargo haulage and airport operations.

70 YEARS OF BMS - KEY MOMENTS SINCE 1953



1953 Danish Government founds BMS (Byggeriets Maskin Stationer A/S) as part of European World War II Recovery Program.

1955 BMS gets its first crane, a Danish-built 6t telescopic crane



1971 Danish developer Asger Enggaard founds crane company Kranløft

1993 BMS is privatized by a group of Danish banks, and then sold to MT Højgaard
BMS buys activities of two Danish companies, MT Materielservice and Per Aarsleff

2001 Acquires Danish crane company Krangården; Kranløft changes name to Kranringen



2011 BMS Heavy Cranes is founded



2004 BMS merges with crane company Kranringen, owned by Enggaard family; opens subsidiary in Sweden



2007 Enggaard family buys remaining 50% of BMS; opens subsidiaries in Norway and Germany



2010 Opens subsidiary in Poland

2015 Opens subsidiaries in South Africa and the UK



2014 Acquires Danish transport company Kruse Maskintransport



2016 Buys Danish transport companies Torben Rafn and Vamdrup Specialtransport and part of K. Knudsen; opens USA subsidiary

2017 Opens subsidiary in Australia; acquires Danish transport company Thomas Thomsen

2019 Opens subsidiaries in Taiwan and Spain

2020 Opens subsidiaries in Vietnam, Finland, and the Netherlands

2012 Takes over 90% of Kranringen in Norway



2021 Opens subsidiaries in Ukraine and Ireland

2021 Buys Danish transport company Skaks and 50% of Crane Norway



2022 Renowned magazine "Cranes International and Specialized Transport" names BMS Group world's 5th largest crane company

2023 BMS celebrates its 70th anniversary.

CELEBRATING TEN YEARS AT ØSTERILD



// DENMARK
// ONSHORE WIND

When Østerild Wind Turbine Test Field celebrated its tenth anniversary in October 2022, there was also reason to mark the day at BMS Group. Since the beginning, several of our companies have been involved in both erecting and replacing the giant wind turbines in the northwestern corner of the Danish mainland.

Since 2012, thousands of tests have been carried out on wind turbines from the world's leading manufacturers, documenting what can be achieved

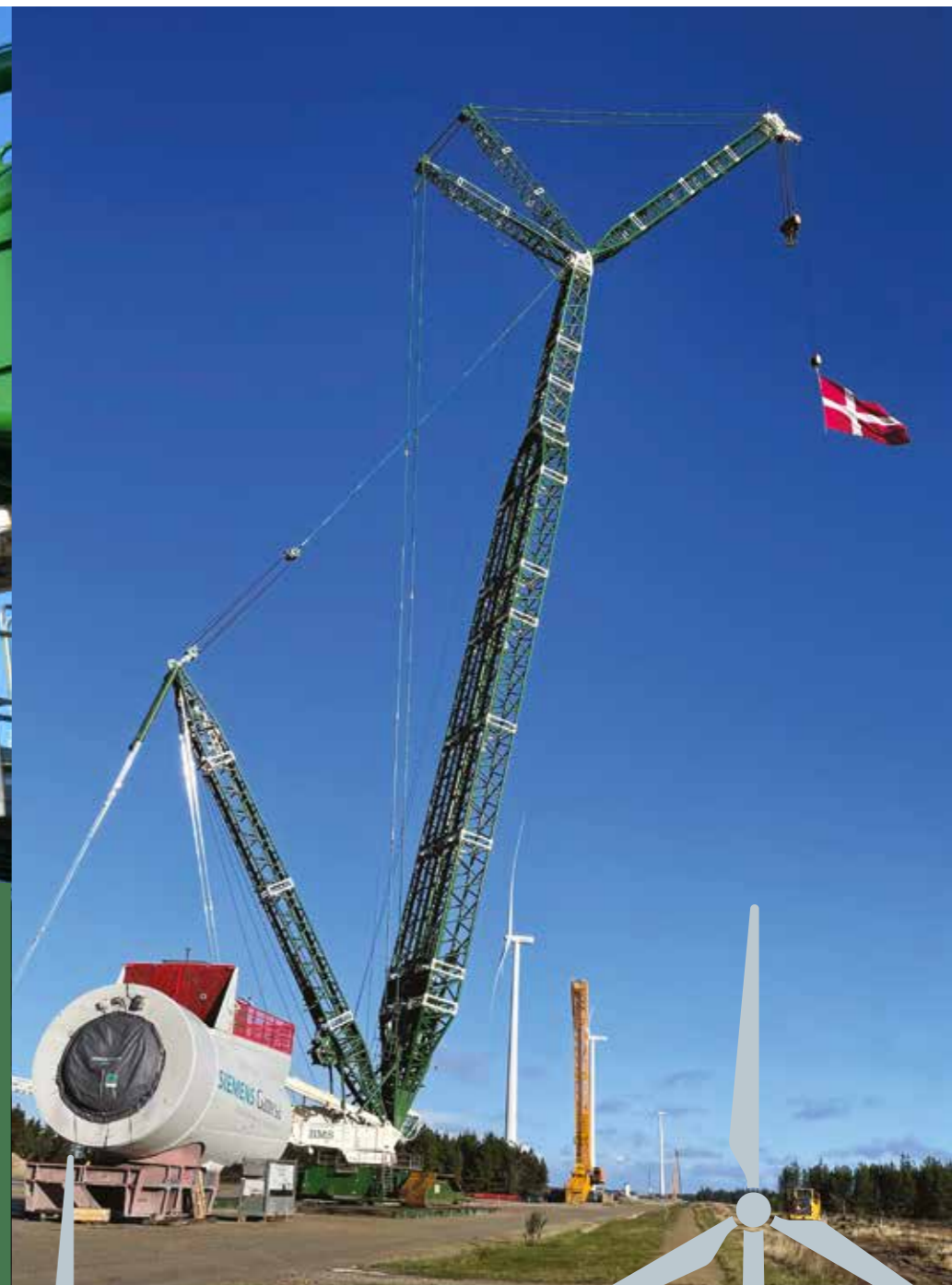
with their equipment. Continuing testing is necessary if further advances are to be made within this essential renewable energy source. Or as Anders Vedel, Vestas Wind Systems A/S' Chief Science Advisor, put it at the anniversary celebrations: "If the green jersey is to be maintained, three prerequisites for development must be present: training of new researchers, testing facilities, and a strong industry."

BMS Heavy Cranes has been involved in Østerild from the very beginning,

and over the years, the company has installed more than 90 percent of the turbines. Along the way, the company's crew and equipment have also been involved in dismantling tasks, as it is not the original turbines that today tower over Østerild.

In addition to BMS Heavy Cranes, BMS A/S has assisted with smaller cranes and self-propelled modular transport (SPMT) equipment, while Torben Rafn A/S has been responsible for a wide range of road transport tasks.

Østerild is the most suitable place to test large wind turbines in Denmark, as the test centre is located in Europe's best wind field. A mean wind speed of at least 8m/s at 100m altitude is needed to test the giants. In Østerild – only 7km from the North Sea – the average is significantly higher, and the wind is very stable. Another advantage of the Danish test centre is that it is far from residential and outside bird protection areas.



HISTORICAL TRANSPORTATION OF BERGEN'S TOP TOURIST ATTRACTION

// NORWAY
// INFRASTRUCTURE

SINCE 1918, THE FUNICULAR RAILWAY FLØIBANEN, WITH ITS TWO CARRIAGES, HAS BEEN A LANDMARK FOR THE INHABITANTS OF THE NORWEGIAN CITY OF BERGEN AND TOURISTS FROM ALL OVER THE WORLD. CONNECTING THE CITY CENTRE WITH THE MOUNTAIN OF FLØYEN, IT IS A SIGNIFICANT ATTRACTION TRANSPORTING MORE THAN ONE MILLION PASSENGERS ANNUALLY.



In connection with a complete upgrade of the Fløibanen, two new carriages were to be transported through Bergen's cramped mountainside streets up to Fjellveien station, where they were lifted onto the railway. This honourable task was entrusted to Crane Norway, the country's largest crane company with a fleet of more than 300 mobile cranes and, since 2021, partly owned by BMS Group.

Prior to the actual transport, several journeys were made along the route to make the required measurements. On the day, the task was solved using a Volvo truck with air control on all axles and a Broshuis hanger with sideways adjustment and remotely controlled steering on the rear axle. Thanks to the highest degree of manoeuvrability and close radio contact between the units, the carriages came safely through tight

alleys and sharp turns. The carriages were transported to the destination and lifted onto the track without the need for any physical interventions along the route.

Throughout the route, people stood with flags in their hands to pay tribute to the historic transport. Both local and national media coverage made it clear that the over 100-year-old Fløibanen is appreciated far beyond Bergen.

We are pleased with this type of challenge, because it tests us against what we have committed to in our vision and values. Always in place, trustworthy, and solution-oriented. In this specific case, joy was also part of the experience, both for our customer Fløibanen AS, the people of Bergen, and our employees.

The idea for Fløibanen was first put forward in 1895, work began in 1914, and by 1918 it was ready to be put into operation. The single-track funicular railway has an overall length of 844m with a height difference between the two terminal stations of 302m. The new carriages each weigh 16.5t, are 16.5m long, and can accommodate 120 passengers who can use Fløibanen every day of the week from early morning to late evening.

IT NEVER BECOMES ROUTINE

Over the course of more than three decades, several companies in BMS Group have installed thousands of wind turbines across five continents. Although it never becomes a trivial routine, it is often the same type of equipment and the same solutions that characterize these tasks.

For more than 30 years, BMS Group has worked closely with the world's leading wind turbine manufacturers, erecting, and servicing a vast number of offshore and onshore wind turbines. Over the years, we have handled wind turbines at the erection sites and performed port handling and transportation of all types of wind turbine components. Our scope of work includes receiving and offloading turbine components, transport of turbine elements to storage, the up-end of towers and assembly of

towers on tower stands, lifting and bringing full towers to quayside or operation site, and transportation of nacelles and blades to the quayside, as well as, to the operation site.

As wind turbine components are becoming still larger, we continually invest in the best and most recent versions of the largest cranes, specially developed for the efficient erection of wind turbines.

// GLOBAL // OFFSHORE & ONSHORE WIND

From time to time, we encounter inventions that make even seasoned BMS people open their eyes wide. This was the case, for example, when we first met a new universal lifting tool for wind turbine blades from CERTEX Danmark A/S.

The CTX Blade Gripper is developed by CERTEX Danmark's in-house engineering department. The lifting beam has the great advantage of self-adapting to different wing types and having a working load limit of 20t. In addition to installing wind turbine blades, the CTX Blade Gripper can be used for repair and dismantling tasks.

The Autonomous Positioning System (APS) is developed at Seasight Solutions A/S to increase the safety level in lifting operations, by securing reliable and precise steering of the burden from a distance. As it is designed with redundancy on all systems, the use of tagline systems is needless, thus eliminating personnel on the ground next to or directly under the lift. In this case, Seasight Solutions, in cooperation with CERTEX Danmark, developed the interface systems for the CERTEX blade lifting beam. The APS can be integrated into any kind of lifting beam and situation.

Through more than 135 years, CERTEX Danmark has built up comprehensive know-how within lifting equipment, lifting applications, and related services. Today, the enterprise has 21 sister companies and locations, as well as warehouses in 20 countries. A central part of CERTEX Danmark is the Renewables Division, with extensive experience in providing tools, products, and services to leading operators and manufacturers in the wind and renewables industry. As the company is part of the Lifting Solutions Group, CERTEX Danmark has access to manufacturing facilities in more than 100 locations in Europe, the United States, Australia, and China.

In the specific case, illustrated in the photos, we chose to use a Liebherr LTM 1750-9.1 800t mobile crane with a hook height of 111m and a lifting capacity of 47t.



A SPECIAL OPERATION FOR THE GERMAN ARMED FORCES

// DENMARK & GERMANY // SPECIAL OPERATION

When 2,500 soldiers from 12 countries' special operations forces met with their Danish colleagues for Night Hawk 2021, everything went according to the extensive exercise plan that had been laid out. Or almost everything. While packing, damage was caused to one of the German Armed Forces' Sikorsky CH-53 Sea Stallion heavy-lift transport helicopters.

The damage meant the helicopter could not fly back to Germany, but fortunately, this is where BMS Aalborg could help.

Toward the end of the exercise, BMS Aalborg had already assisted with relocating three Dutch inflatable crafts. Therefore, when the German Armed Forces (Bundeswehr) suddenly had an urgent task, we gladly stepped in again. The request was to "lift a helicopter", and although we are used to moving almost everything, it was necessary to investigate and plan the job in more detail.

We agreed with the customer that the task should be split in two. First, we would help remove the six rotor blades and lift the rotor to reduce the helicopter's transport height sufficiently for it to be transported on a low loader. Only then followed the actual lifting of the helicopter, which was carried out with a Liebherr LTM 1160 160t mobile crane. Finally, the helicopter and all related equipment were transported for reparation at a military base in Germany on three low loaders.

Sikorsky CH-53 Sea Stallion

The Sikorsky CH-53 Sea Stallion heavy-lift transport helicopter, designed and built by the American rotorcraft manufacturer Sikorsky Aircraft, was introduced in 1966. In the late 1960s, the Bundeswehr purchased 110 of this type of helicopter, and since then, a larger number has been added, part of which was built by VFW-Fokker GmbH in Germany.

- :: Crew: Two pilots, one or more loadmasters/crewmen
- :: Capacity: 38 troops (55 in alternate configuration) or 24 stretchers; 3,600kg payload
- :: Powerplant: 2 × General Electric T64-GE-413 turboshaft engines (2,927 kW each)
- :: Main rotor diameter: 22m
- :: Gross weight: 15,195kg
- :: Max takeoff weight: 19,051kg
- :: Maximum speed: 310km/h

BMS UNPLUGGED

// GLOBAL
// EQUIPMENT

ONE OF BMS GROUP'S VALUES IS TO ENSURE THE EFFICIENT USE OF RESOURCES IN RESPECT OF THE ENVIRONMENT. RECENTLY, THIS STATEMENT GAINED EXTRA WEIGHT WHEN THE EXTENSIVE FLEET OF CRANES WAS EXPANDED WITH A LIEBHERR LR 1130.1 UNPLUGGED, THE FIRST ELECTRIC CRAWLER CRANE IN THE 130T CLASS.

We already have 16 Liebherr crawler cranes with a lifting capacity of 130t. However, the 17th in the series stands out in more than one way. Apart from being the newest in the fleet, it is also the only one, until now, with an electric motor and battery pack instead of a conventional diesel engine.

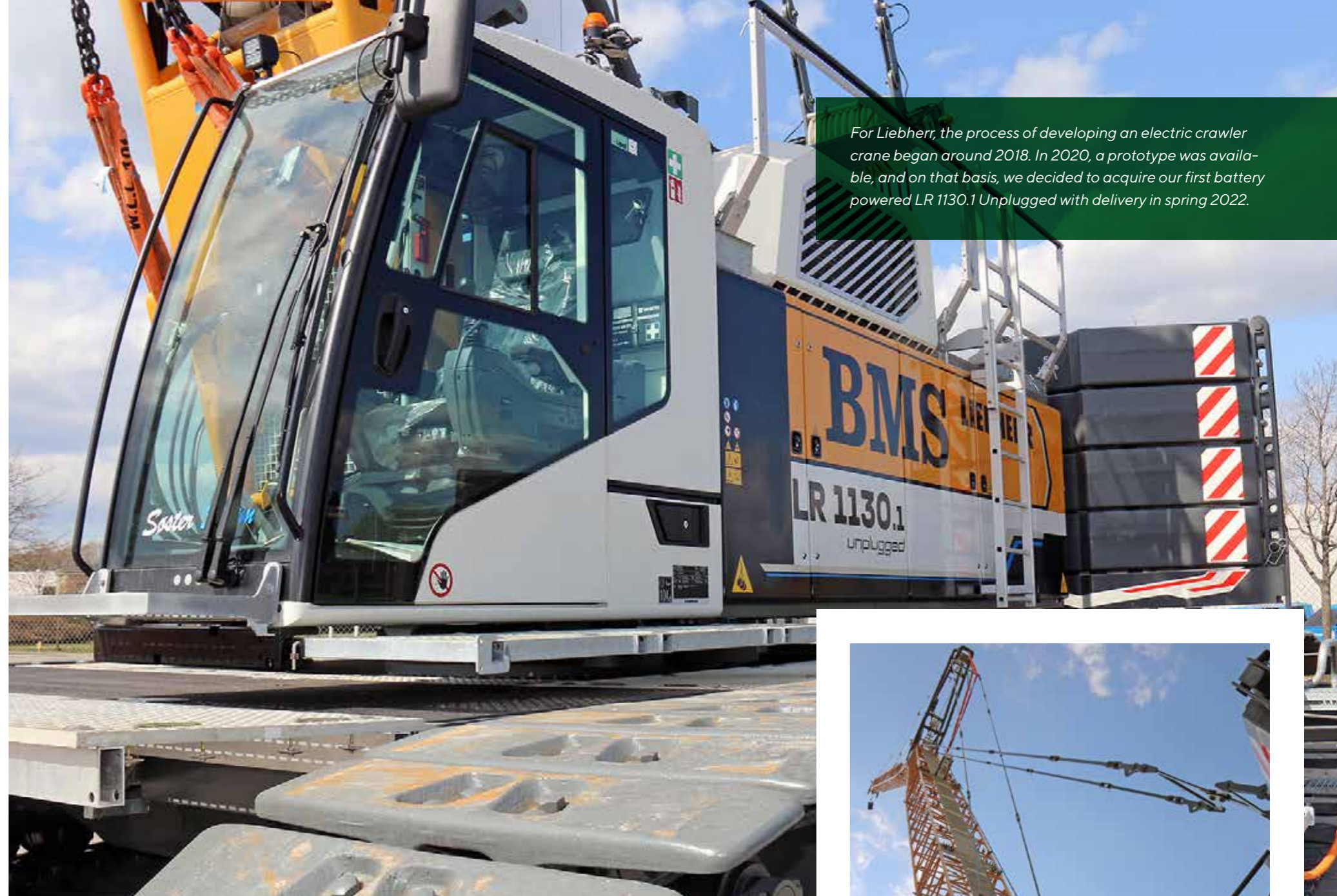
We have a tradition of giving our large cranes female names. For instance, all crawler cranes bear a name beginning with "S", and in line with this, the new machine has been baptized "Søster Strøm" – or in direct English translation, "Sister Power".

"Sister Power" has a lifting capacity of 130t, the hoisting height is up to 126m, and the crane has a working radius of up to 78m. The crane can either work on a conventional electrical connection with a cable in the power supply or unplugged. The motor

power is 255kW, and the battery capacity is 165 kWh.

Compared to the well-known Liebherr LR 1130.1 diesel-powered crawler cranes, there is no difference in performance, as the new crane can run six efficient operating hours without a plug-in. Moreover, charging can be done at night when the power is cheap, and thus, we can minimize power consumption during the day when the load is high on most construction sites. In addition, the new crane can run on either 32 or 63 amp.

In other words, "Sister Power" has no loss in performance or usability compared to the corresponding machine with a diesel engine, and the weight and dimensions are the same. An additional advantage is that the noise level is lower by going from diesel to power.



PUT A LID ON

// DENMARK
// INDUSTRY

Scrap metal is highly suitable for recycling, and the process can, in principle, be repeated an infinite number of times. The benefits are quite tangible: For example, recycling 1t iron saves over 1t CO2 emissions, and recycling aluminium saves 95 per cent of the energy compared to making aluminium from new ore. The collection and processing of scrap metal is becoming increasingly widespread, as experienced at Stena Recycling in Denmark.

Iron and metal scrap is sent to Stena Recycling's branches throughout the country or to its environmentally approved and certified shredding plants.

Here the scrap is checked, sorted, and processed to meet steel and metalworks' quality and purchasing requirements. Stena Recycling then supplies quality-assured raw materials to the plants to be part of the cycle for manufacturing new products.

A metal crusher is part of the process at Stena Recycling's branch in Grenaa on the Danish mainland. As this plant needed a new 29t heavy lid, Stena Recycling required BMS Aarhus to solve the task. Because the gantry crane in the 17m high building could not be dismantled, it was necessary to tilt the load to about 45 degrees. This allowed the lid to go between the rafters and the rails for the gantry crane. The lifting was carried out using a Liebherr LTM 1300-6.2 mobile crane and two 20t electric snatch blocks with synchronized remote control.

After the existing lid was lifted out of the building, the new one was hoisted down through the roof structure and tilted back horizontally so it could be mounted on top of the metal crusher.

Stena Recycling – a part of the Swedish-based Stena Metall Group with operations at around 200 locations in nine countries – recycles and refines 6,000,000t of waste and end-of-life products each year. Stena Recycling aims to find the most resource-efficient way to get the maximum value from industrial waste and increase the proportion that can be used as new raw material.



20KM OF CONSTANT CHALLENGES

// DENMARK
// TRANSPORT

In the north-western part of the Danish mainland, there is a stretch of country road with a fairly narrow roadway and many roundabouts. Despite these obstacles, it plays a central role in the development of the wind turbines of the future, as it leads from the North Sea port in Hanstholm to Østerild Wind Turbine Test Field.

On numerous occasions, companies in BMS Group have collaborated on the various tasks, such as lifting the wind turbine parts from vessels in the port of Hanstholm, transporting them along the approximately 20km of road to the test centre and installing both towers, nacelles, hubs, and blades.

One of the tasks that presents special challenges for Torben Rafn A/S – a haulage company which is part of BMS Group – is the transport of blades. As the height and performance of the wind turbines installed in Østerild Wind Turbine Test Field become ever greater, the volume of blades also grows.

Over time, the length of the blades has reached over 115m, and there is nothing to indicate that this should be the limit. Naturally, this places considerable demands on the operation, especially because the transport of the blades now entail a heavy hauler's length of almost 72m and a total length of the transport of just under 131m. In addition, the unpredictability of the Dan-

ish winter weather presents extra challenges. A good example of this was the blade transport carried out in December 2022, where the job was postponed by a day due to a sudden frost.

The wind turbines, hauled in December 2022, have a design lifetime of 25+ years depending on the site conditions, and provided the tests proceed as expected, serial production could be launched in 2024.

In 2021, wind supplied over 1,800 TWh (terawatt hour) of electricity, which was over 6 per cent of world electricity ("Global Electricity Review 2022"). With about 100 GW (gigawatt) added during 2021, mainly in China and the United States, global installed wind power capacity exceeded 800 GW ("Wind Power - Analysis", International Energy Agency, 2021).



This transport photo represents an excellent example of the close cooperation within BMS Group. The front blade is transported by Torben Rafn A/S, while the rear is handled by BMS A/S, using self-propelled modular transporters (SPMTs).



70 BMS
YEARS
ANNIVERSARY

YOUR CONNECTION TO CRANES, LIFTS AND MORE

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// **BMS Krane GmbH**
Germany
HQ: Harrislee

// **BMS Heavy Cranes
UK Ltd.**
United Kingdom
HQ: Huntingdon

// **BMS Lifting Ltd**
United Kingdom
HQ: Brough

// **BMS Heavy Cranes
Australia Ptd. Ltd.**
Australia
HQ: Melbourne

// **BMS Heavy Cranes A/S**
Denmark
HQ: Nørresundby

// **BMS Heavy Cranes Inc.**
USA
HQ: North Carolina

// **BMS Heavy Cranes
Iberica S.L.**
Spain
HQ: Madrid

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Sp. Z.o.o**
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