

CORUM
GROUP



SUMMER-2019

DIGEST

CORPORATE EDITION FOR CLIENTS OF CORUM GROUP



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Digest / Summer-2019

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Corum Group
Corporate Edition
DIGEST, Summer 2019

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CORUM
GROUP





DEAR PARTNERS!

Mikhail POTAPOV
CEO Corum Group



This year marks the 130-year anniversary of the Corum Group. Over these years, our company has demonstrated continuous and sustainable development. The indicators of our performance evidence this across all the areas of our business. In 2018, we exceeded the business plan for contracting by 80%. Supplies of products to customers, much of which are in the Russian market, grew by 40%.

The longwall complex for the South Coal Company, delivered in the autumn of 2018, helped miners to extract over half a million tonnes of coal in just a matter of months. Our miners from Corum Shahtspetsstroy are working in the Arctic Circle for Vorkutaugol. At the end of last year, our company supplied a unique SP326 low-speed conveyor to the EVRAZ company for use in cleaning the drainage shaft at the Osinnikovskaya mine – this indicates readiness to offer and implement individual solutions. The «Corum-Sibir» Repair and Service Centre is continuing its work and is preparing to fulfil several large orders of the Kemerovo region miners over the coming months.

We aim to satisfy the needs of clients both from the East and from the West. In 2018, we completed the supply of ZRP15/35 powered roof support for

the Soshnitsa mine, which is part of the Polska Grupa Górnicza state-owned company. The order was carried out in accordance with all individual customer requirements and in full compliance with European quality standards, including welded metal structures, confirmed by the certificate of the TÜV Thüringen German certification laboratory. The next contract for the supply of 135 similar sections of the powered roof support to the Piast-Ziemowit mine has already been concluded. In the near future, we expect to transfer our European experience to Kuzbass, where the working conditions are similar in terms of seam height.

Corum Group factories operate following the trends of development and assistance to clients in matters of import substitution: The Pokrovskoye Mining Group belonging to the Donetsksteel Group has received another batch of pan line equivalent to that of foreign manufacturers. Power hydraulics produced by the Corum Druzhkovsky Machine-Building Plant effectively work with the supports of any manufacturers, and the Vorkutaugol miners have seen this first hand.

The willingness of Corum to undertake the implementation of non-

standard projects and their successful implementation increases the trust of our clients and breaks down the boundaries between businesses. A striking example of such partnerships is the agreement on a strategic alliance with the Donetsksteel Group, concluded in October 2018. Such cooperation will lead to a boost in production efficiency at the enterprise, on the one hand, and the development of Corum longwall equipment, on the other – an optimal manifestation of a win-win culture.

Another example of joint strategic work is the creation of innovative products designed in accordance with the partners' needs. This is, for instance, a modern CLS450 shearer, which helped miners set a record and increase daily production by 65%. The RH160 tunnelling machine with a rock anchor mechanization system that will reduce the drifting time by 30–50% and make the work of the drifter safer. Complete transformer explosion-proof substations with a self-diagnostic system increase the efficiency of equipment operation, as well as provide a contribution to the enterprise's energy savings.

Most of these products are developed jointly with DTEK energy holding, which has been our strategic partner for more than five years. The recent integration of our companies makes it possible for Corum to implement large and ambitious projects, to quickly create and bring to the market new equipment, to work with our clients with conditions which are more favourable for all parties.

To continue the joint success with clients, the Corum Group unceasingly improve its competitiveness and efficiency. To this end, we have engaged KPMG consultants to conduct an independent assessment of the production capacity of enterprises and the incorporation of international experience. You can evaluate the results of this cooperation by using our company products.

Our relationship with regular and new partners is based on the desire to help achieve their strategic goals. While helping you, we are developing new products, mastering more advanced technologies and setting new records, which will go down as shining moments in the 130-year history of the company.

The Corum anniversary is a reason for us to become better than we were yesterday and to offer you, our partners, innovative and high-tech equipment. Find out more about the new products released under the Corum brand either on the pages of this customer digest or by visiting our production sites and enterprises of our clients

CORUM GROUP RECORDS

This year, our company is celebrating the 130-year anniversary of its foundation. During this time, the Corum Group has achieved significant success in the field of engineering. The individual achievements are so weighty that they are vying for a place in the Book of Records. In honour of the anniversary, we decided to make a selection of the most notable ones in the review of the last 10 years. We invite you to get acquainted with the Top 7 records of the Corum Group.

The KPD roadheader set a record for Ukraine

The average rate of longwall preparation at the Yuzhnodonbasskaya No. 1 state mine used to be 250–300 meters per month. Using the KPD roadheader manufactured by the Corum Group made it possible to do the same amount of work 2.5 times faster. The rate of tunnelling reached 715 meters per month. This indicator became the Ukrainian national record in 2013.

7
THE FASTEST ROADHEADER



Service in record time

A specialist of our company arrives on call within 11 hours. While yet six years ago, it used to take 8 hours more. In case of an emergency call, service responds within 3 hours. In 2013, the average time spent on the initial troubleshooting of an average complexity was 41 hours, in 2018, this time was nearly cut in half. At that, since 2017, the dispatch function for Corum customers works with a 24/7 hotline. This service allows customers to more efficiently use our company equipment and minimize downtime and the risk of accidents.

6
THE BEST SERVICE



Corum miners set a record at the Pokrovskoe Mining Group

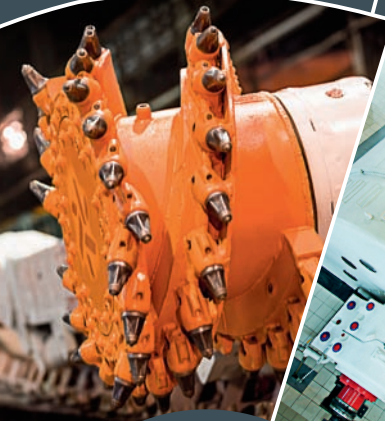
Miners of the Mining Area No. 1 "Corum Shahtspetsstroy" set a company record for heading tunnels. In one month, the mines built 202 meters of the ventilation tunnel of the 9th southern longwall of the Pokrovskoye Mining Group block No. 10. The peak daily rate of tunnelling reached 11.05 meters or 17 metal-arch support frames. It was possible to achieve such indicators thanks to the organization of the process, the use of high-performance equipment and highly qualified personnel.



CLS450 increased monthly coal mining

The CLS450 shearer helped the miners of the Dobropolskaya mine (DTEK Dobropolyeugol) mine 80 thousand tonnes of coal, exceeding their monthly plan. Thanks to this extraction equipment, the miners completed the early development of the 9th southern longwall of the Dobropolskaya mine.

1

**THE LARGEST
EXTRACTION**

2

THE FASTEST REPLACEMENT**Replacement of the winder in 6 days**

In a record short time — 6 days — Corum machine builders replaced the winder at the mine named after the Heroes of Space, DTEK Pavlogradugol. Thanks to this equipment, the capacity of a coal enterprise increased from 9 to 11 thous tonnes of coal per day!

3

**THE TIGHTEST DEADLINE
FOR LONGWALL PREPARATION****The front-face roadcutter system was able to manage this task in 30 days**

The front-face roadcutter system reduced the time required for longwall preparation by almost three times. With our equipment, the miners of the coal-mining company DTEK Pavlogradugol prepared the longwall in 30 days, although before this used to take nearly three months.



4

THE HIGHEST FIGURE**Thanks to the KDK-500 shearer, the Sadkinskaya mine set an all-time Russian record**

Thanks to the work of the longwall complex, the Sadkinskaya mine was ranked among the top three Russian record-breakers in terms of coal production volume. In 2006, its figures outstripped those of Kuzbass, as reported by the specialized magazine «Ugol». The company managed to increase production volumes due to the operation of our equipment — a powered longwall complex consisting of a KDK-500 shearer, a SPTs230 armoured face conveyor and a 3KD90T powered roof support.

5

**THE SHORTEST TIME
FOR LAYING A MINE ROADWAY**

WIN-WIN STRATEGY: WE WIN TOGETHER WITH THE CLIENT





Competently



Oleg NESTERENKO

Director of the Corum Trading company

 The goal of our company is to study the needs of the client, understand the problem and find optimal solutions that will help him achieve maximum results with minimal costs in a short time. We solve every problem individually and in close contact with the client. Thanks to an individual approach to everyone, today our company has a pool of more than 200 permanent business partners in Ukraine and abroad – in the CIS and the European Union. Over the years, Corum has become an integral part of the life of these enterprises and feels its involvement in the successes and achievements of our partners.

 Win-win is a strategy that Corum Group has been pursuing in its work with clients for many years. This approach helps both the customer and the contractor win in deal.



A client-oriented approach is at the heart of the Corum Group values, and this is primarily manifested in the culture of win-win cooperation. The company does not merely sell equipment, but rather aims to solve the client's problems. At the same time, when the client is open, it gives insight into the nature of the task, helps immerse oneself into the problem and, as a result, offer the most effective solution. Here are just a few examples of how this relationship model works: in the autumn of 2018, Corum entered into an alliance with Donetsksteel for a period of three years and had previously formed similar business long-term alliances with Metinvest and DTEK Energo.

CUSTOMIZED APPROACH

Corum recognizes that each client is unique: this is manifested in the mining-and-geological conditions, the established processes and even in their own vision of future changes. Therefore, our company does not offer universal solutions, but is ready to adapt to the needs of a particular client, using developments that have passed the test of time and proven their effectiveness under similar conditions with other clients. Such an approach was used in the development of a unique mechanised complex for the Sadkinskoye Mining Group (South Coal Company), which was handed over to the client in September 2018.

The complex is based on a number of unique design solutions that provide high performance of equipment and fulfilment of production plans. The longwall complex consists of 203 pieces of 3KD90T special design roof support sections, an upgraded KDK500 shearer, an armoured face conveyor and a stage loader SPS230. It is able to provide a high level of output – up to 12 thous tonnes per day. With its smooth operation, the equipment will pay for itself in a few months. With the help of this equipment, the miners of the Sadkinskoe Mining Group plan to produce over 1.5 mln tonnes of high-energy anthracite coal from longwall No. 45 over the year.

In some cases, our experts are ready to develop together with the client and produce special equipment that solves the unique task facing the customer. Thus, together with the DTEK miners, Corum specialists created a unique front-face roadcutter system – the first tunnelling complex of its kind in the world. It is intended for laying roadway of rectangular section in low-thickness formations (up to 2 metres). The front-face roadcutter system fully mechanised the process of cutting niches in difficult mining and geological conditions. Its capacity is 1.5 tonne per minute. The system is able to increase the speed of laying mine roadways up to 10 metres per day. This equates to a 60-percent acceleration in the launch of longwall to extract coal from thin layers. On average, with this equipment, the miners save a whole month on the preparation of one longwall.

Specialists of Corum Group are ready to share the company's experience accumulated over 130 years, act as experts, advise and even be general contractors in cases where it is necessary to link our equipment with equipment from other manufacturers.

ADDING VALUE

From the point of view of the organisation of the production process, it is more profitable for machine builders to replicate serial products. But in this case, customers are deprived of choice and flexibility in solving their problems. A compromise in the purchase of a serial product does not guarantee that the issue will be 100% resolved. For this reason, Corum deliberately rejects the notion of standardized products. Instead, our company proposes a solution of the problem developed in tandem with the client, thereby creating additional value from such an interaction.

WHAT HELPS USACHIEVE



-  Finding a solution to a client's problem has a higher priority than supplying a serial product
-  Individual approach and readiness to adapt, create and combine our own products with the client's existing equipment fleet
-  In-depth understanding of the client's business and readiness to achieve ambitious goals together
-  Engineering potential and years of experience
-  Constant feedback and continuous improvement of our own technologies and processes

VALUE OF WIN-WIN STRATEGY FOR THE CLIENT: helps avoid the need to find a standard solution (which might not exist – Editor's Note) and helps to proceed from the tasks and challenges without thinking about «how to do this.» The client receives a reliable supplier who understands his needs and is able to satisfy them.

THE VALUE OF A WIN-WIN STRATEGY FOR THE COMPANY: helps build long-term partnerships which promote the development and prosperity of both parties. The manufacturer receives a guaranteed volume of orders, which makes it possible to invest in the development of production and technologies in order to offer the most advanced solutions to his partners in the future.

At the end of 2018, our company's volume of contracting increased by 76% as compared to the annual business plan. Compared to the figures of 2017, exports went up by more than 50%.

These figures confirm that the win-win strategy, by which the Corum Group has operated for many years, works and helps coal enterprises set records in coal mining in addition to allowing machine builders to move confidently towards modern technology for mine 2.0.

CORUM SHAHTSPETSSTROY:

MINE SHAFT REACTIVATION IN HARSH CONDITIONS

In the past few years, more and more mines have begun reactivation of shafts, the construction of which was suspended for one reason or another. Corum Shahtspetsstroy has expertise in this matter and shares its observations and knowledge using the example of the Komsomolskaya mine in Vorkuta.

SECOND WIND FOR MINE SHAFT NO. 4 OF THE KOMSOMOLSKAYA MINE

In August 2018, Corum Shahtspetsstroy began restoration works at the Komsomolskaya mine, a part of Vorkutaugol, the largest mining enterprise in Russia. The site is a 900-metre air shaft, which was flooded to 885 metres. The team of miners will have to revive the No. 4 air shaft in under two years.

The decommissioning works are carried out in difficult conditions, given that the site is located beyond the Arctic Circle. This project is implemented in three main stages. First of all, the mine workers will have to complete work on pumping water from the flooded part and equip the shaft with mining equipment before deepening the shaft to 90.1 m (to the mark -999.1 m). In the end, they will need to mount the cable reinforcement as part of the permanent equipment.

"Our task is to ensure the operation of the air shaft of the Komsomolskaya mine, which will help the client continue mining the reserves of the mine field", says Dmitry Vorozhtsov, director of Corum Rus. «This contract is not the first experience of cooperation between Corum and Vorkutaugol in recent years. Assessing our mining equipment, the miners entrusted us with another project. Its administration will be fully carried out by the trading company Corum Rus, in order to be in touch with the customer 24/7».

Corum Shahtspetsstroy plans to complete mining operations in the shaft and reinforcement in 2020. With the end of construction of the air shaft No. 4, the Komsomolskaya mine will get its second wind.

FOR PUMPING WATER FROM FLOODED MINES, ONE HAS TO INVENT NEW TECHNICAL SOLUTIONS



"The colleagues began to drain the mine shaft at the end of January", stated Alexey Zhitnik, director of Corum Shahtspetsstroy, commenting on the progress of work in Vorkuta. «With the help of a submersible pump, more than 16 thousand cubic metres of water have already been pumped out – this is a fourth of the total volume of flooding in the shaft of



Competently



**Alexey
ZHITNIK**

Director of Corum Shahtspetsstroy

✦ Constructing a new shaft is a costly affair. Therefore, increasingly, managers of mines are considering the option of restoring shafts that have already been built, but are not being used. We are often called upon to survey such objects. Over the course of a month, we study the object and then give an expert opinion. Afterwards, the leaders of mining companies decide on the feasibility of conducting restoration works and contact us for this service.

the Komsomolskaya mine. The water level in the shaft dropped to -350 m from the surface. The amount of water pumped out would be enough to fill eight Olympic pools.

The offer from Corum Shahtspetsstroy to use submersible pumps enabled pumping water up to a depth of 350 m, while in parallel working on equipping the shaft with mining and tunnelling equipment».

"In order to pump out water from 350 m and below, as well as to further penetrate the shaft to a design depth, it was necessary to make a suspended ceiling", says Dmitry Torubalko, planning and production manager for the construction and mining department at Corum Shahtspetsstroy. «To pump out fluid from such a depth, mine builders use several pumps installed in a series, or graded outflow. With their help, water will be brought to the surface. After that, a new stage of deepening the shaft to 999.1 m will begin.

The experience and equipment of Corum Shahtspetsstroy make it possible to construct and restore shafts up to 1500 m deep. Today there is great market demand for this type of work. Last year alone, the demand for services of Corum miners increased 2.2 times in comparison with the figures for 2017. This once again confirms that the trend to restore mothballed shafts is only gaining momentum, since it is more beneficial and cheaper by almost 2 times than the construction of a new facility».

CORUM SHAHTSPETSSTROY PORTFOLIO OF COMPLETED ORDERS

In 2013, the Corum Group established its own mine-building division. During this time, its staff has implemented a number of projects. We are speaking about the most noteworthy and the most significant in the portfolio of Corum Shahtspetsstroy.

/ The most important international experience in Corum Shahtspetsstroy portfolio is the construction of two vertical shafts for the Nui Beo Mine (Vietnam): the main and auxiliary — 6 m in finished diameter and 389 m and 417 m in depth, respectively. As part of the project, the mine builders assembled metal structures for the reinforcement of shafts using new technologies — with the aid of chemical anchors.

// Corum Shahtspetsstroy built the main fan installation for the Zaporozhskiy Iron-Ore Plant (Dniprorudne, Ukraine). It was a turnkey project, under which design and construction and installation works were performed. At the same time, the equipment produced by Corum Group was used to equip the facility. Its installation and commissioning were also part of the implementation of this

project for the Zaporozhskiy Iron-Ore Plant.

/// The laying of capital mine roadways at the Tentetskaya mine, owned by ArcelorMittal Temirtau (Kazakhstan), was an important stage of development for Corum Shahtspetsstroy through the sinking of horizontal and inclined mine tunnels. Carrying out the customer's tasks, the mine workers laid 514 m of roadways using the roadheading method.

//// During the mining of gypsum at the SINIAT mine (Bakhmut, Ukraine), Corum Shahtspetsstroy used a KPD roadheader produced by Corum Group. In Ukraine, it was the first example of using a tunnelling machine for the production of gypsum. As a result, 144.7 thous tonnes of gypsum was mined.

CURRENT PROJECTS OF THE CORUM GROUP MINING DIVISION

At the moment, experts of Corum Shahtspetsstroy are simultaneously implementing three projects in Ukraine and Russia. In Vorkuta, miners in the harsh conditions of the north are engaged in the reactivation of shaft No. 4 of the Komsomolskaya mine, owned by the largest Russian coal mining company Vorkutaugol, and its further sinking to the level of 999.1 m. In parallel with the works beyond the Arctic Circle, the Corum miners are carrying out the construction of tunnels at the Pokrovskoye Mine Group facilities (Donetssteel). And at another project in Ukraine — the Almaznaya mine — workers at Corum Shahtspetsstroy are repairing mine roadways (undermining the soil and retimbering). All these projects started last year and are being implemented in stages in accordance with the schedules.



RH160 REDUCES THE TIME OF ONE BOLTING CYCLE BY UP TO 50%



The roadheader with a roof-bolter under the Corum brand will make the work of miners safe and will allow reduce the time to perform the drifting.

The development of new coal reserves is inextricably linked with the need to conduct workings in difficult mining and geological conditions. For the effective solution of such problems, the use of selective action tunnelling machines of the light and middle classes is often not enough. In response to client requests, our company has developed and manufactured medium-class selective action roadheader – RH160. Now this innovative product is undergoing industrial tests at the Yubileinaya mine, which is part of Pershotravenskoye Mining Group (DTEK Pavlogradugol).

BOLTING MECHANISATION EQUIPMENT

The RH160 tunnelling machine is a joint project of the Corum Group and its long-term partner DTEK Energo. Specialists of the two companies have been together solving the problem of drilling mechanisation and installation of roof bolts in the tunnels with a cross section of 15 m² and more. The difficulty was that the minimum cross section in which the RH160 tunnelling machine (without a roof-bolter) could work is 13 m². Therefore, to equip the tunnelling machine with a roof-bolter and ensure its fit into the 15 m² section was a challenge for Corum engineering.

Simultaneously, another problem was solved: when performing the main function of a tunnelling machine – destruction of a rock massif with a strength of up to 110 MPa – the drilling module should not limit the work of the controlling device and the tunnelling machine as a whole. After the end of the face cut, it is necessary to ensure its delivery to the working area, to

Competently



**Alexander
UDOVICHENKO**

Corum Group Tunnelling
Equipment Manager

Our engineers first got the idea to create the RH160 back in 2013. The tunnelling machine was designed based on the considerable personal experience of Corum designers and advanced technical solutions of foreign manufacturers. Due to this synergy, a unique innovative product appeared that would launch the new generation of medium and heavy tunnelling machines.



The modular design of the controlling device gear box depends on the client's task: it can be equipped with a gear box with both transverse and longitudinal-axial arrangement of cutting crowns.

the face, for drilling boreholes and installing roof-bolts. After completing this operation, the module should return to the transportation position for the next face cut cycle. To ensure that the tunnelling machine can work in such small dimensions, engineers have developed a design with minimal gaps and tight layout.

With the existing technology, the time to complete one bolting cycle is about 30–40 minutes. The use of an RH160 tunnelling machine with a roof-bolter should shorten the cycle time by 30–50%. Industrial tests of roadheader should confirm this.

THE MECHANISATION OF THE BOLTING PROCESS WILL INCREASE THE SAFETY OF PENETRATION

One of the prerequisites for the emergence of RH160 was the customer's desire to secure the work of the miners when laying mine roadways and installing roof-bolts. To solve this problem, a new Corum roadheader was equipped with a remote control. It operates in two modes: radio wave and wired, which allows workers to be in a safe zone during the conduct of tunnelling works.

The mechanised bolting process can be opposed to the technology of drilling boreholes with manual pneumatic drills. The disadvantage of this method is the large weight of installations, which requires intense physical labour of miners during the installation and dismantling of equipment. In addition, manually control of such installations is associated with the risk of injury of workers, since the operator is in the zone of open face.


Engineers of our company designed the roof-bolter from scratch. It is not similar to any existing equipment on the market. Corum machine

Competently



Alexander KOVALCHUK

Director of the Corum Svet Shakhtera plant

 There are no analogues to the RH160 roadheader in Ukraine. It is equipped with a powerful roof-bolter, which drills boreholes in rock with the installation of bolts. They hold the walls and roof and do not allow the rocks to collapse. I am sure this machine will match the market demand.

MAIN CHARACTERISTICS OF THE RH160 ROADHEADER

Power of the electric motor drive of the controlling device is **160 kW**

Strength of rocks being crushed – **up to 110 MPa**

The cross section of the tunnels – **13–35 sq. m.**

The angle of the tunnels **±18°**

Specific ground pressure – **0.14 MPa**

Diameter of the cutting crowns – **1050 mm**

Working pressure in the hydraulic system of the tunnelling machine – **250 MPa**

Gearless hydraulic drive of the feeder loading spiders

Planetary hydraulic gear motor in the drive spiders of the chassis

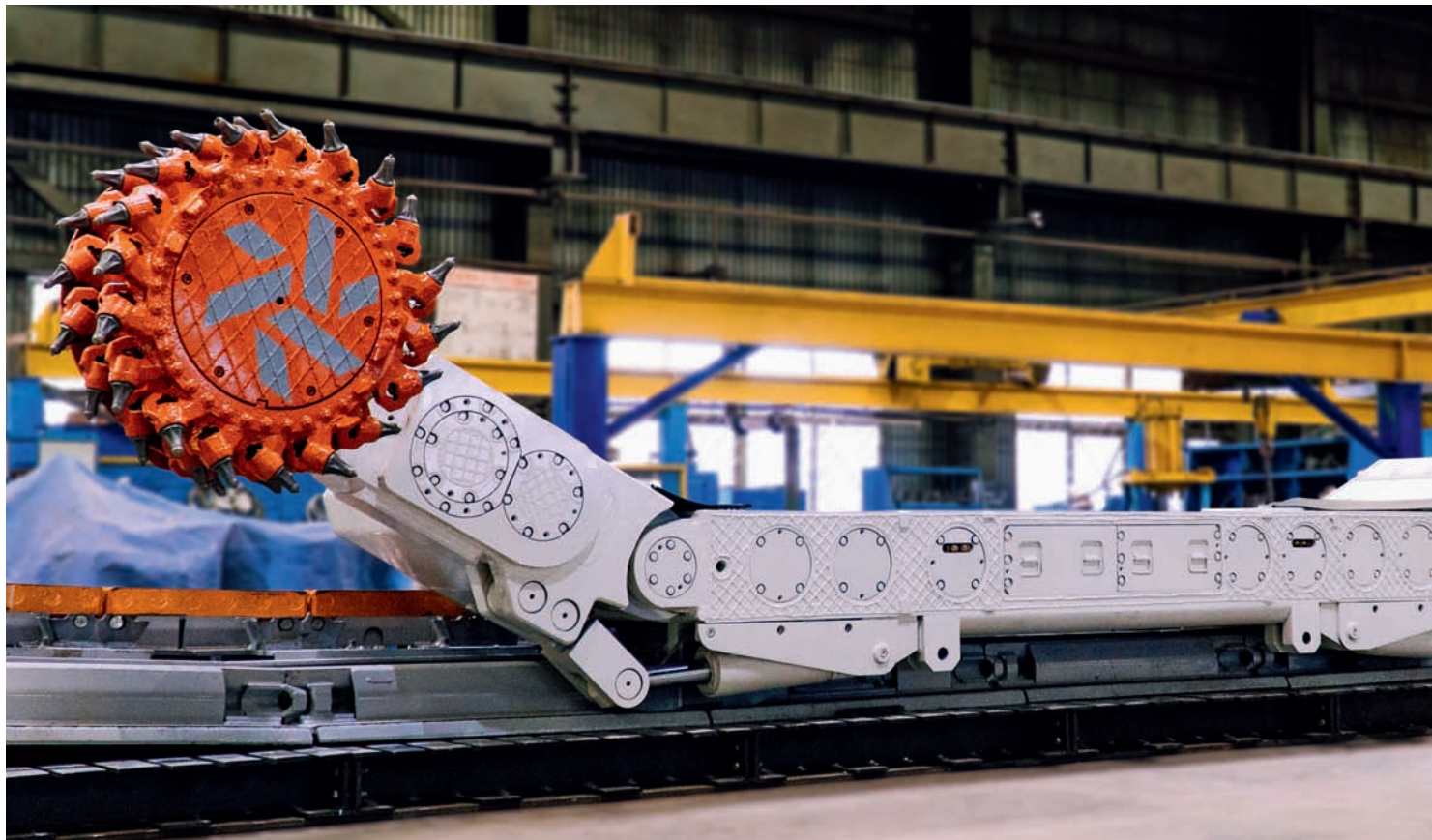
Remote control of roadheader

Roadheader weight is **55 t**

builders are constantly looking for effective solutions to give miners new opportunities to increase the rate of drifting and coal mining. It is important to ensure the profitability of our customers' business, safety and hazard-free operation of the miners.

After the completion of industrial tests, the Corum Group introduces the RH160 – a new-level roadheader – to the world market. Major Ukrainian and foreign mining companies are already interested in this innovative product.

SHEARER CLS450 BEGINS OPERATION AT ALMAZNAYA MINE



The use of the new CLS450 shearer boosts coal production by almost 1.5 times – as evidenced by the outcome of operation of previous machines of this model.

The CLS450 shearer, represented to the miners in February, is already in operation at the Almaznaya mine. However, it is just the beginning of its operation because it is still too early to speak about the results at this facility, since the Almaznaya rock contains adjacent sandstone, which distinguishes its mining and geological conditions from other mines of DTEK Dobropolyeugol, where CLS450 shearers have been successfully operated since 2017. In order to avoid the hard rock coal-cutting with stone, the designers made the equipment as compact as possible – the length of the shearer along the axes of the controlling devices is only 8.1 m. This improves the fit of the machine into the coal vein and increases the stability of its operation in variable hypsometry.

Thanks to the CLS450 shearer, it was possible to increase the daily production plan at the Dobropolskaya mine from 1,700 to 2,920 tonnes, i.e. by 72%, despite the low reservoir thickness and gas constraint. We expect the same result at Almaznaya mine because the new machine is almost the twin brother of the previous one, with

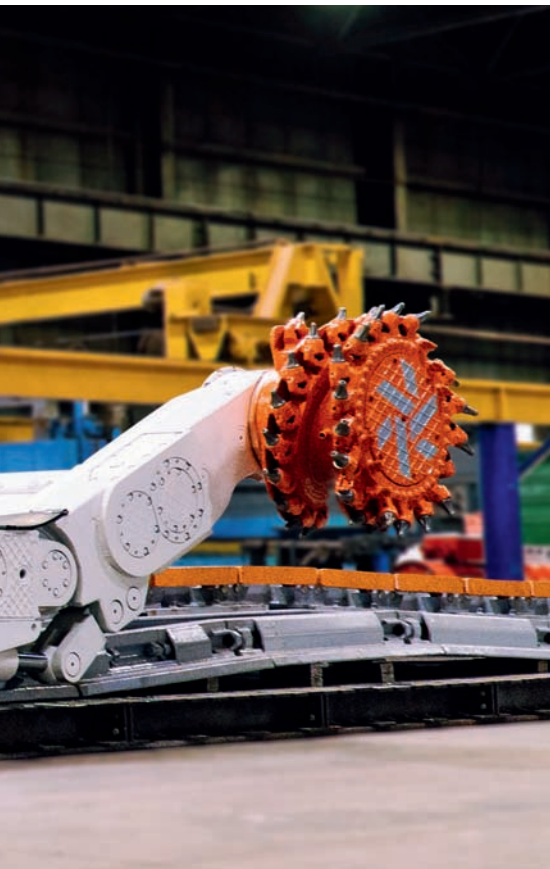
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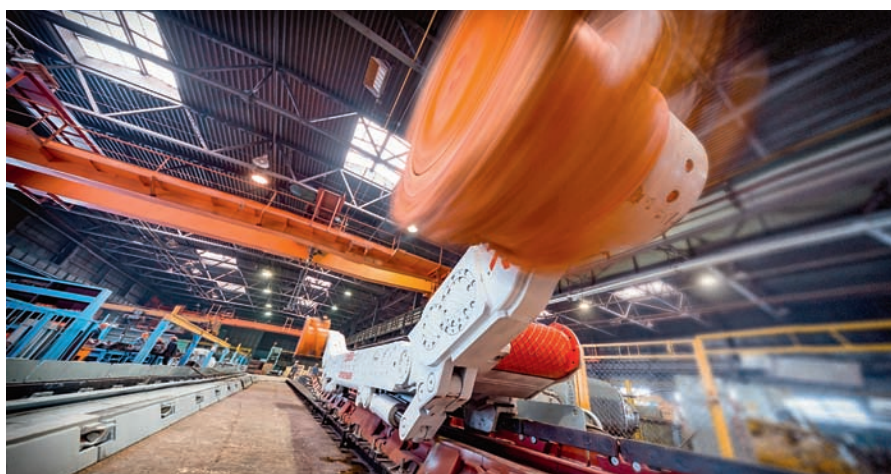
Anatoly KOROLCHUK

Corum Group Shearer Sales and Development Manager

The new CLS450 is a shearer designed for processing thin and medium layers with varying formation terrain from 1.05 to 2.4 m. It is equipped with new electronics – reliable and easy to operate. Differences from the previous models include a modernised hydraulic system, an enhanced support system for the protection of component parts and more advanced electrical equipment. This shearer allows miners to increase mining efficiency: it can reach a working speed of up to 11 metres per minute!



Client feedback

**Sergey BIATOV**Head of Energy and Mechanical
Support Department, DTEK Energo

perhaps minor manufacturer's modifications. It takes into account the wishes of the Dobropolye miners and includes modifications to the mechanisms for feeding and attaching the shearer to the armoured face conveyor.

The CLS450 shearer is designed to operate in the most complex conditions for mining thin and medium layers from 1.05 to 2.4 metres with varying hypsometry.

Thus, CLS450 helps to turn economically unattractive deposits into exploitable,

and most importantly – into profitable ones. In its characteristics, the machine is not inferior to similar equipment of European manufacturers, for example, to MB410E or KGS-245 shearers. However, the Ukrainian shearer has lower maintenance costs, compared with similar equipment. Consequently, the total cost of ownership of such a machine, as well as the cost per tonne of coal produced will be less.

By helping customers increase production and optimise their costs, the company

“ Our miners have been directly involved in the development of this equipment and in its testing in the conditions of the Dobropolskaya mine. Today, already three CLS450 shearers are successfully operating at DTEK Energo mines: Dobropolskaya, Belozerskaya and Almaznaya.

The miners are satisfied with the equipment. Thanks to this equipment, they have increased daily production to 3,000 tonnes (the shearer worked in longwall with a capacity of 1.49 meters with a restriction on the gas factor. – Editor's Note) and more, and this ensured profit growth for the company as a whole! Now DTEK Dobropolyeugol mines are being re-equipped with CLS450 shearers and each machine being adapted to the conditions of a particular longwall.

pursues a single aim – to become a reliable partner of your business and an expert in the field of mining.



Client feedback

**Piotr BOYARSKI**Vice President
of Polska Grupa Gornicza

“ The acquisition of 140 sections of the ZRP 15/35 powered roof support for our Soshnitsa mine was the beginning of good business relations with Corum Group. The joint work of our specialists with the Ukrainian machine builders allowed us to launch important longwall for our company in a short time. We had a positive experience of cooperation with Corum. And moving forward, we have signed a contract for the supply of 135 sections of powered supports for our largest mine, Piast-Ziemowit.

POLISH MINE EQUIPPED WITH ZRP 15/35 ROOF SUPPORTS

As a result of the fruitful cooperation between Corum and PGG in the Soshnitsa mine project, a new contract was concluded in the spring of 2019. The company will manufacture another complex of 135 sections of the ZRP 15/35 powered roof support for the Piast-Ziemowit mine, which is part of the same holding. The powered roof support design is adapted by Corum engineers to the mining and geological conditions of this enterprise.

THE COMPANY CONTINUES TO SUPPLY POWERED ROOF SUPPORTS TO EUROPE

In spring, the Polish Soshnitsa mine, which is part of the largest coal mining company in the European Union – Polska Grupa Górnicza S.A. (PGG), launched a new longwall equipped with Corum Group equipment. The work of 140 ZRP 15/35 powered roof support sections will bring miners closer to the planned target – total mine production of 8.5 thous tonnes of coal per day, which is 1.5 thous tonnes more than the current daily norm.

The order of powered roof supports for Polska Grupa Gornicza is a pilot project for the Corum Group to supply longwall equipment to the Polish market. The development of new products was held in close cooperation with representatives of the customer. In developing the ZRP 15/35 powered support, R&D Corum service engineers reworked design documentation for equipment production at the Druzhkovka Machine-Building Plant.

The powered roof support meets modern safety requirements and has innovative features. The complex used a system for monitoring the pressure of the working fluid in the hydraulic system. In case of problems with the integrity of the channels, there is an instant notification of the operating personnel. To control and record equipment, powered supports were equipped with electronic tags.

The ZRP 15/35 is designed to work on seams with a width from 1.6 to 3.5 m in conditions of heavy roofs of Polish mines due to the high working resistance in excess of 6,000 kN. The powered support is already used in the new longwall of the Soshnitsa mine, which has recently been on the verge of closure. But thanks to Poland's state energy security program and the new equipment produced by the Corum Group, the company will continue to mine coal. This is the case when both the manufacturer and the customer benefited from the joint work on the project.

Competently

**Mikhail LYSENKO**Corum Group Chief Longwall
Equipment Specialist

✦ Carrying out the order for PGG, Corum adhered to European production standards, as evidenced by international certificates: ISO 9001 – on quality management compliance – and ISO 3834-2:2008 – on the conformity of the welding quality to the requirements of the European Union. The receipt of these documents is nothing more than a confirmation of our company operating according to international standards.





MODERNISATION OF SP251 CONVEYOR ENABLES MINIMISATION OF CONVEYOR DOWNTIME

At the request of miners from the Dniprovskaya mine (DTEK Energo), Corum specialists increased the power and automated the control of the SP251 armoured face conveyor, in keeping with the recent trend of digitalisation.

To automate the conveyor control system, the Corum Group developed a design. It provided for the integration of electric motors with a built-in frequency converter into the drive of the SP251 conveyor and a mine controller that allows controlling the speed of the face conveyor depending on the load on the shearer. The introduction of electric motors with embedded frequency converters into the conveyor equipment made it possible to increase its power from 400 to 500 kW.

The developers managed to bring to zero the conveyor's downtime associated with the need for degumming in case of an unplanned shearer shutdown. Cases of chain breaks have also become rare. This led to an increase in the machine time of the conveyor operation as a whole.

Another undoubted advantage is that the metal construction of the drive was left unchanged specifically for the customer in order to unify the equipment. Thus, the customer can install a new sample drive in any other existing conveyor – e.g. during an overhaul.

The new Corum technology allowed miners to increase production by 25% in peak moments. The maximum speed of movement of the traction body of the conveyor chain has increased from 1.36 to 1.63 meters per second. And the peak performance increased from 460 to 625 tonnes per hour. This is the maximum throughput of the upgraded SP251 conveyor. The operational tests lasted three months and were successfully completed in March 2019.



Client feedback



Vadim DUDCHENKO

Chief Mechanic
of the Dneprovskoe Mine Group,
DTEK Pavlogradugol

“ In spring 2019, we completed testing of the SP251 conveyor with a frequency converter and KD-A-EE shearer control equipment. The new equipment makes it possible to smoothly start the conveyor loaded with coal after an unplanned shearer shutdown. Thanks to the SP251 conveyor with a frequency converter, the downtime of longwall over three months was reduced by 12 hours. Qualitative changes in the operation of equipment are noticeable even now. Without a doubt, the introduction of a frequency converter is a progressive step towards more productive coal mining and improving the energy efficiency of the enterprise.



MULTIFUNCTIONAL CONVEYOR FOR "EVRAZ":

TRANSPORTATION AND SIMULTANEOUS DRYING OF MINED ROCK

Corum Group specialists have created a single model of a custom-tailored stage loader for drainage shaft cleaning-up. The basis for the development was the serial model SP326, but if you compare it with ordinary equipment, then more than 90% of the nodes in the conveyor are new design solutions.

Unique technologies and an individual approach set Corum apart from the rest. Our partners from Raspadskaya Coal Company (Evraz Corporation) witnessed confirmation of such. Last year, its miners mined 12.7 mln tonnes of coal. However, the company does not intend to dwell on the volumes achieved and is pursuing modernisation and operational improvements in both the production and auxiliary areas. The miners working in one of the oldest deposits of the Kemerovo region – Osinnikovskoye – had a request: to increase the cleaning efficiency of the subskip space from spillage of coal, rock and dust, thus ensuring the mechanisation of transportation of the mined rock.

In the slot under the skip, spills are formed from the transported coal. At Osinnikovskaya, they mix with mine drainage waters and form a liquid suspension, which from time to time fills the settling sump.

The miners had been cleaning it manually by loading the suspension into the mine cars and lifting to the surface. Due to the nature of the transport chain, it was not possible to load more than one mine car per cycle. Besides, hiring individual staff for these needs seemed irrational; therefore, the primary mining workforce was used for such operation. As result, this process became even less effective.

The Osinnikovskaya management decided to use the conveyor to transport, dewater and load more material into the mine cars. However, there was a problem too: the equipment needed to be at least 230 metres long.

Since the end of the twentieth century, a UKST type conveyor was produced for such purposes in Russia. However, its length does not exceed 30-50 m. Thus, the mine would have needed to install up to 7 such units, with the need to allow transfer of filling loads from one unit to another. The miners sought to get a durable conveyor that can cover the entire distance at a time. In addition, UKST conveyors are light in nature, which means that their usage life is not high.

Specialists of the Kharkov Corum Svet Shakhtera machine-building plant developed and manufactured equipment, bringing the idea of miners to life. The unique conveyor was delivered to the customer at the end of 2018. At this very moment, its installation at the operation site is being completed. The conveyor, which has no analogues on the market yet, is planned to be launched into operation in June.

Competently



Vitaly SENICHKIN

Corum Group Longwall Equipment
Sales and Development Manager

✦ Our designers were connected to the development of SP326 for Osinnikovskaya. Along with the customer, we developed a conceptual conveyor scheme. On the basis of SP326, a new conveyor was produced. It meets all the technical requirements: low transportation speed – up to 0.15 mps – and the installation of two special pans with slotted screens in the lower inclined part of the conveyor, which provide dewatering of the mined rock passing through them. After transportation, this mined rock is immediately loaded into the mine cars. The discharge part of the conveyor is performed on racks: up to 7 mine cars run in under it, which are then sequentially loaded. The use of this conveyor greatly speeds up the sump cleaning process.





TECHNICAL CHARACTERISTICS OF THE SP326 CONVEYOR

The capacity of the electric motor drive is **160 kW**

Length is **34 m**

Productivity is **not less than 1000 t/h**

Conveyor speed can be **regulated** depending on crushing unit load

THE SP326 CONVEYOR INCREASES PRODUCTIVITY UP TO 1,000 TONNES PER HOUR



In the spring of this year, operational tests were successfully completed on the SP326 conveyor equipped with a crushing device and a control system at the Estonian Ojamaa mine, part of the Viru Keemia Grupp (VKG).

The Estonian group VKG set a goal to increase the production of shale oil (the product is a substitute for oil. – Editor's Note), which required increasing shale extraction and equipping the mine with new equipment that would immediately load the mined rock in four places instead of two, as it was before.

Western manufacturers of mining equipment, which VKG representatives had previously consulted, offered only serial products, which not completely match requirements. Corum, which is known for its individual approach to each customer, accepted the challenge of the Estonian customer. Our company engineers developed the conveyor on the

basis of SP326 in accordance with all the customer's requirements.

The unique equipment has provided simultaneous loading of mined rock in four places due to lengthening of the loading part up to 19.5 m and an operational capacity in excess of 2 mln tonnes due to the use of special steel grades in the pan manufacture. The design of the crushing device allows the material to be crushed to an optimal size, which is crucial for the further production of shale oil. The conveyor ensures a peak performance of up to 1,000 tph.

Since 1999, Corum has supplied 88 SP326 type armoured face conveyors to mining companies in Ukraine, Russia, Belarus and Estonia. The design and technological solutions of equipment for Ojamaa differed by 90% from production models, but its operational tests demonstrated the high quality of Corum equipment. And this is another step that was taken by Ukrainian manufacturers of mining equipment to strengthen their position in the EU market.



Client feedback



Sergey EFIMOV

VKG Kaevandused Chief Mechanic

“ The partnership with Corum was an interesting experience for our company. The loading and crushing complex was tailor-made for the conditions of the Ojamaa shale mine of the VKG Kaevandused group and in collaboration with its technical specialists. The distinctive feature of the conveyor is the increased length of the loading section: 19.5 m. Thanks to this, we can load the material with shovel loaders and haul trucks simultaneously, thereby optimising the production cycle of the mining site.

During the tests, the Corum Group conveyor has already overloaded more than 850 thousand tonnes of mined rock. Original solutions have been found in the design of the complex and in the control system.

There is confidence that the Corum SP326 complex will take a worthy place in our equipment park along with the equipment of other manufacturers.

CORUM SKIPS ARE BECOMING INCREASINGLY POPULAR

During the period from January 2018 to May 2019, the Corum Group concluded contracts for the supply of 14 skips. This is almost a record for the company.

CASE LINING WILL INCREASE EQUIPMENT LIFE

At the Abaza mine (EVRAZ) of the Russian Khakassia, ore has been mined since the middle of the last century. The rock was raised to the surface by two skips at once. During operation, their structures have deteriorated significantly, so the customer decided to purchase two hoisting equipment at once, ordering special design skips. The new Corum equipment will replace the already working CO6.4 skips of another manufacturer.

Corum engineers developed an ore skip with a tilting body customised for the mine conditions of Abaza. The lining in this design was made of hardox 500 wear-resistant steel. Moreover, it has a different thickness depending on the location – from 10 to 20 mm. More dense steel has been used to harden those skip parts, which bear a constant shock load. Where the shock load is smaller, the material is correspondingly lighter. Engineers revised and strengthened the frame structure, including all power elements, moving and articulated joints.

In the joints of the walls in the inner part of the body, there are no corners. Such a roven and practical tool will ensure both the absence of ore sticking (which means the customer will have a guaranteed time for unloading the cargo) and additional rigidity of the body structure. For reliable lining fixation, exceptionally large-diameter screws - M24 – were used.

The antifriction pony wheels, which have perforations in the standard design, were made of solid rubber. The delivery of each skip includes a UPS30 suspension device, an additional set of hardox linings, replaceable parts for plain slideways, a set of bushings. The warranty period for operation of such a skip is 7 years.


Corum engineers have developed an ore skip with a tilting body customised for the mine conditions of Abaza. The lining in this design was made of hardox 500 wear-resistant steel.

Competently

**Sergey
ASTAPENKOV**

Corum Group
Chief Design Engineer



 The decision to strengthen the structure in some areas will make the skip not too heavy. If you make the lining of a large thickness throughout the whole structure, then the skip mass will create an additional load on the hoisting machine and the entire system. Therefore, here we decided to make a lining of different thickness.





This design will help eliminate the spillage of coal when unloading the skip and clogging the drainage (i.e. the lower) part of the shaft.



«ARMOURED» HOISTING EQUIPMENT

A new R3511 skip has already been delivered to the Samarskaya mine (DTEK Energo). The company produces up to 2 mln tonnes of coal annually. The skip manufactured by Corum Group has been modified specifically for the customer, who had already dealt with exactly the same equipment. Since 2016, the R3511.316.1-00.000 skip with a body capacity of 18.3 square metres and with a swinging gate and telescoping pan has been operated on the Samarskaya mine.

Mine management wanted to modify this skip: to remove a trapdoor for transporting people and to make the metal structure itself more durable. The skip swinging gate is kinematically connected with a telescoping pan, which «drives out» when the swinging gate is opened. This design will help eliminate the spillage of coal when unloading the skip and clogging the drainage (i.e. the lower) part of the shaft. Metal-graphite bushes are used in the hinge joints, which make it possible to

get along without the obligatory lubrication. Canopy and fences are made in the form of a prefabricated structure which will make it possible to install them directly in the shaft after skip hinging.

Modernised sliding guides for rail conductors were installed to equipment, thanks to which it will be easier for miners to change replaceable bushes.

A distinctive feature of the skip is the lining of wear-resistant material – two-layer bimetallic sheets. Thanks to the chromium-carbon alloy deposited by special technology, the wear resistance of the sheets was increased. Such «armour» will help reduce the coal wind downtime associated with the lining replacement and prevent premature abrasion of the body and its internal parts.

Previously, the company had already manufactured an R3511 skip for this mine; however, with each delivery, it improves the design of the equipment, changing it to the new needs of the miners.

Client feedback



Leonid SHOSTAK

Deputy Director for Production of Ternovskoe Mine Group, «DTEK Pavlogradugol»

“ The coal skip project was developed in accordance with our technical task, as well as taking into account the expertise of the Corum specialists. Owing to the proposed technical solutions, we have received a safe skip with a broad range of functionality, while also completing the tasks set out for us: reduced operational and time costs for its maintenance.

Competently



Evgeny Petrov

Chief Corum Group Infrastructure Equipment Specialist

“ The customer is no longer interested in mass-produced products. Each client seeks to get a product adapted to his/her conditions of operation. And in this case, it was imperative to cater a solution to the need, and this required a deep understanding of the design and operational nuances. That is why the presence in the company of high-class engineering combined with manufacturing capabilities and production experience make Corum Group the supply leader in the segment of hoisting equipment.

CORUM SHEAVES HELP TO AVOID DIRECT LOSSES

The Corum Group supplied a new important unit to the Severopeschanskaya mine of the Bogoslovskoe Mining Group, which is part of the UMMC Holding. This unit is an integral part of a multi-rope hoisting machine, and its operation is impossible without a deflector sheave. The modern improved sheave design guarantees safe and secure operation of the hoisting complex for the mine personnel.

Equipment downtime during working hours due to the failure of the sheave components will be reduced to a minimum. This will allow the customer to avoid direct losses associated with the non-fulfilment of the planned hoist productivity and the undersupply of ore. What were the factors that helped achieve this result? The deflector sheaves include sensors that control the correct balance of a number of parameters: hoist speed, rotational speed of the sheave discs and traction sheave. The approach to the design and manufacture of metal structures has changed. Weak units and lining attaching points have been re-engineered.

The Corum Group machine builders have already manufactured three sheave blocks with a disk diameter of three

metres. The customers were ore and coal enterprises from Russia and Ukraine: Severopeschanskaya mine (UMMC Holding) and the mine named after the Heroes of Space (DTEK Pavlogradugol).


Sheaves are only nominally considered a commercial product. Each piece of equipment comes from the enterprise with a number of basic and additional functions.

Thus, at the request of customers, sheaves with discs have already been manufactured, where both rolling bearings and sliding bushes can be installed. And the discs themselves can be of a solid or a split design. The latter option has been developed according to a special requirement of the customer and guarantees the performance of repairs in the future without dismantling the sheave.



Tatiana KALUGINA

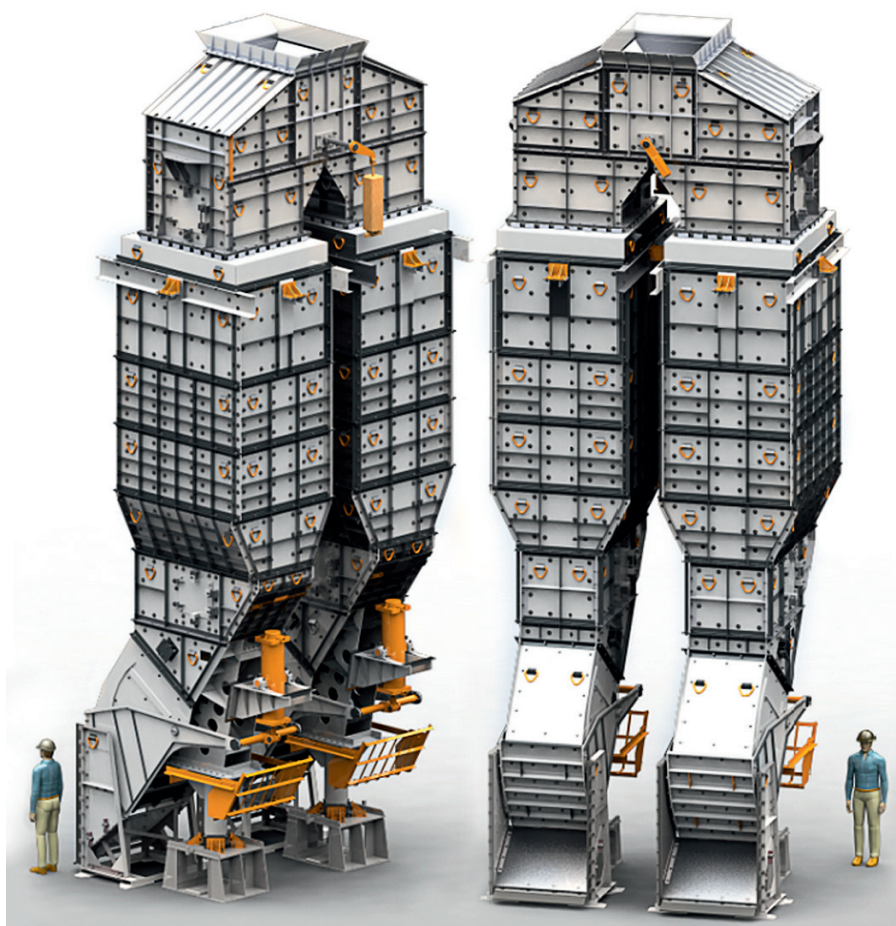
Director of Corum Druzhkovsky
Machine-Building Plant

 Our plant produces the entire line of Corum Group stationary equipment: grip blocks, suspension gears, cages, skips, counterweights, loading devices, sheaves, fans, hoisting machines, sinking winches, units for the exchange of mine cars in carriages, shifting platforms, creepers and hydraulic rams. Today, we not only produce this serial equipment, but also modify it to the needs of our customers.

Competently



CUSTOM-TAILORED "TROUSERS" FOR POKROVSKOE MINING GROUP



The loading structure operates underground and is installed essentially at the lowest part of the skip shaft. The main task in the operation of the structure is the cyclic and metered loading of mine skips with coal.

The design of this 2ZUK loading structure is non-standard and different from most equivalent products manufactured at the factory. A pan interconnects a pair of loading bins at the top, which in professional slang is called «trousers». The presence of this coupled section in the 2ZUK loading structure helps distribute a single stream of coal between the two loading bins and fill in the required one. When assembled, the loading structure has a height of as much as 12 m. In order the miners are able to deliver down and mount the new equipment, the 2ZUK loading structure is divided into a number of sections.

Each section is a prefabricated structure, and the walls are connected through flanges with fasteners. Such a modification will afterwards facilitate the installation or replacement of the damaged wall of the loading bin.

The 2ZUK loading structure is intended for work in the intensive mode of operation. Therefore, at the client's request, each block of the structure has undergone hardening. Now the equipment is able to withstand any extreme conditions – this is just what miners need. For durability of the loading bin, its walls are protected from abrasion by replaceable lining sheets. And in order for the coal not to knock down the heavy sheets, when filling the structure, the designers provided for the fastening with enlarged screws in combination with atypical flat washers.




Corum engineers have developed the 2ZUK loading structure as an unusual product that will occupy a worthy place in the transport chain for the delivery of extracted coal from the mine.

Competently



Evgeny PETROV

Chief Corum Group Infrastructure
Equipment Specialist

 Corum received a contract for the supply of two pairs of 2ZUK loading structures. After upgrade, each pair of «trousers» weighs 38 tonnes of low-alloy construction steel! Currently, 2ZUK loading structure can handle 37 tonnes of coal. But at the same time, its geometry allows placing up to 42 tonnes of «black diamonds» on it. So the mine has the opportunity to improve the performance of the hoist, especially since we guaranteed a reserve of durability when designing the structure!



CORUM IS CONTINUING TO PRODUCE NEW GENERATION KTPV-D-1000 SUBSTATIONS

The next batch of powerful and ultra-safe electrical equipment is already in production. This summer, it will be sent for operation at the DTEK Energo mines. On the eve of this event, we would like to share more about the new line of Corum Group transformer substations.



SECURITY SYSTEM ALGORITHMS HAVE BEEN IMPROVED

Our company started the production of KTPV-D model substations of low power levels 400 kVA and 630 kVA in 2013. After the completion of testing at the Dobropolskoye Mine Group, enterprises in Ukraine, Russia, and Kazakhstan began actively purchasing Corum Group KTPV-D type transformer substations. Demand contributed to the fact that the company began to develop this line of electrical equipment. Thus, a new generation substation – KTPV-D-1000 – appeared in production.

In addition to the increased power, KTPV-D-1000 has a number of other functions that correspond to the request of clients. First of all, security system

algorithms have been modified. The switchgears of high and low voltage have been equipped with BZU type microprocessor protection and control units, which control vacuum switching devices. The substation has a cascade protection system that provides protection redundancy. For example, if the vacuum switch fails in the low-voltage switchgear in an emergency and when a shutdown command is given, the vacuum switch does not open, a backup command will be given and the vacuum contactor of the high-voltage switchgear will be disconnected.

In addition to the existing functions, KTPV-D-1000 has been equipped with two-level temperature protection: the current value of the temperature in the most heated place of the power transformer is displayed on the information display



of the substation. When the set limit is reached, the vacuum contactor of the high-voltage switchgear is disconnected. This prevents an emergency failure of the power transformer.

In addition, the substation monitors the voltage – if its value is out of the allowable range, threatening an emergency, the substation switching devices switch off. This preserves both the performance of the KTPV-D-1000 itself and the process equipment being fed. The substation also uses arc protection. All security measures make it possible to localise the accident and prevent its development. Microprocessor control protection blocks have a black box function that records all personnel actions and keeps an emergency log. If the

equipment fails, one can see what preceded this event and take measures to prevent similar situations afterwards.

ENERGY-INTENSIVE AND EASY-TO-USE ELECTRICAL EQUIPMENT

KTPV-D-1000 substation is equipped with a number of additional features that are important for modern mining equipment. For example, it keeps technical records of electricity consumed. It is possible to view the consumption for a certain period of time (day, week or month). Using this information, it is possible to determine the optimal operation mode of the powered equipment, which helps enterprises improve their energy efficiency.

Substations also have the important function of automatic reconnection. What is it for? In the event of a power interruption at the mine for a short period of time, when power is restored and there is no prohibition on switching on (successful self-diagnosis of protection and control blocks, no prohibition of air-gas control equipment, etc.), the substation can turn on independently (without human intervention), if the corresponding function is activated. This permits minimisation of interruptions in the power supply of the tunnelling and wide sections and, as a result, reduces the gas contamination of the tunnels.


The substation provides one of three types of control: the first one is local with the help of buttons on the case, the second one is from remote control panels, and the third one is through the information network via the RS-485 interface. Information about the operation of the substation is displayed on the dispatcher's computer, where all event logs are stored. From the dispatcher's

Competently



Sergey PODOLYAN

Corum Group
Electrical Equipment
Manager

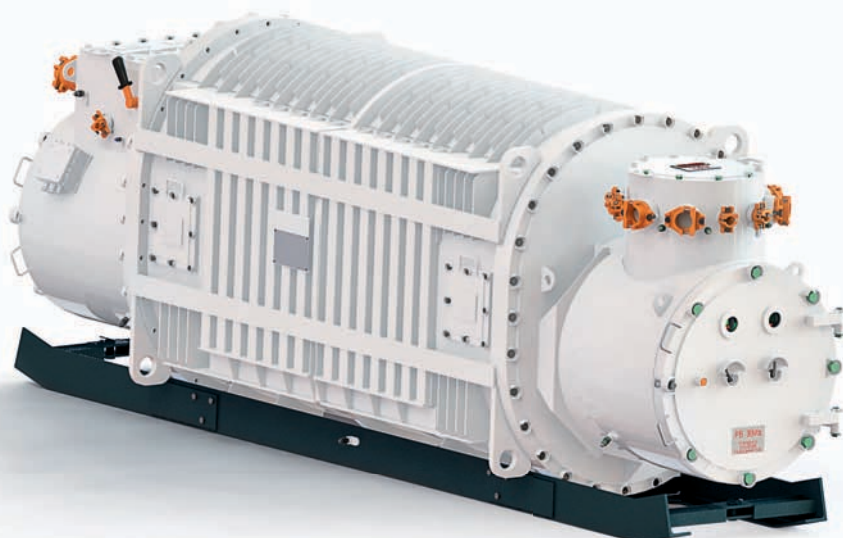
 **KTPV-D-1000 has a number of differences from its predecessors – KTPV-D-400 and KTPV-D-630. In addition to increasing power, the algorithms of the protection operation are have also been improved in the new equipment. Information about the operation of the substation is displayed on the dispatcher's screen, which enables control of the equipment without going down underground. Digital solutions help our products become better, more modern and closer to perfection.**

console, one can turn on/off the substation. From the surface, it is possible to carry out regulated checks of the AZUR protection apparatus against charge leakage into the ground. The results of the checks are stored in the event logs.

In aggregate, all these improvements ensure reliable and trouble-free operation of the KTPV-D-1000 substation and the equipment which it feeds with power.

THE COMPANY CONTINUES TO SUPPLY TRANSFORMER SUBSTATIONS TO KAZAKHSTAN

The next batch of five KTPV-630 substations was sent to client Kazzink in May, and the company will receive nine other substations of other sizes in the summer. In total, in the first half of the year, Corum Group will supply 19 KTPV substations and TSP transformers to the Kazakhstan-based enterprise. Such significant volumes of orders are the best demonstration of client confidence and recognition of product quality.





CORUM ELECTRIC LOCOMOTIVES EQUIPPED WITH NEW LIGHTING, ALARM AND SPEED CONTROL SYSTEMS

In May, our company manufactured a 2AM8D-900 coupled battery-store electric locomotive for the Vorgashorskaya mine (Vorkutaugol), where in April the installation of a new longwall began. Two more battery-store locomotives will be shipped to the client at the beginning of the summer. The same AM8D locomotive, but suited for a 750-mm-wide gauge, will be shipped to Kazchrome (Eurasian Resources Group, Kazakhstan) with an initial visit to the UrM-2019 Exhibition as an exhibition part. All four electric locomotives are equipped with a control system, the development of which is owned by Corum.



The control system of electric locomotives is responsible for lighting, signalling and speed control and is designed to provide a warning signal, automatic control of headlights, control and display of speed and mileage of the electric locomotive. Previously, purchased equipment was used for these purposes, but the company decided to take up the development and manufacture of its own control system.

"The lighting, signalling and speed control system is based on a programmable logic controller (PLC) and a text operator panel, which compares favourably with previous systems", says Oleg Chepizhko, Mine Transport Development and Sales Manager at Corum Group. «If the old speed

meters were equipped with only a digital speed indicator, then now the operator panels are supplemented with an analogue form. It allows the driver to control the speed with side sight, while looking at the road. The panel displays information about speeding, lighting control and alarm. The lighting, signalling, and speed control system of our design has lower power consumption, which is very important for a battery-powered car.

The new lighting, signalling and speed control system is more advanced and sophisticated than the one used previously. It is made on the modern element base using components of famous brands. The intellectual component – the control program – was fully developed by Corum. The AM8D and 2AM8D serial electric locomotives manufactured by the company will now be equipped with control systems of our own production. The new development possesses many advantages compared with previous models and will help Corum strengthen its position in the market of mining vehicles.

Competently



**Dmitry
VOROZHTSOV**

Corum Rus Director

 Corum electric locomotives are in demand. In June, an AM8D-900 locomotive will go to the Vorkutinskaya mine, and in July, an 2AM8D-900 coupled battery-store locomotive will be shipped to the Komsomolskaya mine. In the new supply, customer will receive upgraded electric locomotives with the lighting, signalling and speed control system. The locomotives will be equipped with explosion-proof battery boxes.



A BELT CONVEYOR FOR THE TRANSPORTATION OF ORE IN GALLERIES OF THE POLTAVA ORE MINING AND PROCESSING PLANT

Belt conveyors for Poltava Ore Mining and Processing Plant (Horishni Plavni, Ukraine) are designed to move iron ore concentrate in the open air and in the galleries of the plant. Structurally, the conveyors are similar to those for mining, but they also have fundamental differences based on operating conditions.

Mine conveyors transport coal and rock with a bulk density of 0.85–1.4 t/m³, and iron ore concentrate density is 4.2 t/m³ (i.e. 4 times more). Therefore, more reliable and durable rollers and roller supports were used in the conveyor belt for the Poltava Ore Mining and Processing Plant. For a belt tension of 1200 mm width, a cargo device was used, which, unlike a shaft winch, automatically maintains the

tension. Cargo devices are not used in mining transportation, as they are too bulky. However, for surface conveyors, overall dimensions are not the determining factor, therefore any design idea can be implemented.

The conveyor consists of blocks K-1, K-2, K-3, K-4, K-5, K-6, K-7, and K-8. Some of them were manufactured and handed over to the customer at the end of 2018. The customer received the second batch in March this year.

Structurally, K-6, K-7, and K-8 have a lot in common with K-1 and K-2 conveyors: mounted modular drives of drums, take-up by gravity of the conveyor belt, rollers of reinforced construction. However, there are some peculiarities. K-6 is a reversible 108-metre conveyor with two end drive drums and six loading points for the material being transported. K-7 is a non-reversible conveyor with a length of 75 metres with a maximum allowable lifting belt angle. K-8 is a 17-metre irreversible short.

The Corum Group has produced mine belt conveyors since 1994. For 25 years, the company has manufactured more than 510 belt conveyors of various sizes and belt widths.

Competently



Boris DUMA

Corum Group
New Product Manager

We manufactured a custom-tailored conveyor chain (Poltava Ore Mining and Processing Plant) with reference to the existing galleries of the enterprise. Owing to this equipment, the transportation of ore will be carried out several times faster and with fewer losses, which will help the customer reduce the production time of pelletized pellets and fulfil its planned indicators.





CORUM REPAIR: CLIENT SERVICE SUPPORT

The scope of customer service of Corum Repair goes far beyond repairing equipment. It also provides full support during commissioning of new equipment. Its specialists help interlink the Corum Group equipment with the equipment of other manufacturers already under operation in clients' coal-mining enterprises. See below how it happens in practice.

SERVICE SUPPORT AT THE BEGINNING OF THE LONGWALL COMPLEX OPERATION AT SADKINSKOE MINING GROUP (YUZHNOE COAL COMPANY)

With any order quantity, Corum Group will provide exceptional service. This was demonstrated by the supply of equipment and its forwarding to the Rostov Oblast (Russia). The Sadkinskoe Mining Group (Yuzhnoe Coal Company) ordered a whole complex for mining seams from 1.4 to 3.2 metres. Moreover, it was the first time the company acquired such a volume of equipment from a single supplier.

Corum Group supplied 203 custom-made sections of the ZKD90T special roof support to the south of Russia, including 3 end and 3 drift sections, a KDK500 shearer, a 305-meter long SPTs230-21.2 armoured face conveyor with a 34X126 traction round link chain manufactured by Becker Prünte, 63-metre long SPTs230-63 stage

loader. The total weight of the equipment supplied exceeds 3,000 tonnes, and 247 vehicles were required for its delivery.

Corum always takes care of its clients, and therefore the company decided to control all commissioning works and conduct a three-month service maintenance of equipment. In this regard, Corum faced a new challenge – the reorganisation of subdivisions. In the Southern branch of Corum Rus subsidiary, it was necessary to improve the level of service so that the service would work quickly and efficiently at a distance from the centre. Previously, the division had been more focused on sales, rather than the provision of services.

As quickly as possible, we had to completely change the concept of the branch's work and put it into practice. Warranty and post-warranty service should be made uninterrupted and qualitative. It would seem to be a huge piece of work – to change the very nature of the company, but



failures. The scope of works on servicing equipment is carried out taking into account the particular natural factors at the mining companies. And, as a result, the profitability of client companies only increases.

ON YOUR MARKS, GET SET, LAUNCH!

Adjusting the launch of the equipment is not an easy task. Every enterprise has experienced difficulties during this process. Corum Repair is here to save its clients from such headaches. The company's specialists control every step during the launch. The miners of the Pokrovskoe Mining Group of the Donetsksteel Group saw this first hand. A fairly young mining group, established in 1990, ordered 200 sections of the DT08/18 powered roof support.

Corum Repair maintained the operation of this complex at all stages – from the moment of commissioning and departure from the installation chamber until the moment the 14th south longwall reached steady operation. And then for another 90 days, the specialists monitored and maintained the operation of the support sections and transferred the experience of technical maintenance to the employees of the Donetsksteel Group.

Such service support guarantees uninterrupted and long operation of the equipment, which, in turn, only benefits the client. Providing such a service, the coal mining company will certainly keep the leading positions. Until now, the effectiveness of the Pokrovskoe Mining Group has exceeded the industry average and reached the level of the best European companies.

Corum managed to implement it masterly – to reassign the service of the Corum Repair branch and quickly adjust the equipment service at the Sadkinskoye Mining Group.

Prior to this, Corum Repair has repeatedly demonstrated the successful experience of organising service support from scratch. Excellent customer feedback was received during the implementation of the CLS450 No. 1 shearer at the Dobropolskoye Mining Group, accompanying the work of all three shearers of the Dneprovskaya mine, controlling over the longwall set of sections of DT type powered roof support, which lasted three months at the Pokrovskoe Mining Group of the Donetsksteel Group. All this baggage of knowledge and experience was transferred to the southern branch of Corum Rus.

For the updated service, highly qualified specialists were hired and trained, modern diagnostic means and tools were purchased and a fleet of vehicles was established. A round-the-clock customer support hotline was introduced, with the possibility of being connected with the company's engineers for free.

Manufacturer service support saves both the time and resources of the client. In addition, customers can be confident that the services will be provided in the best way possible – just like in the parent organisation. Highly qualified experts carry out equipment diagnostics and monitoring of compliance with the regulations for replacement of parts and operation, and this, in turn, reduces the customer's costs, as it prevents premature equipment





NPS: HOW CLIENTS HELP CORUM TO GET BETTER

Surely most of you have encountered a situation where after you received a service at a bank or in a store, an independent company called you to assess the level of service or product on a 10-point scale. Similar surveys are conducted today by all major global companies to determine the Net Promoter Score (NPS) of their clients. Corum has also followed this trend for more than eight years in a row.

WHAT IS BEHIND THE NUMBERS?

Based on the responses received, clients are divided into three groups: "Promoters" – those who praised the work of the company and gave a score of 9–10 points; "Neutrals" – people who are satisfied with the work of Corum, but not willing to actively recommend it, the score is 7–8 points; and those who gave a score of 6 points and below – people who are not satisfied with our work – "Detractors". The difference between the share of «Promoters» and the share of «Detractors» is the index of customer satisfaction with our company.

The survey is held annually, and more than 400 customer representatives participate in it. Following the results, we compare our performance with the benchmark – the average value for the industry, as well as with the values of previous surveys: are

the indicators getting better or worse? For what reasons? Employees responsible for the indicator develop a plan to improve the values and eliminate the causes of negative client ratings.

For example, numerous client comments on the reaction speed of service personnel and its insufficient qualifications led to the decision to create a centralised service centre – Corum Repair. Over several years of the function's operation, the average time of arrival of specialists for a customer's call reduced from 37 to 9 hours, and to the staff's best knowledge, no client complaints have been recorded in recent surveys.

Analysis of the feedback of miners during the company's quality committees influenced the change of some suppliers of components of shearers and tunnelling machines, the modernisation of fan and electric locomotives units, as well as the

investment into additional modern equipment for company's plants – e.g. Loch drilling machine, which provides the best quality of power hydraulics of powered supports.

Such systematic work with feedback led to the fact that the company has never lowered the bar since 2014, regularly improving the value of the indicator. For example, in a survey based on the results of 2018 43% of customers taken part in the survey rated the company's work at a maximum score of 10 out of 10.





Competently

**Daniel DOMASHCHENKO**

Marketing Manager


 The main rule that we adhere to during the study is client anonymity. The survey is conducted by an independent company, and only a general report on the results is distributed within Corum. In the company, there are only two employees that have access to complete questionnaires (with full name identification). The rest see only a rating and a comment to work with. Thus, we protect ourselves from the fact that personal relationships would affect business communication with the client and distort the assessment in the future.



Photo: strategic session after discussion NPS survey results in February 2019

5 MINUTES OF YOUR TIME ARE INVALUABLE TO US

After each assessment, we also ask for a comment: What was the reason for such a score? In these explanations, the company finds the most valuable feedback – they help identify strengths, competitive advantages, bottlenecks and areas for product development.

Corum has set an ambitious goal – to increase NPS by 1.5 times by 2022. Therefore, it is so important for us to receive feedback from you in order to grow and develop in the right direction. The next time a research company calls you to evaluate Corum's work, please give us 5 minutes of time and describe what influenced your assessment. We listen to every comment!

SYSTEM WORK IN EACH DELIVERY

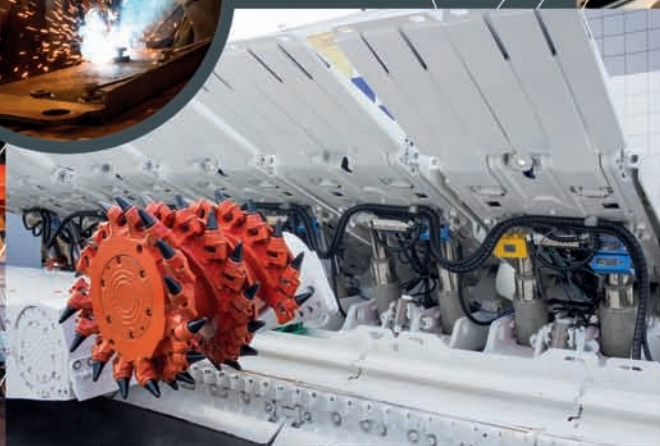
When a company receives equipment requests from clients, no one can say for sure whether we become the winner in the tender or not, whether customers acquire our equipment or that of competitors and whether the customer takes part in the next NPS survey. The opinion about Corum is continually being impacted, starting from the first moment of communication; for this reason, sales managers pay maximum attention to every request.

After receiving the client's application, we strive to immediately find out the client's representatives who will use the equipment in the future and will be able to evaluate its work. During the presentations and negotiations, product managers and designers try to find out the maximum wishes of the clients, and then reflect all of them in the commercially offer. If the

equipment is ordered from us for the first time, we always invite potential customers to visit the production sites and get acquainted with similar equipment that is being prepared for shipment to other customers.

Certainly, after the supply of equipment, the responsible product manager is independently interested in client satisfaction: have all comments been taken into account? Are there any suggestions for a change for future orders? Are consumables and spare parts enough to operate the equipment?

Thus, when an independent survey company calls clients to get an opinion on the Corum products, there are almost no unpleasant surprises for us – if the customer's representative mentions the difficulties in the operation of the equipment, then they probably have long been eliminated.



CORUM GROUP

COMPANY THAT
WORKS FOR PEOPLE



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