SKW

Opencast Mining Systems

Design Implementation Consultancy



We have been implementing important projects in the opencast mining industry with the cooperation with investors already since 1991. We employ specialists with high qualifications and rich experience acquired during the participation in the majority of investments in the basic machine construction for opencast mining, starting from the construction of the first Polish excavator KWK-1400 in 1976, through many years of cooperation with global potentates in the industry (Krupp, O&K, Lauchammerwerk AG) to the objects implemented with our cooperation.

The design potential of SKW is well-adapted for the implementation of the largest undertakings in the industry – the construction of machines of the daily capacity of 200 thousand cubic meters. During the construction and modernization of basic machines for all the Polish lignite mines we have elaborated efficient methods of the investment implementation with the cooperation with investors – machine manufacturer, subcontractors of particular systems and our company as the designer – coordinating the project or general supplier as well.

The many years of applying methods of modelling the bearing structure of basic machines and modern solutions of the machine systems with the elements of leading manufacturers enable us to offer basic machines at the world level.



Design

Designing is the core of our activities. The specifics of opencast mining machines industry requires preparing an individual project taking into account the exploitation conditions and financial capability of the investor for each new venture. We do our best to combine our comprehensive knowledge and abilities with the investor's requirements and experience in each project.

The design potential of SKW enables the implementation of the largest ventures within the construction of opencast mining machines and the equipment of depository sites.

Implementing in the last few years challenging designing tasks (ZGOT-15400.120 spreader, KWK-910 excavator) our team worked with modern designing tools enabling comprehensive durability analyses as for the fatigue durability, stability, temporary durability with girder, surface and solid models, both linear and non-linear.

Designing machines for the exploitation of hard diggable deposits we have elaborated methods of modelling the bearing structure so as to minimize geometrical ridges, ensuring the required fatigue durability with rational expenditures for welded structures. We place great importance to dynamic reliability of the structure by carrying comprehensive dynamic analyses (modal and as a reaction of the body to dynamic forces) already at the initial designing stage.

In our everyday designing work we try to take the most advantage of relatively simple designing tools. The designers can take advantage of Autodesk software: AutoCAD Mechanical, AutoCAD LT, Mechanical Desktop and Inventor and for calculations NE/Nastran as well as specialized software for calculating girder structures elaborated in our company. The specification we prepare includes a whole design – from a detailed initial design for the evaluation of the offered solutions through the operational specification with the drawings of details up to the assembly specification. The active participation of the designers in the implementation process and during the assembly of the objects triggers the constant improvement of construction solutions as for technological aspects and rationalization of the implementation costs.

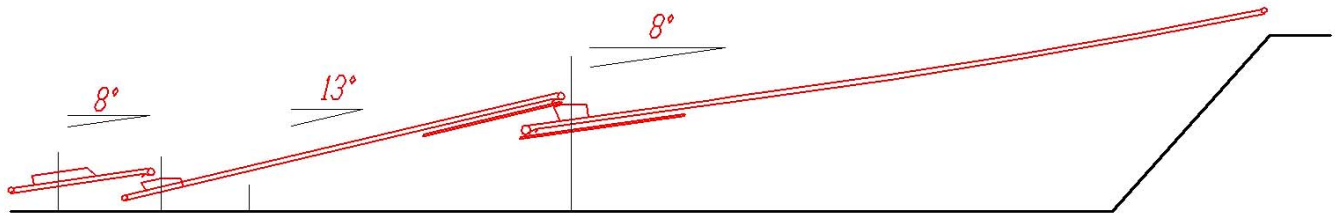


transportation way as the starting point for shaping of the whole structure of the spreader

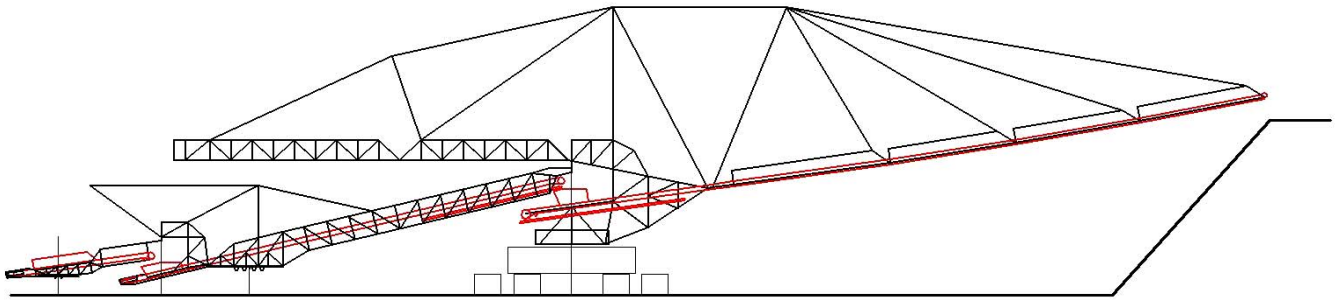
B=2600 mm
V=5,24 m/s

B=2450 mm
V=5,86 m/s

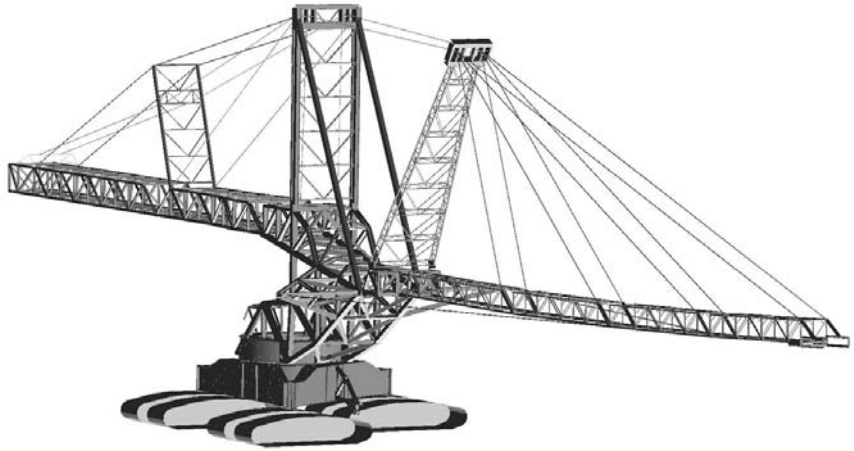
B=2250 mm
V=6,70 m/s



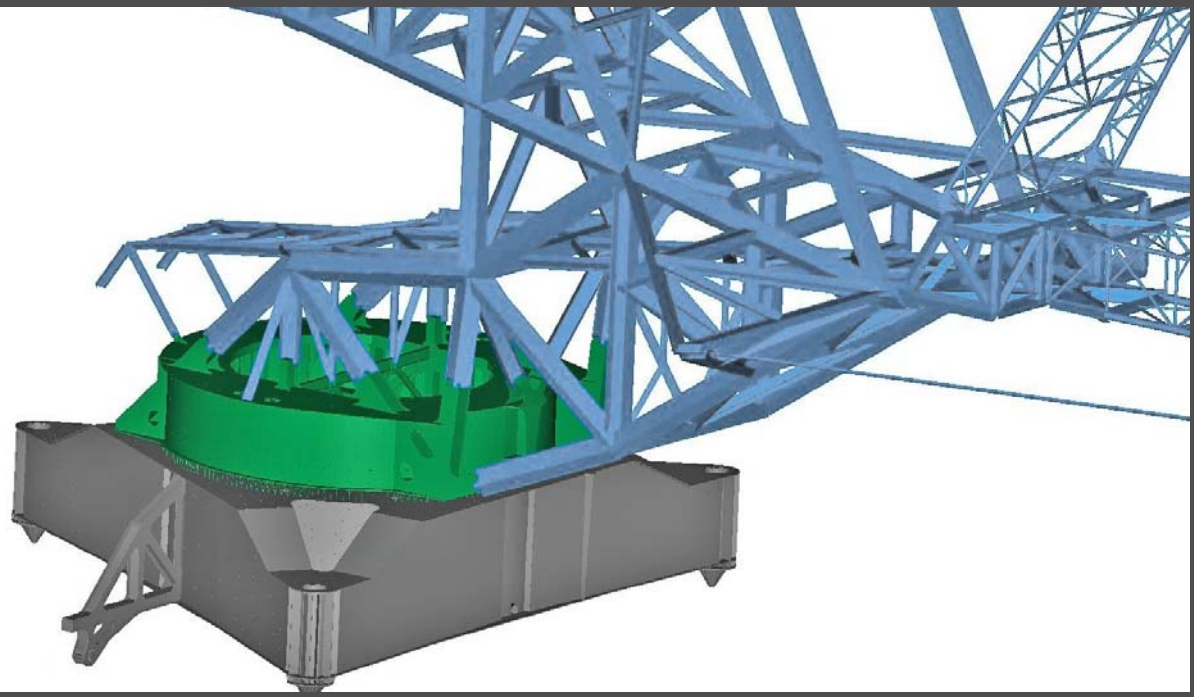
design of the structure of the spreader based on technological demands and parameters of belt conveyors



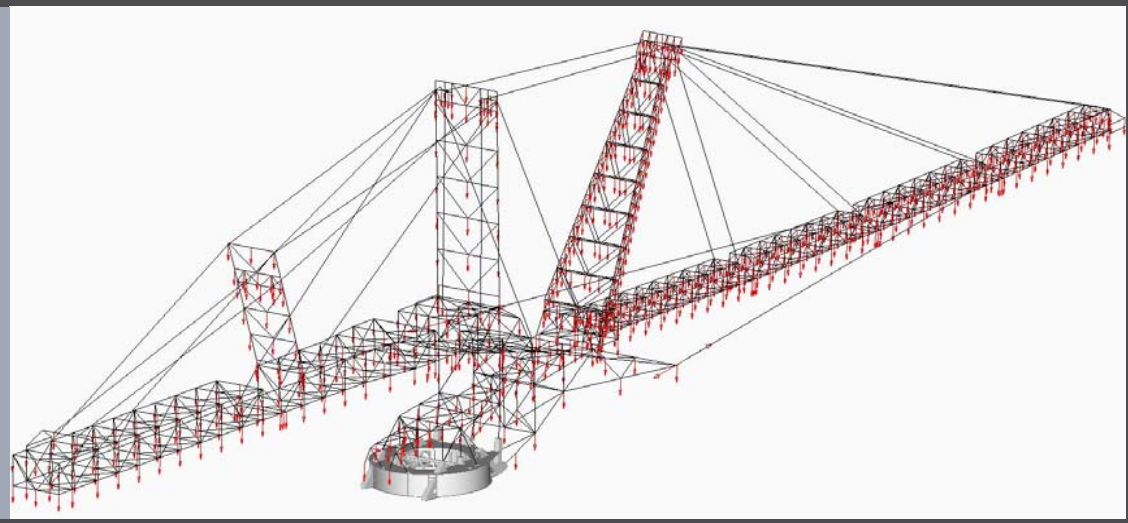
a general model of the spreader's structure



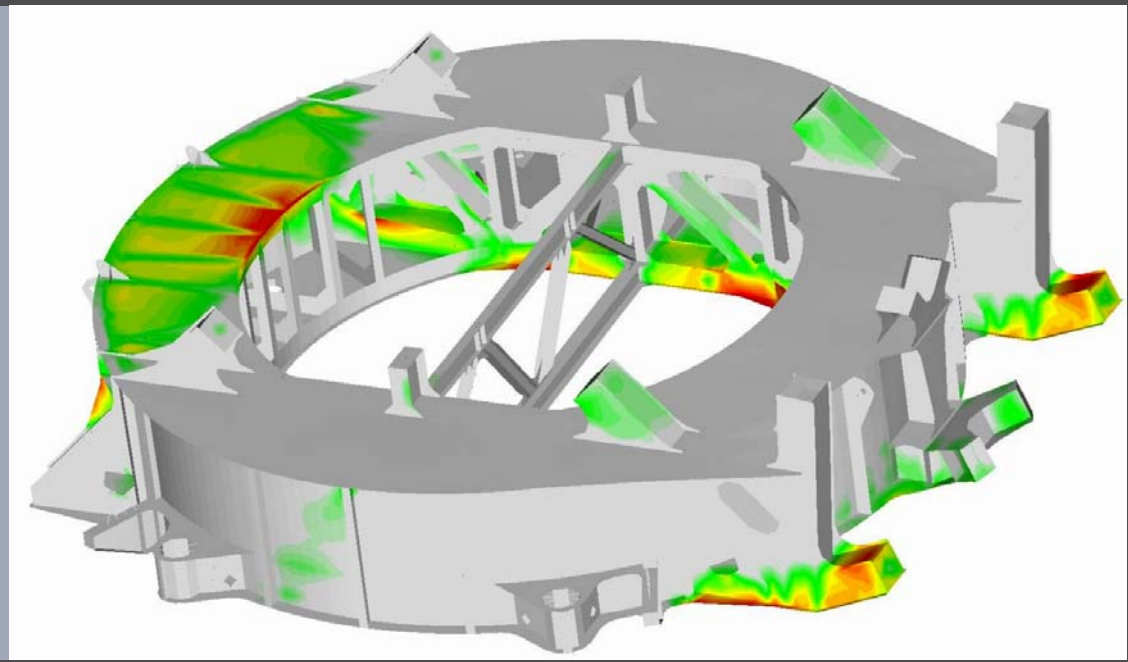
complex model sequence for optimization of the stiffness of the substructure and the superstructure



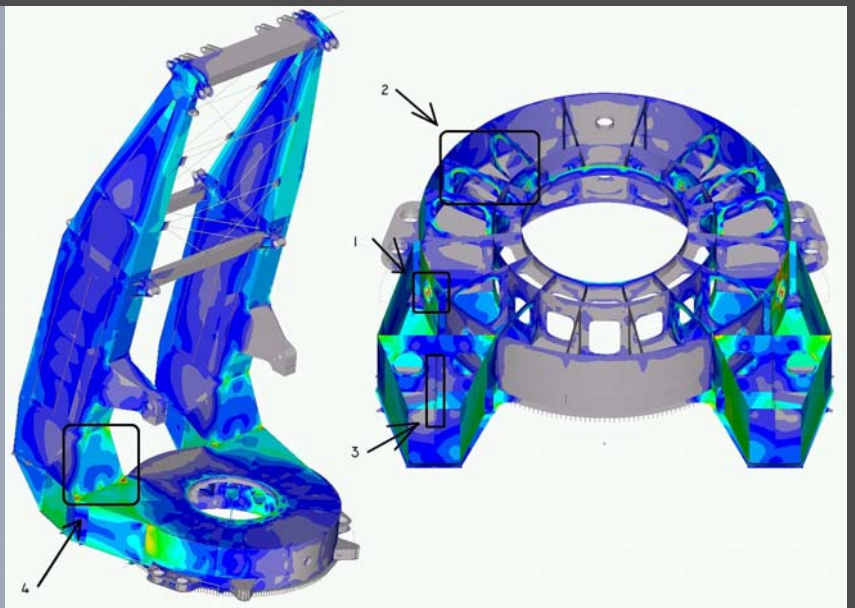
loads distributed over the whole superstructure of the spreader connected to turntable



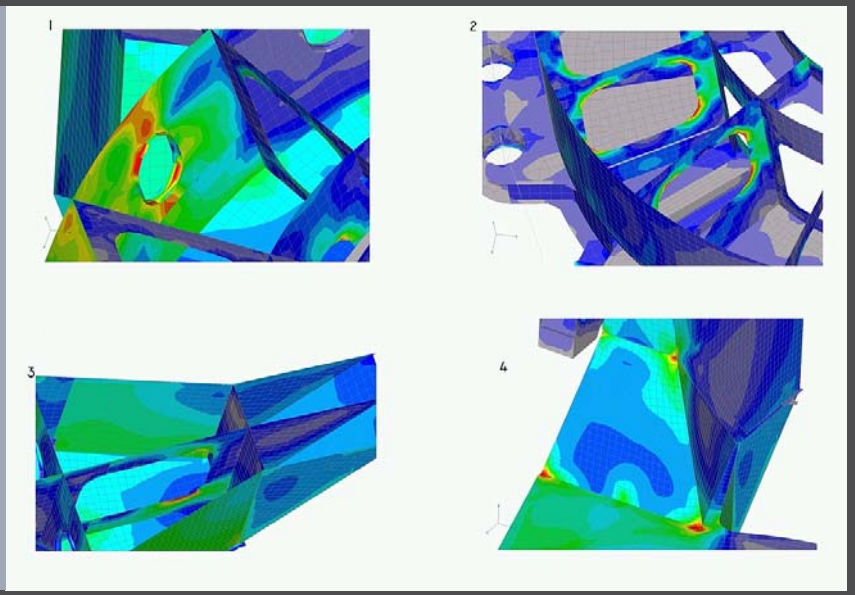
stress distribution as a result of advanced fatigue analysis of the connection of the superstructure framework with turntable

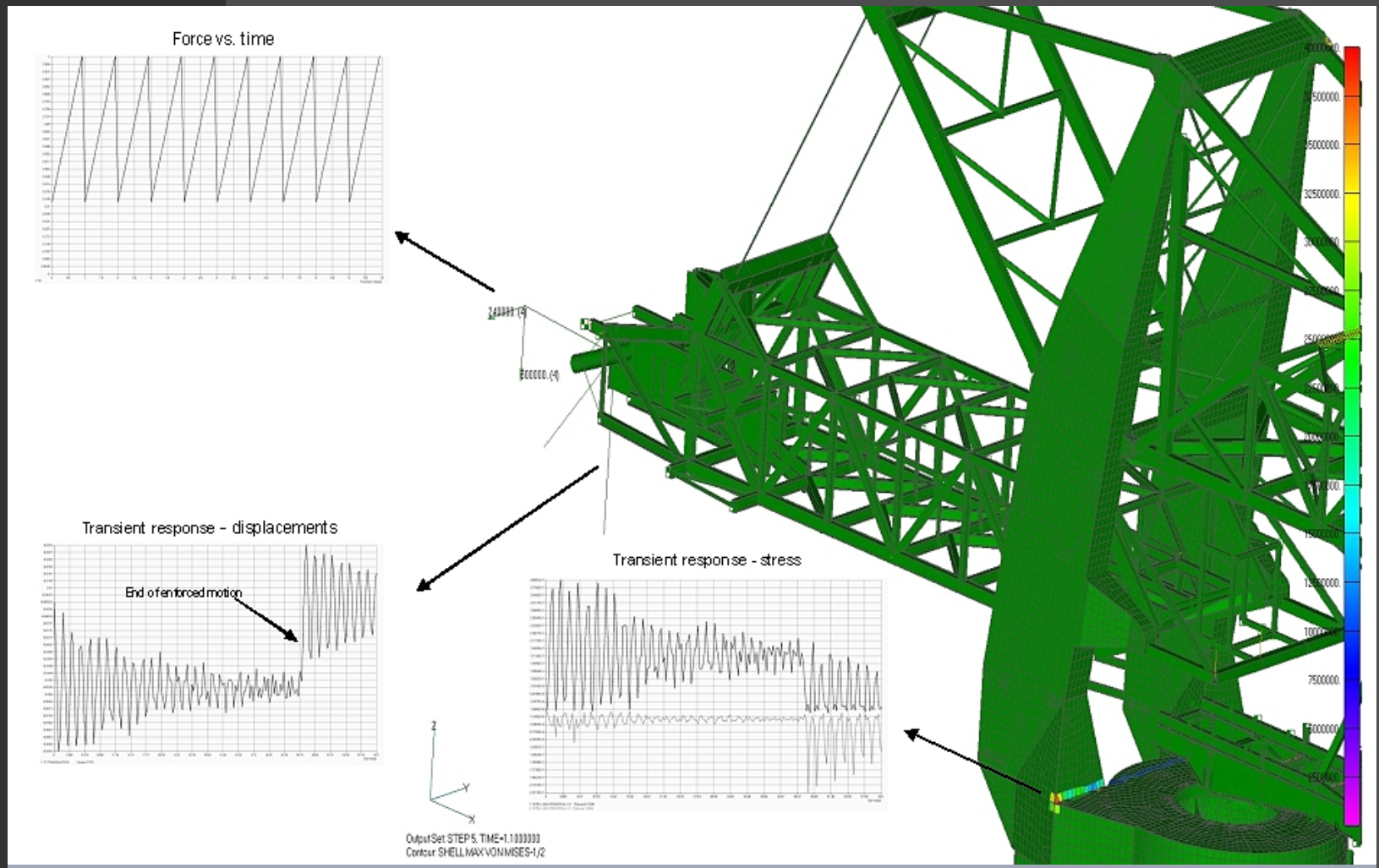


points of stress concentration resulting from action of dynamic loads on BWE's superstructure

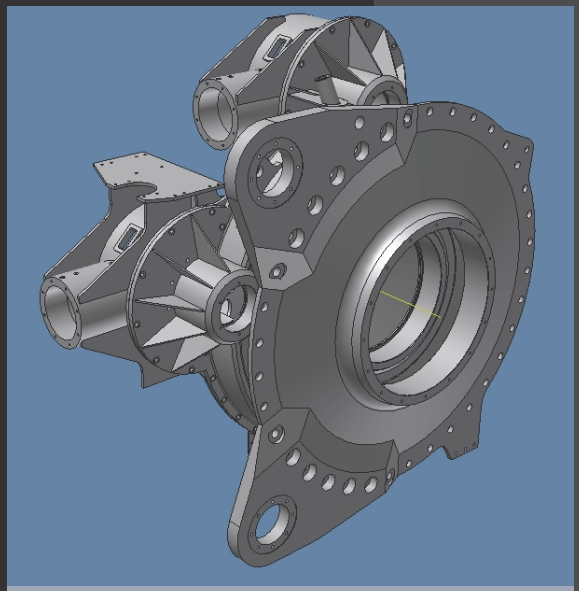


detailed fatigue life prediction in points of stress concentration

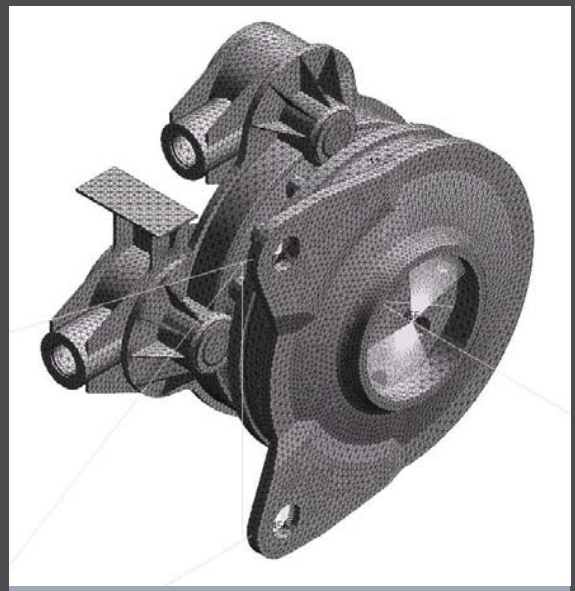




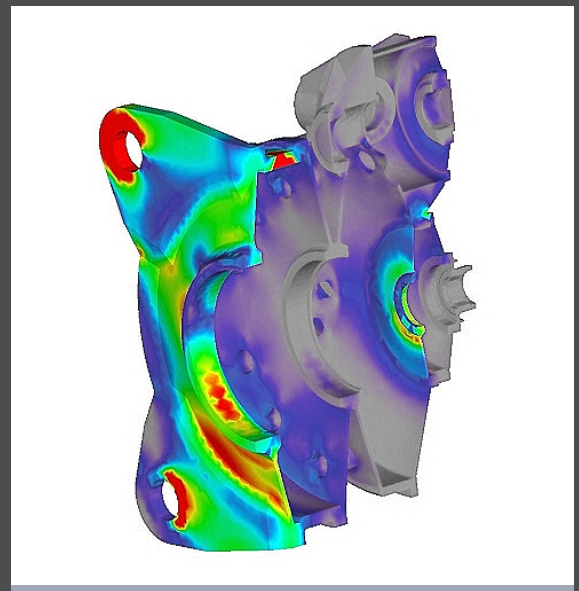
transient response analysis of BWE's superstructure – no resonance effects are visible



constantly actualized 3D model of the 1000 kW gearbox case



3D model prepared for FEM analysis



stress distribution - result of structural analysis

Implementation

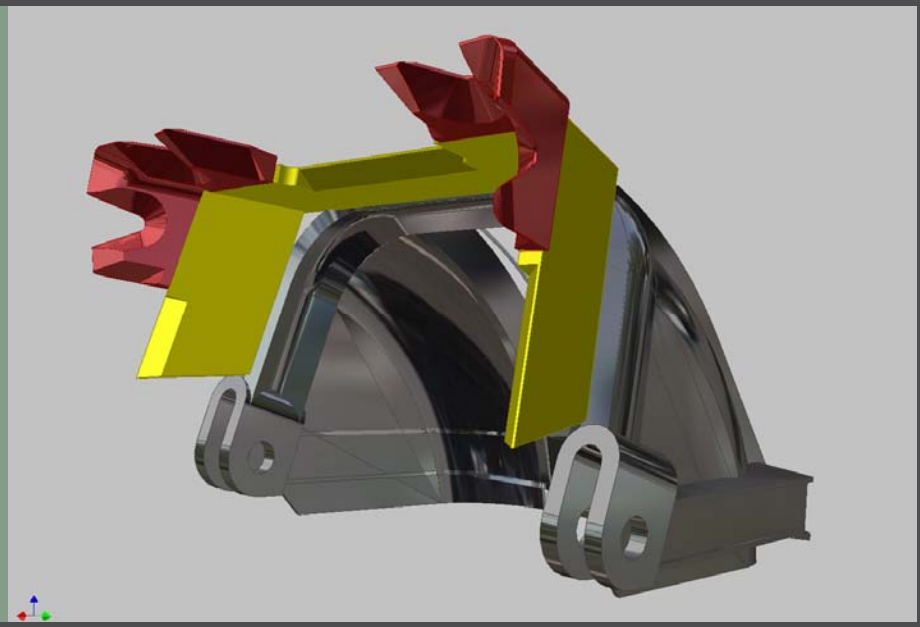
Modern designing is not completed at the stage of the specification. The highest quality of the product and timely implementation of the whole undertaking requires the designer's involvement in the entire process of the production and assembly. Only in such a situation it is possible to ensure modern construction solutions at the highest level of reliability and preserving rational expenditures to the implementation and assembly.

Our experience of many years indicates a whole lot of possibilities to improve exploitation reliability of elements at the implementation stage by modifying the designing solutions or selecting proper materials. The organization of the manufacturing and assembly processes are equally crucial to the costs and deadlines of the whole project. At the executive stage we ensure the task implementation within the agreed deadline by selecting the optimal organization of the project, e.g. overall coordination of the supplies and operations or forming a consortium implementing the whole project. As a result the construction costs are reduced owing to the free choice of particular subcontractors by the Investor basing on the selected and reliable offers as well as current and direct payments for the agreed on supplies and implementation stages. As the main contractor we provide technological and organizational surveillance over the manufacturing, supplies and assembly as well as guarantees for the applied solutions and manufacture deliveries.

We guarantee a high quality of the implemented project by the selection of specialized contractors for particular construction, machine, electrical and other systems as well as for the assembly.



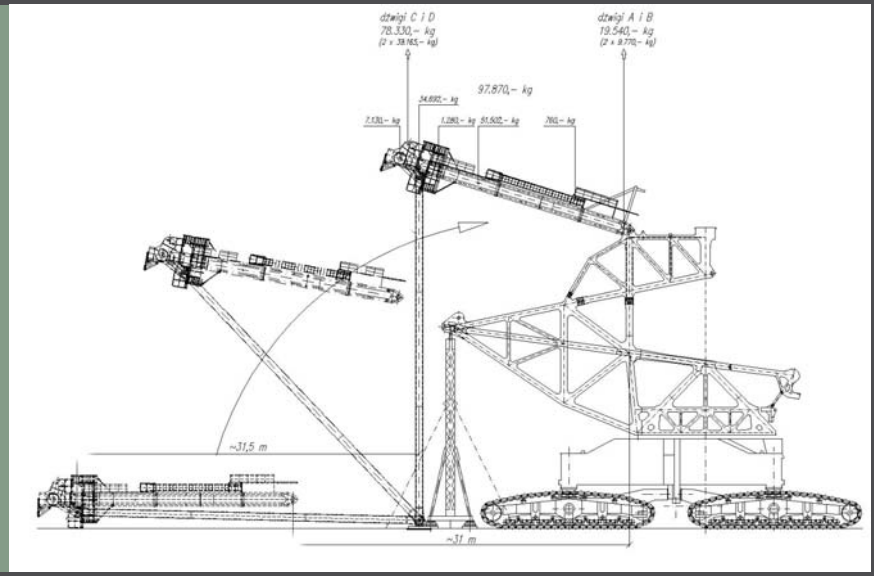
conceptual model 3D of the bucket dedicated to hard material



final shape of the bucket corners made of special alloy as a result of many years of experience and tests carried in the conditions of hard deposits



technological documentation concerning assembling of upper part of the spreader's superstructure

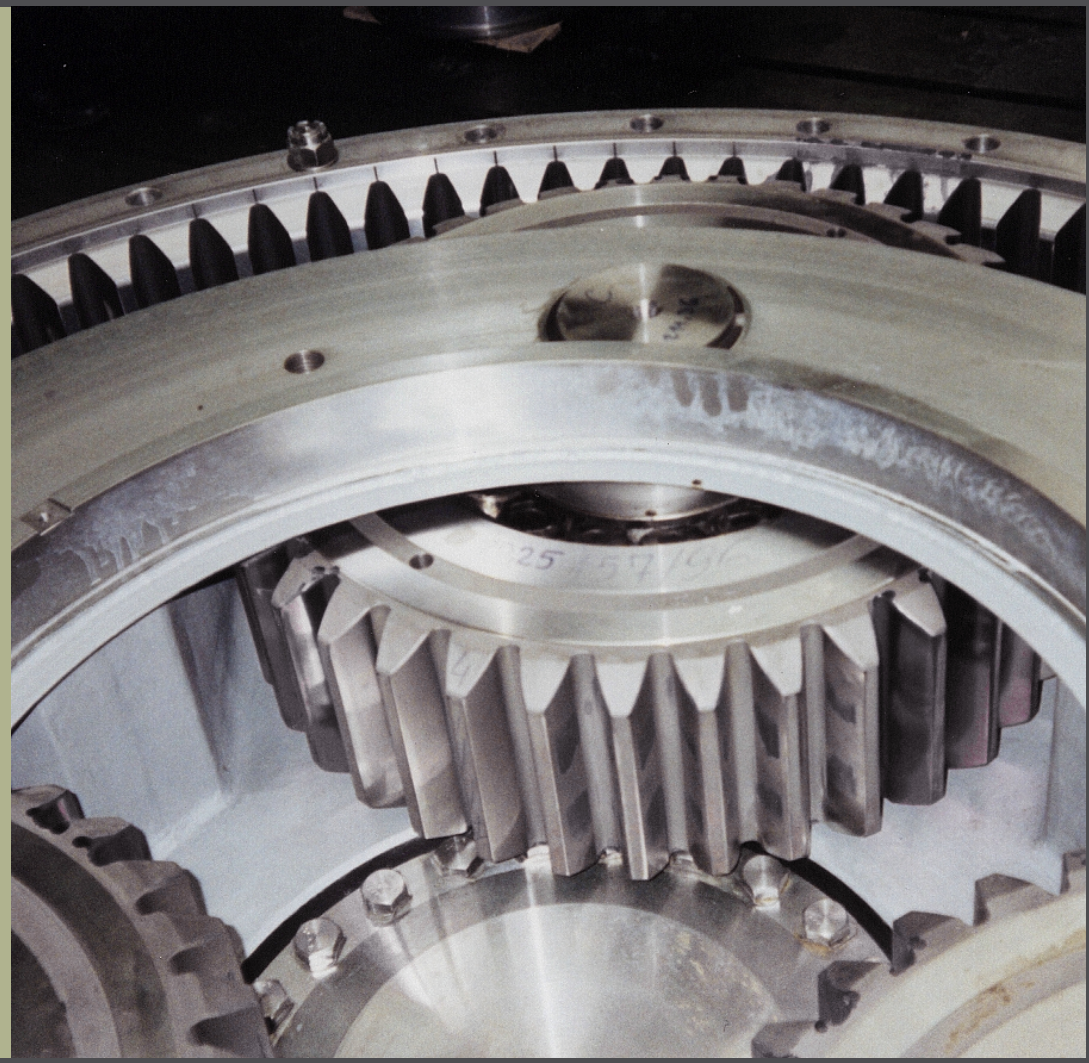


realization of the assembling operation using four heavy cranes

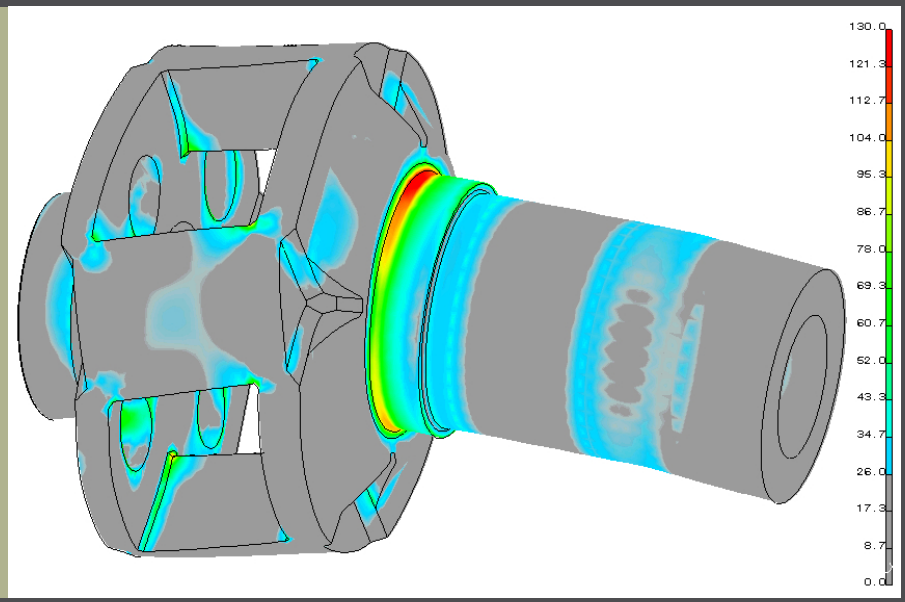


Consultancy

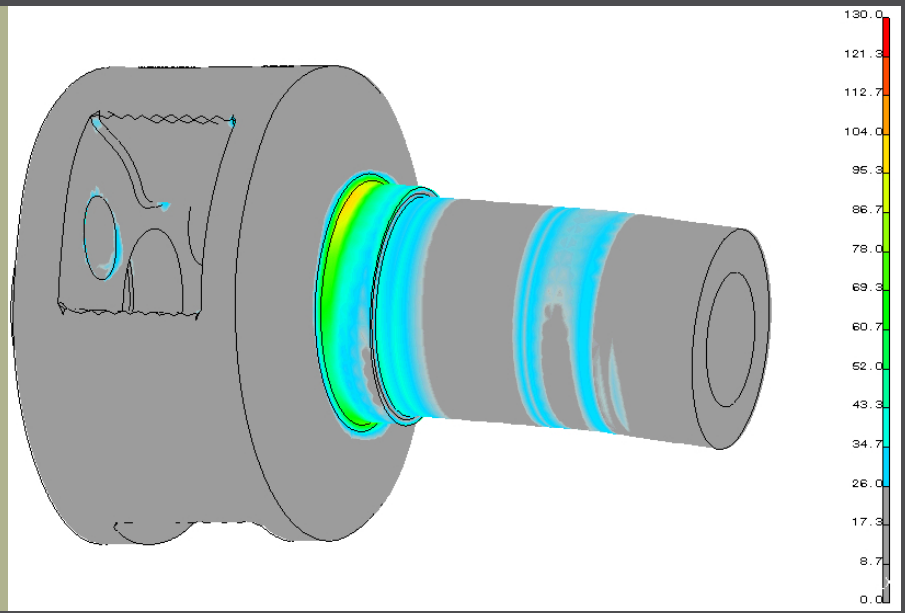
During several years of our designing activities we have solved a whole range of difficult problems requiring both practical experience and advanced durability analysis. Successfully implemented complicated modernizations of basic machines are the best evidence here. Our knowledge and vast experience entitle us to offer our services within the consultancy and support while solving sophisticated technical problems in the lignite industry. It concerns the evaluation of technical conditions of the machines with long exploitation time, the selection of the methods for the elimination of threats in the machine operation, the selection of solutions aimed at the improved reliability of the entire objects or its elements, the reduction of exploitation costs and expenditures to maintenance, the preparation of technologies for complicated assembly-maintenance operations.
Our elaborations of technical expertises are characterized by the precision of offered analyses and solutions for the diagnosed problems.



planetary gear cage analysis – large scale of deformation and many points of stress concentration are visible



final result of modification of the cage shape – significant lowering of stresses and growth of the stiffness



Spreader ZGOT-15400.120

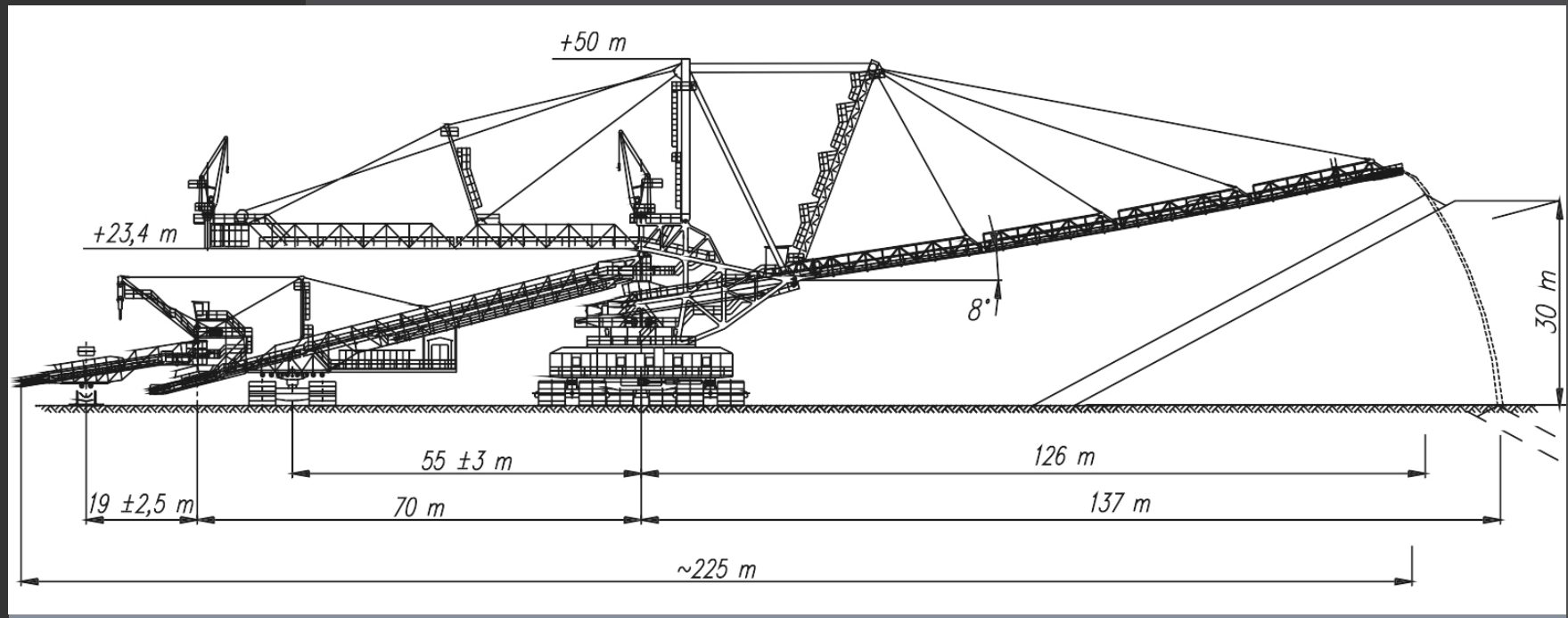
a new generation giant spreader ZGOT-15400.120 built in Opencast Mine „Belchatow”





MASTER OF TECHNOLOGY 2005

Spreader ZGOT-15400.120



theoretical capacity	15400 m³/h
total weight	3660 ton
average ground pressure	78 kPa

Spreader ZGOT-15400.120



erection of heavy elements of the steel structure carried out with high precision

Spreader ZGOT-15400.120

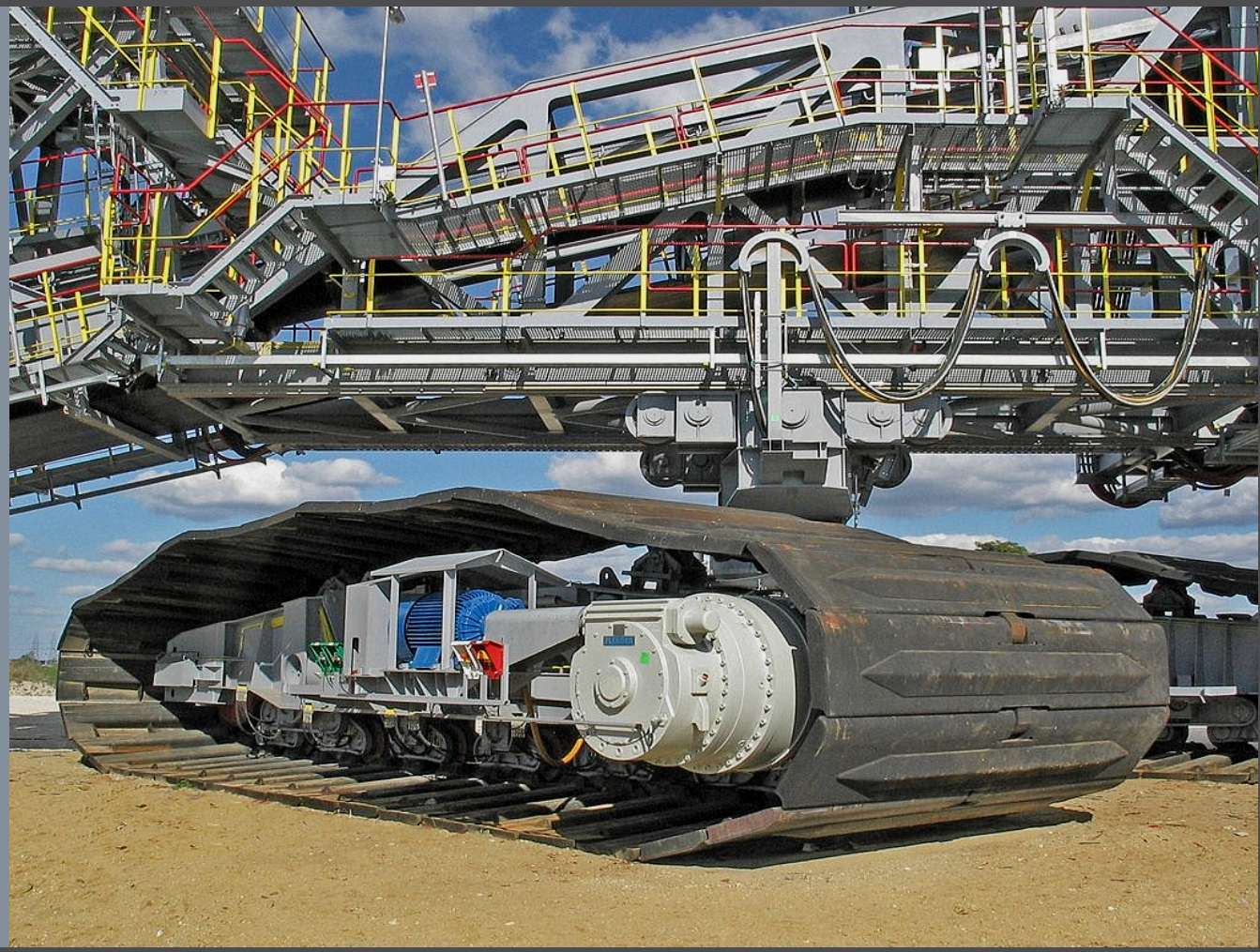
big radius (R>150m)
of the belt conveyor in the
hoisting point



full section of the conveyor in
the belt chute

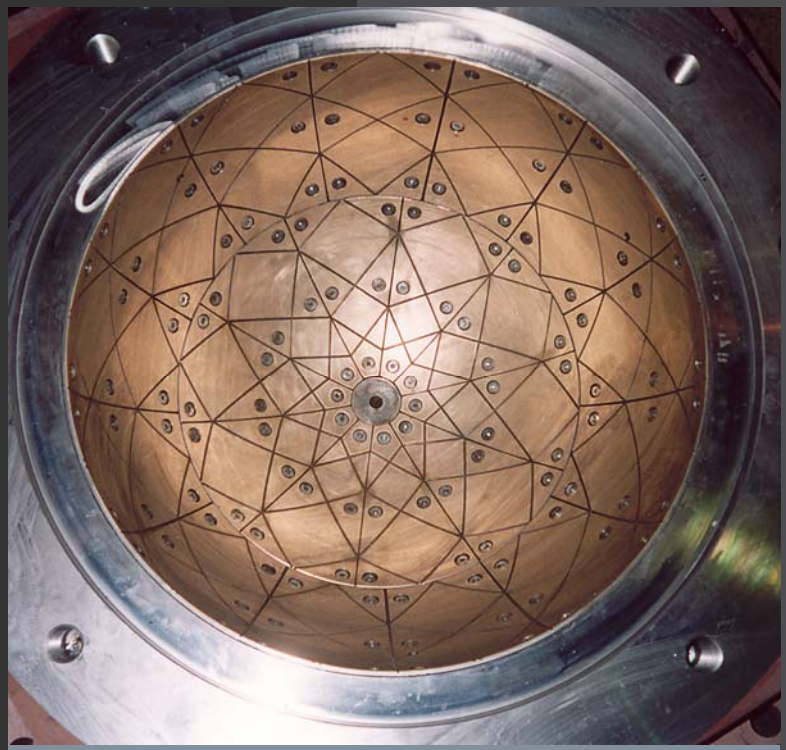


Spreader ZGOT-15400.120



crawlers with plates of width B = 4200mm and planetary gears realize transport of the spreader and feeding car

Spreader ZGOT-15400.120



lower part of the supporting point
Ø 800 mm with new layer bronze lining



slewing mechanism - ball bearing Ø 12500 mm
with balls Ø 200 mm

Spreader ZGOT-15400.120



steel structure design and manufacturing conforms DIN 22 261 standard



minimizing of the stress concentration for improving of the fatigue life

Spreader ZGOT-15400.120



low noise level of drives and operator’s cabin with A/C enables full control over the machine



proper stairways ensure high safety level and maintenance comfort

Spreader ZGOT-15400.120



spreader ZGOT-15400.120
in operation



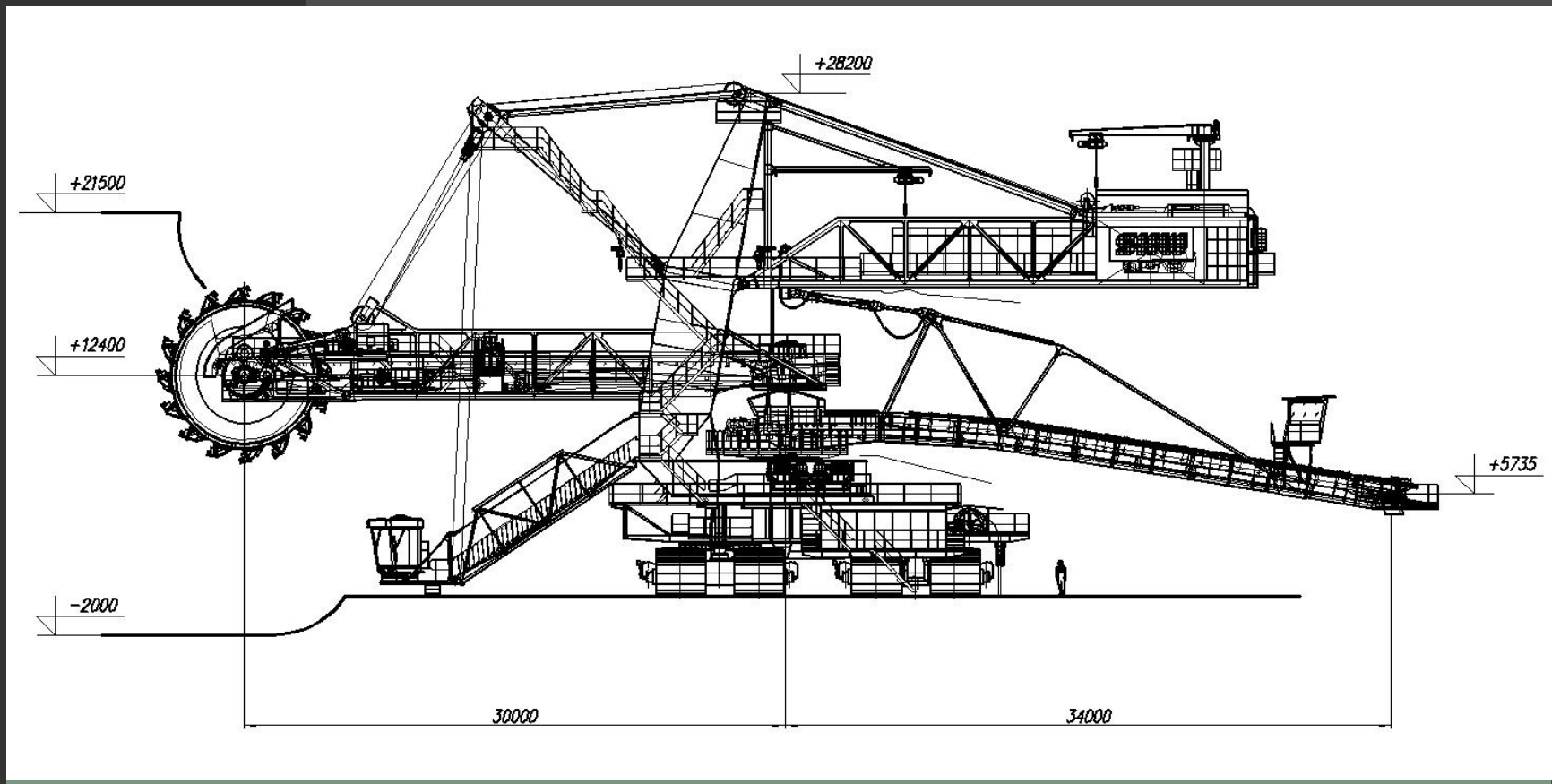
capacity testing
Q = 16 230 m³/h

Bucket Wheel Excavator KWK-910

bucket wheel excavator
dedicated to hard material
built in Opencast Mine
„Turow”



Bucket Wheel Excavator KWK-910



theoretical capacity	4400 m³/h
bucket wheel drive power	1000 kW
cutting force	425 kN
lateral cutting force	240 kN
specific cutting force up to	200 kN/m

Bucket Wheel Excavator KWK-910



structure divided into elements easy to assembly on site

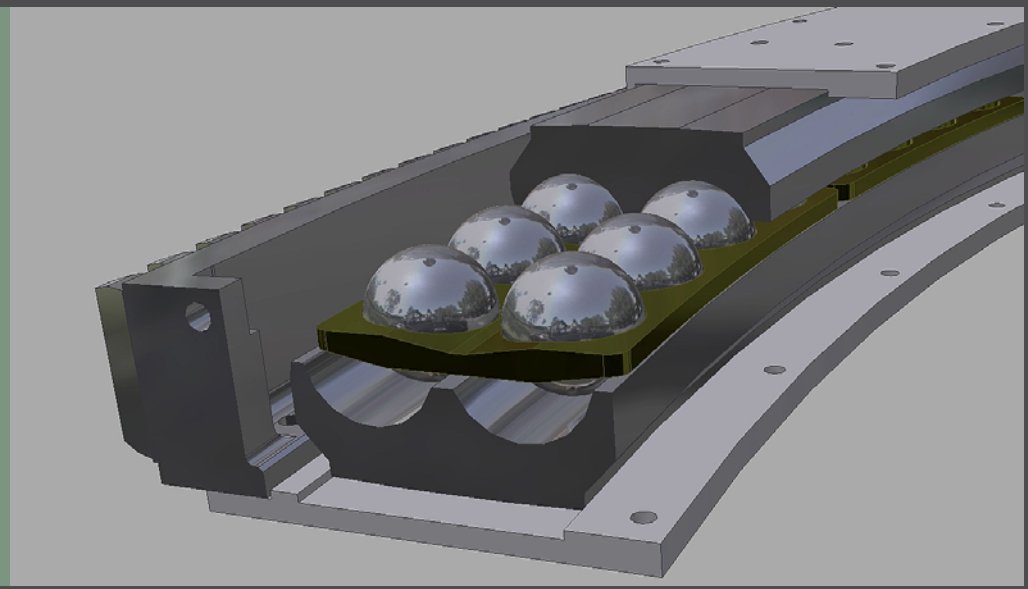
Bucket Wheel Excavator KWK-910

the digging system with 2x 500 kW drives is an effect of planning to reach the unitary cutting force of 200 kN/m
a modern planetary gear of 1000 kW drives the bucket wheel through an easily disassembled tooth gear and a shield fixed to the wheel with spring screws
a single layer wheel with a self-cleaning chute is equipped with characteristic spokes ensuring the transfer of the large side digging loads



Bucket Wheel Excavator KWK-910

a double-row ball bearing Ø 9000 mm with balls Ø 150 mm ensures slewing of the superstructure
special design of the bearing with skew force vector enables exploitation with ground inclination 1:20



the slewing mechanism consists of four drive systems with hydraulic drives ensuring lateral cutting force up to 240 kN
flexible support for the moment levers and securing devices in the hydraulic system buffer the effects of side impact loads from the digging organ



Bucket Wheel Excavator KWK-910



comfortable operator's work conditions facilitate taking advantages of a whole range of the excavator's options and faultless interpretations of hundreds of displayed data



a comprehensive communication system ensures an access to all crucial points of the machine and enables its safe operation

Bucket Wheel Excavator KWK-910

travel control with a hydraulic cylinder ensures a turning radius R= 25 m, unique for 6-crawler machines



work in semi hard material proved stability of the steel structure and efficiency of the digging unit



Bucket Wheel Excavator KWK-910



work in semi hard material



self-sharpening corner of new construction buckets

bucket wheel excavator
SchRs-1200 after total catastrophe
in 1990
in Opencast Mine „Adamow”



reconstruction and modernization of
the machine above as
KWK-1200M in 1992



bucket wheel excavator
SchRs-800 in Opencast Mine „Konin”



reconstruction and modernization of the machine above as KWK-800M in 1997 after transport to a new open pit



bucket wheel excavator
SchRs-1200 in Opencast Mine „Turow”

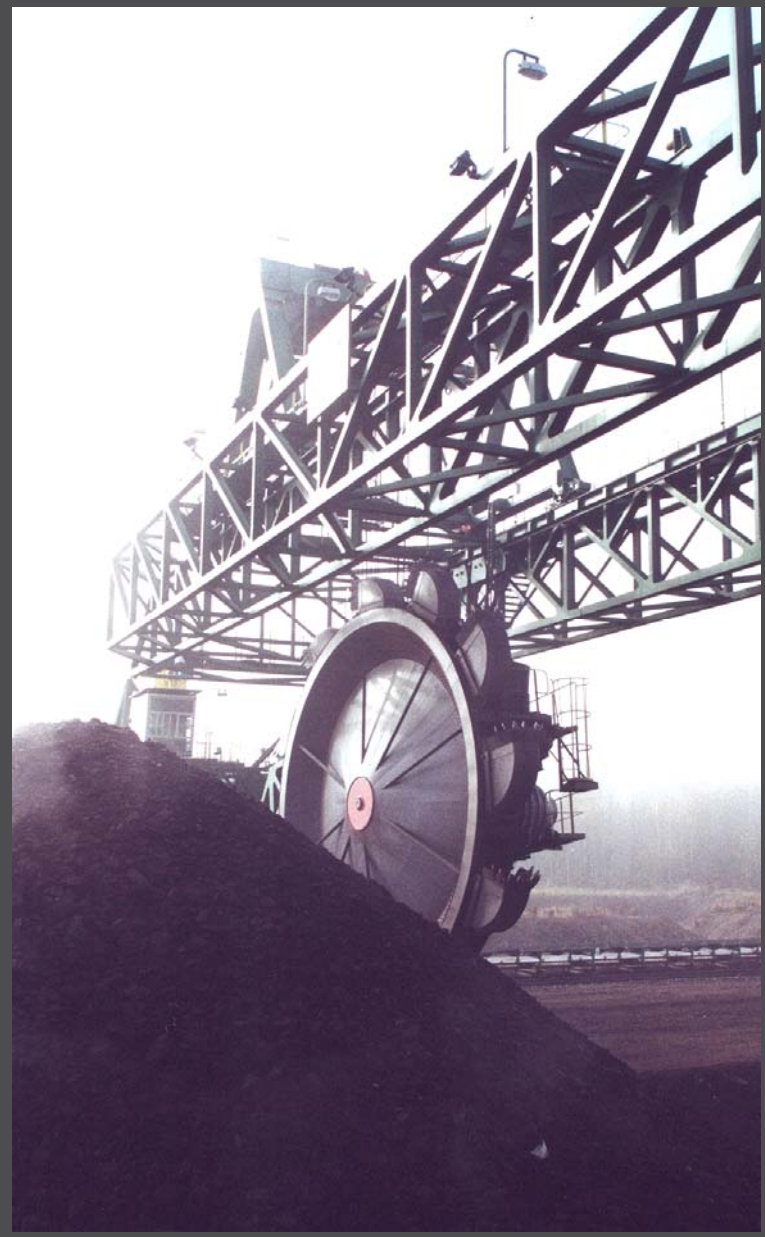


the machine above after comprehensive reconstruction and modernization as KWK-1200M - modernization of 4 BWEs in 1996-2002



Lignite Stockyard in Opencast Mine „Turow” consisting of belt conveyors system, stacker, bucket wheel loader BK-1500





Ash transportation

ash transportation system in Power Plant „Turow” consisting of belt conveyor system and spreader ZGOT-2000.50 with feeding car





Contact

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