# Commercial proposal

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Erection of bloomery

Jan Małachowski, the Great Chancellor of the Crown, founded in the 18th century a bloomery in the site of the current ZUK Stąporków.

At the time between WWI and WWII, the ‘Huta Stąporków’ steel mill operated in the current ZUK’s site. After WWII the ‘Stara Góra’ mine was established here, and remained in operation until the 70ties.

Founding of ZUK

Based on the decision of the Minister of Heavy and Agriculture Machinery, the state-owned enterprise ZAKŁADY URZĄDZEŃ KOTŁOWYCH „STĄPORKÓW” was founded. The main products of the enterprise at that time were stokers, stoker drive mechanisms and slag removal conveyors. Changes in the Polish economy occurred in late 80ties caused the need to diversify and extend the production assortment.

ZUK „Stąporków” transforms to a Joint-Stock Company

ZUK „Stąporków” Joint Stock Company („Spółka Akcyjna, „S.A”) was established in 1995 as a result of transformation of the former state-owned enterprise. In September 1995 the shares of the Company were contributed to the National Investment Funds.

Stock Exchange listing

On the 3rd August 2007 the Company was listed for the first time on the Warsaw Stock Exchange. Currently, ZUK Stąporków is one of the leading companies active in the power engineering sector in Poland. We have been present on the market continuously for 40 years.

Sale of shares

In July 2002 the shares of ZUK “Stąporków” held by the investment funds were sold to STALMAX S.J.

Flue gas desulfurization and denitrification

In 2016 ZUK Stąporków started the supplies of components for flue gas desulfurization and denitrification plants for power boilers.

New business area

In 2010 ZUK Stąporków signed the first contract for completion of a „turn-key” project as the General Contractor.

2016

2010

2007

2002

1995

1976

1738
Our Company is one of the leading players on the European Power Market. We have been present on the market continuously for 40 years. We have gained the specific expertise and great experience and have enhanced our position as a General Contractor of the Projects in industrial, thermal and commercial power generation sector over this time.

Main products we offer to our Customers are: air protection systems (for removal of dust, SO2 and NOx), conveyor systems, various fuel processing and combustion facilities (including combustion of RDF and biomass) and engineering and steel structure of any type.
Bag filters

Our bag filters offer large throughput and high efficiency of flue gas, other gas and air cleaning. They are particularly suitable for power engineering applications.

Application and description
Bag filters are designed to remove dry and no sticky dust particles, which do not form explosive mixtures with air, from flue gas, air and other gaseous media. They are mainly used in power generation sector, and also find application in cement mills, lime plants, foundries, steel mills and glassworks. They are also suitable to remove dust from flue gases produced by power boiler. Special version of bag filter with ATEX-certified safety systems may be used to clean explosive dust & air mixture.
**Main components of bag filter:**

- Supporting structure
- Hopper
- Filtering chamber with dust precipitation duct
- Clean air chamber
- Roof structure
- Filter cleaning system using compressed air blowing
- Filter cages and bags
- Working platform, barriers and ladders
- Dust collection and evacuation system (screw conveyor with chamber dispenser)
- Control cabinet

**Operation and maintenance**

Bags are replaced from the side of clean air chamber. The bags may be cleaned by blowing with compressed air either in the set time intervals or at any time upon reaching differential pressure value set at the filter controller.
**Cyclone filters**

**Application**

Cyclone filters are intended mainly to remove dust from stoker-type, coal-fired power boilers in order to guarantee keeping the emission level below 100 mg/Nm³ at 6% O₂ level referred to dry flue gas at standard conditions (i.e., 273K; 101.3 kPa).

To obtain the required cleaning efficiency, a portion of flue gas from the hopper of cyclone battery circulates through an additional bag filter. Circulation is forced by additional flue gas booster fan. The bag filter module is arranged horizontally between the rows of separated cyclones.

Flue gas inlet to and outlet from the bag filter may be closed. In case of maintenance works (bag replacement) or failure - the flue gas cyclone-filter may operate with closed flue gas circulation through the bag filter.

**Unique features of our cyclone filters**

- Thanks to the use of high-efficiency-cyclones with two outlets of clean flue gas, the filtration surface may be considerably reduced, which offers in return relatively low operating costs.
- Compact, uniform design.

- Filter module may be completely isolated, and operation with only cyclones is possible at full boiler load and in case of system start-up, failure or maintenance.

**Basic technical parameters**

- Dust content at flue gas inlet - 5 g/m³
- Dust content at flue gas outlet - 100 mg/m³
- Max. long-term operating temperature - 260 °C

The equipment is subject to the patent application no. P.216 644
Two-stage dedusting systems

Basic data
The use of both equipment as one compact unit improves the efficiency and effectiveness of the dedusting system. The use of the described solution allows obtaining dust content in outlet flue gas lower than 300mg/Nm³.

Cyclone batteries
Cyclone batteries are fabricated of 5 mm thick steel plates made of a standard quality constructional steel. Some part of the inlet section may be provided with an insert made of abrasion-resistant HARDOX steel to extend the component lifetime. The cyclone batteries may be also used as pre-dedusters in e.g. bag filter stations.

Basic technical parameters
1. Actual diameter of one through-cyclone Ø 250 or Ø 315
2. Recommended flow rates:
   • for diameter of through-cyclone Ø 250 - 0.6 m³/s
   • for diameter of through-cyclone Ø 315 - 1 m³/s
3. The total capacity of one through-multicyclone depends on the number of individual cyclones used and their actual diameters.

Through multicyclone
Through-multicyclones are used as pre-dedusters in the dust removal systems. They eliminate the most abrasive particles and, thanks to that, the lifetime of cyclones and filters is longer.
Modernisation of existing dedusting systems

The objective of modernising the systems of dust removal from flue gas coming from stoker boilers based on the cyclone batteries is obtaining the dust emission level below the admissible limit of 100 mg/Nm³ at 6% O₂ level.

Basic information

To improve efficiency of existing cyclone battery, additional flue gas circulation system with bag filter and fan of appropriate capacity is provided. Some part of flue gas supplied to the cyclone battery circulates through the filter and is subsequently delivered to the main flue gas collector downstream of the flue gas exhaust fan. To guarantee high efficiency of the whole system, negative pressure is built-up in the dust silo of cyclone battery and flue gas is sucked off from the silo by a booster fan. The negative pressure also causes the dust suck-off from the cyclones to the silo and limits air uplifting in the bottom part of the cyclone.

The primary advantages of the system are following: no need to modify the existing deduster and possibility to use the system with closed circulation through the bag filter and bag replacement without start-up. The bag filter capacity is designed proportionally less than the capacity of the entire system, which reduces prices and operating costs.

Note:

Prior to the execution of the modernization, a feasibility study will be carried out to assess whether the conditions of the cyclone battery and of the entire facility justify the investment and guarantee the profitability of the project. Also, free space sufficient to install new equipment must be available.
Flue gas desulfurization and denitrification plants

Basic data

In response to the more and more stringent requirements for and limits of emission of such components as dust, sulphur and NOx, ZUK Stąporków has marketed new products to fulfill all requirements of the emissions and extended its offer by modern denitrification (deNOx) and desulfurization (deSOx ) technologies.

As many methods and technologies of removal of harmful components (particularly those produced during combustion of fossil fuels) from flue gas are available on the market, ZUK Stąporków, as an engineering company, always selects the most appropriate technology for each individual case.

Thanks to our long-term experience, professional and well skilled staff and advanced engineering tools we may offer comprehensive execution of ‘turn-key’ projects based on our own Know-how or using other licensed solutions of our partners and leading world technologies.

Please do not hesitate to contact us if you are of interest of our offer.
Heavy stokers

Elevated grate stokers are designed to combust fine coal in layers in steam and water boilers of the output of 6 – 50 MW.

Application

Heavy grate stokers of RTWC, RTWK or RI-type are designed to combust fine coal in a layer system in boilers of the output of 3 – 60 MW.

Boilers of the output of 3 - 20 MW are provided with single grate stokers, while the larger boilers of 25 - 60 MW output - with the double ones.

Air boxes of the stokers are split into separated and air-tight zones. The term of ‘zone’ means a space around the air inlet.

Design of air box assures 100% air tightness between zones. Thanks to this feature we guarantee proper control of the amount of air supplied to individual zones of stoker. Number
of zones depends on the boiler type and useful length of the stoker. The optimum number of zones should consider a ratio of the dead 'inter-zone' areas to the total useful surface of the stoker.

The grate (chains, grate bars) may be made in a standard version or in a version with increased temperature resistance (e.g. chains made of Cr-Mn steel, grate bars - of steel with Mn-content of up to 2.5%).

Fuel is fed by means of a standard bucket with guillotine and coal gates or a cascade bucket (feeding drum). Reversing carriage may be used for standard bucket to distribute fine coal uniformly at the whole width of the grate. Shafts of stokers rest upon roller bearings with increased play. Bearings are lubricated either by stationary grease nipples or by automatic lubrication system.

Reliable and robust worm gears of BNr-2000 or BNr-1000 type with gearmotors suitable to work with inverters are used to drive the heavy stokers. The most advanced solutions of heavy stokers used by our Engineering Office support the increase of combustion efficiency and by the same, also the improvement of efficiency of the whole boiler, reduction of excess air coefficient and of oxygen content in flue gas.

**Technical Data**

Max. local thermal load of the grate: **1280 kW/m²**.
Calorific value of the fuel used: **19 – 28 MJ/kg**.
Actual efficiency of combustion on the stoker: **97.5%**.

We provide full guarantee and post-guarantee services and all spare parts.

**Heavy grate**

1) Lateral, left & right supports. 2) Lateral left and right supports, 3) JW support, 4) OW support, 5) chain link t=203, 6) Roller 355, 7) Grate bar (395,345), 8) Distance rod, 9) Tensioning screw.
Light stokers

**Application**
Grate stokers with light grates of Rn, Rtn, Rtsn, Rt-snc and Rtsr type are designed to combust fine coal in a layer system in fire-tube and water tube boilers of the output of up-to 6 MW.

Air boxes of the stokers are split into hermetic zones supplied from primary air system. Number of zones depends on the boiler type and useful length of the stoker. The optimum number of zones should consider a ratio of the dead ‘inter-zone’ areas to the total useful surface of the stoker. NB-250 or NB-500 gears are used to drive this type of the stokers. The gears are suitable to work with frequency converter.

**Technical Data**
- **max. heat load:** 900 kW/m²
- **max. calorific value of the fuel:** up-to 23 MJ/kg
- **max. thickness of fuel layer:** 0,12 m

**Light grate**
1) Grate bars (200S, 230S, 250S, 300S), 2) Chain t-64, 3) Distance rod, 4) Cap, 5) Lateral sealing
Step grate stokers

For combustion of biomass, municipal wastes and fossil fuels of a low calorific value. The best results are obtained when using reciprocal step grates.

Basic data
Step grate stockers are designed to combust biomass of plant origin (wood chips and dusts, disintegrated straw, energy plants, pellets, corn cobs and other residues of plant origin) and of other fuels (coal of low calorific value or RDF alternative fuels). The step grate stockers manufactured by us are used in water and steam boilers of the output of 1 MW to 30 MW.

Stocker design
The stoker is made of a rigid frame and adapted to accommodate a steel heat exchanger (boiler) or a ceramic Dutch oven. Air box is split into separate zones supplied with primary air by independent fans of adjustable capacity. The grate is composed of bars made of castings of high Cr-content, arranged alternately, in stationary and moving rows. Moving grate bar rows are driven hydraulically and moved by carriages and pushers. Screw conveyor arranged transversely to the stoker centerline is used to evacuate ash. Subject to the slag removal grate installed, a scraper belt conveyor may be also used.
Stokers for combined coal and biomass combustion

Co-combustion is the simplest and the cheapest way to increase the share of renewable fuels in thermal power generation.

Biomass co-combustion

The best way of biomass co-combustion in grate boilers is a layer ("sandwich type") combustion. ZUK Stąporków has its own solution of biomass co-combustion based on the patent no. PL Nr 194812 "Mixed solid fuel feeding equipment".
The concept of up-grading the existing stoker comprises:

1. Providing bi-sectional version of the fuel bucket suitable to supply separately two fuels (biomass and fine coal) to existing grate.
2. Stoker extension in its front section.
3. Splitting of existing coal bin into two sections for biomass and fine coal.

Benefits of biomass and fine coal co-combustion in a layer system are following:

**Ecological benefits**
- reduced emission of CO₂, SO₂, NOₓ and other pollutants because of:
  - use of biomass and its properties as a fuel,
  - reduced amount of coal bearing harmful pollutants in combustion process,
- low costs of WR and OR boiler adaptation to combustion of biomass and fine coal blend
- thanks to the coal used, the stabilisation of the layer („sandwich-type“) combustion of two fuels allows to use a biomass of high and variable humidity
- protection of the grate from excessive heat load owing to 15-20% ash content in coal, which in co-combustion process forms the first layer on the grate
- elimination of harmful phenomena (so called „crater-type combustion), which may occur during the co-combustion of biomass with fine coal
- in case of temporary biomass shortage, power generation is secured.

**Economic benefits:**
- low costs of WR and OR boiler adaptation to combustion of biomass and fine coal blend
- thanks to the coal used, the stabilisation of the layer („sandwich-type“) combustion of two fuels allows to use a biomass of high and variable humidity
- protection of the grate from excessive heat load owing to 15-20% ash content in coal, which in co-combustion process forms the first layer on the grate
- elimination of harmful phenomena (so called „crater-type combustion), which may occur during the co-combustion of biomass with fine coal
- in case of temporary biomass shortage, power generation is secured.
Scraper conveyors of OZDW type

Application and technical description

Scraper conveyors of OZDW type are made of a single trough. Slag and ash are dragged at the bottom of the trough (so called „bottom scraping”). The trough bottom is lined with abrasion-resistant steel or basalt plates. The design of slag removal conveyors is simple, user’s friendly and very durable.

Scraper conveyors are available in three basic trough widths: 350 mm, 570 mm, and 770 mm; total length is within the range of 3 - 25 m. Overall dimensions of the conveyors depend on the boiler type and specification of other conveying equipment.
Shafts rests upon slide or antifriction bearings. Additional equipment comprises: discharge valve, water level control system, motion sensors and emergency stop cable switches. Scraper conveyors are provided with safeguards of horizontal and inclined troughs.

**Technical Data**

- Capacity of the conveyor amounts to: 0.27 m³/h, 2.5 m³/h and 3.5 m³/h for Bu = 350mm, 570 mm or 770 mm, respectively.
- Motor power depends on the total length and width, of the trough and is within the range of **0.55 kW to 1.5 kW**. Gearmotors are adapted to work with inverters.
- Overall dimensions of the conveyor (such as total length, trough width, height to the driving shaft) will be agreed with the designer of slag removal system or directly with the user.

**Design**

1. trough, 2. front shaft, 3. Rear shaft, 4. drive, 5. scraper belt, 6. abrasion-resistant plates or basalt lining, 7. replaceable shoes or guiding roller 8. float chamber, 9. discharge valve.
Scraper conveyors of OZGW type

Application and description

The scraper conveyor of OZGW type is a dual-trough conveyor with upper material dragging. Upper trough filled with water is used to quench and transfer the slag to the other conveyor, and scraper belt returns „dry” in the bottom trough. Such construction of the slag removal conveyor allows to evaluate the wearing grade of the scraper belt on running basis and eliminates accumulation of floating ash and slag fractions.

Scraper conveyor (including slag removal conveyors) have been manufactured in ZUK Stąporków for more than 40 years.
Slag removal conveyors of this type are offered in two basic trough widths: 570 mm and 770 mm, and the length within the range of 3 to 25 m. Overall dimensions of the conveyors depend on the boiler type and specification of other conveying equipment.

Shafts rest upon antifriction bearings. Additional equipment comprises: discharge valve, water level control system, motion sensors and emergency stop cable switches. Scraper conveyors are provided with safeguards of horizontal and inclined troughs.

**Technical Data**

- Conveyor capacity: for $B_u=570$ mm - up-to $2.5$ m$^3$/h; $B_u = 770$ mm - up-to $3.5$ m$^3$/h.
- Motor power depends on the total length of the conveyor and trough width and lies within the range of **0.75 kW to 1.5 kW**.
- Overall dimensions of the conveyor (such as total length, trough width, height to the driving shaft) will be agreed with the designer of slag removal system or directly with the user.

**Design**

1. trough, 2. front shaft, 3. rear shaft, 4. drive unit 5. scraper belt, 6.aAbrasion-resistant plates or basalt lining, 7. replaceable shoes or guiding roller 8. float chamber 9. discharge valve
Scraper conveyors of PPZ type

Application and description
This type of slag removal conveyors is used mainly in fire-tube boilers. The trough of conveyor is provided with drive shaft, tension roller, scraper belt, and top and bottom shoes to guide the scraper belt. Shoes are replaceable. Drive unit is composed of gearmotor and chain gear and is protected from overload by security pin arranged in the sprocket wheel of the drive shaft.

Technical Data
Max. conveyor capacity: 0.8 t/h;
Motor power: 0.55 kW.

Design
1. trough r, 2. front shaft, 3. rear shaft, 4. scraper belt, 5. drive unit, 6. chain guide.

Suspended scraper conveyors are designed to quench the slag and protect the boilers from suction of false air.
Slag removal conveyors for applications in power plants

3.0

Application and description

Dimensions of slag removal conveyors depend on the boiler and requirements of the deslagging equipment. Useful width of conveyor trough is within the range of 1000 to 2000 mm, and its total length is up-to 18 m. The chain used in this type of conveyors is a chain for mining application, type 24 x 86. Bearings of drive shaft and tension and guide rollers are provided with automatic lubrication system. Scraper belt is washed with water upon each slag discharge. Drive wheel is made in version of two- or three rows; toothed ring and wheel hub are connected by a security pin, which is activated in case of overload.

ZUK Stąporków supplies scraper conveyors of large capacity for applications in commercial power generation facilities.
Application and description
Screw conveyors are used to convey fine coal, slag, fines, biomass and other bulk materials.

Technical data of the conveyors:
- worm diameter od 150 mm do 700 mm
- capacity od 100 kg/h do 80 t/h
- motor power od 0,55 kW do 18 kW
- length of the conveyor is adapted to the requirements of the particular facility and to the concept of conveyance of respective material.

Main components of screw conveyor are: frame (trough), screw set with bearings and drive unit. In the screws of small diameters and larger length, central bearings are provided, which form also a kind of support to protect the screw shaft from deflection. Bottom of the trough (particularly of heavy-duty conveyors) is covered with abrasion-resistance plates or basalt lining. In the screws of small diameter (e.g. for conveyance of fines), shafts are made of thick wall pipes and helices have a tight pitch. Screw conveyors for heavy-duty applications have screw sets made in either version:
- shaft made of thick wall pipe; helix with variable pitch
- tapered shaft; helix with constant pitch

The selection of helix form is aimed at obtaining a loosen consistency of a conveyed material.
Belt conveyors are used to convey slag, ash, fine coal and other bulk materials.

Parameters:
- Belt width $B_t$ - from 400 to 1400 mm,
- Belt length $L$ - from 5 to 300 m,
- Capacity $G$ - from 10 to 700 m³/h

Main customers of belt conveyors are leading companies active in commercial thermal and electric power sector.

Technical Description
The conveyor route is made of steel sections. Drive pulley rests upon antifriction bearings. The pulley is provided with rubber lining to prevent belt slippage. Additional slippage prevention measure is a directional pulley installed near the drive and reversing pulleys.

Self-adjusting roller sets are used to control the run of rubber belt in the conveyor.

Gearmotors mounted directly on the drive pulleys are used to drive the conveyors. Thanks to this solution, additional gears between a drive unit and a shaft are not required.

A plough and a scraper mounted at the drive and directional pulley, respectively are used to clean the conveyor belt from outside. Main plough is provided with replaceable pushing plates made of sintered carbides. An inner plough is provided to clean the belt from inside and to prevent passing of conveyed material to the surface of reversing pulley.

Conveyor belt is tensioned by adjustable screw mechanism, or, for longer conveyors, by counterweight system. Each conveyor is provided with emergency stop cable switches and rotation sensors.
Steel structures

- Large size panel formwork systems for construction applications
- Steel structures (including absorbers, silos, support structures, and flue gas ducts)
- Large size steel structures

Steel structures

We fabricate steel structures in our own manufacturing site equipped with the technologically advanced machine pool. The whole manufacturing process and associated processes are supervised by the production management system integrated with the welding and quality control systems. All management systems used by our company have been certified according to various standards, including PN-EN ISO: 9001, 14001, 18001, PN-EN ISO: 3834-2, PN-EN1090-2 for EXC2 class.
We offer steel structures for:

- thermal and electric power plants,
- chemical and crude oil/gas processing,
- wood processing,
- dedusting and desulfurization plants; waste incineration facilities,
- manufacturing and storage bays,

Our offer comprises also:

- silos, hoppers, tanks, aeration runners,
- steel air and flue gas ducts and channels for process equipment of rectangular and round sections,
- steel structures of heat exchangers, reactors, scrubbers, and absorbers,
- steel structures of scraper conveyors and other bulk material conveyance equipment
- steel structures of machines and equipment,
- support structures of the plants and pipelines,
- stairs, barriers, ladders and working platforms,
- fittings, diffusers, confusors, and steel compensators,

The Customers, who orders steel structures will receive the top quality products and our technical support. ZUK Staporków may fabricate steel structures either based on the engineering documentation provided by the Customer or on its own engineering designs prepared by experienced engineers and designers.

Engineering designs are made according to the PN or EN standards or EUROCODES. We use the IT tools such as SOLIDWorks, INVENTOR and AUTOcad to design:

Steel structures are made of constructional steels for general applications and special steels (e.g. stainless, heat and acid resistant steels, etc.). They are fabricated according to the standards: EN 1090-1-2, NS 3464, BSK 07, DIN 18800-7, DIN 15018, DS 804, DIN 19704 and AWS D1.1.

**Machine pool and applicable technologies**

We use the most advanced machines and equipment to the production. Most of our machines is provided with CNC control and is PC-supported. CAM data created by us or supplied by the Customers are commonly used in CNC control of the machines and equipment.

- abrasive blasting of components and machines in a stationary cabin or in a continuous facility,
- torch cutting of steel sheets using TRULaser 3060 laser cutter, CNC plasma cutter and CNC ESAB gas-plasma cutter,
- torch cutting of shapes from steel profiles,
- cutting of steel profiles using band and circular saws,
- cutting of sheets and profiles using guillotines,
- bore drilling in profiles and sheets,
- opening cutting in profiles, sheets and strips,
- bending and straightening of material on vertical bending brakes,
- straightening of sheets (thickness: up-to 20 mm),
- material processing in presses,
- machining of workpieces in the advanced, horizontal milling centre: milling table feed-in distance: X-4100, Y-1830, Z-1070, table load: up-to 2 tons,
- welding methods: 111, 131, 135, 141, 783 for material groups: 1.1, 1.2, 1.3, 1.4, 5, 6 and 8.1.
- production process is supervised in accordance with the
Corrosion protection

ZUK Stąporków offers the following services:

- shot blasting to class SA 2.5 according to PN-EN ISO 8501-1,
- hydrodynamic painting according to PN-EN ISO 12944,
- spray metallic coating according to PN-EN ISO 2063,
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