

PRONAR INCREASES SALES ON ALL CONTINENTS

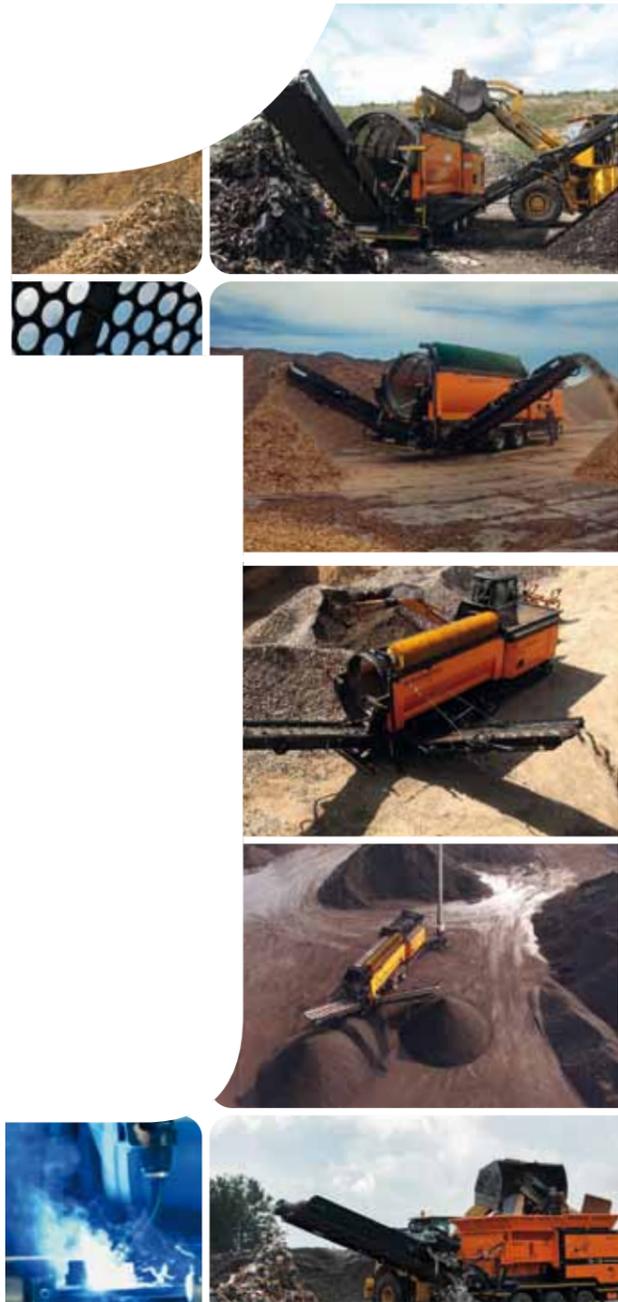
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OF RECYCLING MACHINERY
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AHEAD OF OUR COMPETITORS!

pronar-recycling.com

An advanced agrarian and organisational culture ensures high crops, but for stable development farms need fulfilment of their specific needs regarding modern agricultural machinery. Functional and reliable state-of-the-art machinery is necessary when one wants to run an advanced farm. Therefore Pronar improves its products on a continuous basis by introducing successive innovative solutions. Let's not forget a good offer also involves attractive pricing. On that account, Pronar's agricultural machines meet with very positive reception in many countries.

We perceive the importance of environmental protection for the modern world. It is a matter of huge interest for both EU citizens and countries/institutions. Pronar has years of experience in manufacturing mobile recycling machinery such as trommel screens or shredders. They help protect nature e.g. by reclaim degraded post-industrial land, prepare horticultural substrates, shred and segregate waste electrical equipment, furniture or construction waste and obtain material from segregation for energy generation.

With civilisational development, we pay every greater attention to the cleanliness and visual aspects of our surroundings. Pronar's products come in handy here as well e.g. sweepers, which allow for the installation of different mounting systems and work with many carrying vehicles (e.g. tractors, forklift trucks, trucks), so they may be used all year round. In the spring they clean roads after winter maintenance; in the summer they help maintain the cleanliness in housing estates or construction sites; in the autumn they collect leaves and in winter they sweep snow and spread sand to make roads or pavements less slippery.

Other municipal machines by Pronar do great work in the maintenance of both infrastructure (spreaders, snow ploughs, snow blowers, containers) and road shoulders plus grasslands (multifunction arms with a wide range of working heads).

We are aware of the high technological and quality requirements in many markets. The growing sales of our products shows, however, we can meet them.



Sergiusz Martyniuk
Chairman of the Board, Pronar

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NEWS

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PRONAR



New plant opens in Siemiatycze

WE KEEP UP OUR PACE

Pronar concluded last year on December 30th with an opening ceremony of a new production hall in Siemiatycze (Podlasie Province, North-eastern Poland). 2017 started with the opening of new production halls at the Narewka plant (see pages 8 - 9).

On December 30th, 2016, Pronar's new production hall opened in Siemiatycze. The opening ceremony was combined with the New Year's event attended by Pronar employees and the Management Board. The representatives of the government, local authorities, clergy and journalists from all over Poland attended the ceremony. Over 2,000 people gathered in the newly-built second production hall in Pronar's Siemiatycze plant.

Sergiusz Martyniuk, Pronar's President of the Board opened the official ceremony with a speech.

The President emphasised the importance of expanding the Siemiatycze plant and its positive impact on the company and the entire region. He indicated that the company would introduce modern and innovative solutions for manufacturing agricultural, municipal and recycling machines. Further, he pointed out the significant role of the state in the operation of large companies and their support and promotion in international markets.

The President summarised the year 2016 and set strategic goals for

the next year, repeatedly stressing that Pronar's success depends on team work, hence the great concern for its employees, their continued education and assurance of the best working conditions possible. He underlined that Pronar with its own Research and Development Centre, seven plants fitted with modern machinery, innovative products and a landing pad is on course to become an attractive company to do business with.

After Mr Martyniuk's speech, Krzysztof Jurgiel, Minister of Agriculture and Rural Development,

and Bohdan Paszkowski, governor of the Podlasie Province awarded gold, silver and bronze Medals for Long Service to employees who had performed their professional duties faithfully and conscientiously. "Order of Merit for Agriculture" honorary badges were presented by Sergiusz Martyniuk, President of the Board, Krzysztof Jurgiel, Minister of Agriculture and Rural Development, and Jerzy Leszczyński, Marshal of Podlasie Province. Further, representatives of Pronar Management Board presented employees with Pronar Golden Badges.

Jerzy Leszczyński congratulated everyone on the opening of the production hall and creation of many new jobs. The expanded plant will see its workforce increased from 170 employees to around 250.

Edyta Dworzańczyk

The Author is the Marketing Department
Manager at Pronar





Expansion of the plant in Narewka

DEPUTY PRIME MINISTER ASTONISHED BY THE SCALE

An opening ceremony of an expanded plant in Narewka (Podlasie Province, northeastern Poland) was held in March. It had its floor space increased from 16 thousand to 27 thousand m².

The symbolic opening of the new shop was performed by: Jarosław Gowin - Deputy Prime Minister, also holding the position of the Minister of Science and Higher Education, Jerzy Leszczyński - Marshal of Podlasie Province, Bohdan Paszkowski - Governor of the Podlasie Province, Mirosław Romaniuk - Starost of Hajnówka and Martyniuk - Chairman of the Board of Owners of Pronar. The ceremony in Narewka was also attended by such

guests as: representatives of the clergy, uniformed services, regional media, officials from local authorities and the plant's workers.

The Deputy Prime Minister Jarosław Gowin, who had visited Pronar for the first time, emphasised he was astonished by the scale of the investment and also of the entire enterprise. - I would like to express my admiration for what you have done - said the Deputy Prime Minister Gowin. - My deepest

respect goes firstly to the president of the company, Mr Sergiusz Martyniuk, because such a grand undertaking would not have been created without a charismatic leader, a person who devotes all his free time to this enterprise, a person with a vision. And this company was born out of a vision. But no matter how charismatic the leader is, he would not make it without an excellent team and you all do form such a team.

The Chairman Sergiusz Martyniuk indicated the expansion of the Narewka plant was an undertaking initiated by the plant's management. - The management of this plant insisted on building this shop and here it is - said the Chairman Martyniuk. - During my visits to Narewka I saw the working conditions weren't the best and our capabilities let us change it. Therefore we decided to make this investment.

The Chairman Martyniuk also emphasised the new shop was built by the Pronar's staff. - You have done it - he said.

The plant extension allowed for a wider range of products manufactured. The production of three models of hook trailers has already been moved to Narewka. The new shops will allow for the assembly of each type of trailer to be separated, which will ensure even faster fulfilment of orders.

Further, the plant expansion



created new jobs for the inhabitants of Narewka and its surroundings. Approximately 200 people used to work in the plant and the completed investment has enabled the employment of 50 people more. The next stage in Pronar's development

strategy will be to open a new plant in Hajnówka (odlasie Province).

Helena Landowska
The Author is a Marketing Expert,
Pronar



Pronar exports over 80% of its production

SPECTACULAR GROWTH IN EXPORTS

PRONAR brand and products gain recognition all over the world. More than 80% of the production is sold abroad. Pronar operates a well-prepared export strategy. Deep market insight, following of trends, investment in state-of-the-art technology and quick response to changes lead to successful sales even on very exotic and difficult-to-get markets.

Pronar exports its products to many countries around the world. Outside Europe, it is also present in more remote countries such as the Americas (USA, Argentina and Uruguay), New Zealand and many others. Pronar is well positioned to swiftly respond to changes on each market, because it is hardly dependant on third-

party suppliers — third-party components account for less than 10% of production. We have no major issues with approvals or registration procedures in the countries we export to.

Last year Pronar had a nearly 50% share in the sales of some trailer categories in many countries. In the Benelux countries

(Belgium, the Netherlands and Luxembourg), Pronar increased its trailer sales by 100% within a year. In 2016 Pronar extended its range of hook lift trailers with the T286 and T386 models. Pronar forecasts these trailer will enjoy a further increase in sales in the coming years.

In 2016, Pronar's share in



7 FACTORIES



MORE THAN
2000 EMPLOYEES



AREA OF PLANTS
= 80 FOOTBALL PITCHES

the trailer market in Hungary amounted to 22% and 11% in Bulgaria. (this places Pronar second in Bulgaria, just after a local brand). With 20% market share, Pronar comes first in the registration of new trailers in Slovakia. In Romania, Pronar trailer sales rose by 21% last year. The German market, where Pronar has been triumphant for quite some time now, we recorded an increase by 28%. The PRONAR T046 and PRONAR T046/1 livestock trailers are unrivalled in southern Austria. In 2016 sales of these trailers in Austria rose by 60%.

In 2016, one of the largest agricultural machine dealers in Switzerland established exclusive cooperation with Pronar. This resulted in the successful launch of new products on the Swiss market, including push trailers (not sold there before), bale trailers with hydraulically raised sidewalls, the T286 hook lift trailer and the T700XL monocoque trailer. The



PL

100% POLISH
PRODUCTS



INNOVATIVE
SOLUTIONS



WORLDWIDE
DISTRIBUTION NETWORK

deal also boosted sales of livestock trailers (once adapted to comply with the Swiss regulations).

Despite the Brexit vote and unstable GBP rate — there was a 15% increase in the sales of Pronar products in the UK as compared to 2015. In 2016 Pronar successfully launched a number of new products in the UK and Ireland. These included a series of forage machines, livestock trailers, hook lift trailers and the new series of NV manure spreaders, the T700XL trailer and T679/3 and T679/4 gravel trailers.

Forage machines were successfully launched in Latin America and sales are splendid in Uruguay and Argentina. The sales of front loader accessories had a very good start in the Benelux countries.

In line with global trends, Pronar is increasing its sale of municipal and recycling machinery in more countries. Pronar has gained a large share of the municipal

machinery market in Sweden, Benelux and Germany. In the past Pronar had a solid debut in the Americas as well as in Italy and Greece. In the first quarter of 2017 Pronar recorded a 50% increase in the sales of municipal and recycling machinery in Benelux (as compared to the first quarter of 2016). On other markets where Pronar has been present for a relatively short time, the company is just as successful boasting an annual sales increase of several hundred percent.

With excellent strategy and well trained staff to implement it, all international markets are now within Pronar's reach. The company is well positioned to take advantage of all these opportunities.

Helena Landowska
The Author is a Marketing Expert,
Pronar

Why Pronar products sell well?

THE SECRET OF SUCCESS

What are the factors that affect the growing sales of Pronar products? What is the recipe for a good product, which promotes itself? Many PRONAR customers praise the quality of our products.. This does not happen by chance. Pronar takes special care to ensure that every customer can use its products as long as possible.



Top quality steel

Pronar's products are made of up to 90% of steel. Therefore Pronar uses the highest quality steel. It is thus very important to secure adequate stock level. In order to guarantee consistently high product quality, Pronar collaborates with many renowned EU steelworks and all the products they supply are accompanied by quality certificates. Through many years of cooperation with suppliers, a special grade of steel has been developed for Pronar.

It is used for machine construction and enables Pronar to compete with the largest global manufacturers.

Short lead times

Short lead time is one of Pronar's greatest strengths. Thanks to this Pronar can be more competitive and achieve ever better sales. Short lead times can be offered to customers thanks to a modern warehouse with an area of 10,000 m², where steel is stored to be delivered later to each of the seven

factories. Pronar manufactures many components used in the final product, which reduces lead time even further. These components include axles, wheels, suspension systems, hydraulic cylinders, wall profiles, plastic fittings, disk wheels and bevel gears. Pronar is in full control of its production process and advances it by delivery times from third-parties. By producing its own components, Pronar is able to use custom specification and reduce costs.

Closed profiles

Pronar designers have made sure that every product has a solid construction. Frames of many trailer models are made from closed rectangular profiles that can withstand much higher loads than open profiles. Construction made of closed rectangular profiles is safer. Trailers manufactured with these profiles can be used safely for many years without the risk of bending by transported loads.

Series production

Thanks to high consistency and production repeatability, the customer will always receive a product with the same dimensions and the same high quality. The repeatability of the products also contributes to reducing production errors almost to zero. Specific tooling and instrumentation is

assigned to every larger component manufactured by Pronar to ensure the same high quality every time.

Paint coating

It goes without saying that all customers wish to use their trailers for many years without any corrosion. To achieve this Pronar uses a coating system that ensures high corrosion resistance based on chemically bonded, two-component paints that provide a highly durable protective coat. Painting is a high precision process. Every stage has an impact on the life of resultant paintwork.

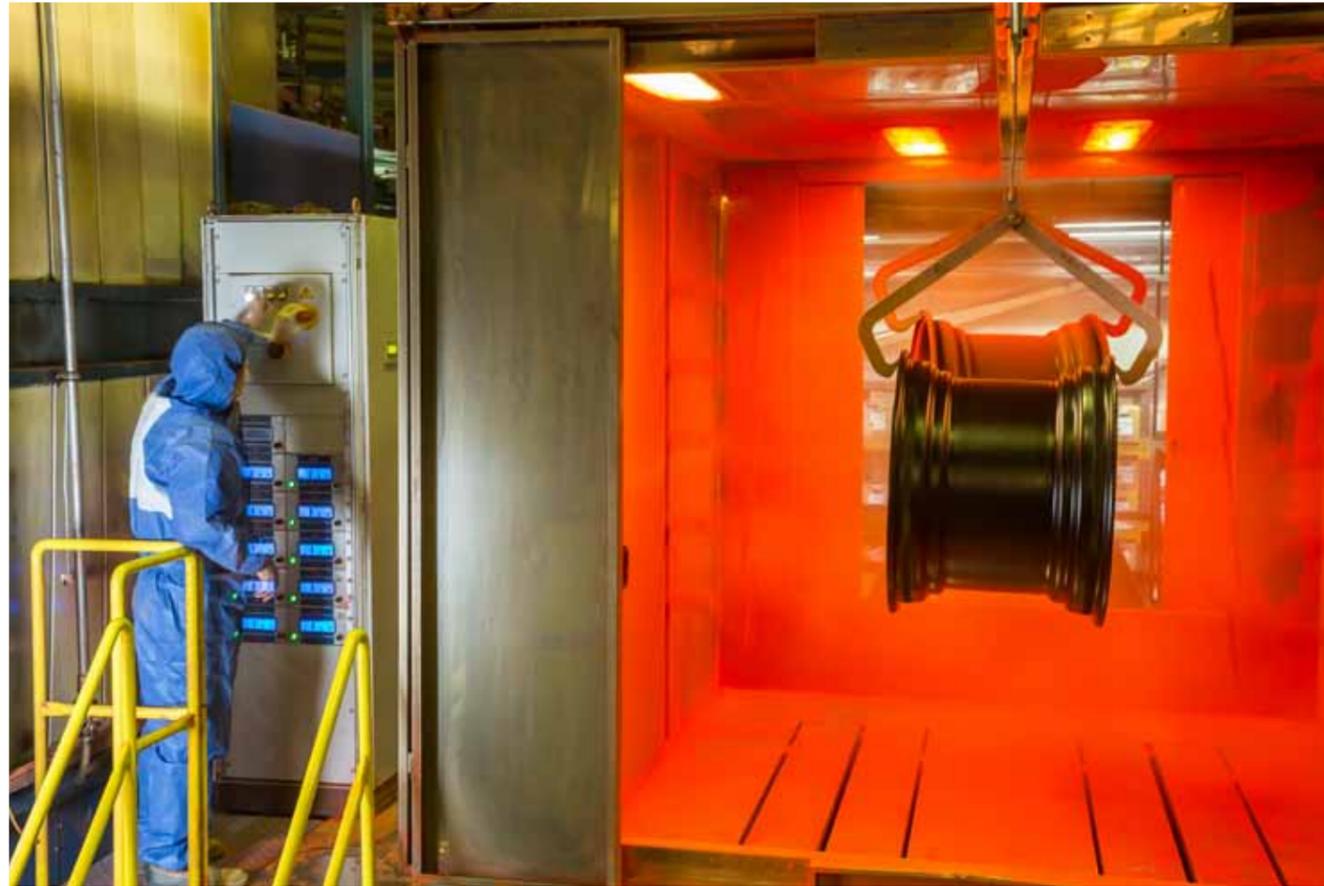
It is essential to thoroughly clean components prior to painting. This removes all dust and particles that adhere during welding. To remove these particles more easily, steel components are covered with a special greasy substance, which

must be washed off completely. Already cleaned components are then moved to a furnace to dry. The drying process is followed by application of paint coat and the painted components are dried again. Controlled heating of the paint layer is essential. Otherwise, micro blisters could form that expose the coating to penetration by humidity and sunlight, and this can lead to poor adhesion to steel and flaking. After final product assembly, rolling wax is also applied to protect the hardest-to-reach places and micro gaps against corrosion.

Professional after-sales service

At Pronar we manufacture an extremely large number of components and simple items of equipment but we also make





machines that require advanced machinery and innovative technologies. Pronar's after-sale service is given as much attention as production and sales. This is why Pronar only works with dealers who have adequate facilities, extensive market experience and trained staff with a high level of interpersonal skills. These are the only companies that may provide after-sales and post-warranty service for the most complex products. During the growing season, every minute counts. Pronar machine operators can feel secure with local dealers who can efficiently make repairs and provide service.

Katarzyna Prusinowska
The Author is Export Sales Specialist
at Pronar

PRONAR TROMMEL SCREEN IN LAS VEGAS

Last March, the PRONAR MPB 20.55g trommel screen was shown at a prestigious Conexpo CON/AGG 2017 exhibition at the Las Vegas Convention Center, USA.

Held every three years, the trade show is considered to be the world's most important for companies engaged in road maintenance, construction, recycling and mining. This year's show was attended by over 2,800 exhibitors. The number of visitors from over 150 countries exceeded 128,000. The trade show was accompanied by over 150 conferences and discussion panels on the state-of-the-art recycling technologies used in 200 product types.

In addition to the latest models of excavators, cranes or loaders, an important part of the exhibition were crushers, shredders and trommel screens that are critical for the construction and recycling industry. In the trommel screen

category, Pronar presented its latest MPB 20.55g model, which was recognised for its modern and solid design, simple maintenance, track undercarriage and remote controls.

The machine was exhibited at Pronar's US partner booth and it

drew the attention of numerous visitors, industry experts and the media. Right after the show our trommel screen was taken into service by a company that provides soil screening and sorting services.

(bt)



2017 RECYCLING AKTIV TRADE FAIR IN KARLSRUHE

At the end of April, the Recycling Aktiv Trade Fair was held in Karlsruhe, Germany, for the fifth time. The exhibition brought together leading recycling machinery manufacturers and distributors from Germany and many other countries.

Pronar's German business partner showcased one of the most popular trommel screen models on the market, namely the PRONAR MPB 20.55, and the PRONAR MRW 2.85g, the new tracked slow-speed shredder model. Through the use of modern technical solutions, Pronar machines ensure high performance and operator comfort.

Both the design and robust construction combined with an affordable price attracted a wide group of prospective customers to the booth of German Pronar dealer. The fair resulted in new sales contracts for MPB series mobile trommel screens and numerous contacts with customers interested in buying the MRW 2.85g shredder.



(jc)



2017 ROSKILDE DYRSKUE TRADE FAIR IN DENMARK

At the end of May, the 2017 Roskilde Dyrskue agricultural machinery fair was held in Roskilde, Denmark, starting the cycle of summer trade fairs in the country. Roskilde Dyrskue is one of the largest events of this type in Denmark. It was attended by industry-leading distributors and manufacturers of agricultural equipment.

Within three days the exhibition was visited by over 87,000 people. As every year, visitors included many professionals involved with the agricultural and municipal machinery.

This year's event was special, because it was the first time Pronar had shown forage harvesting machines on the Danish market, thus extending its product range and providing even more options. The T028ML bale trailer with hydraulically controlled walls and 12.5 m platform, attracted the most interest. Similarly to the other Pronar machines, it soon found a new owner.

Pronar was represented by its Danish business partners. However, Pronar specialists also assisted trade fair visitors. The machines displayed at four booths included ploughs (PUV4000HD, PUV1600), winter road maintenance spreaders (EPT-15, KCT07), trailers (T286, T386, T679/3, T028ML, T700XL), forage harvesting equipment (rakes: ZKP 350 and ZKP 420; tedders: PWP530, PWP770 and the PDT300 rear-mounted disc mower.

Pronar products showed at the fair are aimed at customers from many sectors of the economy. This improves Pronar's position on the Danish market. All our machines drew a lot of interest. We were rewarded with numerous orders and many inquiries from the visitors.

(wp)



TRADE FAIRS IN ARGENTINA AND URUGUAY

The PRONAR brand is increasingly recognised in the South American markets thanks to our frequent attendance at expert meetings and trade fairs. This year Pronar participated in events in Argentina and Uruguay.

Expoagrom, one of the largest fairs in Argentina, was held in March near Rosario (eastern Argentina, the province of Santa Fe). It showcased modern livestock farming methods and latest machinery, including Pronar forage machinery. Our machines received a lot of positive feedback. Fair participants paid special attention to the quality of workmanship and modern technical solutions.

Argentina is a large country spread across three climatic zones, therefore its farms need extremely diversified machines to operate. Based on feedback, Pronar machines

have proven their great value. Pronar range is so diversified that it satisfies farmers from provinces with extreme climatic conditions as the severe and windy Patagonia and the tropical Entre Rios.

Another event where Pronar machines were shown, was the Expoactiva fair held in the neighbouring Uruguay last March. During this year's edition there were many new arrivals and novelties presented, which attracted international visitors to see Pronar exposition. Just like last year's fair, the most innovative trailers shown were those made by Pronar —

T663/2 with tandem suspension and the T653/2 double axle.

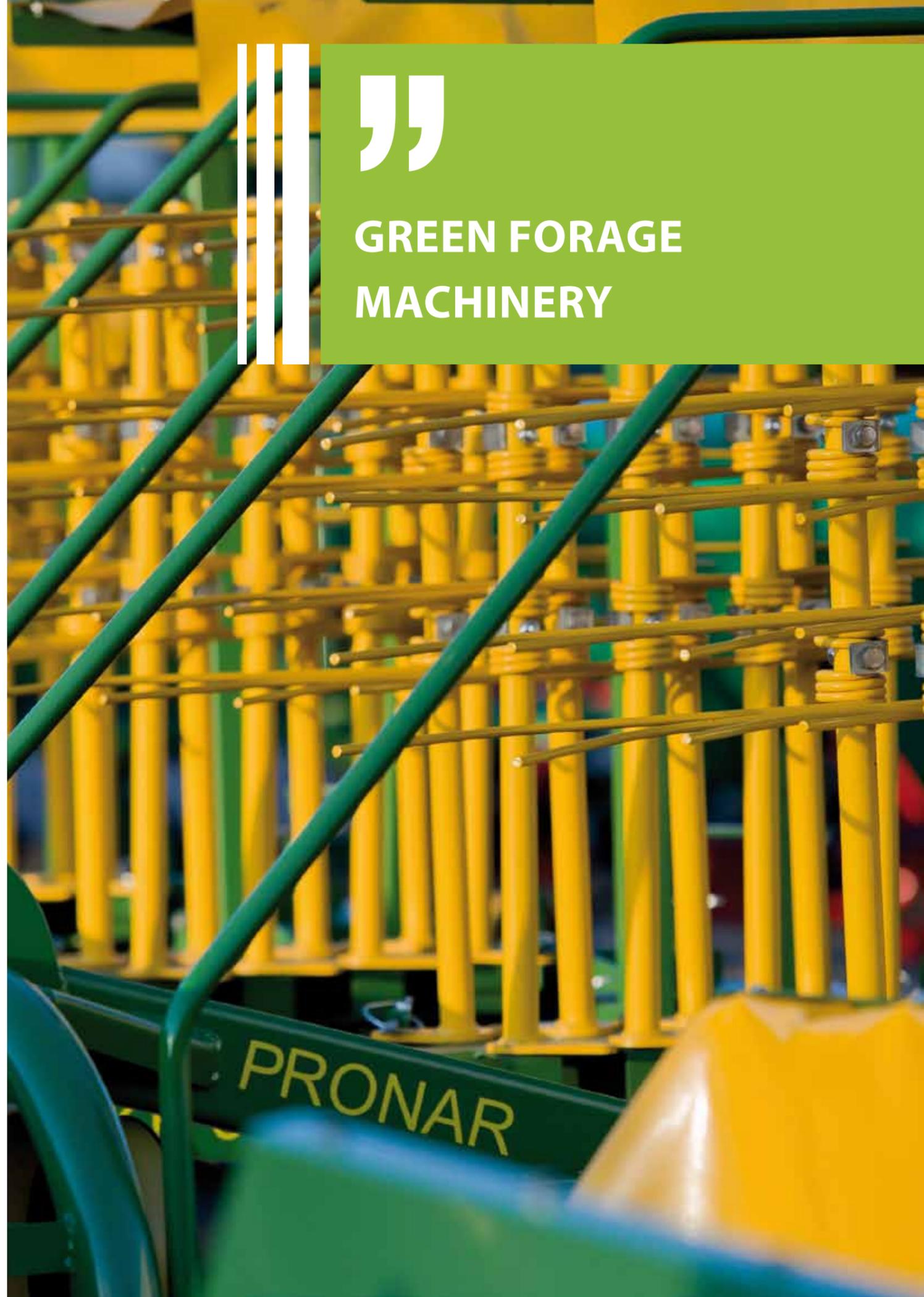
Forage machines — mowers, a rake and wrapper — drew a lot of attention. Our informative brochures handed out to visitors presented Pronar's production capabilities, investment momentum, extensive range of components and equipment as well as the multitude of offered machines. Pronar's potential to build the most advanced machines was appreciated by local manufacturers. In the corridors they commented on Pronar's growing strength on the Uruguay market.

(ac)



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GREEN FORAGE MACHINERY



A full line of agricultural machines for forage harvesting and management

ALL OF THIS FROM A SINGLE MANUFACTURER

Pronar is a leading Polish manufacturer of a complete range of machines for forage harvesting and management. The machines available from Pronar include: fertiliser spreaders, mowers, tedders, rakes, round balers and wrappers. With these fine machines you will be able to comprehensively manage grassland areas by mowing, proper drying, raking, baling, and ultimately wrapping the dense bales in film. The range of Pronar agricultural machines is complete with bale transport trailers and feeder wagons.

Well designed, functional spreaders for granular or loose fertiliser will enable you to make the most of your crop growth potential. Pronar manufactures single and double disc fertilizer spreaders. Spreaders can be hitched to most tractors equipped with a three-point linkage. They are easy to operate, durable, corrosion-resistant and provide convenient access to the fertiliser dose control lever (at the operator station).

Pronar manufactures two single-disk spreader models: FD1-M03L (weight: 42 kg) with a capacity of 250 l (325 kg) and FD1-M03L (weight: 52 kg) with a capacity of 500 l (650 kg). Pronar also makes a double-disc spreader FD2-M10 (weight: 170 kg) with a capacity of 1000 l (1300 kg).

The disc mowers manufactured by Pronar include both rear-mounted machines (PDK220, PDT260, PDT260C, PDT300, PDT300C and PDT340) and front-mounted machines (PDF300, PDF300C, PDF390) as well as rear-mounted double mower combinations (PDD830, PDD830C). The PDT and PDD mowers feature central suspension to ensure precise ground following, clean cut and optimum cutting height. Another advantage of these mowers is that cutterbar ground pressure can be adjusted to match the type of soil

— from soft peat to hard and dry soils. This is enabled by the stay spring adjustment system. Highly adjustable tilt angle (-16° to $+11^\circ$) helps operate the mowers in rough terrain.

The PRONAR PDT260C, PDT300C and PDD830C mowers are fitted with a swath conditioner, which breaks the mown stalks and also removes the layer of wax, which effectively accelerates the drying process.

The PRONAR PDF300, PDF300C and PRONAR PDF390 front-mounted mowers are manufactured using the latest technology and high quality materials. These mowers are very functional high performance, modern machines. They are characterized by modern design and compact, sturdy, yet lightweight construction with highly flexible ground following (-6° to $+7^\circ$).

The PDD830 and PDD830C mowers stand out with their widest working width in Pronar's range. They are an excellent investment for farmers with large areas of grassland. The PRONAR PDD830 features two cutting units (each with a working width of 3 m) attached to a single frame. The cutting width of 8.3 m is obtained in combination with a 3 m front-mounted mower. For transport, the combination mower is folded with a hydraulic system — the rear cutting units are raised to

vertical position. A hydraulic safety device protects the mowing unit against damage from collision with obstacles — the cutting unit is lifted and tiled back.

Tedders are another component of our forage management lineup. Pronar manufactures three models:

- PRONAR PWP 460 (weight: 600 kg) - four rotors, working width of 4.6 m and power demand from 30 hp (22 kW);
- PRONAR PWP530 (weight: 685 kg) - — four rotors, working width of 5.3 m and power demand from 30 hp (22 kW);
- PRONAR PWP770 (weight: 915 kg) - six rotors, working width of 7.7 m and power demand from 60 hp (44 kW).

All Pronar tedders offer high reliability and operating efficiency.

Rotary rakes are another group of forage harvesting machines. Pronar manufactures single and twin rotor rates. Single rotor rakes include:

- PRONAR ZKP300 (weight: 285 kg) equipped with eight arms and total working width of 3 m. There are three double raking tines installed on each arm. The rake is mounted on a rigid axle system equipped with two pneumatic tyres. It



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Juha Salin (a farmer near Virrat in the Pirkanmaa region, Finland).

My adventure with the PRONAR brand began last year when I purchased the T700XL monocoque trailer. Having seen the quality of workmanship and its modern design — so different from the straight and angular trailers typical for the Finnish market — I decided to buy it together with wall extensions for transporting grass and wood chips. Shortly after that my old mower broke down at a crucial moment — during the first pass. I went to Pronar dealer in Virrat the very same day. Thanks to their really competitive pricing I bought the PRONAR PDF300C front-mounted mower and the PDT300C rear-mounted mower, both equipped with swath conditioners. I am really happy with how efficient and simple to operate they are. These machines are all I need for my farm. I also ordered the ZKP460, a medium-size rotary rake and I am currently waiting for delivery. I some plans for future investment and I will definitely go with PRONAR.

is designed for tractors with power of 20 hp (15 kW) or more.

- The PRONAR ZKP350 (weight: 315 kg) equipped with nine arms with a working width of 3.5 m. The rake is mounted on a rigid axle system equipped with two pneumatic tyres. It is designed for tractors with power of 25 hp (19 kW) or more.
- The PRONAR ZKP420 (weight 500 kg) has eleven arms and a working width of 4.2 m. There are four double raking tines installed on each arm. The rake uses active suspension with a moving head (to improve manoeuvrability and ground following) and two

shock absorbers to increase operator comfort. Its axle system is equipped with four pneumatic tyre wheels in tandem arrangement. The rake is designed for tractors with power of 30 hp (22 kW) or more.

- The PRONAR ZKP460T (weight: 680 kg) is a rake hitched up with a folding drawbar. A hydraulic system raises or lowers the machine to a pre-set depth. It has twelve arms and a working width of 4.6 m. There are four double raking tines installed on each arm. Its axle system is equipped with four pneumatic tyre wheels in tandem arrangement. The rake is designed for tractors with power of 30 hp (22 kW) or more.



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Jesse Myllykoski (a farmer from Jyväskylä region in Central Finland).

I came across the Pronar brand for the first time at a fair in Finland, in 2014. I took some interest in the brand then. I assessed my options and needs and the choice became very simple. The key arguments were the high quality and high performance of Pronar machines combined with attractive pricing. Last year I purchased a number of forage machines including the PDF300 double wing front-mounted mower, the PDD830 double wing rear-mounted mower and the PWP770 tedder. This is an ideal combination for my farm. The machines are easy to operate and don't require much servicing before or after the season. This means less time required to maintain the machines in running condition. I try to visit the PRONAR importer every now and then to share experiences and find out about new machines and solutions available. In the future I'm going to bet on Pronar machines, because I appreciate their high quality. I'm also thinking of replacing my old rake with PRONAR ZKP800.





The twin rotor rake model:

- The PRONAR ZKP800 (weight: 1940 kg) is an excellent and efficient machine with a simple, reliable design. It can be used with most commercially available tractors. The ZKP800 hydraulically adjustable rake with a manually lockable working width of 7 to 8 m offers productivity of up to 7 ha/h. Depending on user adjustments, the swath width can vary from 0.9 to 1.9 m. A turntable hitch ensures that the rake follows the tractor perfectly. Rear turntable drawbar improves manoeuvrability. The tandem axle system of the rotors allows for perfect ground following. Self aligning rotor suspension enables longitudinal and lateral ground following to improve raking performance.

The HSM PRONAR Z500K round baler is definitely among the machines indispensable for the proper forage preparation. It is a modern, high performance, chain driven fixed chamber baler, providing highly compacted cylindrical bales. It is designed to harvest straw, hay and green forage mass. The double-twine wrapping system reduces the wrapping time and prevents bale unwrapping. The net wrapping system is optional equipment. The use of elastomer springs in the mechanical tailgate locking system guarantees high bale density, which is important for silage quality.

Pronar also offers THE Z500R round baler with a rotor to pre-shred the green forage mass. The use of the rotor greatly improved bale density and compactness, thus reducing ingress of air into silage. The baler design employs a new type of grass pickup with a greater working width of 2200 mm to ensure high machine

performance.

Once grass or hay is baled, bales must be wrapped to obtain the desired silage fermentation level. The PRONAR Z245 and PRONAR Z245/1 self-loading bale wrappers are perfect for the job. With hydraulic control systems, they are easy to operate. Automated loading and unloading reduce the time to the next wrapping cycle. Thanks to the film cutting system the wrapping process eliminates the need for the operator to leave the tractor cab. Due to these advances the Z245 and Z245/1 bale wrappers require little labour, few machines and operators thus help save time and money. The PRONAR Z245 bale wrapper can be equipped with electric controls to improve operator comfort.

Wojciech Parfieniuk
The Author is Export Sales
Specialist at Pronar

Front loader attachments

COMPACT, YET EXCEPTIONALLY USEFUL

With the right selection of attachments, you can easily maintain the cleanliness of farm buildings, handle straw, hay or silage, pick up stones in the field, scoop manure into heaps and load it onto a manure spreader, load fertilisers into fertiliser spreaders and crops onto trailers. To make all these operations easy, Pronar offers silage cutters, manure forks, pallet forks, a range of buckets, bale cutters and big-bag slings.

Grapple buckets (CHC15, CHC15E, CHC18, CHC18E, CHC20, CHC20E) are used for handling loose material (e.g. grain, gravel), bulk material (sawdust, rubbish) or loosely bound material (manure, silage) from storage locations onto vehicles or to move these materials within the

farm. Steel mesh can be used to make sure materials do not spill. Pronar offers the attachments with various capacities and widths: 1.5 to 2 m for the EURO carrier or for a front loader.

Loose material bucket is tight and features a strong blade. The bucket is made of abrasion-resistant steel

sheet. The bucket makes it very easy to handle earth, sand, fertilisers and grain. Buckets with the following capacities are available: 0.32; 0.6; 0.7 and 0.8 m³

The root crops bucket (COK20) for easy handling of crops such as potatoes, beetroots or other root crops. The openwork design of the



bucket allows the soil to fall through, while blunt edges prevent damage to the load. The bucket's inner walls are reinforced to enhance durability.

The bulk material buckets (CV24, CV24E, CV24S) are indispensable for loading and/or handling bulk materials. Pronar designers recommend the bulk material bucket for loading loose snow, grain, fertilisers, sawdust and wood chips. Bucket components subject to abrasion are made of high-strength abrasion resistant steel. The three available bucket models differ in how they are installed on the carrier.

The multi-purpose bucket (CW-18E), as its name suggests, can be used for a variety of tasks. It will do great in transporting materials over short distances and will perform reliably when landscaping, levelling,

cutting or snow removal.

Bale grapples (35CB, 35CB1, 35CB2, 168CB, 168CBE, 168CBS) allow for efficient transport of wrapped or unwrapped bales over short distances. The round arms of the bale grapple do not damage film. They smoothly slide and hydraulically clamp around the bale to ensure a firm grip.

New to Pronar's offering is the bale cutter (PB-1,5 EW), which is very useful for handling haylage or straw bales. You can easily transport bales to barns where forage is prepared and cut netwrap or film around the bales. The bale cutter is a reliable attachment for loading bales onto forage wagons. It can be easily used to hold netwrap or film.

Log forks (CK, CKE) are indispensable in forestry and sawmills.

Thanks to innovative design they are quick and easy to install. An arm driven by a hydraulic cylinder presses the log against the fork preventing it from sliding out during handling.

Manure grabs (CO12E, 35CO, 35CO1, 35CO2, 35CO3, 35CO4, 35CO5) are very useful tools on every farm. Manure grabs are fitted with a grabbing system resembling crocodile jaws. Sharp spikes sink into the manure and prevent it from dropping during handling. If any spike is damaged, it can be quickly replaced. This is made possible by the attachment method, i.e. the spikes are screwed in.

You can use manure forks (35WO, 35WO1, 35WO2, 35WO3, WO-12E) to load not only manure but also compost and litter. Manure forks are indispensable tools for efficiently removing manure from barns and



cowsheds. Thanks to ingenious design and solid construction, Pronar manure forks are reliable and durable and safe to use.

Pallet forks (35WP, 35WP1, WP-25E) make everyday farm work much easier. Using pallet forks you can easily load or unload boxes and wood logs (with a suitable attachment). High quality of workmanship guarantees reliable and long service life.

Silage cutters (WK1.25, WK1.25E, WK1.25W, WK1.25EW, WK1.25SMS, WK1.25SMSW, WK1.5, WK1.5E, WK1.5W, WK1.5EW, WK1.5SMS). Once silage is ready as required, it is important to retrieve it without interfering with the heap structure. Pronar high quality silage cutters will save the day. Pronar will soon begin production of its latest cutter model with netwrap/film grabbing mechanism: WK-1,6 EW.



PRONAR big bag sling (ZB-10) makes it easy to transport and move animal feed as well as other materials packed in large bags. The sling is a versatile tool with a simple, robust and reliable design that can

be used not only in agriculture but also in the construction industry and production plants.

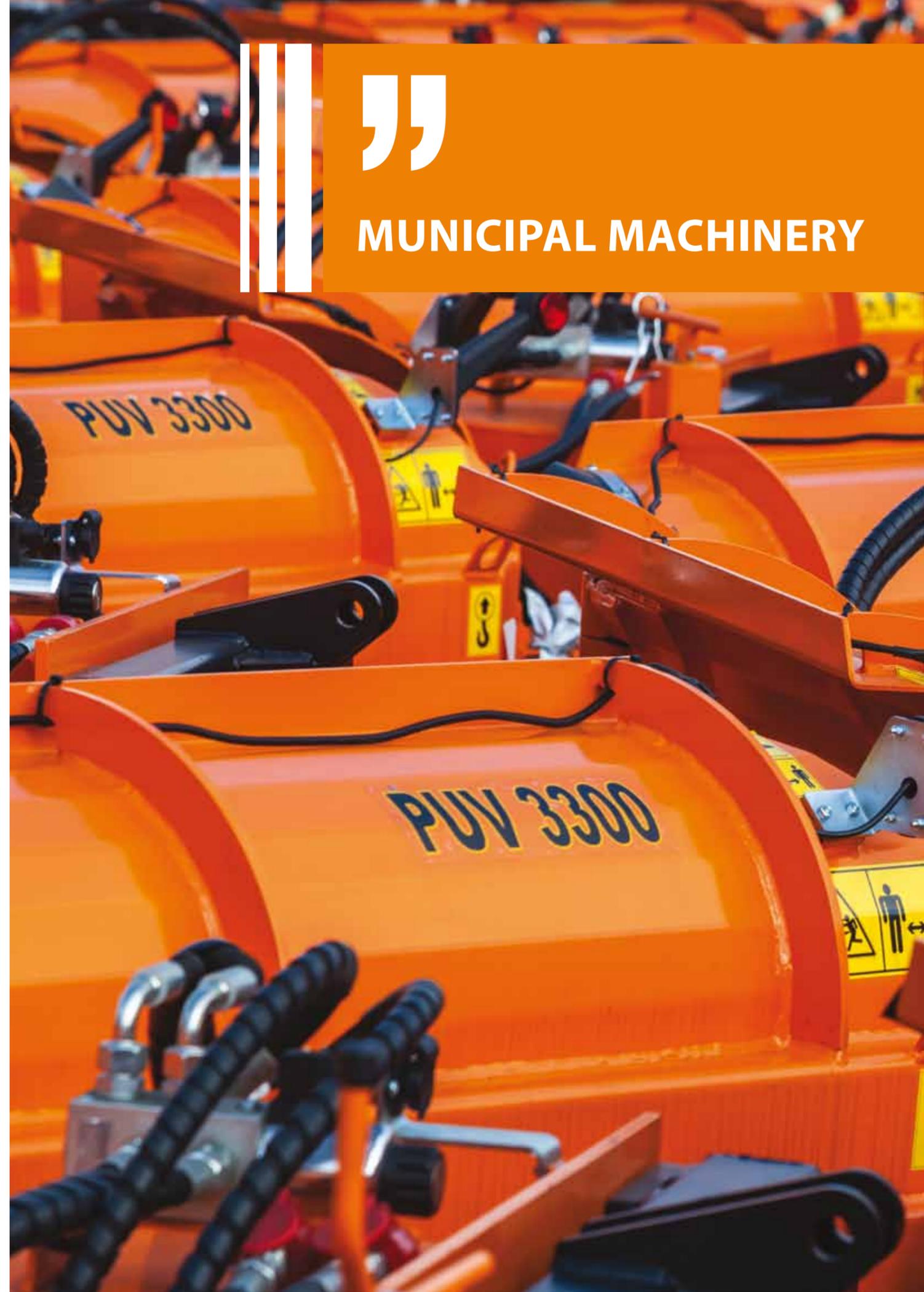
Iwona Grygoruk
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Pronar

COMPLETE PRODUCTION LINE FOR HAYMAKING,
STRAW HARVESTING, AND FEEDING



”

MUNICIPAL MACHINERY



Global market in waste recycling machinery

MORE COMPETITION WELCOME

Pronar's recycling machines are used in waste management (including energy generation), forestry and production of compost. They are available in Europe and in the US. Pronar strives to meet all its customers' needs and deliver its waste recycling machinery with the shortest lead time possible.

Here are some Fairs and exhibitions, where potential buyers can find out more about Pronar machines: IFAT (Germany), Pol-Eco-System (Poland), Ecomondo (Italy), Bio-Energie (France), USCC Compost and Conexpo CON/AGG (USA). During these fairs, Pronar specialists provide expert advice and help to identify benefits a buyer will get with the right configuration of options and accessories.

The market still lacks true competition, which can negatively affect the prices and choice available. Even though there are over 3000 manufacturers of such machines, few produce mobile trommel screens or mobile slow-speed shredders. Consultations, panel discussions, surveys and talks during trade fairs seem to suggest that trommel screen and shredder users would be welcome more choice.

What future buyers are most unhappy about is long delivery time (in excess of four months; for comparison, Pronar will deliver any of its recycling machines in half this time). Potential buyers point out poor innovation in the industry and are critical of the unsatisfactory value of the machines on the market and inadequate quality of service. Users typically complain about poor spare parts availability (increased



downtime) and insufficient number of competent service partners. This abnormal situation in waste-sorting and recycling machinery market does not motivate the manufacturers to improve the quality of their products, conduct adequate staff training or provide aftersales service.

The distribution model used by top manufacturers is one of the main factors shaping the market. In this model a single distributor is exclusively responsible for the entire sales in a country. This results in a low number of importers who engage in practices leading to limited competition. Pronar, on

the other hand, uses a chain of specialised dealers who form its global distribution channels. These are reputable companies on their local markets who are able to provide customers with expert advice, know-how and professional technical service.

Pronar carefully monitors the global market in waste management machines aiming to match the price level with customer expectations. This does not mean, however, that Pronar products are the cheapest on the market. Pronar uses in its machines both high-grade components and the latest

technology. Pronar offers high spec machines with rich options that make them more functional than products of the competing companies. Still we can offer our screens and shredders at prices that are very competitive when compared the products by other global manufacturers. This opinion is shared by many of our customers. Such a pricing policy results in the large annual increase in sales.

Our customers expect products that come with professional service and maintenance by expert technicians and engineers. It is crucial for them not only to be able to



buy machines but also to have access to service, regular inspections, spare parts, consumables and repairs. Few manufacturers provide such services in Europe. If a greater number of competing manufacturers offer higher quality, more flexible pricing

policy, better specification and performance, then situation of recycling machinery buyers will improve. Therefore it is important for Pronar to increase its production capacity of waste management machines by expanding its

production plant in Siemiatycze (see the article on page 6 - 7).

Bartosz Tomczak
The Author is a Foreign Trade Expert,
Pronar



Pronar delivers recycling equipment to clients in Italy

BROAD RANGE OF DELIVERED MACHINES

Pronar is becoming one of the leading suppliers of recycling machinery on the Italian market. Pronar's success at the largest trade fair in Italy — Ecomondo in Rimini — resulted in acquiring new, very large and significant customers, and therefore an increased share of the market. Pronar delivered its trommel screens to the largest group of Italian enterprises whose members are municipal waste processing companies.

As ordered, these high spec machines were fitted with numerous options, which improve functionality and meet the customers' needs. The machines are a showcase of unique solutions that were previously unknown on the Italian market. Pronar's ability to meet the needs of the Italian customers was one of the reasons why Pronar was selected as the main supplier. The range of delivered machinery was very broad - from the smallest to the largest models with different drives (electric and diesel) and chassis (tracks or

wheels).

Another argument which prompted Italian entrepreneurs to purchase our machines is that Pronar shredders and trommel screens can be used to build a technological line for processing both municipal and green waste. The municipal waste processing companies in the group operate across Italy - from Milan to Sicily.

As a result our partner's efforts and after representatives of Italian companies visited our plant, Pronar began its conquest of the Italian

recycling machinery market. Pronar's spectacular contract with the largest group of municipal waste processing companies may have a significant impact on Italian recycling machinery suppliers. It is even more likely as our Italian customers plan to order more high spec machines fitted with options to meet their specific requirements.

Radosław Puciaty
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Polish and US production

A JOINT VENTURE IN MOBILE TROMMEL SCREENS

Pronar has signed an agreement with a well-known US machinery manufacturer called Morbark LLC of Winn, Michigan as part of its plan for expansion onto foreign markets. The Polish-US partnership in the recycling machinery industry has resulted in the production of mobile trommel screens called PRONAR-MORBARK.



The first machine jointly constructed was the PRONAR-MORBARK MPB 20.55g mobile trommel screen which featured a caterpillar chassis. The demonstration of its operation was combined with many publications in American trade media. It was showcased in California, during the presentations in Los Angeles at the largest global conference concerning the composting sector - USCC Compost 2017. What's more, this is not the only model manufactured for the American market - a PRONAR-MORBARK MPB 20.55 wheeled chassis variant was also purchased. More and more machines are produced and sold on the American market on a

continuous basis.

Cooperation between the two companies in North America is a major event in the recycling machinery industry in 2017 and will certainly enhance the range of modern products for the waste management and compost industry in the USA and Canada. During preliminary testing of the first demonstration model, our US partner noticed the high quality of our workmanship and the excellent fuel efficiency of our mobile trommel screen.

It would not have been possible to establish any cooperation with a major US recycling machinery manufacturer, if Pronar's products had not stood out against the

products of other companies with the best price to quality ratio, including a caterpillar chassis, magnetic separators and different types of screening drums. Obviously, Pronar's mobile trommel screens meet strict US emissions standards.

The PRONAR- MORBARK MPB 20.55g was showcased in Las Vegas, at the Conexpo CON/AGG in March this year- the largest world fair devoted to specialised machinery in industries including construction, infrastructure and recycling machines. The number of exhibitors exceeded 2500.

Bartosz Tomczak
The Author is a Foreign Trade Expert,
Pronar

PRONAR MRW 2.85 mobile slow-speed shredder

DEMO SHOW IN THE NETHERLANDS AND GREECE



Pronar dealers in the Netherlands and Greece organised demonstrations of waste recycling machinery. The Dutch PRONAR dealer organised a series of presentations showcasing the operation of the MRW 2.85 slow-speed shredder. This simple to operate high performance shredder received very positive reactions from prospective buyers. Demonstrations typically took place on the premises of a prospective buyer. During the presentations, the machine was used to shred typical materials, such as wooden, industrial or municipal waste.

Our Greek business partner did another presentation of the PRONAR MRW 2.85 shredder, which resulted in a successful sale. With the support of Pronar's experts, the dealer



successfully proved that Polish engineering can meet and exceed expectations of Greek customers.

Just like in the Netherlands, Germany, Belgium, France and Great Britain, our demonstrations of the mobile slow-speed shredder were very successful and resulted in more

orders strengthening the position of the PRONAR brand in Europe.

Radosław Puciaty
The Author is a Foreign Trade Expert,
Pronar

Multifunction arm attachments

MORE CHOICE

Vast majority of the maintenance work on roadsides is performed with municipal machines hitched up to a tractor. Pronar manufactures municipal machines including multifunction arms. High versatility of our multifunction arms allows for attaching different working heads (for many applications) and installation on different carrying vehicles e.g. a tractor or truck.

Pronar manufactures two series of multifunction arms designed for installation on agricultural tractors. The WWP series includes the front-mounted machines: PRONAR WWP500 (working width of the mowing head: 5.55 m) and PRONAR WWP600 (working width of 6.75 m). The WWT series includes multifunction arms for rear mounting on a tractor: WWT420 (working width: 4.2 m), WWT480 (4.8 m) and WWT600 (6 m). Pronar also offers the WWP500U multi-function arm, which interfaces with Unimog multi-purpose all-wheel drive trucks.

All multi-function are compatible with working heads including: a flail mower, branch cutting saw, sludge removal head and washing brush. Pronar manufactures flail mowers of different working widths 0.8 to 1.4 m that attach to hydraulic multifunction arms. Light mowing heads are designed for smaller multi-function arms and lighter work, while heavy heads are designed for heavy-duty use.

The main purpose of both types of these implements is to mow roadside ditches, shoulders and other hard-to-reach places. Mowing heads are

made of wear resistant steel, shafts are made of thick-wall pipes supported on bearings and mowing blades are made of high-grade steel. All this makes the mower sturdy, durable and trouble-free, which means it can operate in harsh conditions.

The PRONAR GM500 washing head is another implement to effectively maintain and clean road infrastructure. It is ideal for washing roadside traffic signs, information boards, railings or road posts. The cleaning may be performed on both sides as the brushes moving in opposite directions



are attached to two shafts (driven by hydraulic motors). The GM500 guard made of transparent plastic prevents excessive water splashing and protects bystanders against contact with the spinning brushes. The washing head can be connected to the PRONAR R1000 water tank supplying water to the washer.

The PRONAR GO800 is a sludge removal head for purging gutters and drainage ditches by removing accumulated soil, plant matter or mud. It's main component is an 80 cm diameter working disc. The material discharge direction can be changed and combined with a multifunction arm, the head allows for clearing very hard-to-reach water courses. The implement has a simple and durable design, which is reliable under any conditions.

The PRONAR GP200 cutting saw is designed for cutting tree branches, shrubs and other plants. It consists of four circular saw blades attached to a frame. A mounting beam is attached to the frame and connects the head to the hydraulic arm. The head working width is 2 m. Each saw has a diameter of 60 cm, which ensures the required performance. This implement is particularly useful for roadside, path/passage lawn maintenance. Head mounting at a substantial height allows unrestricted passage of even the largest vehicles. A number of Pronar working heads plus a multi-function is a powerful and useful combination for fruit and forestry farms as well as companies providing municipal services.

Prior to commercial launch, Pronar is testing new multi-function arm

attachments, i.e. a trimmer (working width: 1.5 m) and a shearing head (2 m). These attachments are perfect for trimming tree branches, bushes and hedges — both horizontally and vertically.

The significant growth of the municipal services market and the creativity of companies to offer new types of services encourage Pronar to design and manufacture new models of machinery and upgrade its current models. This year Pronar is planning to launch the production of new multi-function arm models with greater working range (7 up to 9 m) and a new roadside milling machine.

Arkadiusz Kidrycki

The Author is a Municipal Equipment Trade Expert, Pronar

BKD — the new series of mowers

IDEAL FOR MOST COMPANIES

Pronar constantly strives to improve and increase the number of machine models produced, thus expanding its offer and the number of potential clients. The new BKD series of flail mowers soon to be launched on the market is one example. In addition to municipal services, these machines can be used in agriculture to mow stubble after maize or tobacco harvest and in vineyards and orchards to mow passages between trees and shrubs.



Pronar's range includes the BBK flail mowers with a lateral positioning mechanism (BBK series). The range of flail mowers is complemented with units featuring the parallel positioning mechanism driven by the tractor hydraulic system. These models can be front or rear mounted on the tractor. It is a useful solution as mower design requires no modifications: with a double-sided frame and bevel gear, you can attach them easily either to the

front or rear three-point linkage of the tractor.

The BBK series rear-mounted mowers fitted with the lateral positioning mechanism will enable you to increase the machine's working width and to combine with the BK series mower operated at the front. The BK is another mower series to be attached either at the front or rear of the carrying vehicle. Our flail mowers can be used to mow slopes or hard-to-reach areas. The

new BKD series mowers are equipped with the lateral positioning mechanism to avoid obstacles and allow mowing on the right side of the tractor (the mower can be repositioned up to 44 cm).

Depending on the needs, the mower can be equipped with different blades. The most popular are the multi-purpose flail blades to mow grass, tobacco or corn stubble and even branches. Pronar offers two flail blade

variants depending on duty cycle. "Y" blades are suitable for mowing grass and thin branches. The other blade types, "T", "TI", "YI" and "YY" can be installed depending on the type of mowed surface.

The BKD series mowers are available in three working width variants: 160, 180 and 200 cm. The customer can match the right mower model to the needs and tractor power. Due to the low power demand (40 hp for BKD160P) and CAT I or II three-point linkage mounting, the BKD series mowers can be operated with small municipal tractors. This extends the group of potential buyers to include those who only have compact tractors.

To ensure durability and reliability,

the BKD flail mowers have strong 159 mm diameter mowing shafts. To ensure the highest performance and allow the mower to be used for different tasks, the flail blades on the shaft can be replaced with different blade types. The 160, 180 and 200 cm mowers can be equipped with 14, 16 and 18 flail blades respectively. The BKD mower flail shafts run at 2500 rpm. You can easily adjust the height of cut.

The BKD series flail mowers belong to the range of municipal machinery manufactured by Pronar, yet their versatility goes beyond the applications attributed to this product group. Their most common users are municipal companies, which maintain road shoulders. However these machines

can be also used in agriculture to mow stubble after maize or tobacco harvest and in vineyards and orchards to mow passages between trees and shrubs.

The BKD series machines perfectly complement the range of Pronar flail mowers with new technology and better functionality to meet our customers' specific expectations. This makes Pronar municipal products more competitive on all markets. Pronar can now compete not only with its high quality and attractive pricing but also with diverse portfolio of machines offered.

Sebastian Bachmura
The Author is Export Salesman
at Pronar





Agata series tractor-mounted sweepers

COMPATIBLE WITH MANY CARRYING VEHICLES AND WORKS ON ANY SURFACE

Towed sweepers are some of the most versatile municipal machines manufactured by Pronar. They can be installed on many types of carrying vehicles and used to clean a variety of surfaces. It is therefore very simple to adapt these machines to meet the client's needs.

Agata series consists of four sweeper models of different roller brush widths allowing you to match the sweeper to your existing carrying vehicle and the task at hand. Each model has a side brush that significantly increases the working width and helps clean hard-to-reach areas along kerbs. Thanks

to this Pronar sweepers will work on any surface — narrow lanes and passages between building, city streets and in large warehouses and surrounding areas.

In addition to the side brush, each Agata series model can be fitted with a broad range of accessories that make work easy and improve

the functionality. When fitted with a water tank and a spraying system sweeping is enhanced, because rotating brushes will not raise dust which settles back on the already swept surfaces thereby reducing the effectiveness. The sweeper is fitted with a jockey wheel, which makes it possible to mount the machine at



the front of the carrying vehicle, so that operator can see it and control it easily. The lighting system and warning triangle make the operation of the sweeper much safer as other people can see it attached to the carrying vehicle.

Agata series sweepers can be attached to tractor front or rear three-point linkage. Pronar designers have extended the group of potential buyers by fitting the sweepers with a mountings systems compatible with many types of specialised machinery (forklift trucks, loader-excavators, excavators, etc.) PRONAR sweepers are used for sweeping yards, warehouses, production halls, and construction sites (during and after construction). Construction companies frequently use Agata sweepers to clean the underlying surface prior to applying a layer of asphalt.

A version of the sweeper with a detachable rubbish bin can be used for snow removal from pavements. All it takes is to set the brushes at



the right angle to clear snow from a pavement. In the summer you can use the same setup to sweep rubbish aside.

Our sweepers offer an unquestionable advantage, which is selecting different types of bristle for the main and side brushes. You can choose plastic or wire bristle or a combination of these two. As the main roller brush wears you can lower it so that you can continue to use it

rather than replace it prematurely.

Pronar machine users love how simple to operate they are. Less experienced operators have no difficulty attaching them to a carrying vehicle. Rubbish bin hydraulic dumping system makes the operation even easier.

Sebastian Bachmura

The Author is Export Salesman at Pronar



The PRONAR ZMC 3.0 conveyor sweeper

SUCCESS IN THE UK

The ZMC 3.0 is the largest towed sweeper manufactured by Pronar. The machine is ideal for sweeping large areas such as streets, car parks, construction sites, racetracks or airfields. You can also use ZMC 3.0 to sweep other surfaces such as lawns.

The ZMC 3.0 utilises two front disk brushes (in front of the axle) and a roller brush installed behind the axle. The surfaces swept by the side disc brushes and the roller brush partly overlap, ensuring thorough sweeping across the entire width of the machine. Dirt and litter swept by the side brushes is transported back to the roller brush, which rotates opposite to direction of travel and sweeps dirt and litter onto a conveyor belt which transports it to the container.

Each brush, including the fourth (optional) has water spray nozzles to prevent raising dust during sweeping. The machine is

equipped with water tank with a capacity of 1150 l. Collected dirt can be easily unloaded on a trailer. Controlled from the operator's cab, hydraulic cylinders raise the rubbish container.

As a towed machine, the ZMC 3.0 sweeper can be attached to most tractors. This Pronar sweeper perfectly handles the difficult to sweep leaves stuck to road surface that pose danger to road users.

In contrast to self-propelled sweepers, the ZMC 3.0 does not feature a suction turbine. Therefore it does not raise a cloud of fine dust particles during operation. Less dust has a positive impact on the health of bystanders. Therefore,

the use of PRONAR ZMC 3.0 results in meeting higher environmental protection standards.

Since it was first introduced in the UK, the ZMC 3.0 sweeper has gained more recognition due to the new applications found by its users. The unique features and affordable price make it a leader on the UK market.

Pronar dealer in the UK has found an innovative use for the ZMC 3.0 sweeper. The dealer tested it at the Manchester airport for sweeping car parks and access roads. It was also used to sweep the nearby lawns to remove insects that birds feed on. Birds pose persistent hazard to aircraft

landing and take-off. Thus the ZMC 3.0 sweeper contributes to safety not only on land but also in the air.

Another innovative use for the ZMC 3.0 sweeper is cleaning up grounds after trade fairs and concerts. Moving across lawns, the sweeper effortlessly pick up bottles, tins and other rubbish left after an event. The organisers can save substantial amount of money on labour by cleaning crews. The ZMC 3.0 sweeper is also great for snow removal from car parks and paths. Tractors that are used for mowing grass in the summer can be used in conjunction with the ZMC 3.0 in winter and become more functional. The working width of large snow ploughs can sometimes negatively affect manoeuvrability in narrow streets and then use of the ZMC 3.0 makes perfect sense.

According to the UK dealer, the features the PRONAR ZMC 3.0 sweeper most sought after by the



British buyers include:

- a much lower price than offered by other manufacturers,
- greater performance thanks to a large working width,
- optional heavy-duty brush,
- 1150 litre water tank,
- 3m³ rubbish container,
- effective sweeping of every

corner and recess along kerbs and gutters,

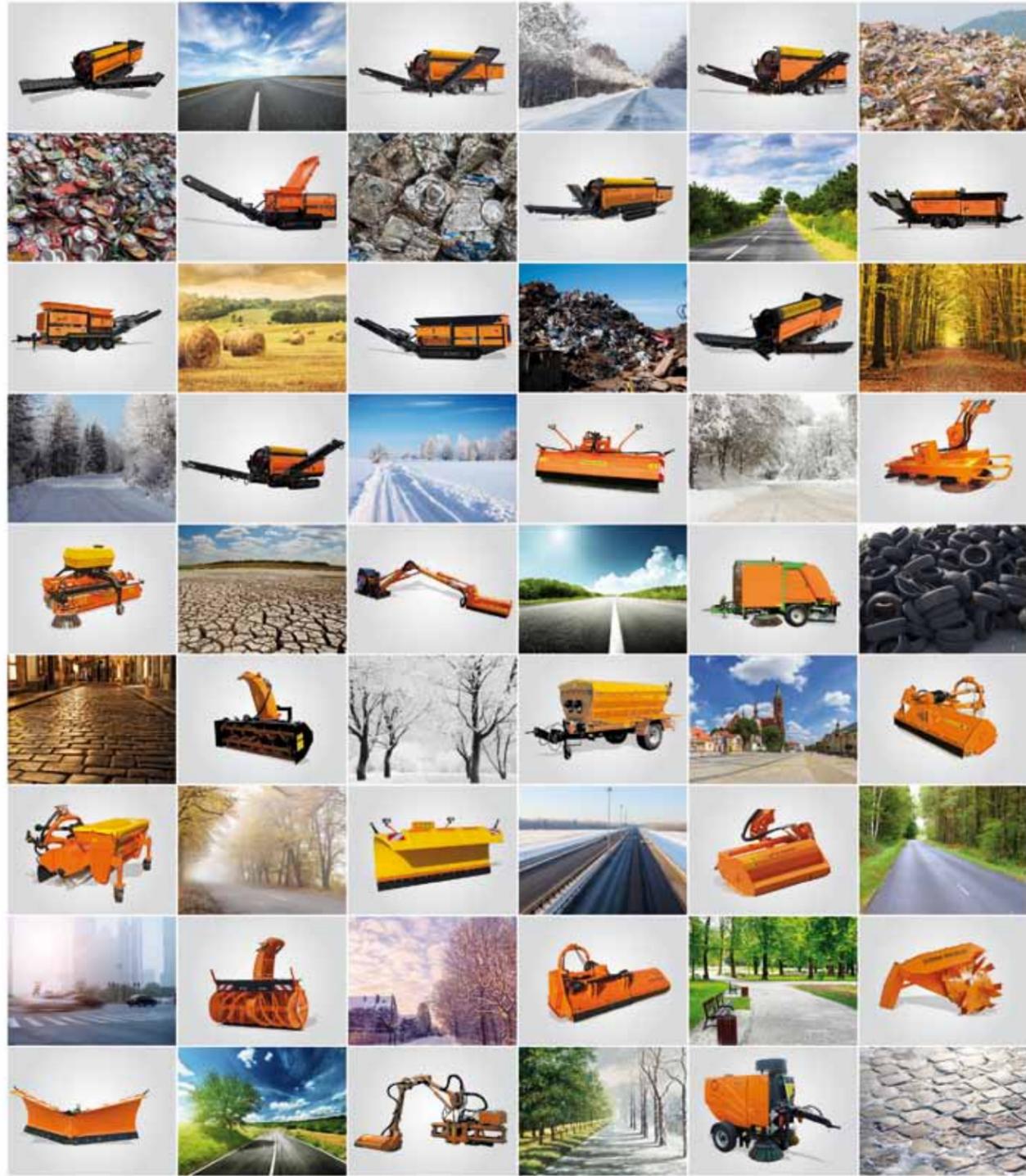
- low operating cost,
- side brush and other function controls and joystick in tractor cab.

Paweł Kuroczycki

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Pronar



MUNICIPAL AND RECYCLING MACHINERY



pronar.pl



TRAILERS



THE PRONAR T028ML BALE TRAILER - THE LONGEST OFFERED

In Western Europe, farmers who transport bales in a trailer without side walls face high fines. Given how quickly Western standards become the norm in other countries, one should bear in mind that similar regulations may become even more common. Therefore this year Pronar started the production of a bale trailer that not only ensures cargo safety but also minimises the loading time.

The standard version of the PRONAR T028ML trailer is equipped with a cargo platform with a length of 12 m. This makes it one of the longest bale trailers available on the European market. Especially for the Danish market, the platform was extended to a total of 12.5 m. The longer version was first presented last May at the summer 2017 Roskilde Dyrskue trade fair in Denmark.

The greatest enhancement of the T028ML is the option to install hydraulically raised and lowered side walls. This solution is already used in other PRONAR trailers with shorter cargo platform and lower carrying capacity. Loading time is reduced substantially when compared to a conventional strapping with transport belts. Hydraulically raised side walls

provide better cargo protection than cargo fixing belts.

The 12.5 m cargo platform trailer is designed for transporting straw square bales to incinerating plants, which provide heat to considerable number of Danish cities and towns. A protective mesh prevents spilling and littering the roads along the route. It ensures cleanliness and safety of road users. Clever mesh design enables the operator to open the walls without leaving the tractor, which enhances operator comfort.

Enormous capacity of the PRONAR T028ML trailer combined with unloading on both sides (walls raised by switching the hydraulic valve lever) make it very useful on the farm. With the length of the longer variant of 14600 mm, the trailer can transport

20 square bales an average length of 2.5 m. Bale size is the result of baler specifications that dominate farms in western Europe.

Taking into account the suggestions by representatives of service companies at many trade-related events, Pronar introduced the long variant of the T028ML trailer to improve performance both in agriculture and municipal services.

Pronar also manufactures other bale trailer models: T022, T022M, T023, T023M, T024, T024M, T025, T025M, T025KM, T026, T026M, T026KM and T028KM.

Wojciech Parfieniuk
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Pronar

Livestock transport trailers

RELIABLE AND INEXPENSIVE

Livestock transport trailers manufactured by Pronar are reliable, inexpensive and versatile machines with many options to meet the diverse user needs. Given their high quality and rich functionality they can successfully compete against trailers made by the largest European manufacturers.

Pronar produces three specialised trailer models designed for transporting livestock: T046 (platform surface: 9 m²), T046/1 (14 m²) and T046/2 with a hydraulically lowered floor (14 m²). All trailers are made of top quality materials - platforms are made of impregnated wood and walls are made of watertight plywood. Trailer design allows for attaching laced tarpaulin cover to protect the animals in transport. Our trailers can be used to transport cattle, horses, sheep, goats or pigs. They are versatile and can be used at livestock farms of different profiles.

The smallest 5.5-ton T046 trailer can hold up to 6 adult cows. It is a

single axle trailer with wheels partially concealed in the chassis, making it easier for the animals to enter the platform. Once opened, tailgate becomes a loading ramp.

The T046/1 trailer with a total weight of 8 tons features tandem suspension system and can be used to transport up to 10 heads of cattle. Its tailgate opens downwards and can be used as an entry ramp.

At 12 tons, the T024/2 model is the heaviest in the range and may hold up to 12 heads of cattle. It is, therefore, suitable for the largest farms.

Depending on the model, there are different options available to improve functionality and comfort

of transported livestock. Options include an extended tailgate hydraulic opening mechanism, thicker 2mm steel sheet walls and front doors on the right side (plywood or steel sheet matching the cargo box).

The side entrance in the T046/2 model (base) allows free access to animals without the need to open the tailgate where animals could escape. Side door improves the safety of the transport supervisor as it provides an escape route if animals turn aggressive.

Jan Kukliński
The Author is Export Sales Specialist at Pronar



Monocoque trailers

APPRECIATED IN THE UK

Despite considerable competition from local manufacturers, Pronar's 679/4 (load capacity: 8 t) and T679/3 (10 t) durable monocoque trailers have gained recognition on the UK market. In addition to manure spreaders and livestock trailers, these trailers they are yet another trailer type launched by Pronar in the UK.



The T679/3 and T679/4 trailers are fitted with robust tandem axle systems with longitudinal rockers, a wide wheel track and low suspension. These design choices make the trailers versatile, enabling transport both on public roads and on rough, uneven, mountainous or unpaved paths.

The high demand for construction trailers in the UK resulting from the strong growth in the UK and Ireland prompted Pronar to launch the first dump trailer on a rigid single-axle suspension: T679/5 (load capacity: 8 t) and T679/6 (7 t). They complement the range of trailers already offered by Pronar and extend the choice of prospective customers allowing them to match load capacity, volume and options to individual needs.

The PRONAR T679/5 dump trailer is based on a rigid single-axle suspension system. The chassis frame is made of rectangular hollow profiles which can carry varying loads. This is possible thanks to the use of the strong axle with a wide wheel track and wide heavy-duty tyres. The resulting structure offers considerable resistance to bending and torsion, thus contributing to the high stability of the vehicle during operation on rough terrain. The wide tyres used



in the trailer improve ride quality, ensure efficient braking as well as loading/unloading on slippery and unstable ground. Soil compaction is lower, too.

The robust load boxes of the T679/3, T679/4 and T679/5 gravel trailers including four fastening rings make it possible to load and transport not only crops, rubble, stones, gravel, sand, clay or aggregate but also machines such as excavators, loader-excavators and other construction and agricultural machines. As an

option, the load box can be made of highly wear resistant steel (hardness of 450 HB) to ensure improved wear resistance and impact strength of the walls and floor to increase service life.

All these trailer models can have a tilt and swing tailgate to enable the transport of bigger loads. A suitable tailgate adjustment system consists of adjustable fasteners and chains for precise control of the chute width during unloading.

Pronar's versatile and durable

construction trailers (T679/3, T679/4 and T679/5) are perfect for construction companies and farms due to their robust and resistant design, the use of high-grade steel and innovative corrosion proof coating. These trailers are designed for operation on any surface, including rough terrain, which is proven during everyday use in many European countries.

Katarzyna Żukowska-Matuk
The Author is a Foreign Trade Expert,
Pronar

PRONAR T740 and PRONAR T743 chase bins

CHASER BIN

Modern grain and corn farms require suitable machinery to improve harvesting, transport and storage of crops. PRONAR T740 and PRONAR T743 chaser bins are the right answer to these needs as they offer fast loading and unloading. Chaser bins act as intermediaries between the harvester and public road transport. They can also be used to transport grain directly to seed drills or to supply fertiliser spreaders.

T740 trailer can hold 28 m³ of load and T743 – 34 m³. Any of these trailers can hold grain from several harvesters or service several harvesters at the same time. Unloading is done with conveyor augers placed in two separate floor

troughs. The transported load is moved to a deep chute chamber where the third conveyor auger picks up the material directly to grain auger. Depending on the type of load, capacity of the auger driven from tractor PTO is 200-400 tons/

hour. With such powerful conveyor system, unloading can be completed within 3 to 6 minutes.

Optional electronic weighing system lets you control the trailer loadbox filling level. The weighing system uses tensometric sensors



installed between the load box and the lower trailer frame. Displayed on a screen inside the tractor cab, the operator has instant access to information on load weight. Several ladders, broad platform and inspection window help the operator in closely monitoring operation of the trailer. Three inspection windows are conveniently placed in the front wall to allow load level control.

Trailers feature tandem (T740) or tridem (T743) suspension with taper leaf spring shock absorbers. The rear steering axle improves manoeuvrability and reduces tyre wear. The 700/50-26.5 tyres are ideal both for transport in the field and on public roads.

Maximum allowable weight of T740 (33 t) and T743 (23 t) requires an effective braking system. The required braking performance is provided by a pneumatic double line braking system with a manual regulator. Parking brake is also provided in base. A double line system with an automatic braking force regulator

may be installed as an option.

The roll tarpaulin cover protects the load from adverse weather conditions e.g. rain. It is very easy to handle, using ladders and a platform.

In both trailer models, load boxes are reinforced with 6-point (PRONAR T740) and 8-point (PRONAR T743) struts, which improve strength and durability.

The trailer should be cleaned thoroughly after completed work. There are holes in the floor troughs designed to remove crop residue from conveyor augers. A hydraulic slide gate at the chute chamber allows for fast and thorough emptying.

Growing global food demand and ever larger cereal farming areas require the use of efficient chaser bin trailers, such as PRONAR T740 and PRONAR T743.

Maciej Jabłokow

The Author is a Foreign Trade Expert,
Pronar





Manure spreaders

STRONG, DURABLE AND EFFICIENT

Reliable manure spreaders not only offer high manure spreading performance but also strong construction and chassis suitable for operating in conditions typical for a farm.

Axle system is a major manure spreader component. This is because axle system is exposed to high and varied loads caused by the weight of transported manure or other material. The latest manure spreader designs from Pronar and other manufacturers show a clear trend to reduce the number of axles. Until recently medium capacity manure spreaders (8-14 t) were available almost exclusively with a tandem axle system. Today, some manufacturers, including Pronar, offer a range of single axle manure spreaders

with large-diameter wheels.

Large wheels combined with specialised tread perform much better. Due to lower rolling resistance, large wheels on a single axle reduce tractor power demand. Other advantages of large wheels include better manoeuvrability and lower soil build-up when turning. Despite this, tandem axle systems still have plenty of supporters. Manure spreaders manufactured by Pronar include single-axle machines (five NV series models and the N161 model for small farms)

as well as machines with tandem suspension (N262, N262/1, N162/2).

Due to much smaller wheel diameter, tandem axle system fits under the load box and does not limit its width. Tandem axles improve manure spreader stability when travelling, which is additionally helped by the use of suspension springs. The use of springs in tandem axles also improves safety and ride comfort. Pronar NV series single axle manure spreaders are fitted spring drawbars to improve operator comfort and load

transmission of the tractor-spreader arrangement. Pronar offers an upper or lower hitch type (Ø40, Ø50 or K80).

Durability and strength of the manure spreader load box is a function of the quality and thickness of steel sheet used. The N161, N162/2, N262 and N262/1 models feature 3 mm walls and 4 mm floor, while the floor and walls of the new NV series are made of high-quality 4 mm steel sheet. The narrower load boxes of the NV161/1, NV161/2, NV161/3, NV161/4 and NV161/5 manure spreaders match their single axle suspension systems — load box fits between the high wheels. A long narrow box harmonises well with the two-beater spreader unit and is deep enough to offer a large volume. The placement of the load platform between the wheels directly over the axle has a positive effect of lowering the centre of gravity and the height

of load (mini loaders or small tractors with a front loader can be used). During loading there is a risk that the operator will damage the edge of the load box. To prevent this a wooden protective strip can be fitted on upper edge of the load box of the manure spreader.

One of the major components of the load box is the chain conveyor. Medium load capacity manure spreaders usually have two combined conveyors, covering half the width of the load space. Each has two chains connected with transverse slats. As standard, the chains are hydraulically driven, which allows for stepless speed adjustment.

In the N162/2, N262, N262/1, NV161/1, NV161/2, NV161/3, NV161/4 and NV161/5 models the transported material is secured with the slide gate or spreader unit guard (depending on the model). The slide gate is a plate slid between the spreader unit beaters and

the load box. It protects the spreader unit against the pressure exerted by the transported manure allows the beaters to start up. This component is crucial to machine reliability as it prevents the transmission system from overloading during spreader unit start-up, which would otherwise bear the weight of the manure. However the main purpose the slide gate is to prevent the spillage of manure during transport. When slide gate moves up to release manure, it also protects the tractor against splashing during spreading. The external spreader unit guards prevent spilling of manure residue from the spreader unit.

Spreader unit is the key component as it directly affects the quality and performance. Spreader units can be divided into two major categories — horizontal and vertical units. The classic horizontal spreader unit design is based on two horizontal beaters, however

Pronar uses a modified proprietary design in its machines.

In the NV series manure spreaders the horizontal beaters are used in conjunction with spreading discs. This machine series features beaters that are shielded — only the lower part of the housing is open. These beaters are not used for spreading but only to loosen the manure and feed it onto the spreading discs. With This design of the dispensing system you can use not only manure but also lime, compost, and biogas plant residue. Major advantage of this spreading assembly is the working width, which can be up to 25 m for some materials. This working width is achieved with the N262 Herkules manure spreader (11.3 m³ load box).

The most popular vertical spreader units can have two or four beaters. The N162/1 and N162/2 manure spreaders feature the AV40 spreader unit in base (AV20 as an option). The AV40 spreader unit has four vertical shredding drums while AV20 — two vertical shredding drums. Both two spreader units may be driven with a 1000 rpm PTO. The four beater spreader unit is suitable spreading of any type of manure across a wide width. On the other hand, the two beater spreader unit is more versatile. It can be used to spread compost, peat or even lime.

With the wide range of models and available options you can choose an optimum machine to meet the needs of any farm. When choosing a manure spreader, decide on its load capacity first. Then consider your applications choose the type of load box and your spreader unit, which determines the performance.

Marzena Piwowarska
The Author is Export Sales Specialist
at Pronar



Pronar's agricultural and municipal machinery on the Swedish market

WE LISTEN TO WHAT OUR CUSTOMERS HAVE TO SAY

Typical for Swedish agriculture is mountainous terrain, short plant growing season and seven climatic zones. Different agricultural machines are required for crops in each region.

Swedish customers expect machines to be highly functional, reliable, durable, easy to operate. They also expect easy access to servicing and compliance with legal requirements, including environmental protection

regulations. Pronar does its best to meet these needs. Our development strategy states that products should even be designed to stimulate and anticipate customers' needs. We respond to market expectations

by expanding our product range and improving the products already in production. As a result of listening to what our customers have to say, Pronar has made numerous changes to hook trailers that are very popular among Scandinavian buyers.

These trailers are highly rated because they are universal and can be used in forestry and construction in addition to agriculture. Advantages that Scandinavian users frequently mention are stability and manoeuvrability in rough terrain on wide tread tires (option). Pronar offers the following hook lift trailers: T185, T285, T285/1, T286 and T386.

PRONAR municipal machinery also gains popularity on the Swedish market. This is helped by high quality, good value for money and compatibility with most mounting systems.

In anticipation of the high potential of the Swedish market, Pronar extended its offer of municipal machinery with M series ploughs. These ploughs complement the machines already marketed in Sweden such as snow blowers, sand spreaders and other snow removal equipment.

Marta Topolewska-Baszun
The Author is a Foreign Trade Expert,
Pronar



Low chassis trailers for use in mountainous areas

SAFETY FIRST

To ensure safety, the use of trailers in mountainous areas requires an adapted design. Pronar has done a great job adapting its trailers to meet these strict requirements and successfully competes against products of other companies.

Pronar trailers feature a durable and resistant design for use in mountainous areas in agriculture, horticulture, transport or municipal services. Trailer bed height measured from the ground is an essential specification item determining the safety of tractor-trailer combination, especially on mountain roads. The design guidelines for such trailers state that load platforms should be fitted no higher than 1 m and tyre tread

must be wide. Low bed trailers are easier to manoeuvre in the field and on steep roads.

Pronar single axle trailers include the low bed T655, T654 and T654/2 trailers with load platforms at a height of 855, 920 and 890 mm respectively. All these trailers can be fitted with optional wide tread tyres to prevent overturning on steep slopes.

The Pronar T663/2 tandem is another trailer very popular among

mountain farmers. The 1060 mm load platform is a safe solution for tandem suspension. The load is distributed not only on the trailer wheels but also on the tractor hitch. This solution is proven to work great in rough terrain.

The PRONAR T653 is a double axle trailer with stable suspension and 1070 mm load platform. It is ideal for use in the mountains. This model is a perfect example of continuous improvement by Pronar



designers to improve safety and functionality of offered products.

Livestock trailers are also popular with mountain farmers. Cattle breeders appreciate both the smaller T046 model with a load capacity of 3.7 t and the T046/1 trailer with a capacity of 5.3 t (holding up to 10 heads of cattle). The inner load box length the T046 is 4.16 m and almost 6 m in T046/1. An important design solution in T046/1 is a long rear foot platform to

ensure easy loading and unloading of livestock.

Both these models feature a frame with crossbar structure in base to fasten a laced tarpaulin cover. The wood floor is deep impregnated with waterproof coating. As an option the floor can be made of 4 mm steel checker decking with two drain holes, lined with safe, 15 mm non-slip natural rubber. Both models can be fitted with a one-piece internal partition

(option) to separate the transported livestock.

Pronar representatives actively participate in trade fairs while our Sales Department closely cooperates with the designers to ensure our trailer range is always up to date and suitable for use even in the roughest mountainous terrain.

Marta Kuligowska

The Author is Export Sales Specialist at Pronar





Load box and monocoque trailers

ANTICIPATE YOUR CUSTOMERS' NEEDS

The manufacture of agricultural and specialised trailers is Pronar's major expertise area. These trailers have won the trust of our customers and Pronar became leading European manufacturer in this segment. Our trailers are offered not only on the Polish market but also in Austria, Croatia, the Czech Republic, Denmark, Estonia, Finland, the Netherlands, Kazakhstan, Lithuania, Latvia, Germany, Norway, Sweden, Russia, Slovakia, Switzerland and Hungary.

The range offered by Pronar includes load box and monocoque trailers - single axle, double axle and triple axle variants with three-sided, two-sided and one-sided tipping and load capacity from 2 to 23 tons. Pronar trailers can be towed at speeds up to 30, 40 or 60 km/h. As standard, all trailers feature a central wall locking system, tailgate chute windows, wheel chocks,

electric system, hand crank brakes, pneumatic or hydraulic overrun braking systems (single or double line systems).

Most load box trailers can be fitted with extra wall extensions and it is also possible to use another set on top. There are many options to choose - customers prefer a tarpaulin cover with a frame and fenced platform, various tyres and

rear hitches as well as special springs to facilitate the opening of load box walls.

One of the markets where Pronar trailers have won acclaim is Germany. German agriculture is very advanced, therefore it makes great demands on companies offering trailers, tractors, agricultural and municipal equipment, considerably higher than those in many other countries.

Pronar successfully identifies and meets the needs of German customers, providing them with competitively priced modern and robust trailers. It is the competitive pricing that has especially contributed to Pronar's huge success in Germany. German farmers own vast multi-hectare farms and require technically impeccable equipment at an attractive price. Trailers with the widest range of options offered by Pronar are the most popular. These include livestock trailers, bale trailers with front and rear folding walls (hydraulically folded walls optional), large high-capacity monocoque trailers and much smaller double axle trailers.

Today's customers expects products to be functional, reliable, durable, easy to operate and aesthetically pleasing. Further, they expect professional service and products that meet all environmental standards. Pronar strives to not only meet our customers' needs but also to develop features in anticipation of these needs. In close cooperation with the Marketing and Sales Department Pronar designers and engineers work hard to continually adapt our products to ever changing customer needs.

This is why working closely with our customers is at the heart of Pronar's strategy. We continue to improve and adapt our products to

individual needs identified through correspondence, phone calls, demonstrations and meetings with customers (at their farm/workplace), technical testing performed on-site and participation in agricultural exhibitions. This is how we at Pronar learn about any issues our customers come across. In turn we can adapt and improve our products. In line with customers' expectations we continually expand the range of product offered and revise our technological processes to improve quality.

Przemysław Rogala
The Author is Export Sales Specialist
at Pronar



120 TYPES OF TRAILERS



TECHNOLOGIES



Growing exports of wall profiles

QUALITY AND PARTNERSHIP

High quality and attractive business terms drive sales. This relationship is illustrated by the launch of Pronar wall profiles in international markets.

Only last year wall profile sales increased by 130%. Several factors contributed to this excellent result. High product quality is the main reason, resulting from the use of the best-grade S235JR steel supplied by renowned EU steelworks. Wall profiles are produced in a modern, automated process line to minimise defects.

Pronar's continuous laser weld technology guarantees the tightness of the upper and lower profile pockets and prevents water ingress. This welding method considerably increases wall profile service life by preventing or delaying corrosion. Pronar offers two types of ribbed profiles - 500 mm and 600 mm corrugated

profiles or 800 mm or trapezoidal profiles. Such ribbing improves compression strength. Ribbing also facilitates unloading of bulk materials.

Pronar produces different types of wall profiles:

- with sealing facing outwards (PSB, PSP) — for use in tipping trailers;
- without sealing (PBB, PBP) - for use in manure spreaders and automotive structures where no tipping system is required;
- with wall extension sealing facing inwards (PNB, PNP) - for use in grain, silage or forage trailers.

Pronar is a reliable partner for both short-term and multiple batch orders. Pronar's flexible approach to business results in good partnership with our clients. Our clients can order profiles cut to custom length with 1 mm tolerance. This high precision will ensure speedy and trouble-free assembly.

Pronar wall profiles are used on trailers manufactured across Europe.

Anna Toczyłowska
The Author is Export Sales Specialist
at Pronar



Supplier quality assurance at the Axle Department

HIGH QUALITY GUARANTEED

Customers pay more attention to quality of goods and services. Quality is an essential for healthy competition among companies. A certified quality assurance system increases the chances of success. However, a company must change its methods. In return, the company gains a better organisation of work, higher ratings from customers and improved image. The company's products gain more trust and sell better.

Supplier quality assurance is intended to ensure that all supplies meet the specifications, applicable standards and agreements concluded. Quality assurance is a major component of the quality management process.

Pronar began production of axles in 2012. Pronar's modern machinery, innovative technologies and experienced engineers all contribute to a broad portfolio of premium products. Pronar's offer includes a variety of wheel assemblies (axles, wheels with tyres and shock absorbers). These assemblies include various types of axles, such as rigid or sprung axles, self-aligning axles

and complex steering axles.

Our Axle Department manufactures over 200 types of axles - unbraked with hubs and braked with hub drums. Pronar meets its own needs and takes international orders.

Square bar measurements

Top quality products require top-grade materials provided by renowned, tried and tested suppliers. Depending on the axle types manufactured, Pronar orders square bars of different lengths and widths. The length of bars ranges from 4 to 6 m while the width from 40 mm to 110 mm.

Quality assurance process begins

with the quality inspection personnel being notified of delivery who then prepare the technical documentation. Supplied bars are selected at random for measurement. The bars are cut to specific lengths (depending on the axle type) and transported to the testing station. Bars are examined for correct dimensions, shape as well as chemical composition. Pronar has asked its steel suppliers to provide relevant certificates with every product batch (every batch is marked with heat code).

Chemical composition testing is performed with a spectrometer and starts with a sample taken during

cutting. Then the sample is transported to the R&D Centre, accompanied by certificates stating the chemical composition of the relevant batch and heat code. The spectrometry results are then compared with the values stated by the supplier. Based on the result Axle Department process engineer accepts or rejects a given batch.

Sub-assembly quality inspection

A complete axle comprises many components. Pronar produces most of them, however, some are supplied by external partners. These are subject to quality inspection. The number of

items subject to inspection may differ depending on the axle type. The more complex and technologically advanced design is, the more components are inspected. Just like square bars, quality inspection of axles begins with the preparation of appropriate documentation and instrumentation. Then shape inspection and overall dimension and tolerance measurements follow. Items are also checked for mechanical defects and signs of corrosion, etc. Items are then checked for completeness.

In order to take more accurate

measurements, supplied items are transported to R&D Centre Measurement Room. There a coordinate measuring machine and measuring arm are used to determine properties with an accuracy of 0.001 mm. In addition to measuring overall dimensions of items, R&D Centre also conducts the non-destructive (NDT) radioscopic testing, using the RT technique, which enables high-precision examination (to detect air blisters, non-uniform material structure, inner delamination).

Once the Quality Control Department, Measurement Room and R&D Centre give a positive opinion, the inspected items are accepted for subsequent assembly. If any deviations from documentation are detected, a supply non-conformity report is prepared and sent to the design engineer for assessment whether the specific non-conformity can be accepted or not. If the decision is negative, the complaint process starts and the entire batch is returned to the supplier.

All components purchased by Pronar from its suppliers are subject to quality inspection. Production in progress is monitored continuously to detect any non-conformities. Pronar manufactures all components using the applicable technology and ensures continuous quality control at every stage of production. Aimed at continuous improvement of product quality and competitiveness, Pronar's production process meets all requirements of the PN-EN ISO 9001:2016 standard. All our processes are supported by advanced Enterprise Resource Planning (ERP) based on SAP system.

Marcin Seliwoniuk
The Author is the Quality Coordinator
at Pronar



Example of hub drum dimension measurements. On the left: the distance from the drum end to the hub using a height gauge (181±1 mm); on the right: measurement of the location of the bearing race using a depth gauge (114±1 mm)



Pronar Research and Development Centre

RAPID 3D PROTOTYPING

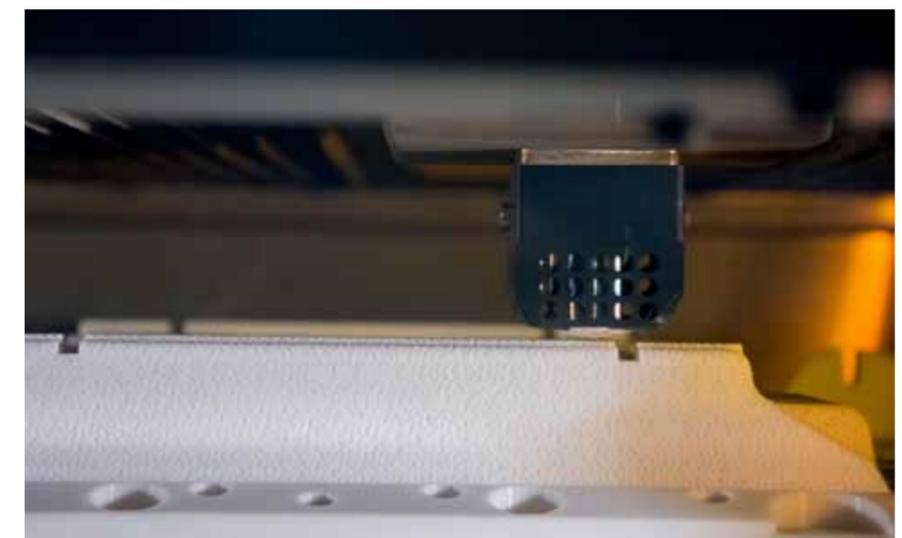
The first rapid prototyping machine was built by Charles Hull at the beginning of the 1980's. The inventor wanted to design a machine, which would reduce the time required for prototyping. Previously, it took several days, weeks or even months to build models manually or with simple tools. The first printed spatial object was a tea cup for the inventor's wife. It was the 9th of March 1983.

Since then, the 3D printing industry constantly surprises us with new amazing ideas and solutions. 3D printers can print with chocolate or dough, prepare ready-to-serve food, build houses and bridges or print organs and tissues from biocompatible materials.

Initially, 3D printing was intended for prototyping only, however, 3D printers are now used more and more to make finished products. Pronar's Research and Development Centre operates a state-of-the-art large-format Fortus 900mc 3D printer. Based on a 3D model, it makes three-dimensional objects out of plastic and makes it possible to test their functional properties. Among devices using the fused deposition modelling (FDM), Fortus 900mc prints details of the largest overall dimensions. It allows printing items up to 900x600x900 mm. If larger elements are required, it is possible to perform split printing. The system enables not only prototyping but also making short production series or actual utility objects.

The Fortus 900mc 3D printing system specifications:

- working space (X Y Z axis): 914x610x914 mm;
- Fused deposition modelling (FDM) printing technology;
- print accuracy ± 0.09 or ± 0.0015 mm (whichever value is higher);



- printed layer thickness: 0.178; 0.254 or 0.330 mm;
- two working heads: one for the object material and the other for the base material;
- automatic material shrinkage compensation;
- heated working chamber;
- soluble base material;
- 3D printout cleaning method: ultrasonic washer.



Pronar Research and Development Centre can 3D print components using the following materials:

- ABS-M30,
- PC (polycarbonate).

On special customer request, it is possible to use other materials for Fortus 900mc printing:

- ABS-ESD7,
- ABSi,
- ABS-M30i,
- ASA,
- FDM Nylon 12,
- PC-ABS,
- PC-ISO,
- PPSF,
- ULTEM 1010,
- ULTEM 9085.

The 3D printing technology was developed for rapid prototyping, but printed objects can also be used for other purposes:

- Produce unavailable or phased out replacement parts.
- Produce parts whose traditional production methods are too expensive, labour-consuming or time-consuming or even impossible.
- Reproduce damaged or worn components.
- Verify if mating components are designed correctly before launching the series production and making



expensive production tooling.

- Product functionality testing.
- Demonstrate a product before its final version is accepted.

Prototypes become increasingly popular among manufacturers

of medical equipment, home appliances and electronics as well as goldsmiths or jewellers and companies operating in automotive, aviation, robotics or prosthetics industries. Here are the greatest advantages offered by 3D prototyping:

- Low cost — it is much cheaper to 3D print a prototype than design and build casting moulds or cut and mill with the CNC machines. At the price of a single milled model you can 3D print a dozen or so items. Savings also come from the fact that no prototyping tooling needs to be build.
- Option to use diverse materials for 3D printing — from the most popular acrylonitrile butadiene styrene (ABS) to elastic acrylic resins, electrically conductive materials to metals such as titanium.

The stages to make an object, prototype and product by 3D printing:

- Create a CAD design.
- Save the CAD object in STL format.
- Process the STL file in Insight software.
- Process the virtual 3D object by slicing into crosswise layers to build the real model.
- Choose the base type to be 3D printed.
- Set the printing head work path.
- Export the 3D object from Insight software to the machine via the Control Centre, which controls the 3D printer operation.

3D printing involves depositing layer by layer of the material heated to approx. 320°C. If necessary, the actual object layers are interlaced with layers of the base material. Depending on the printing head attachment and object specification, the print layer is 0.178 to 0.333 mm thick. The temperature inside the closed working chamber is 90°C to

” The potential of the 3D printing technology was soon perceived in medicine - mostly in reconstruction and transplantation medicine. At first, models of joints or bones were made based on magnetic resonance or computer tomography examinations. At the beginning of the 21st century, spatial printing techniques developed so rapidly as to allow for making implants and prostheses perfectly suited to the patient's needs. It is not the end yet. It turns out that the list of materials which may be used in 3D printing is not limited to plastics. There are bioprinters there which can be used to form or repair (regenerate) tissues and entire body organs, using bio-ink (living cells).

The first one to carry out 3D printing experiments with living cells was Mark J. Post at the Maastricht University (the Netherlands). Interestingly, the scientist was concerned with nutritional not medical uses. As a result of his works, beef was “printed”. Nevertheless, he inspired other researchers to attempt printing tissues and organs.

140°C (depending on the printing material used).

3D object printing time depends on object shape, overall dimensions, filling and intended use. The smallest objects 3D printed at R&D centre take around 15 minutes to print (small taps, covers or nozzles). More complex printouts require

150-200 hours to print (e.g. a real scale trommel screen or shredder), while the biggest printouts can take up to 300 hours (e.g. various split enclosures and instrumentation for thermoforming).

Jerzy Zdrajkowski

The Author is the Modelling Workshop Manager, Implementation Department at Pronar



” The Research and Development Centre carries out every order by the agreed date, with a free-of-charge printout estimate and any assistance required for the completion of a 3D printing project.

For any questions concerning 3D printing, please contact: drukarka3d@pronar.pl or jerzy.zdrajkowski@pronar.pl

Telescopic hydraulic cylinders

FROM DESIGN TO THE FINAL PRODUCT

Produced at Pronar Pneumatic and Hydraulic Department, telescopic cylinders are the most advanced in terms of design and technology.

Telescopic cylinders are applied in machines that require an extension mechanism, such as municipal and construction machinery with extension arms, lifting equipment, lifts, specialised airport maintenance machinery, and most frequently in trailers and semi-trailers with the tipping mechanism, which are also manufactured by Pronar.

Hydraulic cylinder production is a multistage process requiring technical and technological know-

how and involves many people and specialised devices. A telescopic cylinder needs to match the specification and intended use of the machine or trailer. Therefore, it is essential for engineers from the Implementation Department and designers from the Pneumatic and Hydraulic Department to work together.

When the two departments agree on technical details such as stroke, power or mounting method, P&H

designers develop a cylinder design. The resultant technical drawing must be approved by the Implementation Department. Then detailed technical documentation for the production is prepared.

Final documentation is handed to process designers in the P&H Department, where it is complemented with technological documentation including material selection, description of each production stage and selection



of machines to produce cylinder components. The next stage takes place in Production Planning Department, an organisational unit of P&H Department, responsible for placing the cylinder prototype in the production plan.

The prototype is tested for leaks and correct operation and then transferred to the Prototyping Department for fitting in a final product, e.g. a trailer. The finished trailer or machine (with the cylinder fitted) undergoes comprehensive testing that simulates normal operating conditions. In the event any design changes are needed, feedback is given to designers and the above process is repeated.

Once the final product is approved and implemented, the Metal Production Department (and specifically, its planning unit) draws up a schedule for the Pneumatic and Hydraulic Department to manufacture telescopic cylinders.

Kajetan Bogdanowicz
The Author is a Trade and Sales
Specialist in the Pneumatic and Hydraulic
Department at Pronar





Podlasie is one of the most beautiful regions in Poland.

DIVERSITY CREATES DEVELOPMENT

Pronar was established in Podlasie in 1988. All our factories are located in the region. Podlasie is a unique region of Poland. It is characterised by cultural, ethnic and religious diversity. This diversity has influenced economic development, creation of new ideas and solutions and adoption of modern technology. This makes the people of Podlasie full of ideas, pro-innovation and hungry for more know-how.



The Podlasie Province covers 20,200 km² and has a population of 1.2 million. Its capital, Białystok, is an academic, cultural and economic centre of north-eastern Poland. Podlasie is a region bordering Lithuania and Belarus. Its attractive geographic location and traditions going back centuries combined with experience in trade between the East and West of Europe constitute the capital to pave the way for cooperation between the EU and Russia, Belarus and Ukraine.

Podlasie is dominated by agriculture, which is of enormous importance for the domestic production of food. Forestry and timber production are also significant. Wood windows and doors are exported all over Europe. The region is home to many factories making machinery mostly for the food industry, forestry and agriculture. Pronar is the biggest regional manufacturer of machines for agriculture and its products are exported to many countries of the world.

The allure of Podlasie comes from its unique cultural climate and charm

of small villages and towns, where modernity blends with tradition and the past. All these places are surrounded by magnificent nature.

Natural resources are protected by numerous nature reserves, landscape parks and four national parks: Białowieża, Wigry, Biebrza and





Narew National Parks. The Białowieża National Park is a UNESCO World Heritage Site and the Narew National Park is called "Polish Amazonia," because Narew is a braided river with many riverbeds forming a unique ecosystem on the European scale. The Podlasie parks and forests are sanctuary to thousands of animal and bird species, symbolised by the European bison (seen in the province crest).

Podlasie landscape is known for its wooden architecture (windmills, watermills, historic orthodox churches, chapels, manor houses), which can be found in many towns: Hajnówka, Supraśl, Drohiczyn, Narew, Tykocin, Sokółka or Krynki.

The multi-faith past of Podlasie reveals itself through the synagogue in Tykocin or mosques in Bohoniki and Kruszyniany. Representatives of various denominations live here side by side and show mutual respect for the identities and traditions of their neighbours. Besides strongly entrenched traditions, noteworthy is the modern Podlasie Opera and Philharmonic in Białystok. The venue is popular with musicians from all over the world. Białystok is also a dynamic academic centre with a dozen or so universities and academies.

Podlasie is enormously attractive for tourists. It is worth a visit due to its environmental, ethnic, cultural and religious diversity. It is known for its beautiful landscapes, nature and hospitable locals. That's why anyone who visited here once, wants to come back again.

Sławomira Sawicka
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NAREW – PLANT NO. 2

Total surface area of the plant

170 809 m²

Type of activity

Production of trailers, disc wheels,
hydraulic and pneumatic systems,
assembly of tractors
Research and Development Centre

NAREWKA

Total surface area of the plant

128 737 m²

Type of activity

Production of large-sized trailers
and disc wheels



7
FACTORIES



NAREW – PLANT NO. 1

Total surface area of the plant

28 200 m²

Type of activity

Production of plastic products

STRABLA

Total surface area of the plant

12 500 m²

Type of activity

Production of green forage machinery

NAREW – PLANT NO. 3

Total surface area of the plant

25 263 m²

Type of activity

Production of trailer sides
Wholesale of steel

SIEMIATYCZE

Total surface area of the plant

118 369 m²

Type of activity

Production of municipal
and recycling machinery

HAJNÓWKA

Total surface area of the plant

90 000 m²

Type of activity

Production of axles, gears,
steering systems and drivelines