



OVERVIEW OF KEY PRODUCTS

The Grupa Azoty Group classifies fertilizers as nitrogen (single-component) fertilizers and compound fertilizers, the latter including at least two of the following components: nitrogen, phosphorus or potassium.

FERTILIZERS



Nitrogen fertilizers are substances or mixtures of substances where nitrogen is the primary plant nutrient. Nitrogen fertilizers include:

Urea – a nitrogen fertilizer containing 46% nitrogen; it is produced in Puławy (PULREA®), in Police (mocznil.pl®) and in Kędzierzyn. Urea is a universal fertilizer – it can be used for all crops at various growth stages, both in granulated and liquid form. Outside agriculture, urea is used for production of adhesive resins, which find application in the wood-based boards industry as well as in the pharmaceuticals and cosmetics industries. Urea solution – marketed by the Grupa Azoty Group under the Noxy TM (formerly AdBlue®) brand; it is used in the automotive industry, as an agent reducing nitrogen oxide emissions from industrial emitters, as well as in exhaust systems of utility vehicles with selective catalytic reduction (SCR). Urea may also be further processed into urea-ammonium nitrate solution (RSM®), which is a liquid fertilizer, or into melamine.

Calcium ammonium nitrate (CAN) is a nitrogen fertilizer with a nitrogen content of up to 28%. It is a universal fertilizer, suitable for all types of soil. It is characterised by good solubility and is therefore easily absorbed by crops. The Grupa Azoty Group markets CAN in a number of granule varieties; the offering includes the mechanically granulated Salmag® fertilizer range (including varieties with a sulphur or boron content), or bead fertilizers such as CAN 27 standard or CAN with boron.

Ammonium nitrate is a nitrogen fertilizer which is easily dissolved in water, containing between 30% and 34% nitrogen. The Grupa Azoty Group offers a wide variety of this product in various granule forms and sizes, such as mechanically granulated ZAKsan®, with excellent sowing properties, the PULAN® beaded ammonium nitrate, or the “30 makro” ammonium nitrate.

Ammonium sulfate nitrate is a universal fertilizer which combines 26% nitrogen and 13% sulfur; it contains nitrogen in two forms which are easily absorbed by plants: the fast-working nitrate nitrogen and delayed-effect ammonium nitrogen, and may therefore be used for both pre-sowing applications and for top dressing (spring and winter grains, rapeseed). Delayed-effect ammonium nitrogen ensures longer availability of the nutrient to the plants, which is of particular importance in the case of long-growing crops (e.g. corn). Sulfur is a crucial element for the growth of plants and it facilitates absorption of nitrogen and other microelements – sulfate nitrate is the source of sulfur in the form that is best absorbable by plants.

Ammonium sulfate is a nitrogen fertilizer with sulfur, containing 21% nitrogen and 24% sulfur. It is a by-product in the manufacture of caprolactam. Like other nitrogen-sulfur fertilizers, ammonium sulfate increases sulfur content in the soil. The Grupa Azoty Group manufactures a wide range of ammonium sulfate in various granule forms and sizes: selection, macro, standard and crystalline.

COMPOUND FERTILIZERS (NPK, NP)



NPK and NP compound fertilizers are universal fertilizers which, depending on composition, can be applied to various types of crops and soil. Aside from the primary components - nitrogen (N), phosphorous (P) and potassium (K), these fertilizers contain secondary nutrients such as magnesium, sulfur or calcium, and may contain microelements such as boron.

Compound fertilizers may be used to provide nutrients to all types of arable crops. The Group's current offering comprises more than 40 varieties of compound fertilizers, which are sold under the following trade names: Polifoska®, Polidap®, Polimag® Superfosfat, Amofoska®, etc. The Group also manufactures dedicated fertilizers, whose composition is adapted to

the needs of specific customers.

LIQUID FERTILIZERS

Urea-ammonium nitrate solution (UAN – RSM®) is a highly concentrated liquid fertilizer containing nitrogen in amide, nitrate and ammonium forms. Thanks to its liquid form, UAN–RSM® is easily absorbed by plants.

It is also produced with an admixture of sulfur, as UAN–RSM®S.

PULASKA® is a solution of nitrogen fertilizer containing sulfur, derived by mixing urea and ammonium sulfate solutions. It also contains an environmentally-neutral corrosion inhibitor. PULASKA® contains nitrogen in ammonium and amide forms, and sulfur in sulfate form, which is easily absorbed by crops.

Calcium nitrate solution is used to supply nutrients to tomatoes, cucumbers, peppers, as well as cut and potted flowers grown under shelter. However, this solution is also used on a large scale for foliar feeding of calcium and nitrogen to open-grown plants.

Our other products:

ENGINEERING PLASTICS

Engineering plastics (technical thermoplastics) are a group of products which exhibit high thermal resistance and good mechanical properties.

The Grupa Azoty Group manufactures the following types of engineering plastics: basic polyamide 6 (PA6), polyacetal (POM) and modified plastics.

Polyamide 6 (PA6) is a high-quality engineering thermoplastic in granular form for injection processing. It is the leading product among engineering plastics. The product's wide range of beneficial properties mean that it is used in a range of industries, including automotive, construction, electrical engineering, household goods and the food and textile industries. The Group's very popular brands in this segment are Tarnamid® and Alphalon®.

Polyacetal (POM) is a high-quality engineering thermoplastic in granular form, used to manufacture goods through injection processing. It has good insulation properties, low gas permeability and good sliding properties. It is used in industries such as automotive, household goods, electrical engineering, construction, furniture manufacture, machine parts, sport equipment and accessories. The key segment for POM application is the automotive sector. The Grupa Azoty Group markets polyacetal under the trade name Tarnoform®.

Caprolactam – an organic chemical compound and an intermediate product used in the manufacture of polyamide 6 (PA6). It is produced mainly from phenol and benzene. Synthesis of caprolactam yields ammonium sulfate as a by-product. It is manufactured in Tarnów and Puławy.

Cyclohexanon and cyclohexanol are used by the Company, either separately or as a mixture, mainly to manufacture caprolactam and adipic acid, which are used primarily to produce polyamide. Only 5% of their production volume is placed outside of the polyamide market. The key feedstock in the production of cyclohexanone and cyclohexanol is cyclohexane (80%), with the balance represented by phenol (and toluene: 2%).

The market's absorptive power strictly correlates with the target market for PA6 and PA6.6 polyamides. Very important is the situation in the textile, carpet, automotive, and construction industries, as well as in any sector where polyamide engineering plastics find novel applications.

In the case of Grupa Azoty, cyclohexanone and cyclohexanol are used to produce caprolactam, which is later used in the production of polyamides manufactured in Tarnów and Guben.

OXO ALCOHOLS

The Grupa Azoty Group manufactures the following OXO alcohols: 2-ethylhexanol (2-EH), n-Butanol, isobutanol and octanol F (compound of post-distillation residue).

2-ethylhexanol (2-EH) is used primarily in the manufacture of plasticizers. 2-EH and its derivatives are also used in the textile and refining industries. 2-ethylhexanol is also applied as a solvent for plant oils, animal fats, resins, waxes and petrochemical products.

N-Butanol is used in the manufacture of plasticizers, amino resins and varnishes. It is also used as an intermediate product for organic synthesis, an additive to oils, and a component for the manufacture of solvents and coating materials. It is applied in the textile, pharmaceutical and printing industries.

Isobutanol is used as an intermediate product for organic synthesis, for the manufacture of plasticizers, solvents, herbicides and coating materials.

Octanol F is an oxo alcohol used as a flotation agent in mining and as an auxiliary substance in the textile industry.

PLASTICIZERS



The Grupa Azoty Group manufactures four plasticizers: DEHP, DIBP, DPHP and DEHT. Plasticisers are used in the chemical industry as agents softening plastics, mainly PVC, and as an additive to paints and varnishes. The Group manufactures plasticizers using an integrated manufacturing facility, with the majority of materials manufactured on site, except for two types of feedstock: 2-propylheptyl alcohol and terephthalic acid.

DEHT – bis(2-ethylhexyl) ester of 1,4-benzenedicarboxylic acid (currently referred to as Oxoviflex™), used in the processing of plastics as a non-phthalate plasticizer, and in the paint and varnish industry. It also has a wide range of other applications, from the manufacture of floor and wall coverings to children's toys.

DEHP – bis(2-ethylhexyl) phthalate – is a universal plasticizer which is used in the processing of plastics, in particular in the manufacture of PVC. DEHP is also used as an additive for paints and varnishes. The Grupa Azoty Group markets this product under a trade name Oxoplast® O.

Oxoplast Medica® – bis(2-ethylhexyl) phthalate with low content of heavy metals – is a plasticizer used in medicine (e.g. for production of blood storage bags).

DPHP – bis(2-propyl heptyl) phthalate - is a plasticizer used in the automotive industry, in roofing as well as for the manufacture of artificial leather and waterproof canvas. It is marketed by the Grupa Azoty Group as Oxoplast® PH.

Melamine is a non-toxic, non-flammable product in the form of a white powder. It is characterized by high surface hardness, and resistance to water, temperature, light, and stray voltage. Melamine is used for production of synthetic resins, thermosetting plastics, adhesives, paints, varnishes (including furnace varnishes), auxiliary materials for the textile industry, fire retardants, polyurethane foams, concrete liquefiers, moulding mixtures used in the electrical engineering industry, microchips, compact discs, optical instruments, and household equipment.

Hydrogen peroxide is an inorganic compound from the group of peroxides, being a reactive oxygen species offered in the form of 35%, 49.5%, 50% and 60% stabilized water solutions. The Group also offers a special variety of 35% hydrogen peroxide for food processing applications, which is dedicated for use in aseptic food product packaging and filling processes in Combibloc and Tatra Pak systems.

Hydrogen peroxide is used for bleaching in the paper and textile industries, production of inorganic peroxy compounds, disposal of industrial and urban wastewater, chemical processing (as a process medium), removal of SO₂ and NO_x from flue gas, protection against corrosion in the electronic industry, bleaching and colouring of hair in the cosmetic industry, teeth whitening (as an ingredient of toothpastes and rinses), bactericidal processes in the food industry, in brewery, bakery, seed production, as well as military technology (as a component of rocket propellants and as a substance used in torpedo propulsion systems).

Titanium white (titanium dioxide – TiO₂) is a pigment and an important manufacturing component used in numerous industries. The key consumer for TiO₂ pigments is the paint and varnish industry. They are also used in the plastics, paper, rubber, textile, pharmaceutical and cosmetics industries. The Grupa Azoty Group also offers certified pigments for use in goods that come into contact with foodstuffs. TiO₂ pigments are sold under the registered trademark Tytanpol®. Grupa Azoty POLICE currently

manufactures six types of titanium white.

Ammonia is produced in a process of direct synthesis of nitrogen (derived from the air) and hydrogen (obtained from natural gas). Ammonia is the basic semi-product further used in the manufacturing of urea, ammonium nitrate, CAN, ammonium sulfate, UAN, and compound fertilizers. It is also used in the chemical industry, e.g. for production of caprolactam or polymers, or as a cooling agent.

Phosphorites occur as natural deposits in various parts of the globe. Phosphate rock is a sedimentary rock containing phosphate bearing minerals which, after being mined and beneficiated, are used mainly to produce phosphoric acid. Phosphoric acid is an intermediate product used to manufacture phosphate fertilizers such as triple super phosphate (TSP), diammonium phosphate (DAP), and compound fertilizers (NP and NPK). The Grupa Azoty Group is implementing a project to mine phosphorites in its own mine in Senegal.

Sulfur – the product offered by the Grupa Azoty Group is mined sulfur. Elemental sulfur improves, among other things, nitrogen use efficiency by plants, which makes it a useful compound of fertilizers.

Sulfur is mainly used to produce sulfuric acid.

Grupa Azoty SIARKOPOL offers liquid sulfur, prilled sulfur, two varieties of insoluble sulfur, flaked sulfur, and five varieties of milled sulfur. Grupa Azoty SIARKOPOL is the only sulfur mining company in Poland and globally.