

Spolana
ORLEN Unipetrol Group

 **ORLEN** Unipetrol

 **CAPROLACTAM**

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Spolana

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Spolana is one of the largest chemical manufacturing companies in the Czech Republic and has nearly one hundred and twenty years of tradition. The company's headquarters is in Neratovice, and its production plant complex, which covers 260 hectares, is located north of the capital Prague. The company currently employs more than 700 employees.

Spolana is the only Czech manufacturer of PVC and Caprolactam. The company also produces sodium hydroxide and ammonium sulphate.

Spolana has been owned by ORLEN Unipetrol Group since 2016.

CAPROLACTAM

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CAPROLACTAM

Caprolactam is an essential chemical used for nylon 6 production. Nylon 6 fibers are

used in the production of commercial and residential carpets, engineering plastics, automobile plastic components, housings, clothing and packaging.

Caprolactam is generally traded in flaked form since operations with the molten form are relatively costly and the availability of heating installations may also be a problem. European producers, however, are able to receive Caprolactam in molten form (75 °C+) since the destinations are relatively close. This decreases the cost of additional production since there is no need to melt the flaked product. The liquid form is therefore preferable.

The global demand for Caprolactam is mainly driven by demand for its main derivate, nylon 6. The key industries which drive the global Caprolactam market are **automotive, textiles and electronics**.

Spolana's molten Caprolactam export destinations in Europe include Italy, Switzerland, Germany, Poland, Netherlands, Belgium and Slovenia. Flaked Caprolactam is also exported to Turkey, Japan, India, Spain, Taiwan and elsewhere.



CAPROLACTAM CHARACTERISTICS

GENERAL CAPROLACTAM CHARACTERISTICS

Caprolactam is a monomer intermediate used for the production of nylon 6. At room temperature, it is a white crystalline substance which is strongly hygroscopic. It has an unpleasant odour and taste. Its melting point is 69 °C.

Caprolactam forms:

- ▶ molten Caprolactam
- ▶ flaked Caprolactam

LABORATORY TEST METHODS

QUALITY MARKERS	UNIT	VALUES	TEST METHOD	
			INTERNAL REGULATION	RESOURCE STANDARD
Solidification point (min.)	°C	69.0	SOP-A-165	ISO 1392
Volatile alkalis (max.)	mekv/kg	0.4	SOP-A-165	ISO 8661
Permanganate number (3% aquatic solution) *, (min.)	s	12000	SOP-A-165	ČSN ISO 1388-12
Permanganate index (3% aquatic solution) *, (max.)	–	4.4	SOP-A-165	ISO 8660
Colour in Hazen units (50% aquatic solution), (max.)	HJ (APHA)	5	SOP-A-165	ISO 8112
Ash (max.)	mg/kg	7	SOP-A-166	ČSN EN ISO 3451-1
Iron (max.)	mg/kg	0.5	SOP-A-166	ČSN ISO 6332
Substances insoluble in water (max.)	mg/kg	5	SOP-A-166	ČSN EN 872
Alkalinity (max.)	mekv/kg	0.1	SOP-A-165	ČSN ISO 6618
Acidity (max.)	mekv/kg	0.05	SOP-A-165	ČSN ISO 6618
Water (max.)	%	0.1	SOP-A-102	ČSN ISO 760
Absorbance (50% aquatic solution, λ=290, 10mm cuvette), (max.)	–	0.05	SOP-A-121	ISO 7059



Caprolactam classification is in accordance with Act no. 350/2011 Coll. (Chemical Act), Regulation 1907/2006 (REACH) and Regulation No. 1272/2008 (CLP) and their implementing regulations in their effective versions, and potentially also future replacement legislation. It is listed in the relevant safety data sheet. Caprolactam is classified as harmful and irritant.

When handling or working with Caprolactam, the occupational health and safety regulations stated in Chapter VI of the corresponding company standards and on the safety sheet must always be observed.

Caprolactam is manufactured in accordance with valid technological, fire safety and occupational safety documentation.

CAPROLACTAM LOGISTICS

PACKAGING AND TRANSPORT OF CAPROLACTAM

Flaked Caprolactam must be stored in original packaging on pallettes in areas with a maximum relative humidity of 65% (if not, Caprolactam will get wet) and maximum temperature of 30 °C, and protection from direct sunlight. If the storage conditions are satisfied, **the warranty period is three months from the date of shipment of the Caprolactam from the warehouse.**

Caprolactam flakes are filled in 25 kg plastic bags.

Molten Caprolactam is filled into 40–55 m³ railroad cisterns which have heating coils and a thermometer or other railroad containers or car cisterns. If heated, the temperature of melted Caprolactam **must not exceed** 90 °C. The protective atmosphere of nitrogen is maintained above melted Caprolactam to prevent oxidation of the product in atmospheric oxygen. The maximum oxygen content is 50 ppm. To maintain the oxygen content in the inert atmosphere below 50 ppm, both the customer and supplier must ensure a secure the minimum overpressure of nitrogen in the cistern of 0.02 MPa and refill the inert atmosphere in the cistern, or empty the cistern only with nitrogen which does not contain more than 10 ppm of oxygen. The conditions for filling railroad containers and car cisterns and for proper protection during transport are specified upon agreement with the customer. The carrier is responsible for ensuring all the required transport conditions while transporting the goods.

IDENTIFIED USES

1) Uses by workers in industrial settings

- ▶ intermediate
- ▶ monomer for polyamide, polymers, thermoplastics
- ▶ monomer for thermo hardened resins
- ▶ plasticizer for polyamide
- ▶ in leather tanning, finishing, impregnation, coatings and paints

2) Uses by professional workers:

- ▶ laboratory chemical
- ▶ formulation of liquid preparations

3) Uses by users:

- ▶ in coatings/paints (consumer)





CAPROLACTAM NYLON 6 (CSHUNO)

GENERAL NYLON 6 CHARACTERISTICS

Nylon is a generic designation for a family of synthetic polymers. Nylon 6 or polycaprolactam is a semi-crystalline thermoplastic linear polyamide. Its melting point is 220 °C, and autoignition temperature is 434 °C. Nylon 6 is known under numerous trade names including Perlon (Germany), Dederon (former East Germany), Nylatron, Capron, Ultramid, Akulon, Kapron (former Soviet Union and satellite states), and Durethan.

MANUFACTURING PROCESSES

Caprolactam is reacted in the molten state with controlled amounts of water to obtain intermediate 6-aminohexanoic acid which readily condenses to nylon 6 as water is removed under controlled temperature and pressure conditions. Nylon 6 can be modified using selected additives during polymerization so that new chain end or functional groups originate and therefore change the reactivity and chemical properties. It is often done to change the material's color or flame retardance.

NYLON 6 END-USES

Polyamide 6 is a significant construction material used in many industries, including the automotive, aeronautics, electronics and electrotechnology, textiles and medical industries. End-use applications for nylon 6 are divided into two categories – nylon fibers (60 % of total consumption) and nylon engineering resins (40%).

- ▶ **Nylon fibres** – product of the conversion of nylon resins by spinning processes for use in applications in clothing (nylons), carpets, tyre cords, ropes and others.
- ▶ **Engineering resins** – diverse uses , including automotive and appliance components, electrical power distribution, and a wide variety of consumer goods and packaging film.

CAPROLACTAM

INTEGRATED MANAGEMENT SYSTEM

Spolana produces Caprolactam using an Integrated Management System (IMS) which includes processes for managing quality, the environment, safety and energy.

The IMS has been certified by Lloyd's Register Quality Assurance Limited (LRQA) according to the following standards:

ISO 9001:2015 (Quality Management System – QMS)

ISO 14001:2015 (Environmental Management System – EMS)

ISO 45001:2018 (Occupational Health and Safety Management System – HSMS)

ISO 50001:2018 (Energy Management System – EnMS)

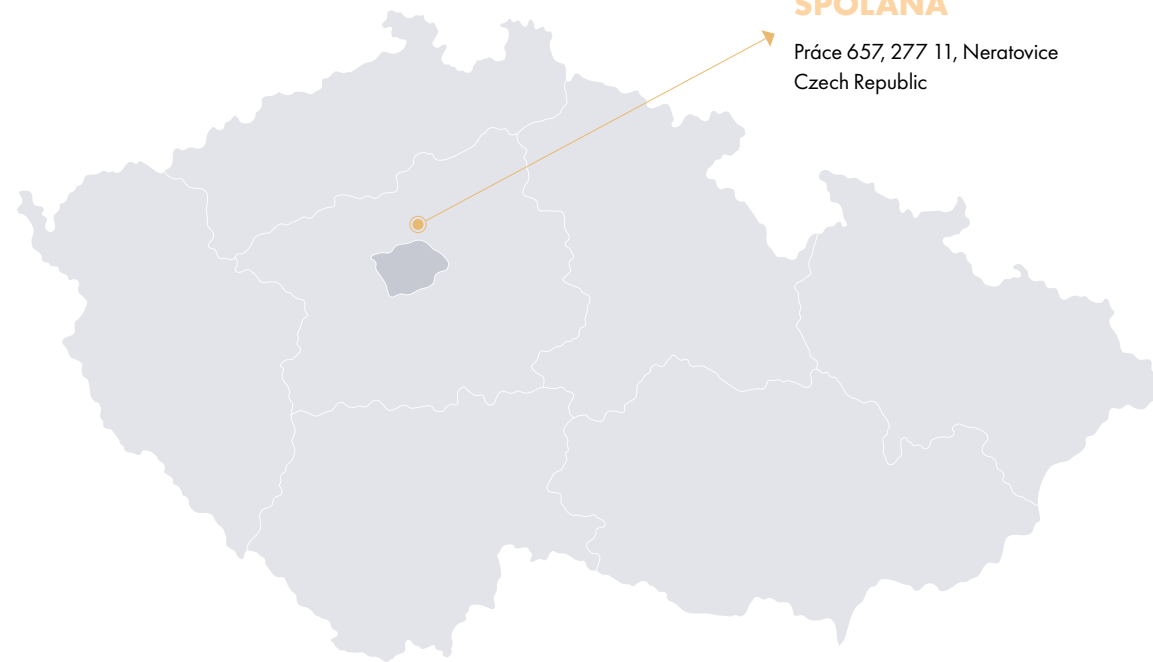




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