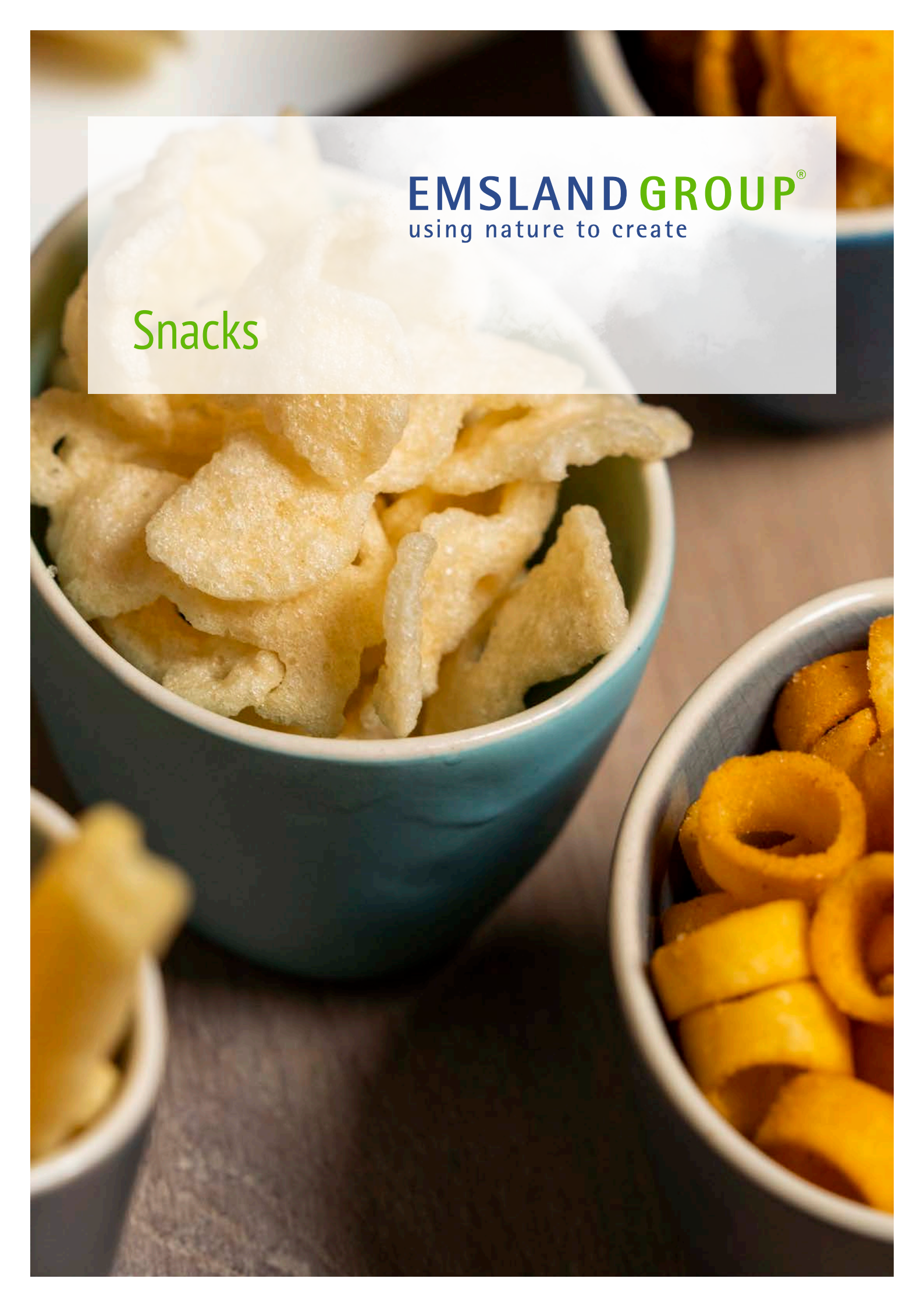


The background of the entire page is a photograph of several bowls filled with different types of snacks. In the center, a teal bowl is filled with golden-brown, irregularly shaped fried snacks. To the right, a white bowl contains bright yellow, ring-shaped snacks. In the bottom left, another white bowl shows yellow, star-shaped snacks. The bowls are arranged on a dark, textured surface, and the lighting is warm, highlighting the textures of the snacks.

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using nature to create

Snacks



Snacks

Innovations within the savory snacks industry are driven by the ever-changing and diverse demands of consumers across the globe. Whether it be affordability, sustainability, health-conscious, additive-free or convenience, consumers are looking for great-tasting and long-lasting snack options that align with their own principles.

For the manufacturer, producing a successful snack product it is a fine balance between the consumer's needs, preferences, tastes and interests. As consumers continue to demand more pure products, the right choice of raw materials becomes even more important. "Natural" attributes, such as "gluten-free", "no preservatives", "no additives" and "vegetarian" have become a focus during new product developments as brands look to promote the healthiness of the ingredients they use.

Emsland Group Ingredients

Flakes and granules are the backbone of many potato-based snacks. Next to that, **native and modified potato starches** are used to influence the manufacturing process or to create the desired expansion and texture. **Pea protein isolate** and **potato and pea fibres** are ideal for protein and fibre enhancement.

The plant-based portfolio of the Emsland Group contains **potato and pea starches, potato flakes and granules** as well as **pea proteins and fibres** – making the Emsland Group the one-stop-shop ingredient partner for potato-based snack producers.

Customer Support

The Innovation Center at the Emsland Group has all the tools to support customers with their snack projects. Depending on the application, process and texture requirements, our snack application specialists are able to advise which starch, flake or granule type our customers can use. Next to that, our modern snack pilot plant enables us to collaborate with our customers in order to develop new recipes and ingredients for most potato-based snack applications.



Extruded Snacks

There are two types of extruded snacks: direct and indirect expanded snacks.

Direct expanded snacks are snacks that are formed in the extruder and expand immediately once they emerge from the die. Indirect expanded snacks are

not expanded after the extrusion process and require an independent second processing step, such as frying, to prepare the final expanded snack. The semi-finished snacks have the advantage that they can be stored easily and therefore have a long shelf life.

Texture & Expansion

The preparation of extruded snacks requires special ingredients that withstand process conditions, such as heat and shear. Next to that, snack producers have their own requirements for specific expansion

and texture depending on regional consumer preferences or market trends.

The Emsland Group has a wide portfolio of starches, granules and flakes for extruded snacks.

Products for Direct Expanded Snacks

	Emflake 3917	Empure KF 1500	Emgranule 3364	Potato starch
Type	Potato flake	Potato flake (clean label)	Potato granule	Native potato starch
Description	Potato flake that provides good expansion and crispy texture	Clean label potato flake for extruded snacks	Provides reduced dough stickiness, homogeneous shaping and, in general, a harder or crunchier snack texture	Standard starch for extruded snacks

Emflo KPS 200
Cook-up modified potato starch (E1412)
Modified potato starch that provides good, stable expansion at higher temperatures – suitable for high shear systems

All products are registered®



Products for Indirect Expanded Snacks

	Emflake 3847	Empure KF 1500	Emgranule 3364	Potato starch
Type	Potato flake	Potato flake (clean label)	Potato granule	Native potato starch
Description	Potato flake with good water binding that provides a light and crispy texture to the snack	Clean label potato flake for extruded snacks	Potato granule that reduces expansion and stickiness of the dough, and provides a homogeneous shaped pellet	Standard starch for extruded snacks

Emwaxy 100	Emjel P
Native waxy potato starch	Pre-gelatinized modified potato starch (E1412)
Waxy potato starch that provides good expansion, a homogeneous shape and a delicate final texture	Cold water binding modified potato starch that facilitates extrusion and controls expansion

All products are registered®



Sheeted and Fried Snacks

Sheeted and fried stackable snacks are prepared by specific processing in frying oil, leading to the desired even stackable shape that is packed in typical cone-shaped packaging. Next to stackable snacks, pellets can also be made by a sheeting process.

Sheeting Properties & Expansion
Challenges of sheeted and fried snacks are related to the dough properties and the final texture of the snack. The dough should form easily and it should be easy to cut the sheet into the desired shape. The expansion should be even and homogenous and the texture crispy and light.

Emsland Group's potato-based ingredients are able to overcome these challenges. Depending on customer requirements and preferences, there are several combinations of flakes, granules and starches possible for a good end result.

Products for Sheeted, Fried and Stackable Snacks

	Emflake 3916	Emflake 3862a	Emgranule 3364	Potato starch
Type	Potato flake	Potato flake	Potato granule	Native potato starch
Description	Standard flake for good expansion and texture	Potato flake that provides a more compact dough with reduced stickiness	Potato granule that provides a dough with reduced stickiness, reduced expansion and homogeneous shape	Golden standard

Emwaxy 100	Emjel P
Native waxy potato starch	Pre-gelatinized modified potato starch (E1412)
Waxy potato starch that provides good expansion, a homogeneous shape and a delicate final texture	Cold water binding starch that facilitates workability and controls expansion

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Sheeted and Baked Snacks

Sheeted and baked snacks have become popular snacks due to the growing consumer awareness of caloric intake and the fact that the fats and oils in fried snacks contribute largely to that. In general, sheeted and baked snacks are produced from a sheeting dough of potato flakes, starches and some minor ingredients such as emulsifiers. The sheet is cut to the desired shape and the dough pieces are baked and seasoned.

Expansion & Texture
The baking conditions that are used for preparing sheeted and baked snacks may lead to random and irregular shapes. Therefore ingredients are required that are easy to expand and result in an even texture.

By using the right combination of the Emsland Group's potato flakes and starches, the requirements of baked and sheeted snacks can be fulfilled.

Products for Sheeted and Baked Snacks

	Emflake 3899	Emwaxy 100	Emjel E 70	Emwaxy JEL 100
Type	Potato flake	Native waxy potato starch	Pre-gelatinized potato starch	Pre-gelatinized waxy potato starch
Description	Potato flake that provides excellent sheeting and cutting properties and a uniform expansion	Waxy potato starch that provides good expansion, a homogeneous shape and a delicate final texture	Cold water binding starch with good dough binding properties	Cold water binding starch that provides homogenous expansion and a light and crispy final texture after baking

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Coated Nuts

Texture & Expansion

Coated nuts (usually peanuts) are nuts covered with a flavoured crispy layer. The layer consists of starches or flours and, sometimes, granules and flakes. Texture and expansion are two important qualifiers for coated nuts. It is important that the

expansion is even and that the air bubbles are homogeneous without leaving room between the nut and the coating, thus preventing the so-called 'rattle effect'.

Potato starches are excellent ingredients for coated nuts. By using a combination of cook-up and pre-gelatinized starches, optimum binding and expansion is achieved. Texture variation can be

created by using a mix of regular potato starch and **Emwaxy**® waxy potato starch. In general, **Emwaxy**® leads to higher expansion and a lighter texture.

Products for Nut Coating

	Potato starch	Emwaxy 100	Emjel E 70	Emjel P
Type	Native potato starch	Native waxy potato starch	Pre-gelatinized potato starch	Pre-gelatinized modified potato starch (E1412)
Description	Potato starch that provides good expansion and a crunchy texture after preparation	Waxy potato starch that provides excellent and homogeneous expansion and a very crispy and light texture after preparation	Cold water binding starch that is used as a binder in the coating process	Cold water binding modified potato starch that is used as a binder in the coating process

Emwaxy JEL 100
Pre-gelatinized waxy potato starch
Cold water binding waxy potato starch that is used as a binder in the coating process and provides a uniform expansion and a light texture

All products are registered®





Enriched with Protein and Fibre

Healthy snacks that are enriched with (plant-based) proteins or fibres are gaining popularity. For several snack types, the Emsland Group has developed protein- and fibre-enriched concepts

using pea protein isolates and pea and potato fibres. An overview of the products that can be used for this purpose can be found in the following table.

Pea Proteins, Pea Fibres and Potato Fibres for Enriched Snacks

	Empro E 86	Empro E 86 HV	Emfibre EF 200	Emfibre KF 200
Type	Pea protein isolate with minimum 84 % protein content	Pea protein isolate with minimum 84 % protein content	Pea fibre	Potato fibre
Description	Standard multifunctional low viscous pea protein isolate	Pea protein isolate with high viscosity	Pea fibre with medium coarse particle size. The fibre has a very light colour	Potato fibre with medium coarse particle size

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About the Emsland Group

Using nature to create is the guiding principle of the Emsland Group. As a global leader in refined products made from potatoes and peas, we offer a wide range of innovative products with the high quality and reliability that the Emsland Group name is known for.

Our plant-based ingredients include native, clean label and modified potato and pea starches, proteins and fibres, as well as potato flakes and granules, which can be used as thickeners, binding agents, emulsifiers and stabilizing additives for various applications. We serve a variety of industries and offer solutions for trends such as clean label, kosher, halal, gluten-free, vegan, fibre enriched, sustainability, as well as non-GMO raw materials.

Innovation is a core driving force at the Emsland Group. Experts at our Innovation Centre in Germany are constantly developing and optimising products and concepts to meet the evolving demands of both the industry as well as the end user. We work closely with customers to further develop our product portfolio and overcome challenges in a sustainable way.

Sustainability is a responsibility that, for us, does not begin in the factory, but in the field. Since 1928, we have been relying on the innovative power of nature and working in harmony with our natural resources in all our endeavours. Our team is dedicated to continuously working to develop products that are in line with newer sustainability benchmarks, helping to drive the global trend towards more environmentally friendly and sustainable options through the production of plant-based solutions.

The Emsland Group offers product solutions for the following food segments:

- Bakery
- Confectionary
- Dairy & Alternatives
- Food Coating
- Meat Analogues
- Meat, Poultry & Seafood
- Noodles & Gluten-Free Pasta
- Potato Products
- Potato Snacks
- Retail & Food Service
- Soups & Sauces

The table below offers an overview of the most common applications of our products in all food segments. For more complete information on the Emsland Group's products and applications, please contact us at info@emsland-group.de.

Ingredients	Functionality	Food applications
Potato flakes <i>Emflake</i>	Texturizing, expansion, forming	Snacks, potato products, bakery
Potato granules <i>Emgranule</i>	Texturizing, expansion, forming	Snacks
Native pea and potato starch	Thickening, texturizing, water binding, expansion, anti-caking	Soups, sauces, noodles, meat, snacks, gluten-free products
Modified pea and potato starches <i>Emes, Emflo, Emden, Emox</i>	Thickening, texturizing, gelling, binding, expansion, forming	Snacks, soups, sauces, confectionary, food coating, baked goods, processed cheese and alternatives, meat and analogues, noodles
Cold water swelling or soluble native and modified starches <i>Emjel, Emfix, Emspray</i>	Instant thickening, texturizing, binding, emulsifying	Snacks, soups, sauces, bakery fillings, baked goods, cheese and alternatives
Potato and pea dextrins <i>Emdex</i>	Film forming, texturizing (crispiness)	Food coating, filler, binder
Clean label pea and potato starches <i>Empure</i>	Thickening, gelling, texturizing, binding	Soups, sauces, potato products, meat analogues
Waxy potato starch <i>Emwaxy</i>	Expansion, thickening, texturizing	Snacks, meat, noodles, cheese alternatives, fruit preparations, bakery fillings
Pea protein isolate <i>Empro</i>	Nutrition (protein enrichment), texturizing, emulsification	Meat analogues, dairy alternatives, bakery, snacks
Pea and potato fibre <i>Emfibre</i>	Nutrition (dietary fibre, water and fat binding)	Meat and analogues, bakery, snacks
Blends <i>Embat</i>	Film forming, texturizing	French fry coating, tempura & adhesion batter

The Emsland Group is committed to producing consistently high-quality ingredients. Customer health and safety, as well as transparency regarding our manufacturing methods, are top priorities.

To view a complete list of our certifications and qualifications, scan the QR code or visit www.Emsland-Group.com



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Disclaimer: All information and data in this brochure are in accordance with the best practise experiences and laboratory examinations of Emsland-Stärke GmbH and Emsland Food GmbH hereafter called Emsland Group. The indications are based on the current state of development, technology and research and should be taken as information on the products of Emsland Group, but must not be understood as promise of characteristics.

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