Salami Sticks & QDSnacks®: **The natural (R)evolution**

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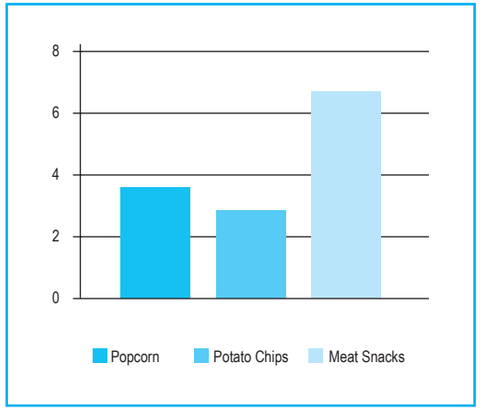
INTRODUCTION

Whether to replace a meal or as a nibble before a main meal, snacks are starting to play a key role in people's everyday lives. Tight schedules and the desire for variety and instant satiation have led many consumers to change their mindset and alter their eating habits. This is because snacks are easy to both eat and carry, and they often adapt better to consumers' everyday lives.

Snack consumers are traditionally thought to be compulsive buyers, being the result of an unplanned action, with the purchasing decision taken when inside the shop. According to "The power of snacking", The Nielsen Company, 2018, the current situation differs from that premise. Snacks have developed and they no longer simply fulfil the aim of satisfying a consumer's immediate needs, rather that they aim to create needs and moments surrounding their consumption. The same article states that both immediacy and acquired emotional commitment are key influences among snack buyers.

North America and Europe are currently the most mature meat snack markets, particularly in terms of meat sticks, mini-salamis, kabanos... However, there are many emerging markets in which the consumption of these products is growing fast.



▲ **Image 1.** Graph showing accepted spend per product in the U.S.A.

According to the article, "Where is the beef? Check the snack aisle", The Nielsen Company, 2017, 2016 saw a 3.5% increase in meat snack sales in the U.S.A. Sales totalled 2,800 million dollars, with essentially a 50% split between jerky and sticks. Furthemore, North American consumers are willing to pay around double for products such as mini salamis compared to other popular snacks, such as potato crisps or popcorn (image 1).

As explained in the article, "QDSnacks®: the future of meat snacks here and now" in Metalquimia's book of technological articles, meat sticks are a natural evolution from salami, fuet, chorizo, pepperoni£ traditional fermented meat products in many countries in the south and east of Europe and North America. This is why these snacks are easily recognised by the general public, leading to them becoming well established in a short space of time in most European and North American markets. It involves converting a product that consumers both know well and accept into a snack, by using individual portions, packs for sharing, making them easy to carry and eat, and stable at room temperature... This makes gaining a foothold in major markets much easier.

▲ **Image 2.** Sticks extruded and dried in QDSnacks of different diameters and flavours.

▲ **Image 3.** QDSnacks 5mm sticks.

QDSnacks® STICKS

Currently available mini salamis are a progression from traditional restructured meats into snack-type products. Furthermore, mini salamis that can be developed using QDS technology are another step in the evolution of these well-established snacks in terms of providing new concepts and formats. This means that QDS is positioned as the ideal technology to continue innovating in the meat snacks sector.

Current mini salami production processes tend to use ovens or driers, meaning that only limited automation is used, with a high number of employees required, given that using the same equipment to bring efficiency to the drying and cooking process is unusual. With QDSnacks® technology, the process is continuous and integrated, starting with processing the meat and ending with the final packaging to obtain the end product.

Additionally, the operational costs of the aforementioned production are noticeably reduced. It requires fewer personnel given the high level of automation involved with the continuous operation.

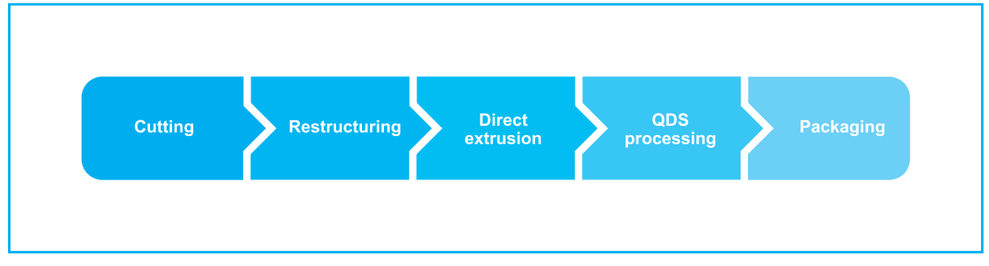
There are currently several methods for producing mini salamis in the sector:

- Casing filling: for sticks with diameters > 12 mm
- Co-extrusion with alginates: for sticks with diameters > 8mm
- Direct extrusion

QDSnacks technology can be used for each of the above, although extruding without a casing can obviously provide more logistical, financial, and safety advantages.

Direct extrusion brings the benefit of being able to work with both smaller and larger diameters without needing to have to use any type of casing or co-extrusion. The main limitation of currently available extrusion equipment is that they usually operate at very high pressures (even above 25 bars).

Given that they use high pressure rotors to regulate flow, defects can occur when creating the end product sticks. This makes them visually unappealing to some extent since you cannot differentiate between lean meat and fat particles.



▲ **Image 4.** Diagram of the continuous manufacturing process of mini salamis using QDSnacks® technology.

Based on currently available extruders, Metalquimia has developed a specific extruder for meat snacks. The main idea was to avoid issues with the meat as a result of the high pressure. This is why an extruding head was designed, which is connected to a bladed vacuum filling machine. It comes with an integrated adjustable pressure control system to enable operations at very low pressures. This patent-pending equipment is the ideal solution to create an outstanding product. Lean meat and fat particles are clearly defined and can be differentiated in the end product due to the low pressure applied during the process. This means that mealting fat and product emulsification are avoided.

The extruder head is located at the outlet of a filling machine and it allows the minced meat mix containing the different ingredients to extrude to obtain a product in the required form and diameter. This is direct extrusion that does not require any casing or any co-extrusion to maintain the product's form. This Metalquimia-developed system can extrude mini salamis from a starting thickness of 4mm, and it is possible to include an integrated cut to obtain pieces of the required length.

▲ **Image 5.** QDSnacks® extruder head

This extrusion tool is very versatile. Simply by changing the nozzles, different diameter products and even different profiles can be extruded. The extrusion can take the form of both stick-type products and meat bar-type products of different thickness and sizes, which are then dried using the QDSnacks®. These meat protein bars, which look similar to energy and cereal bars, already account for a significant market share in the United States of America, and are gradually being introduced into Europe.

This accessory provides significant production capacity, making it the ideal solution for feeding the QDSnacks equipment and obtaining the required end product.

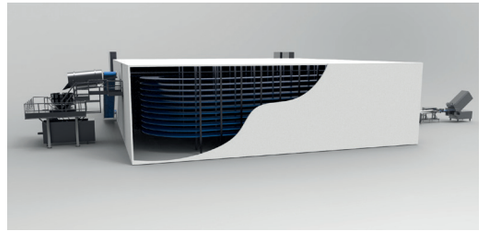
MINI SALAMI PRODUCTION

After extruding the product it undergoes convective treatment in air conditions controlled by QDSnacks® technology.

At present, these snacks are normally produced using ovens or dryers. There is usually a lack of homogeneity

▲ **Image 6.** Clear particles in the whole product when split in half.

▲ **Image 7.** Meat bars produced using the QDSnacks®



▲ **Image 8.** QDSnacks® installation layout.

during production in both cases, with major deviations occurring in terms of the batches and productive output. Production tends to stretch over several days and requires a lot of staff for monitoring due to the limited level of automation involved with those machines. QDSnacks® currently uses two different types of technologies to produce all types of extruded products. Two conceptually different machines have been designed, but they use the same air treatment control system. This means that these snacks can be produced with the highest level of automation possible, obtaining total homogeneity during processing and few product deviations. With two types of QDSnacks® technology available, finding the ideal solution for each product and manufacturer is easy.

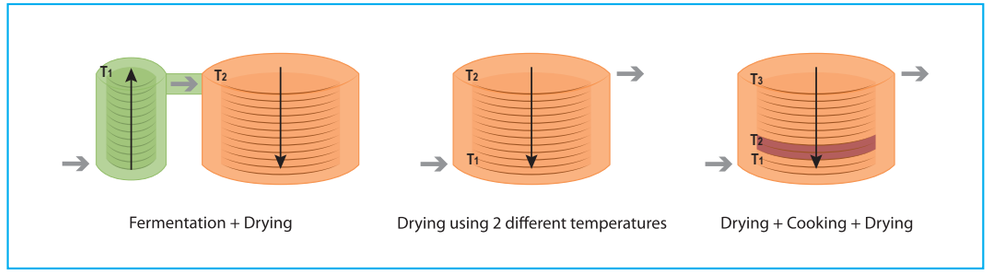
This type of product often goes through a fermentation or acidification stage during the process. This lowers the pH and avoids microbiological issues during the drying stage, which tends to last for a few days. The pH does not need lowering unless required when using QDSnacks technology. This is because the drying times are shorter, thus avoiding this problem. All the same, if a lower pH is desired for organoleptic reasons, continuous rapid fermentations are possible or organic acids can also be used.

The spiral QDSnacks® technology can be used for continuous production processes, drying at different temperatures, fermentation and drying, pasteurisation using heat treatment, and subsequent drying... with the equipment itself able to make products with suitable reductions (even above 50%) in order to achieve an Aw of < 0.85. This combination of reductions in both Aw and pH enables the output of a safe product, with a shelf life of around 6 months, which can be stored at room temperature.

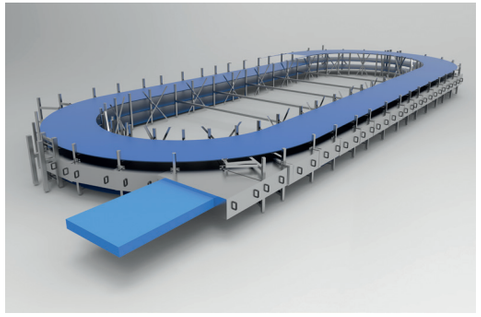
QDSnacks® technology incorporates comprehensive airflow, temperature, and relative humidity control, producing a completely homogeneous and regular product. When combined with the product development know-how accumulated by Metalquimia's technology department over the years, both machines have been given the capabilities to produce a large range of high quality meat snacks. Extensive experience in controlling and distributing environmental conditions and air management and distribution over the product using HVAC units, means that the product drying is both precisely controlled and homogeneous.

QDSnacks® TECHNOLOGY

The spiral QDSnacks® is the first equipment specifically designed for drying meat snacks. It uses spiral drying, enabling continuous snack production. It is a versatile



▲ **Image 9.** Different mini salami production options using QDSnacks® technology.



▲ **Image 10.** Render of QDSnacks® steam cooking belt.

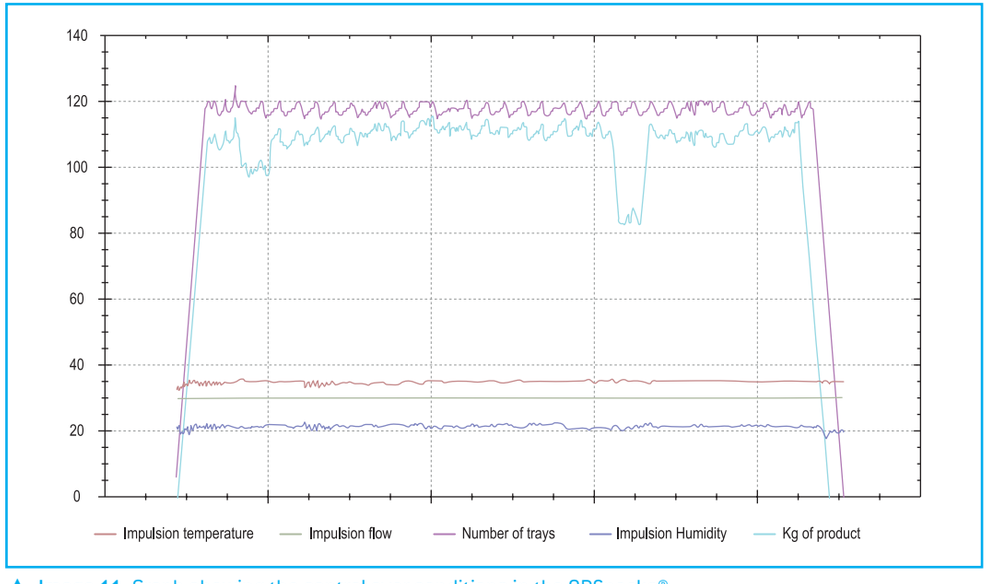
installation, given that it can dry a range of quantities of all types of snacks efficiently.

Continuously operating, the entire sticks production from mincing the meat to packaging the end product only takes a few hours. The meat is minced to a smaller particle size than the required extrusion diameter, the ingredients are mixed, the product is extruded using the extrusion head, and a retractable conveyor belt unloads the product onto the QDSnacks® conveyor belt (see image 14). This enables the optimal use of the space occupied by the product on the belt, and therefore, maximises the final production.

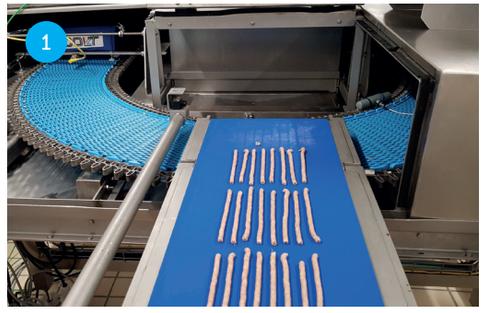
This equipment is conceived for large volume operations. As table 13 shows, it is capable of producing large amounts of meat snacks when operating continuously and effectively.

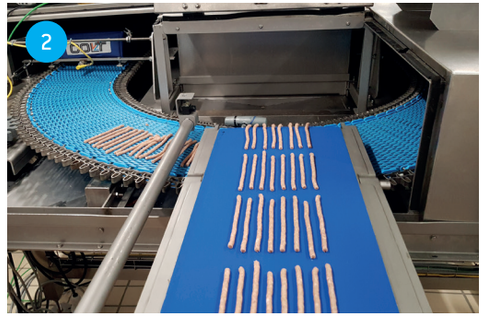
Metalquimia has developed the QDSnacks® ECO line for smaller applications or production requirements. The Eco line is based on QDSnacks® technology, still controlling and distributing the air, but with the option of operating using batches, with slightly lower production levels and requiring less investment. This equipment is very versatile and enables semi-automatic, smaller volume snack production.

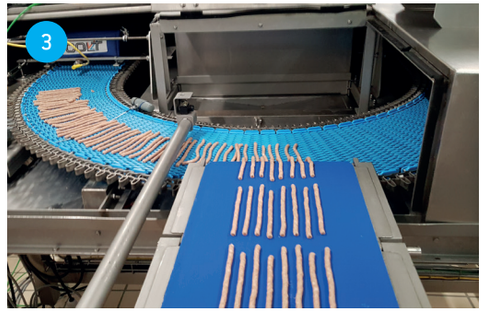
The QDSnacks Eco machine is conceived as a starting point for meat snack production. For higher productive output needs, the spiral QDSnacks® is the right option. It is also the ideal equipment for carrying out both market research surveys with a particular volume and innovative R&D, given that it can quickly produce a specific volume of all types of meat snacks.



▲ **Image 11.** Graph showing the control over conditions in the QDSnacks® .







▲ **Image 12.** The Metalquimia Pilot Plant QDSnacks extrusion and filling sequence.

The air circulates and distributes in the same way as in the spiral QDSnacks®, but the equipment produces batches, rather than applying a continuous process. The product sits on trays and carriages before undergoing treatment with QDSnacks® convective air.

The product in the spiral QDSnacks® moves on a belt through different levels during which the air treatment is applied perpendicularly as it passes through straight sections. The product remains still inside the QDSnacks® ECO, with the air itself adapting to provide a homogeneous treatment using continuous horizontal laminar flow. Different studies and Metalquimia's extensive experience with air treatment equipment have been used to prevent any kind of turbulence or product movement on the tray, which often occurs with currently available technologies. This was achieved by the air entering the drying station via fabric ducts, which act like a lung and homogenise the air pressure throughout the treatment area. This derives in a fully homogeneous product with few deviations between different batches of the same product.

As with the spiral QDSnacks® and in contrast to other currently available technologies, the QDSnacks® ECO line can be operated using wide ranging air temperatures (from below 20ºC to above 80ºC), humidities, and flows, with complete control over every parameter during each phase of the process. This technology can also be used for dry and moist cooking, pasteurisations, and extended fermentation stages. To ensure greater product control, the installation comes equipped with a base with load cells that enable continuous monitoring of the reduction, while also enabling the drying curves to be set.

The product for manufacture, in this case mini salami, is loaded automatically using the extruder head above the trays. The same loading and extrusion accessories are used for both QDSnacks® lines.

As well as batch operations, the QDSnacks® ECO technology is also efficient for longer processes or product sizes that would prove difficult for continuous operation using the QDSnacks®. This means that this equipment line can operate with small sized mini salamis, but also much larger diameter meat sticks. The equipment is very adaptable so it can operate with very long processes if required, such as mini fuets that need mould to grow on the surface, mini salamis with long fermentation periods, large diameter meat sticks

	Meat crisps	Mini salamis (4mm diameter)	Beef Jerky	
Typical production	35	50	75	Kg/hour
Packaged weight	20	25	30	g
Packages/hour	1750	2000	2500	Packages/hour
Final product weight	0.5	1	6	g
Drying reduction	70	50	50	%
Drying time	60	120	120	Minutes

▲ **Image 13.** QDSnacks® approximate productive output 6 levels.

that need several hours or days drying... Additionally, if a co-extruded product is required, such as mini salami, the drying can be horizontal rather than hanging the product, which both ensures correct air distribution and more homogeneous drying, preventing them breaking or adopting a bulbous form.

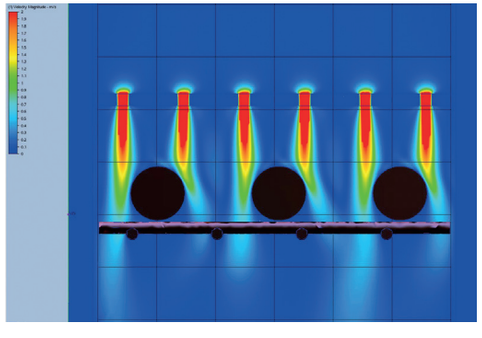
The ECO line can also produce other product types, such as crisps, jerky, meat sticks, etc. over very short periods, to provide the same product as with the QDS Snacks®, but with smaller production levels and less automation.

CONCLUSIONS

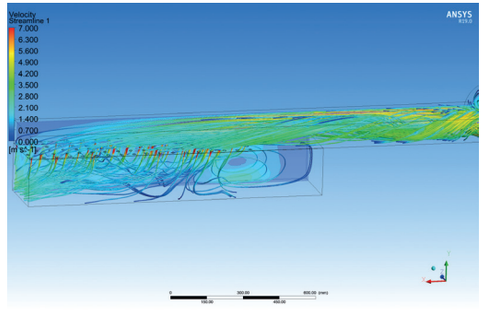
Growing interest among consumers for products like mini salamis, mini fuets, and meat sticks, have created the need for new and specialised technologies to implement more efficient production processes for these types of meat snacks.

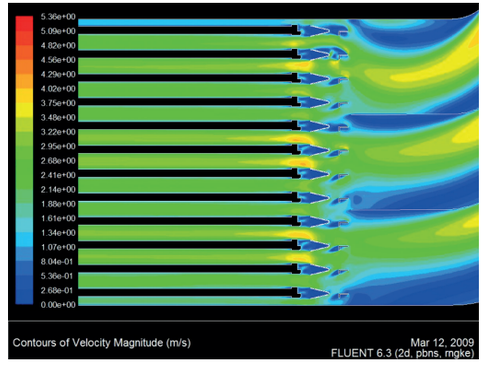
With the development of the extruder head, providing a perfectly defined product in terms of lean meat and fat particles, and the implementation of both QDSnacks® lines, Metalquimia is at the cutting edge of technological development for these types of products.

▲ **Image 14.** The QDSnacks® ECO equipment.



▲ **Image 15.** Extruded product air treatment in the spiral QDSnacks®.





▲ **Imagen 16.** The image on the left shows the air distribution in the spiral QDSnacks® equipment, and the image on the right represents the QDSnacks® ECO.

The new QDSnacks Eco lines will help new meat snacks manufacturers to enter the market, producing high quality snacks, in batches and requiring lower levels of automation and investment. Nonetheless, the QDSnacks® remains the ideal market solution for large volumes of continuous production with its fully automated process.

▲ **Imagen 17.** Currently available mini fuets with mould.

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