

ELECTROPORATION TECHNOLOGY

HOW ELECTROPORATION CAN REDUCE ACRYLAMIDE, LOWER OIL CONTENT AND IMPROVE YIELD IN POTATO PRODUCTION



CAN WE HAVE OUR CHIP AND EAT IT TOO?

Ever since Swedish scientists discovered acrylamide in food in the early 2000s, there has been growing concerns over the potential negative impact it could have on people's health, and some regulatory bodies have been looking at ways to restrict acrylamide levels in consumer products.

Acrylamide is a chemical, which forms during the cooking process when sugars and amino acids are released from food. Starchy vegetables, such as potatoes, have the highest levels, and certain cooking methods, such as frying and barbecuing, produce higher levels than boiling or steaming.

The World Health Organisation and the International Agency for Research on Cancer has labelled acrylamide as "probably carcinogenic to humans"; the US Environmental Protection Agency has categorised it as an "extremely hazardous substance", and the European Food Safety Authority noted that acrylamide was a "public health concern as it potentially increases the risk of developing cancer in consumers of all ages".

While these groups have given clear warnings to regulatory bodies and pushed for stricter, maximum levels to be enforced, some say that not enough is being done to curb the occurrence of acrylamide in consumer products. Is this trend about to shift?

In 2016, Denmark lowered indicative levels for acrylamide, and it seems that the European Commission (EC) is only steps away to setting stricter regulations. In 2007, the EC adopted a Recommendation on the Monitoring of Acrylamide Levels in Food, in 2011, they adopted a Recommendation on Investigations into the Levels of Acrylamide in Food, and in 2017 the EC is set to vote on draft regulation on acrylamide.



So what does this mean for food producers? The acrylamide topic is continuing to gain traction, and it may only be a matter of time before stricter legislation is realised.

Potato chip producers are one group at the greatest risk of being hit by this legislation, with these products producing some of the highest acrylamide levels. European manufacturers especially cannot be complacent and let changing legislation creep up on them without being duly prepared.

This now begs the question: Is there a way to reduce acrylamide in potato chips without compromising on taste and quality? The answer is yes.



The upside is that these products can be marketed as a 'premium' product to appeal to an ever-increasing health-conscious market segment.

These are a number of ways to reduce acrylamide levels in food, such as varying cooking temperatures; storing raw product in different ways; harvesting at different times of the year; ingredient additions; or changing growing conditions altogether. But these methods can affect long-term costs and have negative effects on the taste of your products.

For potato product manufacturers, there is an alternative method which can reduce acrylamide levels by over 50%. This method is known as electroporation. Electroporation is a technique in which electrical fields are sent through a cell in order to perforate the outer membrane with microscopic holes. In the case of a potato, this process allows sugars and amino acids to be released from the potato prior to cooking, which in turn lessens the occurrence of acrylamide.

Heat and Control, in partnership with ScandiNova – a world leader in the development and production of Pulsed Power Systems, have developed a potato processing machine

which does just that. The machine, known as E-FLO™, can fit into any potato processing line and requires low voltage, minimal maintenance and has a patented transformer design.

Peeled and washed potatoes are supplied in measured quantities by upstream equipment and delivered to the E-FLO infeed chute. The rotating E-FLO wheel transports the potatoes through the processing area as a compact packed bed through a water bath. Processing has to take place in a water bath for the electrical pulses to influence the product as desired. After a short exposure to the electric field pulses, to perforate the cell walls, the potatoes are lifted and discharged from the water bath by the continuing rotation of the wheel into the discharge chute. The potato then continues down the production line where greater amounts of sugars and amino acids can be removed during the slicing and washing stages. THE RESULT: potato chips with a reduction in acrylamide of over 50%, in some test cases.

But apart from reducing acrylamide and creating a healthier product, there are a number of other advantages to running your potatoes through a gauntlet of electrical fields:

A CRUNCHIER CHIP – A CRISPIER BITE

A notable benefit to pulsing your potatoes with electricity is that your chip is crispier. The E-FLO increases the amount of starch in the outer layers of the potato, which helps to give the chip that all-important bite. It also reduces the need or length of time needed to blanch your potatoes before cooking.



Less wear and tear

Slicing thousands of potatoes daily can quickly result in dull slicer blades. The E-FLO, however softens the tissue of the potato, allowing the blades to slice between the cells of the potato rather than through them. This lessens the pressure and friction on your tools, which means less down time and longer equipment life. Slicing between the cells of the potato also produces a smoother chip surface. A smoother surface means the chip absorbs less oil, which, in the long run, can significantly reduce your oil expenditure.

Product potential

The E-FLO has the potential to work on a range of products, such as differing root vegetables, making them easier to process. Because the E-FLO softens the tissue of the raw product, different cutting technology can be used to create new shapes more easily.

While there hasn't been a direct link between acrylamide and cancer in humans, the evidence provides researchers with a 'more than likely' scenario. It may just be a matter of time before tougher restrictions are put in place for food manufacturers. Either way, introducing a machine which reduces acrylamide levels while producing a crispier and crunchier chip into your production line makes sense. And giving consumers the choice of a healthier, 'premium' product may just increase your customer base.

With the E-FLO, we can all have our chip and eat it too.



E-FLO machine

What is acrylamide?

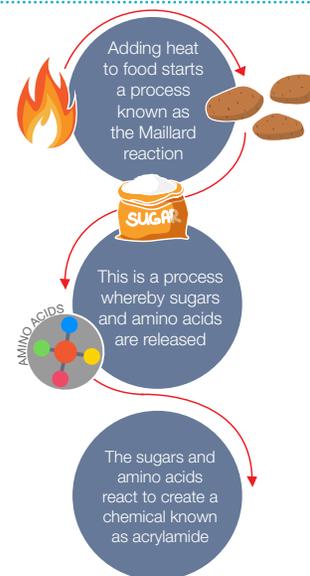
When we cook, sugars and amino acids are released from food to start a process called the Maillard reaction.

This process gives cooked food its flavour. It also produces a chemical called acrylamide.

Starchy vegetables, such as potatoes, are especially high in acrylamide when fried, baked or roasted at temperatures over 120°C.

Acrylamide has been labelled by the World Health Organisation as "probably carcinogenic to humans".

For potato-product manufacturers, offering a product which has lower levels of acrylamide opens up a greater market segment of health-conscious consumers.



Reducing the levels of sugars and amino acids in the raw product, such as potatoes, before it is processed, reduces the occurrence of acrylamide during the cooking stage.

Reduce levels of sugars and amino acids here...

...and acrylamide levels will be reduced here



Pulsed Electric Field Technology

Heat and Control, in partnership with ScandiNova, have developed a new potato processing machine which reduces the levels of acrylamide in potato chips by over half.

The E-FLO uses Pulsed Electric Field (PEF) technology which sends electrical fields through the potato and perforates the cell wall with microscopic holes. This allows greater amounts of sugars and amino acids to be washed out by the E-FLO, without compromising the solid state of the potato. The result is a high-quality product with less acrylamide

Added benefits of the E-FLO



A crispier chip

The E-FLO increases the amount of starch in the outer layers of the potato, which helps to give the chip that all-important bite.



Less time for blanching

The tissue of the potato becomes more permeable, which reduces the need, or length of time needed, to blanch potatoes before cooking.



Blades stay sharper, longer

By softening the tissue of the potato, blades slice between the cells of the potato rather than through them, which lessens the pressure and friction on tools.



Reduction in oil

Slicing between the cells of the potato also produces a smoother chip surface. A smoother surface means the chip absorbs less oil, which produces a healthier chip.

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BENEFIT FROM OUR GLOBAL EXPERIENCE

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Our global team can support you with equipment demonstrations, engineering and applications assistance, project management, installation, training, service and spare parts support wherever your plant is located.

PROCESSING AND PACKAGING

Turnkey solutions offering a single source of supply

Being a single source supplier allows us to provide holistic solutions designed and manufactured specifically to meet the requirements of each individual customer now and in the future.

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