CHIPPING AWAY AT PROCESSING EFFICIENCY

Steam peeling and optical sorting

Dr Jenny Ekman reports

Potato processing, whether for crisps, chips, mash or hundreds of other potato products, is clearly big business. With slender margins and fierce competition, food production companies are constantly trying to find faster, more efficient, more accurate and lower cost ways to process potatoes.

While nobody imagines there are armies of workers peeling potatoes by hand, the technology involved in potato processing is now something to behold. Even better, flexible facilities can process potatoes in the morning, pumpkins at lunchtime and beetroot in the afternoon.

PotatoLink recently talked to Eamonn Cullen, Market Manager, Peeling at TOMRA Food. Eamonn is based in Dublin, but his lab can be accessed remotely from around the world using a network of cameras. His team uses the lab to develop new technology, conduct tests and demonstrate the equipment, providing virtual training to customers located anywhere.

STEAM PEELING

Before development of steam peeling in the 1970s, potatoes were processed using lye. While more efficient than peeling mechanically, the strong caustic solutions used required careful handling, as well as large volumes of water to clean and treat the chemical waste.

Steam peeling provided a major leap forward. With precise control of time, temperature and pressure, the process could be highly automated. Steam

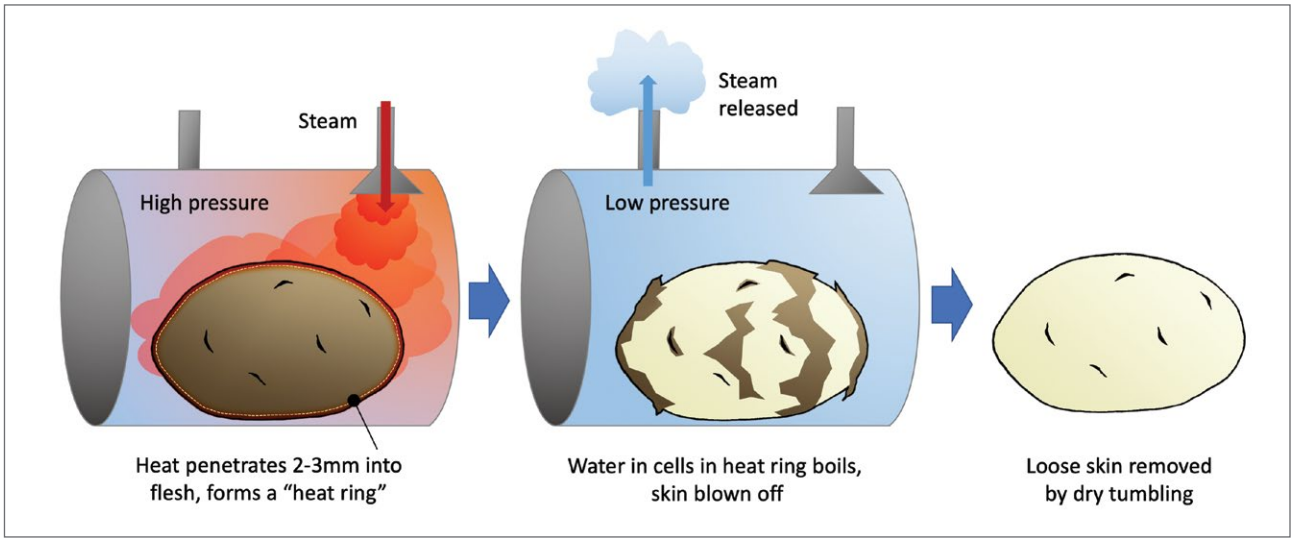

Figure 1. Steam peeling process. Potatoes are sealed inside a chamber and steam is injected. This superheats the cells on the potato surface. The pressure is then released, allowing water inside the cells to boil. This blows the skin away from the underlying flesh. The loose skin is then removed by tumbling.

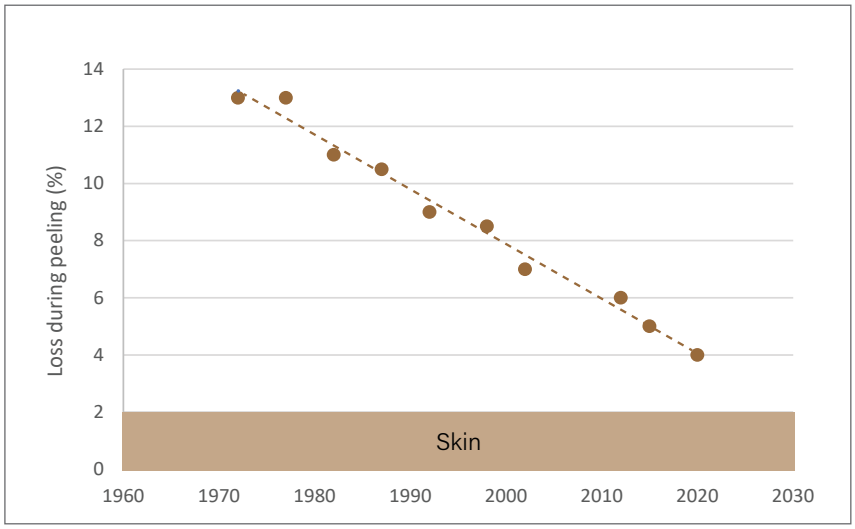

Figure 2. Improvements in peeling technology have reduced waste over time

peeling only reduces environmental impact, but also waste, due to efficient removal of only a few millimetres from the outside of each potato.

It works by exposing the washed potatoes to superheated steam inside a sealed chamber. Water inside the skin heats, building up high internal pressure. The steam is then released, the pressure drops, and water in the skin cells boils. This effectively blows off the skin.

According to Eamonn: "The faster temperature and pressure can be increased and decreased, the shallower the zone of heating in the potato skin, and the less peel is lost". Early systems yielded around 90%; the heat penetrating around 3mm into the potato. Modern systems have increased yield to 94-95%. According to Eamonn, the new TOMRA system yields an astonishing 96%. As 2% of the initial weight is peel, this means only 2% of the flesh is lost as waste.

"We have achieved this by increasing the pressure and temperature of the steam, as well as improved mixing in the chamber," says Eamonn. "Enlarging the delivery pipe is also a way to increase the speed of the cycle. While these results are fantastic, this is a process of continual improvement. We are always looking for ways to refine the system."

Faster peeling also means faster processing. The unit can potentially peel 1,000 potatoes every six seconds. Certainly a lot more than I manage standing by the kitchen sink.

Once the skins are separated, they still need to be removed. The dry peel separator is another recent TOMRA development. Instead of using water to sluice the skins off, skins are removed through tumbling, another strategy to reduce waste.

OPTICAL SORTING

Naturally, not all skins are removed perfectly during steam peeling. Previously, potatoes were passed across grading tables for visual inspection. Now, new optical sorters not only detect adhering skin, but determine size, quality, bruising, green flesh, rots and other defects. They can also detect and remove physical contaminants, such as glass or plastic.

This is not new; optical sorters are relatively common throughout horticulture. What makes the TOMRA system different is that the potatoes are scanned IN MID AIR! The unit can take multiple images, assess and grade up to 40 tonnes/hour. That's more than 11kg/second. Potatoes can be allocated to a secondary, mechanical peeler, rejected, or passed for further processing.

If too many potatoes still have skin adhering, feedback through the system slows down the steam peeler, allowing more skin to be removed per cycle. This means the machine adjusts to the quality of potatoes coming through in real time, minimising waste.

AUSTRALIAN APPLICATION

Australians are, frequently, early adopters of new technology. Whether it's the latest iPhone, electronic gadget or app, many companies use Australia to test the market for their new tech. It seems potato processing is no exception.

The world's newest technology steam peeler is now peeling Tasmanian spuds at Simplot's Ulverstone facility. Additional units are planned for other regions and customers as well.

One of the reasons for this 'world first' is not just that Australians are innovators, but also that we grow potatoes in such a varied range of soil types, climate and environments. These create challenges that are less likely to affect producers in, for example, Idaho or Ireland.

Reducing costs through new technologies could help create opportunities for Australian growers in regional markets. Once dominated by the US and Western Europe, Australia may be able to find additional customers for processed products in growing Asian markets.

New technology like this certainly doesn't come cheap. But, it may also increase yield, reduce waste and improve quality. Better chips all round!