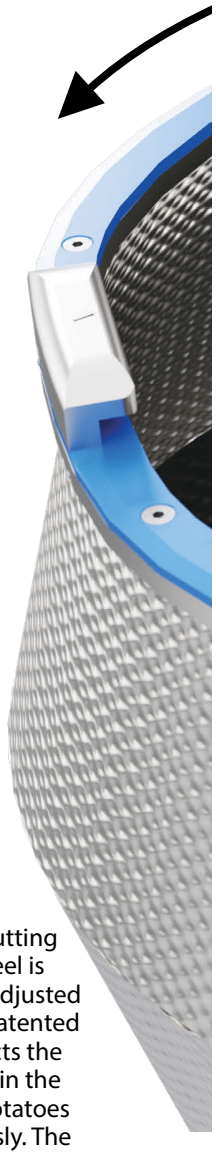
AI-powered Smart Slicing: The Next Leap Forward in Automation and Optimization of Potato Chip Production



FAM STUMABO develops cutting-edge solutions for potato cutting applications. They achieve this expertise using in-depth and hands-on research in their labs. FAM STUMABO has developed a new machine to slice potato for chips will allow the customer to integrate artificial intelligence into its potato chips slicing process. The R&D team together with the Food R&D team at FAM STUMABO can help customers not only to achieve the best slicing results but also to improve their processes using all the benefits of AI.
In this article, **Emmanuel Wanlin** (Food R&D Engineer) and **Emerson Jiménez Barajas** (Blade Manufacturing Operations & Food R&D Director) explain some of the advantages of the new technology in combination with AI.

Slicing potatoes has evolved to the point where it is no longer a standalone operation without interaction with the rest of the line; rather, it is an integrated component of a potato chip production line. The development of Smart Slicing technology by FAM STUMABO represents a significant advancement in this regard. This technology facilitates communication between the slicer and the line, thereby enhancing the overall efficiency and quality of the process.
The integration of AI pattern recognition and Smart Slicing technology offers the opportunity to fully automate and enhance potato slicing, irrespective of variations in feeding.

SCALIBUR DUAL ROTATION TECHNOLOGY

Scalibur™ powered with Dual Rotation Technology is an innovative slicer providing next level cutting solutions for slicing potatoes. This revolutionary slicer features dual rotation technology, a system where the cutting head rotates in addition to the impeller. This unique technology enables controlled, gentle cutting. In contrast to the conventional method of pushing the potato against a static knife, the blade now slices through the potato at a lower speed. The centrifugal force created by the impeller is independent of the cutting velocity, which results in less impact damage to the potato's cell structure. This reduction in cell damage leads to a couple of important advantages for the potato processor including a reduction in scrap, a lowering of the starch loss due to cutting and decreased oil uptake of the potato.
The operating principle of the Scalibur Dual Rotation Technology is as follows: The product is fed through the infeed chute and enters the rotating impeller (1) and cutting head (2). The speed differential between the cutting head and the impeller wheel is programmed and can be adjusted via the touchscreen. The patented Dual Stage impeller protects the potato that is being sliced in the first pocket, while other potatoes can be sliced simultaneously. The blades pass the potato that is lying still against the paddle (3).
In this innovation, the direction of rotation for both the impeller and the cutting head is contrary to that of conventional slicing technology, namely counterclockwise. The counterclockwise motion of the impeller and cutting head facilitates the repositioning of the potato during the transition from being pushed by a paddle to being supported by the subsequent paddle. This repositioning enables the potato to realign its center of gravity, thereby ensuring enhanced stability. The enhanced cutting stability will consequently result in a reduction in the amount of

material wasted. Furthermore, a reduction in cutting velocity while maintaining the centrifugal force will permit a more precise cutting action. This will lead to a decrease in the amount of waste produced, due to an improvement in the ability to cut through the end of a potato.
A further benefit of independent cutting and rotation velocity is that the cutting velocity can be significantly reduced. This results in a substantial decrease in the force exerted by sand particles and small debris on the blade tip, thereby reducing the dulling of the blade. Additionally, mechanical erosion resulting from the grinding of starch granules on the blade's metal surface is diminished at a lower velocity. Consequently, the durability of knives on Scalibur has been demonstrated to be significantly greater than that of knives on conventional technology. This increase in blade durability will have positive effects on the slice quality as it will reduce surface roughness, scrap and tapered slices.

SMART SLICING TECHNOLOGY

As the first potato slicer equipped with the patented Smart Slicing technology in the potato chip industry, the Scalibur's cutting velocity and speed differential can be modified whenever necessary to improve slice quality and slice thickness depending on the potato and other variables, including the dry matter content and size distribution. As changes in the dry matter content (specific gravity) influence the slice thickness, adaptations can be made to counteract this without the need to stop production.
The versatility of the Scalibur extends to other produce as well, with the ability to produce perfect results in the production of vegetable chips from carrots, beetroot, sweet potato, taro, parsnip, etc. Centrifugal force is contingent on the mass of the produce. The capacity to modify the centrifugal speed while maintaining

constant cutting velocity enables the centrifugal force to be adapted in accordance with the size of the potatoes. In the event of other produce being sliced, for example, in a vegetable chips line that processes both a large, heavy beetroot and a small, light swede, while maintaining the same output, the centrifugal force can be adapted accordingly.

This technology is also very useful when slicing in a line with different slicing machines in parallel. In the event of one machine needing to stop to change the cutting head, the other machines can increase the differential speed to absorb the extra capacity needed during the changeover. This ensures that all machines in the line are not overfed.

In addition, this technology features a state-of-the-art automatic product jam detection system. This means that in case the machine encounters e.g., a large foreign object, the Scalibur would automatically stop putting pressure on the cutting head and let the cutting head and impeller synchronize to minimize the damage to the cutting head and the machine. The jammed-up machine is then able to communicate to the line to stop the flow of potato and to the other machines in the line, auto-diverting the potato flow to the other slicers.

AI-POWERED SMART SLICING

The Smart Slicing technology allows for better communication between the slicer and the line, in both directions. But this technology does not only make the line smarter, it also allows for the use of AI. We can enhance the Smart Slicing process by integrating pattern recognition into the slicers to adapt to any situation as well as further expand the communication between the slicers and the production line.

Controlled feeding

Through AI-powered machine learning, the system could identify patterns in feeding rates and automatically detect issues or changes in potato feeding, requiring no human intervention. These issues or changes can be potato related (new dry matter, new average size, etc.) but also process related (new recipe, new produce, changes in the fryer, etc.) Combining this with the Smart Slicing technology, Scalibur could control the capacity of each machine by adjusting the speed differential. This would enable the automatic management of production peaks and the redirection of potato flow as needed. The days of experiencing line shutdowns due to overflowing slicers or blockages as well as suboptimal production will be a thing of the past.

Controlled thickness

In laboratory experiments, the Scalibur technology demonstrated that by adjusting the rotational speed, and consequently modifying the centrifugal force, it is possible to alter the slice thickness within a certain range.

This capability may prove valuable when the quality of the potatoes fluctuates, particularly concerning dry matter content. Additionally, this feature, in conjunction with modifications to the fryer, could influence the ultimate texture of the chip. Machine learning powered by artificial intelligence could provide insights to the production line regarding the desired final texture and, by assessing the quality of incoming potatoes, determine the appropriate rotational speed and fryer settings.

In conclusion, AI has the potential to detect production flow changes as well as sense quality differences in potatoes and automatically adjust production using the Scalibur Smart Slicing technology. This approach allows for the regulation of machine capacity, prevention of blockages, and management of slice thickness, ultimately leading to enhanced production efficiency and an improved final product. •

"Combining the benefits of the FAM Smart Slicing Technology with the power of machine learning will result in a reduction in loss of material, longer blade life, enhanced production efficiency and an improved final product among other benefits."