Digital Sorters can Sort to Grade

As potato processors around the world search for new ways to solve outstanding product quality and production challenges, they often look to new technology for the answer. One machine in particular – the digital sorter – deserves regular scrutiny because rapid advances in data processing power enable more intelligent software to be developed, which adds to the sorter's capabilities.

In this article, we will highlight one of the most important new software-driven capabilities recently developed for potato strip processors – it's called Sort-to-Grade and it's changing the way some strip sorters and whole potato sorters make many of their decisions.

The Old "Sieve" Approach to Sorting

Traditional sorters make sort decisions by comparing the size and color of every defect to predetermined, user-defined thresholds. Those accept/reject decisions are made sequentially for individual items, regardless of final aggregate, in-the-bag, quality results. Since final product specifications usually allow a certain amount of minor and major defects, the operator has to adjust the accept/reject thresholds in an effort to make grade given the inevitable fluctuations in the quality of incoming product. These subjective adjustments typically result in too many defects being ejected and yield is lost. However, if incoming defects spike, this traditional "sieve" approach to sorting often causes too few defects to be removed, and final quality specifications are missed.

The New Sort-to-Grade Concept

Sort-to-Grade (STG) is a powerful new software-driven capability that can be adopted on select strip sorters, automatic defect removal systems and whole potato sorters. It enables the system to control the quality of output to a specific, predetermined grade, defined by the user.

Like traditional sorters, those equipped with a Sort-to-Grade capability consider the size and color of every object, and target all critical defects and foreign material (FM) for removal. Minor and major defects are considered differently – Sort-to-Grade makes accept/reject decisions on each minor and major defect based on how potentially passing each defect will affect the overall final product quality. By evaluating whole potatoes or strips with minor and major defects against the current grade count, the sorter can allow some to pass and still maintain grade. It objectively sorts these defects by count in real-time.

All of the sorter's parameters and tolerances are defined by the user, including the final product specifications used to sort to grade. Of course, the specifications for each grade can be stored in the sorter's memory for fast and accurate recall during product changeovers, with different parameters and tolerances for different customers, if appropriate.
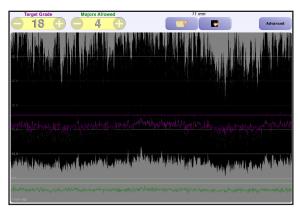

Why Sort to Grade?

Sort-to-Grade is a dynamic production tool that collects product data in real-time from the continuous product flow and analyses the data in real-time to improve the sorter's decision making. It enables the processor to establish a target grade and match it. The system automatically adjusts to stay on grade despite changes in incoming product quality. It eases use by eliminating subjective adjustments and dramatically reduces operator intervention, freeing personnel to focus on other tasks. It helps maximize sorting performance because the ideal adjustments are automatically made in real-time without delay, which improves the consistency of final product. In-field tests show that Sort-to-Grade increases yields by one to three percent while achieving the desired final product quality.

Whole Potato Sorting with STG

By equipping a whole potato sorter with Sort-to-Grade, the processor removes the ideal amount of out-of-tolerance potatoes prior to investing resources to process them. The sorter targets all major defects and FM for removal, while the Sort-to-Grade function considers minor and major defects such as scabs, bruises, rot, green and black defects and remaining peel if sorting peeled potatoes, and permits an allowable amount to pass. Sort-to-Grade can also consider the length, width or shape of the whole potato. It can be programmed to allow the ideal amount of small potatoes to pass, while the balance of small potatoes are ejected and diverted to a line producing a different quality standard, depending on the user-defined criteria for the grade.

Strip Sorting with STG

Sort-to-Grade can be adopted on select wet strip sorters and frozen strip sorters where it manages product quality by ejecting the ideal amount of minor and major defects to make grade while maximizing yields. At each step, the processor has a target grade and Sort-to-Grade achieves it.

A wet strip sorter with STG is typically programmed to focus on color defects including black, brown and green spots, the presence of peel and bruises. The processor defines what constitutes a minor, major and critical defect in relation to each defect type, with the size of the defect determining its classification by the sorter, given the user-defined thresholds. Here, the objective is to remove all critical defects and the ideal amount of minor and major defects prior to processing the product.

A frozen strip sorter located immediately prior to packaging is the "last line of defense," where it becomes imperative to remove all major defects and foreign material and the right amount of minor and/or major defects to make grade. Equipped with Sort-to-Grade, a frozen strip sorter can be programmed to sort by strip length while sorting defects and FM. Removing enough short strips to make grade while passing enough short strips to maximize yields is a common objective here as is removing undesirably long strips that could cause problems during packaging. Using a frozen strip sorter with STG to length grade offers all of the same production advantages as other STG-enabled sorters and more. Using this sorter to length-grade eliminates the need for a separate mechanical length grading system that can actually cause product damage and be a source of microbial contamination.

Information Analytics

Sort-to-Grade is one example of intelligent software being developed for today's powerful digital sorters to help processors improve product quality, increase yields and solve a variety of production challenges. It is a live, online "information analytics" tool that collects product data from the continuous product flow and analyses it in real time to improve the sorter's decision making. The sorter can be programmed to send an immediate alert if a particular event occurs, such as detecting glass in the product stream, or if the sorter cannot maintain the desired grade given the quality of the incoming product.

The data collected by a STG-equipped sorter, including dimensional information and defects, can also be categorized and downloaded to a database for use offline, to identify patterns and trends that help manage a range of upstream or downstream processes. On a whole potato sorter, the data allows a potato processor to derive information about incoming product quality. For example, analyzing product quality data that varies by storage location could help improve storage conditions in the future. A whole potato sorter located after the peeler can collect data about peel coverage that can be used to improve control of the peelers upstream, and a wet strip sorter can collect data to improve control of the water knives.

Data can be analyzed by shift, by day or in relation to a specific source of incoming product to observe trends and draw conclusions. The user defines what data is captured and how it is used.

Conclusion

As the power of data processing systems grows, so do the capabilities of the systems that rely on them. Today, digital sorters are able to make more sophisticated sort decisions than ever before, and they are able to deliver more product information to help control other processes online and offline. Ultimately, this trend toward more powerful sorters and more intelligent software helps potato processors improve product quality, increase yields and enhance their operations.