In recent years, manufacturers across industries have had to re-evaluate their production methods to maximize flexibility and efficiency in response to economic uncertainty and rapidly changing consumer tastes. For many, this has meant moving towards a 'just-in-time' manufacturing methodology. First conceptualized in Japan in the 1960s, the JIT philosophy has become increasingly popular in the West as it allows manufacturers to minimize inventory levels and only receive materials as they are needed, reducing waste and facilitating responsiveness to evolving market demands.[1] For plastic product manufacturers, increasing color changeover frequency has been a major part of the switch to JIT production and spectrophotometers are playing an integral role in developing more efficient changeover methods.

The Challenges of Color Changeover

Switching between colors in a production line, or color changeover, presents special challenges in maintaining color consistency and minimizing waste. When a changeover is made, the old color is flushed out of the system until the new color reaches the desired level to re-start production. Because the time required for color changeover varies depending on the colors being used and time-interval based QC checks often miss the critical moments of the last good old color and first good new color, the process can impair production predictability and efficiency. In the healthier, more stable economic climates of the past, the waste created by imprecise changeover monitoring was frustrating, but its economic impact was less immediately felt, as plastics manufacturers maintained high levels of inventory and often ran a single color for several days at a time. Today, however, it is not uncommon to see six to seven changeovers in a single eight-hour shift as manufacturers respond to a volatile marketplace. This drastic increase in color changeovers creates new impetus for close monitoring to reduce scrap product and associated costs.[2]

Predictable and Calculable Cost-Savings

Employing in-line spectrophotometers in plastics manufacturing to monitor color changeover is one of the most simple and quantifiable ways of increasing quality control and realizing cost-savings. Advanced spectrophotometric technologies seamlessly integrate within a production line to provide ongoing feedback throughout the changeover process and can pinpoint exactly when the old color has run its course and the new color is ready for use. By eliminating guesswork and offering precise, continuous color measurement, manufacturers can significantly reduce waste and enhance efficiency while optimizing quality control.

Let's look at a real world example to more closely explore the economic impact of spectrophotometric integration. For a vinyl siding manufacturer using 30-minute time-interval based checks has a changeover cost of $1,038.25 based on their product and operating costs. By introducing in-line spectrophotometric monitoring, operators are notified that the changeover actually only takes six minutes and they can start using the very first product that comes off the line with accurate coloration. By eliminating 24 minutes of scrap product, the changeover now costs only $207.65, a savings of $830.60. Over time, these savings multiply, significantly reducing production costs. For example, 100 color changeovers using time-interval based checks would cost the company $103,825 in scrap product while spectrophotometric integration creates only $20,765 of scrap, a savings of $83,060.

Full article with photos available here:

https://www.hunterlab.com/blog/color-plastics/just-in-time-using-spectrophotometers-to-optimize-color-changeover-in-plastics-manufacturing/