

Extrusion of color cosmetics

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Executive summary

Color cosmetics are a fast-growing segment of the cosmetics and personal care products market. Manufacturers can gain a competitive advantage by developing more new formulations for this segment at a faster pace.

Compounding solutions from Thermo Fisher Scientific can help speed up the process for formulation development of eyeshadow. Utilize a parallel twin-screw extruder to mix powder and liquid ingredients into a homogeneous product within a single process.

The compact design of the Thermo Scientific™ Process 11 Hygienic Extruder allows users to optimize the process and develop new cosmetic formulations on a laboratory scale, with significantly reduced test time, sample size and waste.

The challenge

Within the cosmetics industry, decorative cosmetics are the fastest growing segment. Consumers' desire for new and innovative products has generated a high demand for new mascara, eyeshadow or facial makeup products.

Developing new formulations in batch processes is quite time consuming, requiring repetitive steps of milling and blending until the final product homogeneity is achieved.

Transitioning from batch to a continuous process reduces the number process steps and gives a distinct advantage to manufacturers of cosmetic products. The result of such a transition is a more homogeneous product and a larger number of new formulations for the same amount of time spent in the laboratory.

Challenge solved

A twin-screw extruder is an excellent mixing tool as it combines multiple process steps into one continuously operating instrument [1]. Its modularity allows different mixing



Fig 1: Feeding powders and liquid ingredients into the extruder.

zones within the process which can then disperse agglomerates by vigorous mixing or apply gentle blending to more sensitive materials such as pearls.

An eyeshadow formulation usually consists of fillers, absorbents, binders, colorants and preservatives [2]. Most often the pigmented powder products are mixed first with the base material (e.g., talc) for a proper color extension, which sets the appearance that the product will have after the customer has applied it. After having achieved the desired degree of homogeneity in the mix of initial substances, the remaining ingredients are added. The more sensitive components are often mixed mildly toward the end of the process.

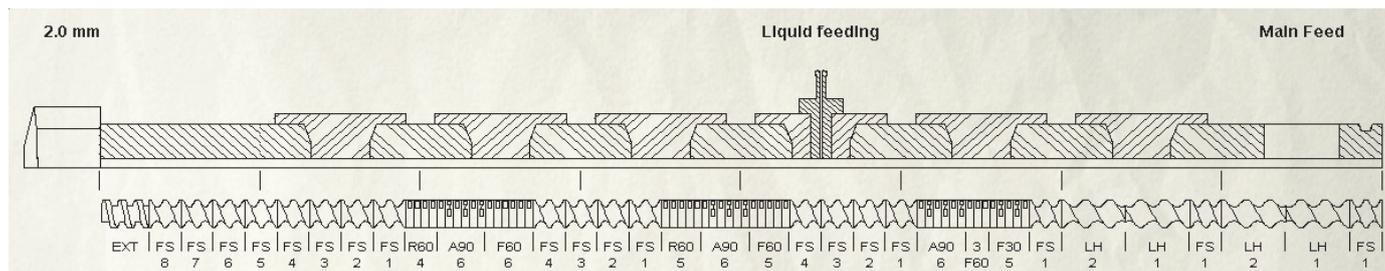


Fig. 2: Barrel and Screw setup.

Fig. 2 shows a typical setup of a screw that has different mixing zones as well as openings along the processing area to introduce ingredients throughout in the process. In addition to powder materials, liquids such as silicone oils may also be added during the compounding process.

At the end of the extruder barrel, a die can be mounted to press the material through giving it a preliminary shape that helps to facilitate the final filling process into godets. Figures 1 and 3 show an example setup of eyeshadow formulation being processed on a Process 11 benchtop twin-screw extruder. The powder and liquid components are mixed continuously within the extruder and the resulting compound is formed by pressing it through a die.



Fig. 3: Pressing the final formulation through a die.

Conclusion

Combining different process steps into one continuously operating instrument, a twin-screw extruder can help significantly speed up formulation development of new makeup products. The precise control of process parameters also mitigates or even eliminates the risk of batch-to-batch variations. The modular setup of the Process 11 instrument helps manufacturers adapt their analyses for different process requirements.

Process 11 Hygienic Extruder:

The Process 11 Hygienic Twin-Screw Extruder has special features and benefits for cosmetic applications:

- Compact bench-top extruder with small footprint
- Intuitive process control via touch screen with data logging
- Allows setup, testing and cleaning by a single user in a laboratory environment
- Eight electric, heated and actively cooled temperature zones for exact temperature control and temperature profiles
- Seven positions along the process to feed multiple components like powders, water, oil or waxes
- Flexible screw design with interchangeable mixing and conveying elements, to optimize the compounding of ingredients
- Suitable for scale-up to industrial production

Further information

We invite you to learn more or contact us to see how we can support you at thermofisher.com/cosmetics.

Resources

- [1] Matthias Jaehrling, "Twin-screw Compounding: Introduction and Scale-up", Webinar, <https://www.thermofisher.com/de/en/home/global/forms/industrial/material-characterization-webinars/twin-screw-compounding-introduction-and-scale-up.html>.
- [2] Baki, G.; Alexander, K.S.; "Introduction to cosmetic formulation and technology", Wiley, [2015]

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