Abstract The use of portable near infrared in industrial at-line process monitoring and control

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Introduction

Many industrial manufacturers are facing the combined challenges of global competitive pressure to reduce manufacturing costs, requirement to increase manufacturing quality, and, in many cases, increases in required quality testing and regulatory compliance. The use of NIR to provide timely, accurate and reliable analytical quality control data has proven to be effective tool within many industries and manufacturing processes. Traditionally, NIR has generally been used within relatively fixed laboratory locations or in dedicated on-line process deployments. The recent development of portable and even handheld NIR systems has opened the door to use NIR in creative ways. One mode of innovative deployment is the use of portable NIR in at-line process monitoring and control roles. The at-line approach offers more timely analysis compared to laboratory based testing and often in a more cost and deployment time effective alternative to full on-line process that do not lend themselves to in-line or on-line process integration.

Materials and Methods

The data and results presented in this presentation were acquired using a portable Thermo Fisher microPHAZIR NIR system using diffuse reflectance macro sampling as well as diffuse and transflection fibre optic probe sampling systems. Quantitative results were obtained using a PLS method and qualitative results were obtained using wavelength correlation and PCA techniques. NIR results were compared to process specific requirements and results from portable NIR were compared to conventional laboratory and process control NIR systems, as well as alternative analysis methodologies including HPLC, LOD and other assays.

Results and Discussion

An example of a successful at-line process control usage is pharmaceutical blend uniformity. Current manufacturing practices require confirmatory analysis of each batch in order to ensure consistent uniformity of blended materials. Traditionally the testing process involves collection of a representative number of samples, preparing the samples and performing HPLC analysis. Because of the high number of samples and the comparatively long analysis time, this testing has been time-consuming and limits manufacturing throughput. By using portable NIR for at-line blend uniformity, results can be obtained quickly, within the required accuracy, and with accuracy comparable to alternative methods but in a fraction of the time required. Other examples of portable at-line NIR analysis will be presented in the polymer, food, agriculture and chemical industries. The presentation focuses on the analytical benefits and advantages of at-line NIR usage and the corresponding financial drivers for industrial manufacturing.

Conclusion

The conclusion is that portable NIR systems can be valuable and cost-effective solutions to some, but not all, industrial process monitoring deployments and the use of at-line portable NIR can expand the role significance in modern industrial manufacturing.