In situ optical monitoring for the display production

Artem Artamonov, CEO
artem.artamonov@insoptics.com
Insoptics Sp. z o.o., Poland

Introduction

The coating industry relies on a variety of well-developed fabrication techniques to realize an ever-increasing quantity of electronic and precision optical products. In recent years, the strong trend has been towards higher performance products, and higher process yields through ever tighter process control.

Problem

Quartz crystal methods measure the deposited mass and typically can achieve accuracy during a single layer growth of a few percent. This error is compounded if multilayers of different materials are deposited sequentially. For these reasons quartz crystal measurement techniques are often ideal for simpler, less demanding layer structures, but their relatively limited accuracy results in inferior production yields and poor product performance when used for more complex layer structures.

Optical monitoring is the only technique that measures the true optical thickness of a layer. This process enables extremely complex and high precision coatings to be achieved with optical monitoring, far surpassing anything achievable with crystal monitoring.

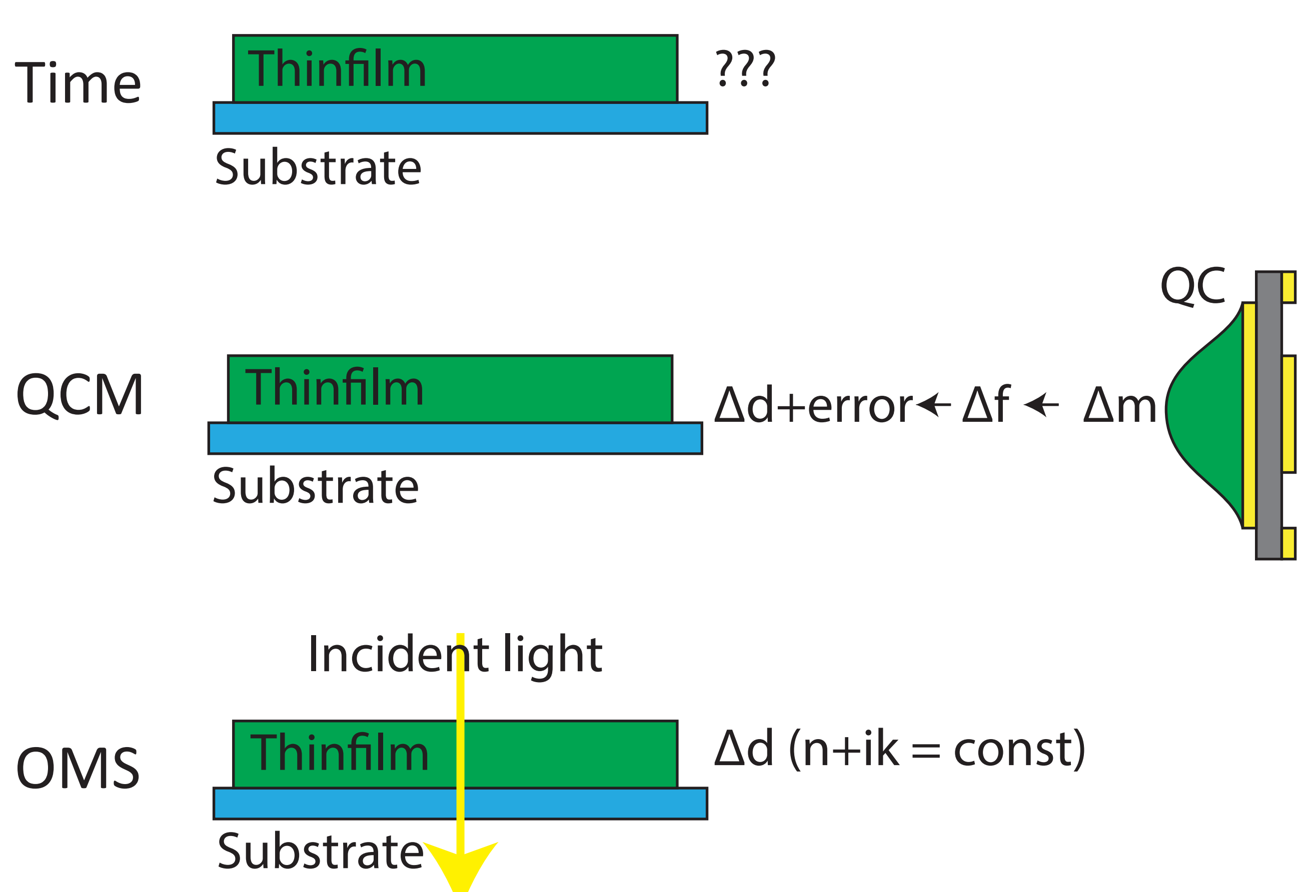


Fig. 1 - Description of monitoring and control approaches

Hardware and software

The Insoptics optical monitoring is a closed solution, which includes a complete set of necessary components for automatic deposition processes. The Insoptics optical monitoring includes a rich kit of supplies that contains everything for easy equipment installation. High precision optics minimize intensity losses and increase data rates to make ultimately reliable control.And provide with the following advantages:

Multiple choice of monitoring strategies;
The calculation algorithm automatically defined endpoint;
Diagrams offer a way to visually conceptualize the control of processes;
All-in-one package.

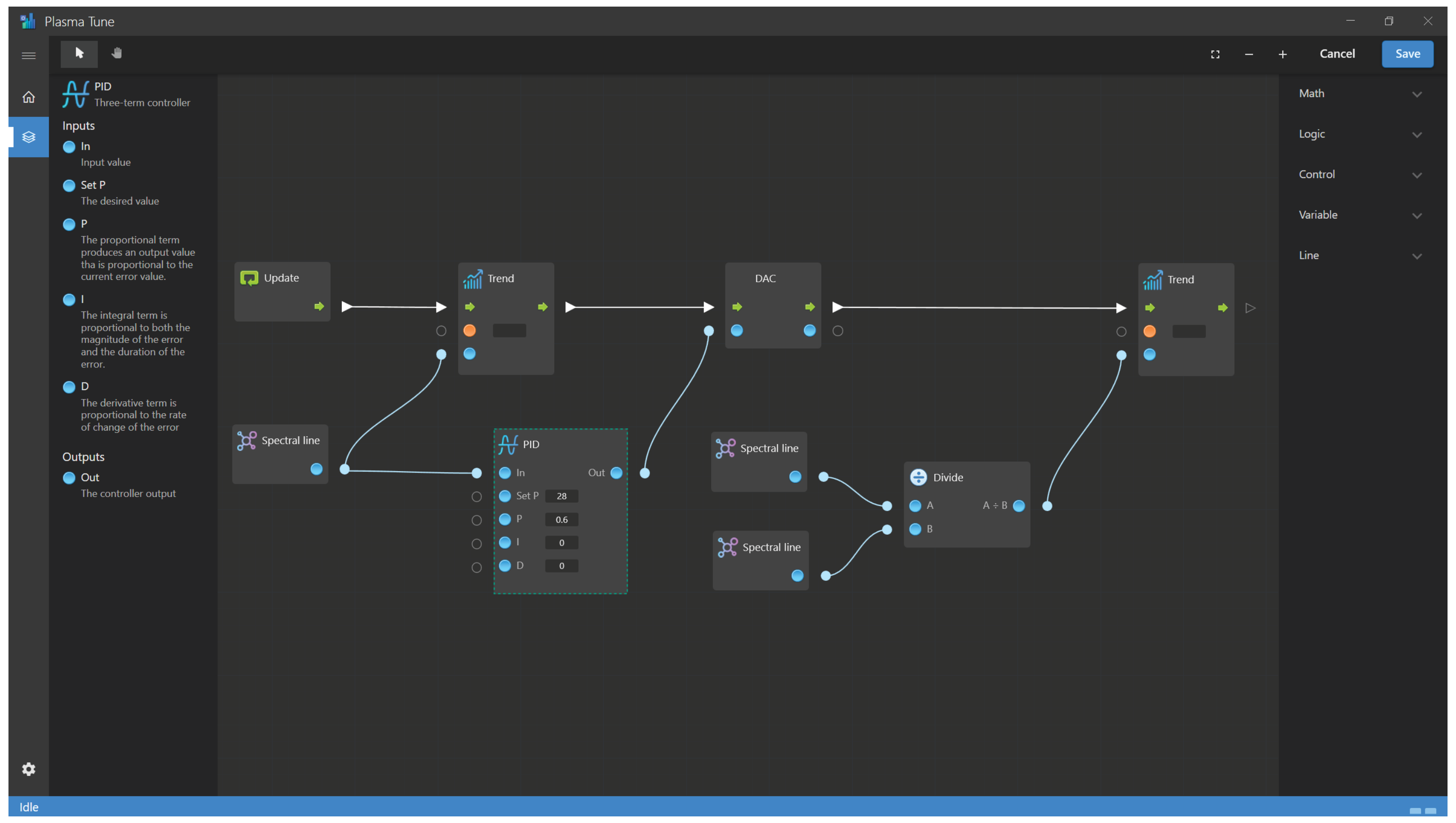


Fig. 2 - Diagramming tool for process control

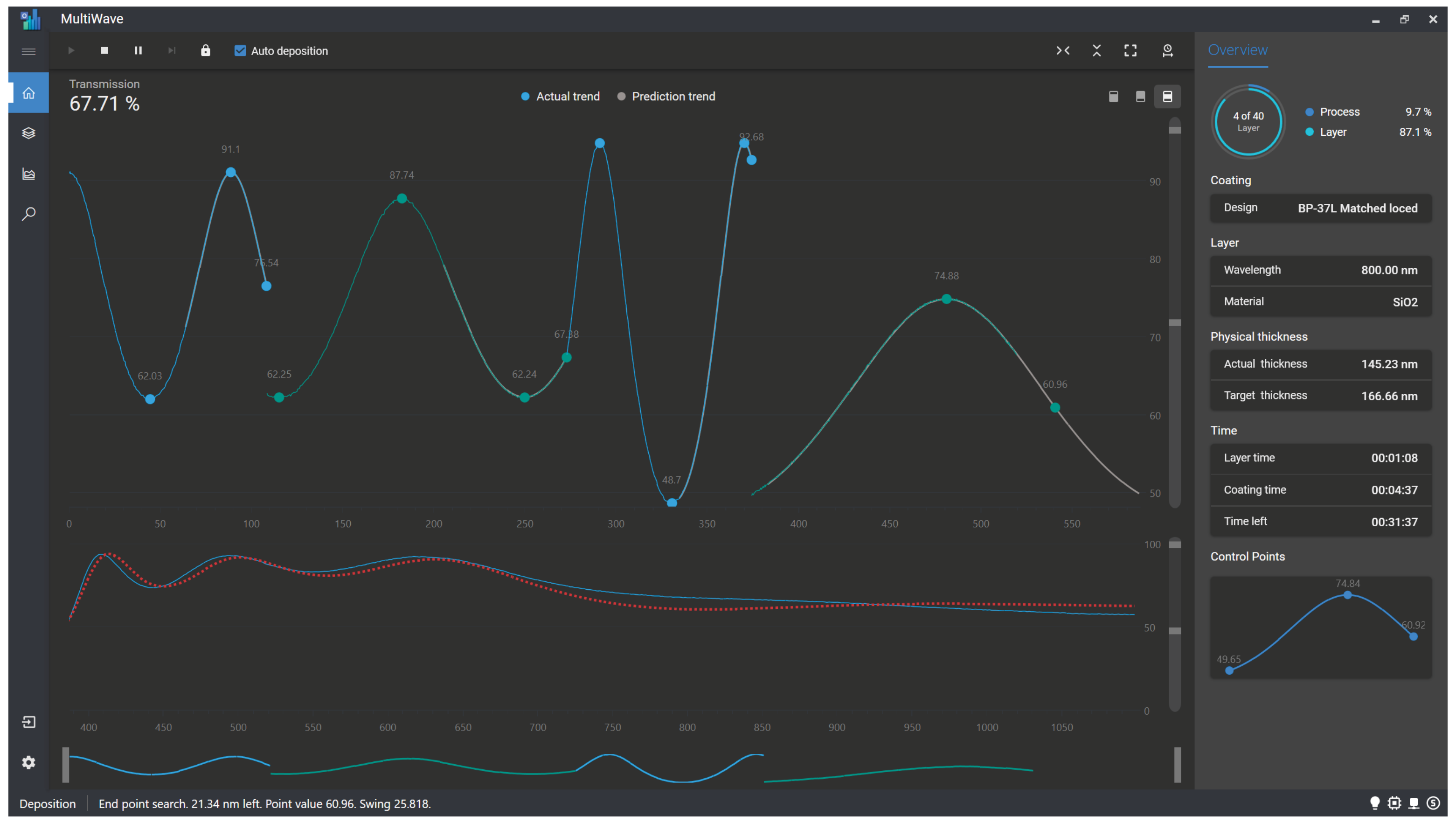
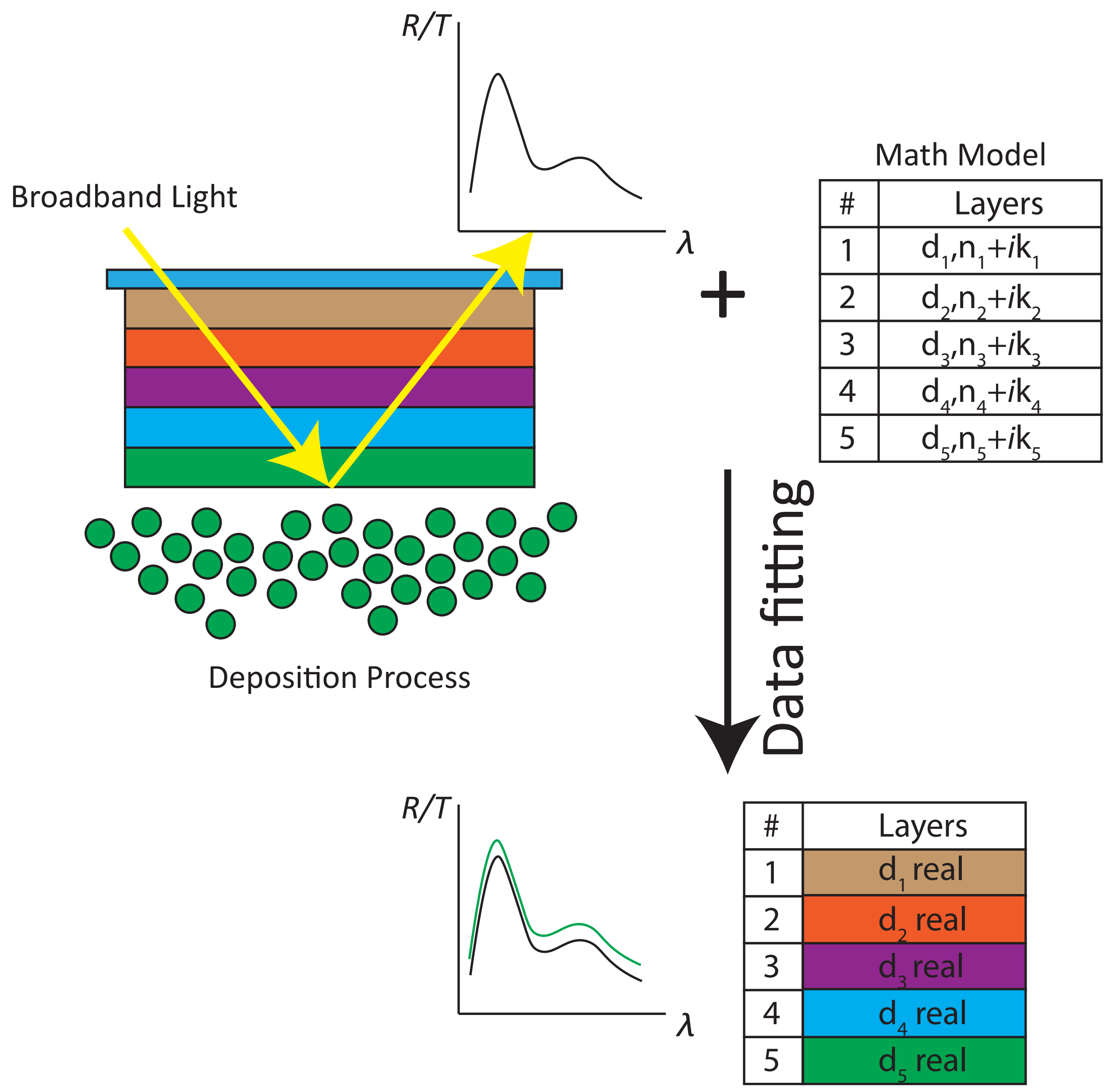


Fig. 3 - Main monitoring window

In situ thickness re-engineering

The main goal of the *in situ* thickness re-engineering is the determination of thicknesses of already deposited layers. The on-line characterization of thicknesses of already deposited layers requires in situ measurements of spectral transmittance or spectral reflectance just after the end of deposition of each coating layer.

The main goal of the *in situ* optimization is the compensation for errors in thicknesses of already deposited layers. The optimization routinecorrects theoretical thicknesses of those design layers that haven't been deposited yet. This correction is done with respect to the theoretical targets used for coating design so as to provide the best possible fit of theoretical targets by spectral characteristics of optimized design.



Conclusion

The modern approach of optical monitoring of thin-film was presented. Model-based optical monitoring methods show more predictable and accurate results during the different types of deposition processes.