

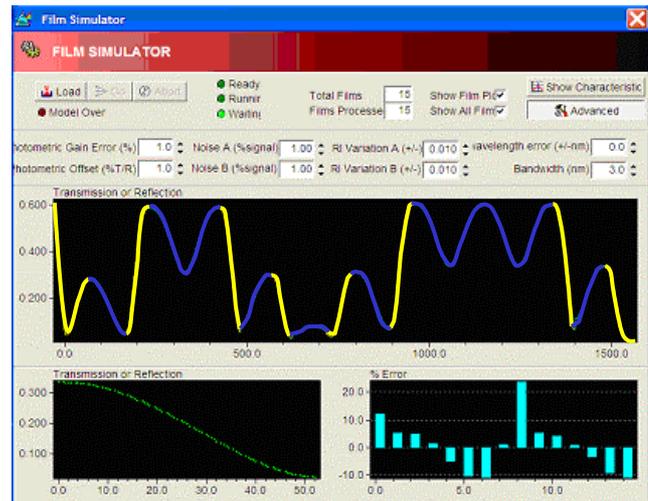
Intellevation Press Release – August 2005

Intellevation Launches Unique Optical Monitor Product for Precision Optical Coatings

Intellevation has announced the launch of a unique simulation capability called *FilmSimulator*[®] offering a significant functional enhancement to its IL550 Series of Optical Monitors for precision optical coating applications. The package enables optical designers to perform off-line simulation runs using pre-programmed film structures and incorporate both the physical effects of the Optical Monitor hardware and the idiosyncrasies of their own coating tool in order to investigate the vulnerability of their design to these factors. The result for optical designers is a powerful process design tool giving valuable information on design robustness and ultimately on process yield.

Standard thin film design packages, including *FilmModeller*[®] supplied with Intellevation's IL550 Series Optical Monitors, model the optical signal from a growing film stack, thereby allowing the coating engineer to determine when to make the 'cut' at the end of each film. The output from these models is calculated from the optical and physical properties of the materials such as refractive index and film thickness.

However, in reality the optical signal from any growing film will also be modified by the specific foibles of the coating tool and coating scheme being used, as well as by the hardware and software associated with the optical monitoring system. Some of these effects inevitably lead to parameter fluctuations not accounted for by the 'ideal' model. For example, in a typical e-beam system electronic noise is often generated from the switching of large current supplies. Also, film growth properties, such as the instantaneous growth rate, film composition and ultimately the refractive index, can also vary depending upon the stability of the e-guns. These run-to-run variations can have a dramatic impact on production yield and are not picked up by the 'ideal' models.



Screen shot from *FilmSimulator*[®]

Intellevation supplies modelling and control software integrated directly with its Optical Monitoring hardware and is therefore ideally placed to provide a solution to this issue. Therefore, to enable the coating engineer to investigate the impact of these system effects, Intellevation has launched *FilmSimulator*[®].

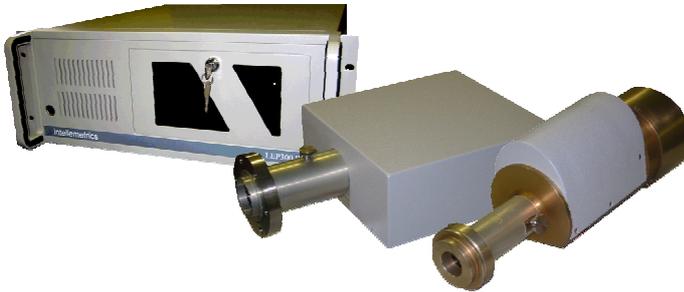
Intellevation's *FilmSimulator*[®] package reads in the pre-programmed film stack design along with its associated process scheme details including monitoring wavelength changes, test glass sequencing, filtering schemes, cut-point detection algorithms, etc. The user can then program a number of coating tool dependant parameters specific to their system. Some of these parameters will be material specific, such as the noise level associated with different material sources which can vary widely. On the other hand, some of the parameters will be process specific, such as the small variations in photometric gain obtained when changing from one test glass to another. *FilmSimulator*[®] takes account of all of the above.

FilmSimulator[®] then simulates the coating run, calculating the cut-point errors on a layer-by-layer basis, propagating them through the stack of films and displaying them in an easy-to-use graphical form. This gives the coating engineer a powerful tool to see inside the process and determine exactly where deviations from the ideal are likely to occur. *FilmSimulator*[®] can overlay the output from many simulated runs giving valuable information on the run-to-run variability and therefore the process yield. Rapid re-optimisation of the design can then be undertaken off-line and the improvements instantly observed thereby eliminating many time consuming test runs on the actual coating system.

Intellevation has also released a related package to determine the spectral characteristics of the final film stack. *FilmCharacters*[®] provides a user-friendly graphical interface showing both the theoretically designed characteristic along with the characteristic from the film produced using *FilmSimulator*[®] which takes into account the 'real-life' growth environment. So *FilmSimulator*[®] enables the coating engineer to create a

robust process and understand and minimise the errors and *FilmCharacters*[®] enables the coating engineer to see the effects of those errors on the final product.

Using these new tools together enables the coating engineer for the first time to resolve off-line many of the



Intellevation's Optical Monitor Hardware

questions regarding the various trade offs in their coating process. For example, this could include whether it is better to use more layers per test glass, or trade the cost of more test glasses for a better yield. Another example would be the effect of increasing throughput by increasing the growth rate. Furthermore, each product will have an optimum balance between the conflicting requirements of high throughput and high yield. Now coating engineers have a tool to investigate the effects of changing this balance.

“The interplay between the accuracy of the cut achieved for an individual layer, and the optical performance of the entire film stack can be extremely complex and sometimes downright counter intuitive” commented Mike Biagi, Intellevation’s Technical Sales Director. “There are many possible variations on a particular design, but not all are equally manufacturable. We come across awkward designs where the chances of hitting an acceptable process after even the 10th coating iteration are slim. Using *FilmSimulator*[®] and *FilmCharacters*[®] we’ve been able to rapidly pinpoint problem areas within the customer’s coating scheme and identify alternatives with quite dramatic impact on performance and yield. An hour spent on *FilmSimulator*[®] and *FilmCharacters*[®] can save the customer many days of process development in the lab”.

The *FilmSimulator*[®] and *FilmCharacters*[®] packages are integrated into - and bundled as standard with - Intellevation’s *FilmMaker*[®] and *FilmDirector*[®] suites of software supplied with each Optical Monitor, giving all new customers access to the latest enhanced and integrated functionality.

For further information, contact:

Intellevation Ltd

5 Dalziel Road
Hillington Park
Glasgow G52 4NN
UK

Tel: +44 (0) 141 882 0058
Fax: +44 (0) 141 882 9223
Email: enquiries@intellevation.co.uk
<http://www.intellevation.co.uk>