

International Training Course

# Color Science and the Coloring of Plastics

25-26 August 2008, Grand Seasons Hotel, Kuala Lumpur

The goal of this course is to familiarize and equip the attendees with the fundamentals of color, color science, and computer color formulation, as it applies to the coloring of plastics. This two day course is designed for color technologists, operators, and technicians who want to understand color science. Plant managers will also benefit as they will gain a through understanding of the process, capabilities, and limitations of color science.

## Course Outline

**The Introduction to Color Science :** An overview of the differences between color and color appearance, and answers the question; "How one communicate about color?" Things are not always as they appear. A visual experiment is included in this section. **Color Vision :** An overview of the human visual system and psychophysical phenomenon's as they apply to object color. The topics include: the triads of color vision - light, objects, and the eye; color order systems; and the standard observers. **Objects Interaction with light :** An overview including the mathematics of how objects interact with light - transmitted, reflected, complex reflection, specular reflection, and first surface body reflection. **Color Order Systems:** An overview of color order systems based on psychophysical responses, physics, and systems based on perception; such as, Munsell, NCS, and Pantone. **Spectrometers :** Participants will acquire the background and skills required for successful color measurement in the laboratory and In-Line. Attendees will learn about the different types of modalities in instrumentation used to characterize color in the plastics industry, how to properly measure specimens, and use of statistics. **Tristimulus Calculations & Color Difference Equations :** Starting with the fundamental spectral data acquired from spectrometers we will review the mathematics (linear algebra) to calculate (transform) our way through tristimulus values such as CIEXYZ, CIEYxy, CIELAB, and CIELCH. Color difference equations; such as  $DL^*$ ,  $Da^*$ , &  $Db^*$  and many total color difference equations,  $DE's$ , are also reviewed. **Metamerism :** The section will illustrate and teach the differences between the three types of metamerism; object, light, and observer. Additionally the concept of color inconstancy and paramerism will be taught. **Colorants - Inorganic & Organic :** This section is designed to teach the differences between Inorganic, Organic, and special effect colorants. Additionally the future direction of Inorganic, Organic, and Dyes will be reviewed. We will review the "failure" mechanisms in coloring, the influences of additives on color, manufacturing with color concentrates, and mixing and dispersion issues. **Computer Color Matching & Batch Correction :** This section is designed to teach the differences between visual and computer color matching and batch correction-their advantages and limitations. We will review the theory and mathematics of Kubelka-Munk theory and Beers Law. This section also covers desaturants, and 3 band theory, and how to select colorants.

## Course Instructor – Jack Ladson

Jack Ladson is a principle in Color Science Consultancy. His company supplies solutions throughout the color supply chain. Ladson studied Optics at the University of Rochester and Mathematics at the Massachusetts Institute of Technology. For twenty-five years Ladson has worked in the field of color appearance technology. His current interests are in digital color technology, digital imaging, spectrometry, colorimetry, and global color control. Ladson is actively involved in the Inter Society Color Council, he is a past -president and serves as Secretary. He is an active member of the American Society for Testing and Materials (ASTM). He chairs the sub-committee ASTM E12.02 on Colorimetry and Spectrophotometry, E12.06 on Digital Imaging, and is task group chairman of Effect Coatings (Metallic and Pearlescent). He is the principle author of four standards. He is actively involved in the committee on the Color Ordering Systems, Color Rendering and Visual Methods. He is a representative on Optical Properties of Plastics to the International Standards Organization (ISO). He is on the BOD of the Society of Plastic Engineers (SPE). He is a member of: the United States National Committee - Commission Internationale de l'Éclairage (CIE); the Council on Optical Radiation Measurement, (CORM); American Association of Textile Chemist & Colorists, (AATCC), Detroit Color Council, (DCC), the American Statistical Association, (ASA); and the American Society for Quality, (ASQ). Ladson has published over 35 papers on color; including digital imaging, color appearance phenomena, instrumental performance, and process control. He is a co-author of color educational programs, Leonardo2000 and COMIC III. He is an invited lecturer in the US, Europe, and Asia. He has been awarded patents for color technology related discoveries. He served as an advisor for 5 years to the PENN State Advisory Board on Nanoparticles.

## Registration Fee per Participant

**Course Registration Fee: 500 US\$**

The above fee includes course materials, refreshments and lunch break on both days. Payment for registration fee needs to be done along with registration confirmation.

**Group Packages:** If 3 or more than 3 participants join from the same organization, 10% discount on registration fee per person will be offered. If 6 participants join from the same organization, one extra person (7<sup>th</sup> Person) can join the course for FREE.

**Book “Coloring of Plastics”:** For every 2 delegates registered from the same organization, ONE copy of “Coloring of Plastics” book will be given to one of the delegates at the training program. This book is written by Dr.Albrecht Mueller (This book published by Hanser). Due to limited copies availability for this program, please register not later than 31 July 2008.

## Program Agenda

### 25 August 2008

08.00 - 09.00	Registration
09.00 - 09.10	Welcome Remarks
09.10 - 10.30	Lectures
10.30 - 10.45	Coffee Break
10.45 - 12.30	Lectures
12.30 - 13.30	Lunch Break
13.30 - 15.00	Lectures
15.00 - 15.30	Coffee Break
15.30 - 17.00	Lectures
17.00 - 17.30	Discussion

### 26 August 2008

09.00 - 10.30	Lectures
10.30 - 10.45	Coffee Break
10.45 - 12.30	Lectures
12.30 - 13.30	Lunch Break
13.30 - 15.00	Lectures
15.00 - 15.30	Coffee Break
15.30 - 17.00	Lectures
17.00 - 17.30	Discussion

**Course Language: ENGLISH**

### **Course Organized by**

**TechnoBiz Communications Ltd,**

300/53, Lardprao Soi 35/1, Lardprao Road, Bangkok 10900 THAILAND

Tel: 66-2-938 2315-6 Mobile: 66-84-658 1444 Fax: 66-2-513 1301

Email: [plastechasia@technobiz-asia.com](mailto:plastechasia@technobiz-asia.com) , [training@technobiz-asia.com](mailto:training@technobiz-asia.com)

Contact Person: Khun Saowalak, Training & Publication Coordinator

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**Color Science and the Coloring of Plastics**  
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**Registration Form**

Instruction: Please fill all the information in English only

Organization Name .....

Address .....

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Tel ..... Fax ..... Email .....

Contact Person ..... Tel ..... Email .....

**Participant Name**

Participant 1: ..... Position ..... Email .....

Participant 2: ..... Position ..... Email .....

Participant 3: ..... Position ..... Email .....

Participant 4: ..... Position ..... Email .....

**Registration Fee per Participant : 500 US\$**

**Payment Method**

Cheque / Draft Payable to "TechnoBiz Communications Ltd., Part."

Bank Transfer to      Bangkok Bank PCL, Ratchada-Latphrao Road Branch, A/C No: 177-0-65819-1  
A/C Name: TechnoBiz Communications Ltd., Part., Swift Code: BKKBTHBK

Credit Card       Visa       Master Card

Card Number .....

Last three digits on signature panel of Card .....

Card Expiry Date .....

Cardholder Name .....

Signature of Cardholder .....

---

**Please send completed registration form**

**TechnoBiz Communications Ltd.**

300/53, Lardprao Soi 35/1, Lardprao Road, Chandrakasem, Chatuchak, Bangkok 10900 THAILAND

Tel: 66-2-938 2315 Mobile: 66-84-658 1444 Fax: 66-2-513 1301 Email: [training@technobiz-asia.com](mailto:training@technobiz-asia.com)

Contact Person: Khun Saowalak, Coordinator