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SOCIETY FOR INFORMATION DISPLAY

SID-Mid Europe Chapter meeting on Projection Display Systems and Display Manufacturing Processes and Equipment at Balzers/Liechtenstein, March 23-24, 2000.

The topics of the technical meeting in Balzers/Liechtenstein were projection display systems and display manufacturing processes and equipment. Over 60 people attended the meeting.

The meeting was opened by *D. Theis*, chairman of the SID-ME Chapter.

First speaker was *H. Kundert*, (*Oerlikon-Bührle Holding AG*), who gave a welcome and introduction to the Balzers Leybold Optics company. This company is currently re-organised and will be highly focussed on information technology in the future. The new name of the company will be announced quite soon.

The second speaker was *P. Wierer*, (*Balzers Leybold Optics*) with a lecture on trends in Light Valve Projection Displays. Thin film components for projection displays are a strategic market for Balzers. The forecasted end-user market is 1.21 million units / 8 billion US\$. The development will proceed in the sequence business application (ultra-portable applications), home-cinema (>40") and monitors (resolution). The driving factors for home-cinema are DVD players and HDTV broadcast. Main projection technologies were reviewed: the colour cube for transmissive LCDs, the colour wheel for digital light processing, the polarising beam splitter for reflective LCDs based on

LCOS. The conclusive remarks were that the annual growth rate will be more than 30% and that ultra-portable will be the mainstream application.

D. Monk (*Texas Instruments/UK*) gave an update of progress in the field of DMD in the last 12 months. He explained first the principle of the Digital Mirror Display and all Digital Light Processing and mentioned that DLP is very well suited for ultra-portable applications. Today's DMD are using XGA resolution with 14 μm mirrors and a double data rate. This requires an increased colour wheel speed to avoid artefacts. For the pixel quality not only the resolution (number of pixels) counts but also the pixel quality (effective use of pixel area). For the future we have to be prepared for the DLP cinema with 14-bit colour processing, 24 frames/second, 42 bits linear, 10000 lumens light output at 5 kW and a contrast ratio of 850:1.

A. de Vaan (*Philips CDS*) talked about the status of Light Valve Projection Systems. As technology trends he mentioned further miniaturisation, more compact systems, higher resolution and the use of a more efficient UHP lamp. He discussed the specific requirements to the respective parts of a projection system. The arc size of the (UHP) lamp is important: 1.3 mm for consumer applications with 20.000hrs life at 100 W and

1.0 mm for professional applications but with 4000 hrs life at 100 W. For the future it is foreseen that 0.9" displays will be without micro-lens array. The importance of proper fluid dynamic for cooling was mentioned as low noise level is required. The speaker compared the colour cube and the Philips prism pros and cons. He announced the introduction of a 3-panel reflective LCoS projection into the market by 2001 and predicted that reflective panels will dominate the future LCD projection market.

A. de Meyere (*Barco Projection Systems*) started with a description of the projection display market. The market share of LCD based systems increases but CRTs remain important. As trends he mentioned: smaller projection systems, more efficiency in light throughput up to 20% and application in video walls. An overview of all existing lightvalve technologies was presented: transmissive LCDs, reflective LCDs, DMD, the TMA of Daewoo based on piezoelectric elements and the grating light valve with laser light source. For a brighter future the projection lamp is the crucial key-component and the use of Xe-lamps should be considered. Further efficient colour management is needed and thermal issues should be solved.

R. Sperger replacing C.Heine (*Balzars Leybold Optics*) focussed on the comparison of the existing colour management systems and their specific issues. Most of the systems use one or three PBS. The PBS is therefore considered as a key component in LCD projection systems. It should have HELF (High Extinction and Low F-number) properties. As special attention points the PBS skew angle limiting the contrast ratio and the glass birefringence were mentioned.

T. Haddeman (*Philips CDS*) gave a presentation on the 3-panel LCD projection system. As market demand he mentioned the requirement of high brightness for the professional market. The consumer market requires high contrast and real colour. Brightness, contrast, colour balancing and colour temperature, picture uniformity, resolution and convergence were mentioned as picture performance indicators. Then the factors that have influence on the performance indicators were discussed in detail together with system solutions for some issues.

For the evening session of the workshop we crossed the border between Liechtenstein and Switzerland by bus along curly roads and arrived at *the medieval Castle of Sargans* where we enjoyed a marvellous diner. In face with colourful wall paintings and old weapon collections in this unique environment we could continue our informal talks and make new contacts.

The morning session of the second day was opened with a presentation of J. Viinikanoja (*Nokia*). He started with an overview of the market price comparison of several CRT and LCD systems. Rear projection to replace CRT requires a resolution better than UXGA. Rear projection monitors require

resolutions better than WUXGA. Thereafter he talked about design issues in LCOS rear projection. Specific issues and requirements of light source, colour management, LC panel, lens, screen and cabinet were discussed.

H. Seiberle (*Rolic Research Ltd*) gave a lecture on photo-aligned optical liquid crystal thin films for LCD projection. The common alignment of LC molecules by brushing can introduce scratches and dust. Multidomain alignment with brushing requires a complicated technology. The new Linear Photo-Polymerisation uses polarised UV-light to achieve alignment in mono- or multi-domains. Since this is a non-contact method there is no contamination, no ESD and no scratches. The pretilt angle is obtained by oblique exposure. Both TN and VAN LCD alignment is feasible. The LPP-method can be applied to Liquid Crystal Polymer layers on single substrates. The LPP/LCP tool has many applications and it was underlined that the photo-stability of these layers is very good. Applications for projection systems can be found in the field of retarders and non-absorbing polarising colour filters.

D. Cuypers (*ELIS-TFCG/IMEC, University of Gent*) presented a paper on Vertically Aligned Nematic Liquid Crystal Displays for projection purposes. He gave an overview of the advantages and drawbacks of microdisplays with LCOS followed by an extensive overview of all LC modes for reflective use with their pros and cons. The Vertically Aligned Nematic effect was discussed in more detail as it is capable of very good contrast. Much effort has been on the technology of the vertical alignment with pretilt. The experimental work resulted in a demo of a 160 x 120 pixel display with 3 μm cellgap. The τ_{on} and τ_{off} are about 10 msec. The achieved contrast ratio was larger than 100:1.

Jutta Trube (*Balzars Process Systems*) gave an overview on different display technologies and related coating processes. Thin films e.g. transparent conducting oxides, dielectric layers, metals and MgO are indispensable in display technology. Depending on the display effect specific thin films are required. This was illustrated with typical thin films needed for FED, TFEL, LED, EL, colour PDP, LCD. Several deposition methods were discussed.

J. Smitt (*Balzars Process Systems*) presented a paper on the TFT Display Mass Manufacturing and focussed on the plasma processing of large glass substrates. Since the glass substrate size is increasing, the manufacturing equipment becomes larger. This has effect on the specifications of the deposited films: conductivity of lines, mobility, lithographic resolution and film uniformity. Present dimensions of the glass substrates are 1100 x 960 cm and a typical substrate thickness is 0.63 mm. Main problem is to adapt the plasma deposition conditions so that high thin film quality is kept. This was illustrated with the trade-off between deposition rate and film uniformity.

W. Rogler (*Siemens AG*) told about the status of OLED development and some manufacturing aspects. He started with the

explanation of the construction of the OLED and the key characteristics. There are two competing OLED technologies: one based on small molecules that are deposited by evaporation and the other with PPV based polymers applied by spin coating. The small molecules and the polymers are the essential layers in OLEDs and an overview of these chemical substances was given. Thereafter the performance of OLEDs was discussed: efficiency, peak luminance, life time and temperature stability. The efficiency can be considerably improved by UHV-processing. The resulting demo is a 32x100 pixel display with an efficiency > 7 Cd/A and a life time up to 10.000 hrs.

Visit to the Balzers facilities.

After lunch there was a guided tour in the Balzers facilities. All participants were impressed by the huge store for materials/parts, the mechanical workshop and assembly halls with cleanroom conditions where PECVD and plasma etching equipment was assembled. An impressive end of a nice and well-organised meeting.

J. Bruinink

SID-ME Chapter Spring meeting.

During the SID-ME Chapter Spring meeting of March 23-24, 2000 in Balzers, Liechtenstein, there was a formal meeting where the election of the new SID-ME Chapter committee members took place and the financial report was presented. Departing members were: *Dr.-Ing. D. Theis* and *Dr. Ir. K.E. Kuijk*. *Lic. Tech. J. Kimmel* and *Dr. J. Bruinink* were elected as their successors. *Dr. P.G. Wierer* was appointed as additional member of the SID-ME Chapter Committee.

The financial situation of the Chapter was reported by *Dietmar Theis*, the leaving chairman.

Since our treasurer *Frank Rochow* was unable to attend the Liechtenstein Meeting he has forwarded a written report which was read by *Dietmar Theis*. According to his statement SID ME has a small surplus in 1999.

Acknowledgement.

We will miss the radiant presence of *Dietmar Theis* and *Karel Kuijk* in the beginning term of the new SID-MEC committee. The way they have run things as the chair and vice-chair left us with little to hope for in terms of improvement. However, the newly formed committee will do their best. We will continue to work closely with *Dietmar* who continues as the Director of the SID-MEC.

Jyrki Kimmel.

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The Newsletter.

If you want to place an article in the Newsletter, which is interesting for the European display society, please send it to:
J. Bruinink, fax: +31 40 274 4335,
E-mail: Jaap.Bruinink@philips.com
(preferably as plain text, not as a Word or Wordperfectfile.)

SID payment.

The SID has changed the annual membership fee to US\$ 75. Please note that the membership is now a rolling membership, which means that it runs 12 months from the month in which the payment was made (previously the membership was always May of the actual year to April of the following year). We encourage our members to pay directly to SID-HQ in the USA, but if they want to pay to the ME-Chapter directly the annual fee should be EUR 80,00 **with all bank fees covered by the member!**

In case of direct payment to the SID-ME Chapter the payment in EURO should be done to

Account no.: 206 020 1104
at: Berliner Sparkasse, Berlin, Germany
Bank code: BLZ 100 500 00
Account name: Frank Rochow, SID-ME

Please indicated your name on the remittance papers.

Announcement.

K.Hecker announced the foundation of the Deutches Flachdisplay Forum. The goal of DFF is to strengthen the German display industry and research centres.

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First Announcement and Invitation.

The Fall '00 Meeting of the SID Mid-Europe Chapter will be held from

**Friday, October 13th to
Saturday, October 14th, 2000**

at the BMW Research and Development Center (BMW FIZ) in D-80788 Munich, Knorrstr. 147, Germany

The central topic of the fall meeting 2000 will be

Automotive Displays

The exact program and further details for this event will be sent to you by early September 2000. Please mark your calendar now, so that you do not miss this important conference in beautiful Munich - or even better apply immediately!

The conference will start on October 13 at 9.00 a.m. and will end at 12 a.m. on October 14. We will have a number of exciting invited and contributed lectures in the field of automotive displays and related issues. The delegates will have the opportunity to visit BMW's famous Research and Development

Center on Friday, Oct. 13th in late afternoon, followed by a buffet dinner on BMW's premises.

You are requested to make your own hotel reservation. A convenient access to Munich hotel addresses and reservation is via www.muenchen.de.

Please fax or send the inclosed application form to the SID-ME Chapter Director Dr. Dietmar Theis, Siemens AG Munich (address/telfax is noted on the application form).

We are looking forward to seeing many of our society members and their friends in October in Munich - unfortunately after the 'Oktoberfest' but it will be easier to book hotel rooms and there will still be enough beer available in Munich anyway!



SOCIETY FOR INFORMATION DISPLAY

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Application form

Yes, I will attend the SID - MID Europe Chapter Meeting
in Munich/Germany 13./14. October 2000.

Family Name:

First Name:

Title:

Position:

Organization:

Mailing Address:

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Country:

E-Mail:

Telephone:

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Date:

Signature: