



**AU Optronics and Siemens – a success story based on a long term customer / supplier partnership**

## On the road to success

AU Optronics (AUO) is the world's third largest TFT LCD manufacturer. AUO supplies flat panel displays for notebooks, e-books, mobile displays, TV screens. The substrate size ranges from 1.5" to 20.1". The company generated over 2 billion USD in sales revenues in 2002 and has over 10,000 employees world-wide. A partnership with Siemens helped make this possible.

**A**UO's Fab L5 (completed 1999) in Hsinchu, Taiwan, manufactures 3.5 generation FPD (substrate size 610 x 720 mm). Fab L5 was equipped with Simatic S7, and for the first time the TIA concept was implemented to integrate the subsystem control systems to FMCS.

Fab L6 (completed 2001) was the first fab in Long Tan, Taiwan. For AUO it was a quantum leap to 4th generation FPD technology. The production utilities, including the control system for facilities, had to comply to highest quality standards. Key

requirements for the facility automation were: Reliability, seamless integration of control systems and SCADA, and short engineering times due to the tight project schedule. Siemens took the challenge and developed an integrated fab concept based on PCS 7.

According to AUO requirements, the entire fab should be operated from one central control room and a smaller control room in the Central Utility Building (CUB).

Multi-clients enable the central operation of the entire fab, local monitoring is

possible with simple plug and play of mobile multi-clients. A clear operation concept avoids mishandling and double acknowledgement of alarms.

Highest reliability has been achieved with high availability distributed servers, Simatic S7-417H for control, redundant Profibus DP and remote I/O in the field.

Reliability is not only limited to single components, but applies for the complete automation system.

Short engineering times have been critical to complete the project in time and

## Spotlight: Flat panel display industry

Displays for notebooks, PDA, cellular phones, ultra flat TV screens, large size video screens are now part of daily life. With an average annual growth rate of 20 %, the FPD industry is developing rapidly into one of the dominant segments in the electronic industry. And in the future, non PC applications like TV screens, mobile displays, e-books, internet appliances and digital picture frames will gain importance. More than 90 % of FPD manufacturers are based in Asia-Pacific. Taiwan has shown the most rapid growth in this industry, increasing its share of world production from 5 % in 1999 to 38 % in 2002. Within the current variety of FPD technologies, three main technologies can be found:

### AM-LCD (Active Matrix-Liquid Crystal Display)

An active matrix addresses each pixel separately. Thin Film Transistors (TFT) are directly integrated in each pixel to amplify the signals.

**Advantages:** High display quality, video-capable

**Disadvantages:** Highly sophisticated manufacturing process, high capital spending required, difficult production of large size displays

**Applications:** Notebook displays

### PDP (Plasma Display Panel)

Plasma displays are filled with a reactive gas like neon. The pixels are addressed by a passive matrix. High voltages are required to ignite the plasma.

**Advantages:** Large size displays, video capability

**Disadvantages:** High power consumption, expensive

**Applications:** Mainly used for large flat TV screens

### PM-LCD (Passive Matrix-Liquid Crystal)

A passive matrix provides multiplex addressing of pixels. No integrated storage elements.

**Advantages:** Low cost technology

**Disadvantages:** Slow switching speed, low resolution

**Applications:** Cellular phone display

Future technologies with a high growth potential are OLED (Organic Light Emitting Diodes), FED (Field Emission Displays) and MEMS (Micro-Electro-Mechanical System) based displays.



guarantee an equipment move-in without delay. Various third party systems had to be integrated into PCS 7.

PCS 7 features a technological library with predefined objects. This makes it possible to shorten the engineering time by more than 30 %. The uniform engineering platform has been an enormous advantage particularly for the integration of the subsystems into FMCS. Third party systems like York chillers, CDA, power meters, etc. have been integrated by free programmable objects into PCS 7. As part of the technological library, these objects can be reused in future projects.

Key data of the PCS 7 solution for AUO L6:

- Total number of hardware I/O points: 19,000
- Controllers: 12 sets of S7-417H, 6 sets of S7-416, 2 sets of S7-414
- Operation and monitoring: 6 redundant servers, 2 stand-alone servers, 7 multi-clients.

Siemens cooperated with the following subsystem vendors for the implementation of PCS 7:

- Cleanroom: M+W Zander (Germany)
- Ultra pure water: Kurita (Japan)
- Process gas supply: Air Liquide (France)
- Chemical supply: Merck/Nisso (Japan)
- Bulk gas: Sanfu (Taiwan)
- LCM: Toyo (Taiwan).

### The story continues

In 2001 AUO expanded their business activities to China. The first LCM fab for turnkey TFT-LCD modules in China was built – with Siemens as partner. Siemens China provided a turnkey solution based on PCS 7.

Fab L8 for the production of 5th generation FPD followed Fab L6 in 2002. The choice of AUO was very clear again – with PCS 7 as a total solution, AUO and Siemens continued together on the path of success.

The latest example of cooperation between AUO and Siemens is AUO CAT (color filter) and two additional 5th generation TFT-LCD lines. Size and scope of the color filter fab are similar to AUO L6. PCS 7 is once more the first choice of the customer. The fab with the proven automation concept from Siemens will start production by end of 2003. With this latest application, Siemens could provide a PCS 7 system with, in total, more than 45,000 hardware I/O points. That means AUO is the largest PCS 7 customer in the semiconductor/FPD industry and one of largest PCS 7 customers worldwide. ■

**Christian Marks, Siemens Nuremberg**

E-Mail: christian.marks@siemens.com