First Technical visit to a Wafer Fab Foundry

SLP visited Chartered Semiconductor Manufacturing Ltd (CSM) Fab 3E on August 14, 2008. The visit was hosted by Dan Steele, who is an SLP member and CSM's Senior Director, Facilities Operations/EHS and Poh Kee Lean, Division Manager of Total Infrastructure Solution.




Our members were first introduced to CSM's operations and products before proceeding on a tour of the facility.

CSM is the third largest wafer fabrication foundry in the world. The company produces 200 mm integrated circuit (IC) semiconductor wafers. Base silicon wafers are processed using nano-technology to create circuits as thin as 65 nanometers. These wafers are subsequently sliced and diced into chips and packaged into IC's that are used in almost every electronic appliance in our daily lives. Production processes are automated; overhead tracks transfer pots of wafers from one workstation to another.

Manufacturing processes are conducted in a 12,000 square-meters clean room. Why a clean room? Dust control is essential because dust particles in the air may cause product defects. The clean rooms are classified as Class 100 or Class 1,000. These refer to US FED STD 209E and denote the number of particles of size 0.5 microns or larger permitted per cubic foot of air. Incoming air is filtered using high efficiency particulate air (HEPA) filters and delivered from the ceiling. It leaves the air space through the mezzanine floor. Some of the rooms designated as yellow use yellow lights, instead of normal fluorescent tubes, to protect against degradation of the UV sensitive photolithographic chemicals used in etching.

A wafer fab foundry uses large quantities of water, electricity and ultra-pure chemicals. 99.9% of the water used is Newater. More than half of the water is reclaimed and reused. It is interesting to note that in some areas the used water is "cleaner than normal tap water".

The foundry stores and uses several types of highly toxic gases. To protect people working there, breathing air is monitored 24 hours x 7 days with sensors at four locations around each tool. This is done real-time and the data from the sensors are linked to building alarm systems. To ensure that gas lines do not leak they are welded and no flange is used.

Caption

Photo 1 : Visitors looking into the processing area of the foundry.
Photo 2 : Operator in his work clothes. Note how he is covered up. This is to minimise possible contamination from his body eg. flaked off skin.
Photo 3 : Clean air from ceiling inlets.
Photo 4 : Open decked mezzanie floor for the air to be sucked out.

CSM has an on-line Risk Assessment (RA) tool that was developed in-house. This results in a consistent assessment of risks for all processes, including changes and new processes. The RA work is headed by a vice-president for QRA. The online EHS testing system covers all levels including the Chief Executive Officer. Employees who do not pass the 'test' are barred from entry. These tests are prescribed by their job descriptions. Every workstation has an electronic access control system that prevents "tailgating" ie. only one person can pass through per card. There is no exception. For example, three VP's have "failed" and out of these, two resigned immediately. This highly disciplined access control ensures that only trained and competent personnel are allowed in work areas.

Each Live-Work Review (permit to work) is vetted personally by the Senior Director. The purpose is to reduce human error. Live work includes installation of new equipment, change of sensors, all tools related to exhausts, inter-lock and calibration work. When the vetting system was first implemented, the rejection rate was high at 25%; now the quality of the requests have improved and the rejection rate has dropped to 5%.

At the end of the facility tour, members spent time interacting with members of the staff and enjoying their hospitality. Ong See Hee, our President, thanked CSM for the time its staff had spent with us and presented a memento to Dan Steele

By Sam Tsen

A smiling Dan Dteele receiving the memento from See Hee. Many thanks Dan for your hospitality.

Visitors and hosts posing for a souvenir picture.