Zero Defect Methodology: Is the GaAs Industry Ready?

Authors: Jan Campbell
Freescale Semiconductor CS1 Fab
2100 E. Elliot Road, MD EL609, Tempe, Arizona 85284
JanCampbell@Freescale.com   480-413-7427

Keywords: … Quality, Zero Defects, Customer Satisfaction

x

5. Shitsuke - assure that everyone continues to follow the rules of 5S, i.e. stick to it.

Seiri（整理）/ Sort and Simplify

Seiri is the process for sorting out what items are required and which are not in normal operation: a) Is it essential for daily operations? b) Does it have to be in the clean room? c) review where to store if not used for 6 months. d) Discard if not used for 12 months. This stage (Sort) may need to be done periodically. One tool used at CS1 is the Zone Defense Team, which does a weekly audit. This team is also part of the Zero Defect Team which organizes weekly fab cleanups. This weekly audits are performed by Zero Defect team members to identify:

1. All visible degradation in the clean room facilities.
2. Foreign material.
3. Abnormalities.

In figure one: CS1 Zone Defense yearly incidents are depicted. The top 10 findings have to be fixed before the following audit.
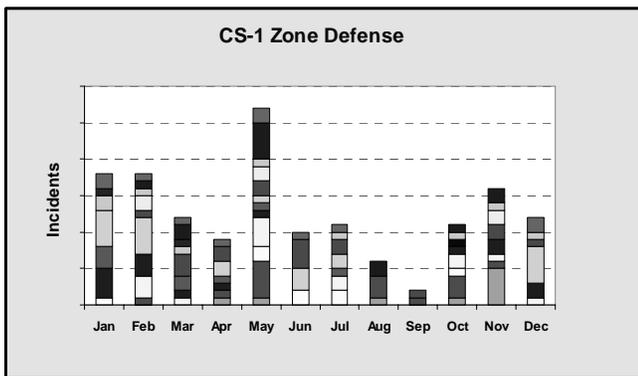
Figure One: CS1 Zone Defense

Seiton（整頓）/ Set in Order

"Seiton" or orderliness, is all about efficiency. This step consists of putting everything in an assigned place so that it can be accessed or retrieved quickly, as well as returned in that same place quickly… Every single item must be allocated its own place for safekeeping, and each location must be labeled for easy identification of what it's for." An example of a work area is shown in figure two: ACI Layout
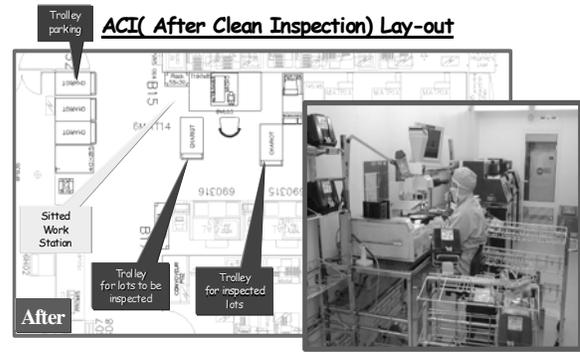
Figure Two: ACI Layout

Seiso（清掃）/ Shine

"Seiso, the third step in 5'S, says that everyone is a janitor." Seiso consists of cleaning up the workplace and giving it a 'shine'. Cleaning must be done by everyone in the organization, from operators to managers. Everyone should see the "workplace" through the eyes of a visitor - always thinking if it is clean enough to make a good impression…" Introduction to a weekly cleanup is essential in keeping defect awareness at CS1. Based on a sister fabrication facility, CS1 has introduced a "HEURE SOLEIL" or sunny hour, where once per week, production is stopped during a 60 minute period and all personnel including CS1 staff participate in the cleaning of the fab, using a specific check list. An example of participation is displayed in figure three: Fab Participation
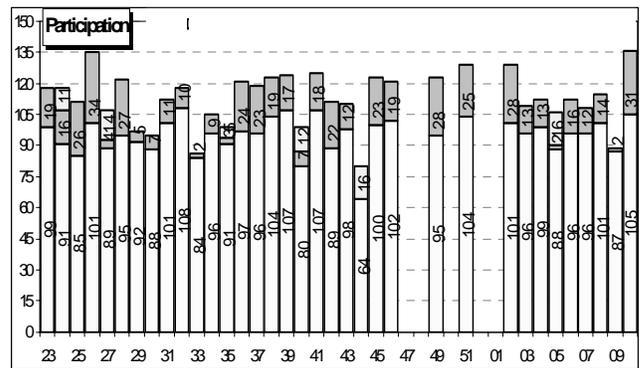
Figure Three: Fab Participation

Seiketsu（清潔）/ Standardize

"Seiketsu" is maintaining and improving cleanliness. Define the standards that need to be kept and put a process in place to ensure that your standards don't drop. You need to complete Seiri, Seiton, and Seiso (sort, set in order, and shine) before moving on to this step. It sets the standards required which are supported by regular check, etc.)

<u>Shitsuke（躾）/ Sustain</u>

"The last step of 5'S, Shitsuke, means 'Discipline.' It denotes commitment to maintain orderliness and to practice the first 4 S as a way of life. The emphasis of shitsuke is elimination of bad habits and constant practice of good ones. Once true shitsuke is achieved, personnel voluntarily observe cleanliness and orderliness at all times, without having to be reminded by management."
Further CS1 has implemented sustaining activities such as

1. Management Commitment
   a) Foreign Material Audit Patrol
   b) Sunny Hour
   c) Error Free
   d) Recommendations
2. Continuous improvement
3. Training
4. Control & measurement of class 10 environment
   a) Particles according ISO Standards
   b) Witness wafers
   c) Deposition rate: amount of particles deposited on a test wafer, permanent deposition test wafers, audit deposition test wafers
   d) Delta of pressure
   e) Laminar air flow
   f) Room filters
   g) Temperature and hygrometry
   h) Out of control situation
   i) Equipments are controlled using SPC rules

RESULTS

Implementing such a system must show clear results: there are several measurements that CS1 uses to measure the success of implementing a defect reduction program. In figure four, final outgoing inspection (FOI), defect awareness has contributed significantly at CS1 to an increase in FOI yield.
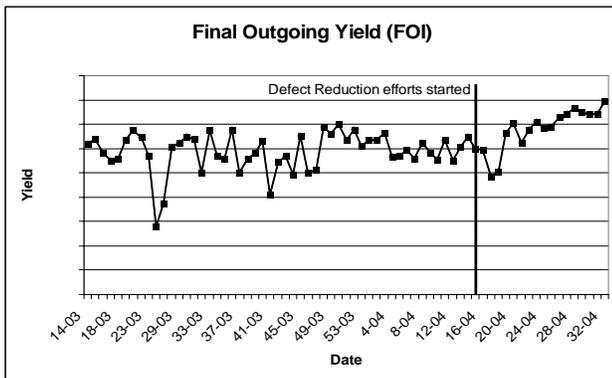
Further, proof of defect awareness and the decrease of defects seen on wafers, is monitored using an automated defect on wafer (DOW). Defects are measured on wafers and monitored per process, tool, area as well as group. This provides clear direction for action items to be driven on a weekly basis. An example of CS1's DOW charting is depicted in figure five, CS-1 Defect DOW.
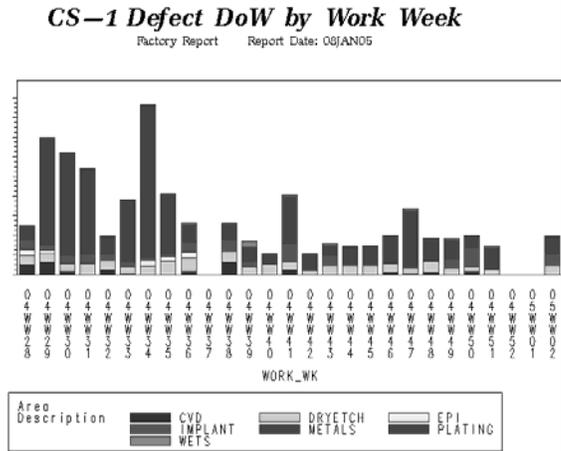

Figure Five: CS-1 Defect DOW.

Probably the most important component of a "Zero Defect" is what escapes to the customer and ultimately be a customer return. This is a very important gauge in determining if your factory is truly moving towards zero defects. CS1 uses a customer quality incident report (CQI) This report includes assembly site requests for corrective action, customer returns as well as any internal or external requests for escapes. CS1's customer quality report in given in figure seven, customer quality incident reports (CQI).
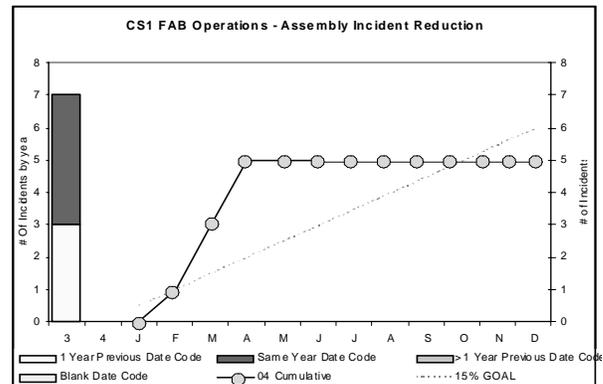CS1's CQI report is presented in figure six, CS1 customer quality incidents (CQI).

Figure Four: Final Outgoing Inspection (FOI),

Figure Six: CS1 customer quality incidents (CQI).

CONCLUSIONS

A "Zero Defect" methodology incorporates establishing a foundation which maintains and monitors defects in a factory. Defect reduction activities are everyone's responsibility. It is a culture change that must be supported at all levels.

Since implementing a "zero defect" methodology, significant improvements have been obtained in the reducing customer quality incidents and increasing final outgoing yield.

REFERENCES

[1] *Industrial Weekly,* Oct 2003

[2] Godfrey Hands NDT Consultants Ltd. 2001

[3] Crosby, Phillip, Martin Marietta 1965

[4] Hirano, H. *The Five Pillars of a Visual Workplace,*. Nikkan LTD Japan, 1990

ACRONYMS