Application Note 005

Cluster Analysis

Cluster Analysis may be used to find void size distribution, based on user defined amplitude and size criteria. For instance, the total disbonded area at the bond interface in a bonded wafer pair may be determined. Other applications of Cluster Analysis include determining the percentage of delaminated die surface area, of die attach voiding, porosity of bulk materials and non-brazed area for brazed joints.

In the example illustrated here, Cluster Analysis is used to determine the void size distribution for a bonded wafer.
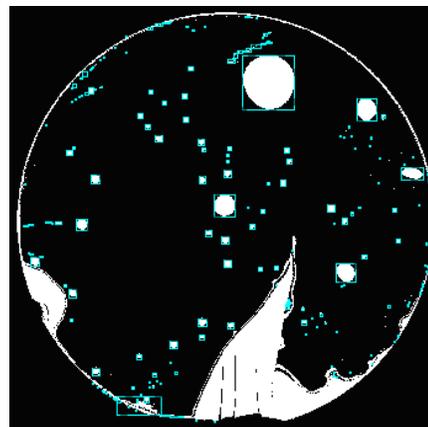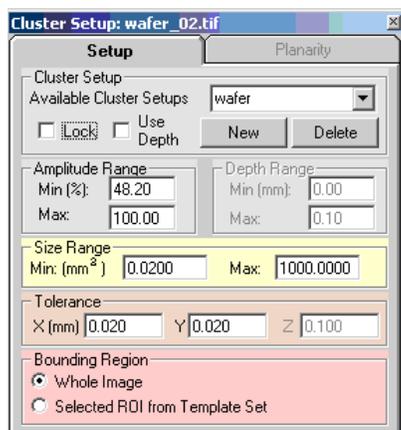

Figure 2: Cluster Results

Figure 1: Cluster

The cluster setup illustrated in **Figure 1** defines minimum and maximum amplitudes and size ranges. Each "cluster" is a group of pixels that satisfies the specified criteria. The tolerance values may be used to determine whether closely spaced clusters need to be combined into a single cluster or be counted as separate clusters. The cluster setup allows these criteria to be saved for repeated use on a part from a specific lot. Parts may therefore be rejected based on total void count, total disbonded area etc. (See Application Note on Auto Analysis to learn about how to classify parts in a lot as Pass or Fail).
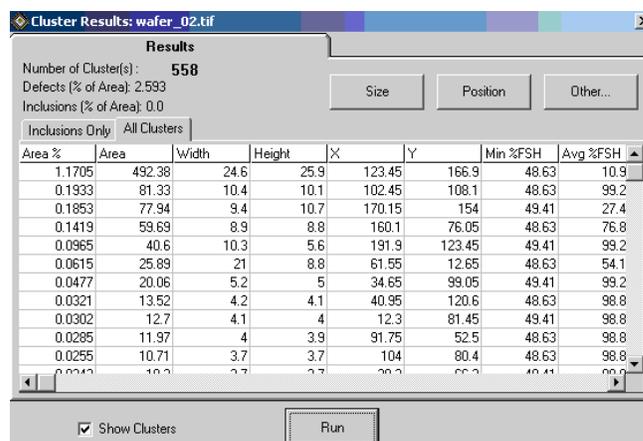

Figure 3: Cluster Results- Void Size

The Cluster Analysis results (**Figure 3**) on the bonded wafer illustrated here shows that 558 voids that satisfied the specified criteria were detected and the void area was 2.59% of the bond area. Each cluster is enclosed by a box (**Figure 2**) and the area of each cluster is determined by counting the number of pixels that satisfy the specified criteria. Each cluster is identified on the results page by its X and Y position, X and Y dimensions, area in mm2 and as a % of the bond area, and amplitude. By obtaining Time of Flight data and specifying the acoustic velocity of the material, the depth of each cluster may also be determined.