Teaming Up - Handler / Test Cell

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Teaming Up

"Applying FEA Simulation for Test Interface Unit"
Jason Koh - Test Tooling Solutions Group

"BI RHINO Handling Solution"
Yaniv Raz - Intel Corporation

"Optical Device Testing at Wafer Level and Package Devices"
Carl Kasinski – Aehr

"Fan-in WLCSP Test Requirements"
Mike Frazier - Mike Frazier
Background

- MVE (Manufacturing Validation Engineering) is a group at Intel which is responsible for test development and validation of Intel microprocessors.
- MVS (Manufacturing Validation Solution) is a Team within MVE.
- The Team’s scope involves delivering complete systems for the validation world, including automation systems.
- The RHINO handler was developed for the BI (Burn-in) validation labs in Intel.
Problem statement

• Burn In (BI) ovens are being widely used in Intel validation sites, for stress tests purposes.

• BIBs (Burn In Boards) are testing boards which are being loaded to the BI oven.
Problem statement

• BIBs are becoming heavier than before, with the latest product BIBs reaching 15 kg.
• The BI ovens include 16 slots for BIB, while the upper ones require a ladder to reach for loading.
• As manual loading and unloading the BIBs to the BI oven involves ergonomic hazards, a decision was taken to develop an ergonomic solution to eliminate the risk of operation.
Solution concept

- Main requirements for the RHINO design team:
  - Eliminate all the ergonomic hazards involved with loading and unloading of the BI oven.
  - Design a lean footprint and easy to use handler.
  - Be able to reach all 16 BI oven slots.
  - Be capable to work with any product related BIB.
  - The Handler can work on a single BIB mode, or on an automated mode (feeding from an 8 BIB cart).
  - System will includes a user friendly UI.
RHINO Handler Concept

- The RHINO Handler is docked to each BI oven side and serves 16 slots.
Lean Footprint

BI RHINO Handling Solution

Width - 987mm
Depth - 472mm

Height - 2900mm
Mechanical Overview

- The Rhino design can be broken down into 2 main mechanisms:
  - Lifter
    - Handles the up-down movements.
    - Carries the loader tray and reaches all 16 BI Oven slots
  - Loader tray
    - Hosts the BIB secured while lifted or lowered
    - Handles the loading and unloading in and out of the BI oven slots
Lifter

- Lifter mechanism is based on 2 coupled Festo electrical slides.
- Calibration - slots location mapping is done with laser sensors.
Loader Tray

- Conveying mechanism is based on a rotating arm and a popup puller pin which are in charge of pushing and pulling the BIB in and out of the BI oven slots.

- Latching mechanism keeps the BIB secured in place while the lifter is transitioning.
Safety Features

- All handler openings are covered by safety curtains, and are finger proof rated.
- Front side lower portion is covered with an optic curtain set (Level 4), while upper is covered by a transparent screen.
- “Person inside” detection is covered by floor horizontal optic curtain.
- While cart is docked, lower curtain is disabled to allow BIB transfers from the cart to the oven and vice versa.
RHINO operational overview

- Operator is able to choose between 2 modes of operation:
  
  Manual bib loading  
  (single BIB)  
  Automated loading  
  from a 8 BIB cart
Project Summary

- Project goal was fully achieved – eliminating all safety and Ergo risks involved with BI ovens loading and unloading.
  - Secondary goals achieved – Lean footprint, capability to work in Manual and Auto mode, higher capacity and speed, capable for any product.
- Budget target was met as well – machine cost for batches of 4+ is $60K.
- Customers satisfactory is high.

- Project team:
  - PM \ SE – Yaniv Raz
  - Lead Mechanical designer – Adi Klein
  - Mechanical designer (student) – Andrey Evgraphov
  - Electrical \ SW design – Shaniv (External vendor)
- Duration - from initiation to 1st article testing ~18 months.
Videos

Video 1 – Board being unloaded

Video 2 – Board being loaded

Video 3 – Slot Change – lower oven

Video 4 – Slot Change – Higher oven

Video 5 – Arm Actuations

BI RHINO Handling Solution