

# Automated Die Attach Oven Cure with Smart Console

Michael D. Capili

Back-End Manufacturing & Technology, STMicroelectronics, Inc.  
Calamba City, Laguna, Philippines 4027

**Keywords**— Die Attach Oven Cure; System improvement; Industry 4.0 and 3.0; Misprocess; Wrong Program/ recipe used.

## I. OVERVIEW

Inspired by Industry 4.0, the goal of most of the Manufacturing today, is to develop a state-of-the-art manufacturing environment in the coming years. With the fast moving technology that requires Automation, in order to achieve company goal of Industry 4.0, our manufacturing systems should be able to surpass Industry 3.0 where automation and computer aided techniques are essential. Industry 3.0 improves productivity and enables companies to remain competitive thanks to technological advances including robotics, big data, machine learning, artificial intelligence, and the Internet of Things.

One way to automate our process is for the recipes to be automatically downloaded from a server or a hard drive to machines. the Team would like Generate an Error Prof system application that can prevent to misprocess due to Wrong Program/Recipe. Also addressing the manufacturing operational as an organizational goal, to reduce the Assembly Misprocess occurrences.

This paper discusses on how to improve existing Die Attach Oven Cure with less financial investment. The implementation of Automated Die Attach Oven Cure with Smart Console, which leads to the development of a new system that will provide computerized traceability and at the same time incorporate an Error Proof system (Poka-yoke) process controls to become one of the most effective tools in the electronics manufacturing industry.

To start with, below is the Assembly Process Flow as shown in figure1. Highlighted, the focus is the assembly process step at Die Attach Oven Cure operations.

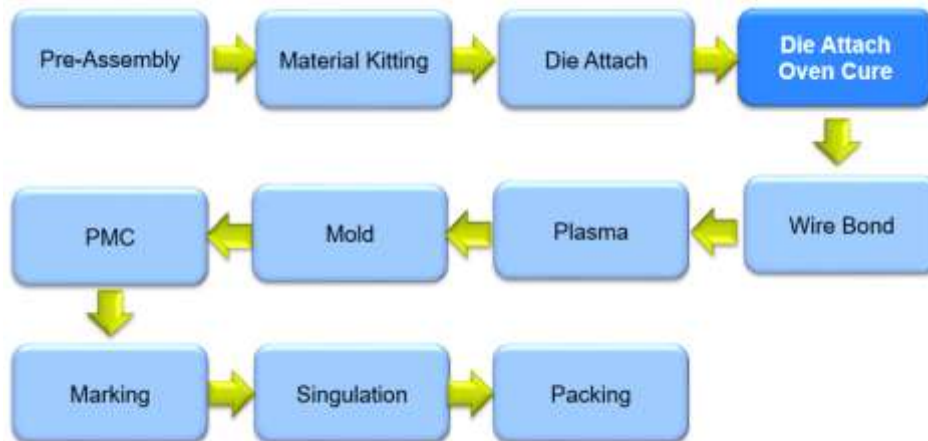


Fig. 1. Assembly Process Flow

After Die Attach process, where singulated silicon dies are picked from incoming tested wafers and placed on a Leadframe carrier or strip with applied die attach material or epoxy. The Assemble units where submit in Oven Cure process for curing as illustrated in figure 2.

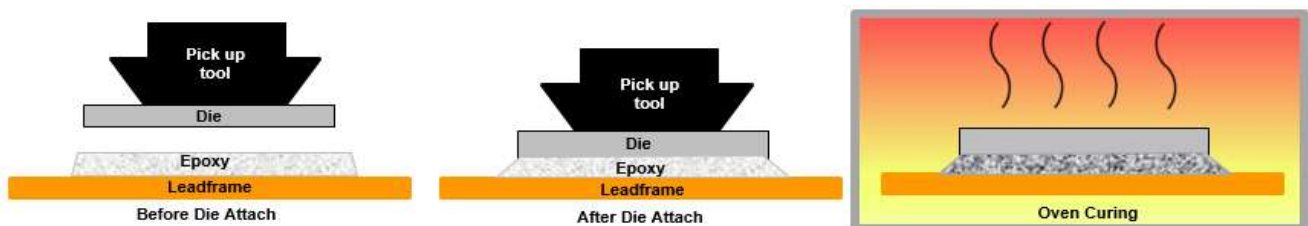


Fig. 2. Die Attach Oven Cure Process

WHAT IS AN OVEN CURING? An industrial curing oven is a piece of thermal processing equipment designed to improve the strength and durability of a material by accelerating a desirable chemical reaction. In its simplest format, a curing oven achieves this by elevating the temperature of a sample material to within or above a specific limit. This may be enough to improve the physiochemical linkages within the material and improve the mechanical characteristics of the product. More often, one or more catalyzing agents are introduced into the curing oven to facilitate the required reaction. In figure 3, it shown the typical Box Type Die Attach Oven Cure machine.



Fig. 3. Die Attach Oven Cure Machine

## II. PROBLEM IDENTIFICATION

Typical box type Die Attach Oven Cure machines is manually operated, below is the Oven Cure SIPOC illustration as shown in figure 4. Where the process input requirement is the Oven Program or Recipe, the operator select program or recipe to be use Oven Cure thru switching the recipe controller in Main control panel. Program Recipe may vary based on Epoxy type and package requirement. Most an Oven Cure machine has more than 2 recipe installed to maximize and utilize the machine, which the process become more critical, that contribute to the problem of Wrong Program or Recipe used during Oven Cure. And this problem may lead to a product quality and reliability issue.

After the processing of the lot at Oven cure, the output response of Oven machine will be manually verified by operator thru checking of curing profile, including Program curing temperature and time requirements based on epoxy adhesive type. And all this material, Lot traceability and machine history are highly important within the manufacturing, as it provides important information.



Fig. 4. Oven Cure SIPOC

III. ASSEMBLY PROCESS IMPROVEMENT

The Automated Oven Cure with Smart Console as shown in figure 5, provides Smart Dashboard and other Smart Console applications are the GUI clients to manage the Oven Management Server and Security Gateways to improved quality and higher productivity. The Program selection and downloading will be Auto download of recipe base on Die Attach Material and Oven Cure Program Management. This make the Oven Cure machine and system smart, meaning better quality control and higher productivity and less cost.

It removes the manual selection and checking of oven recipe, ensures right program will be used in production all the time for the product. The new system application will address and prevent some non-conformances issue especially Wrong Program used.

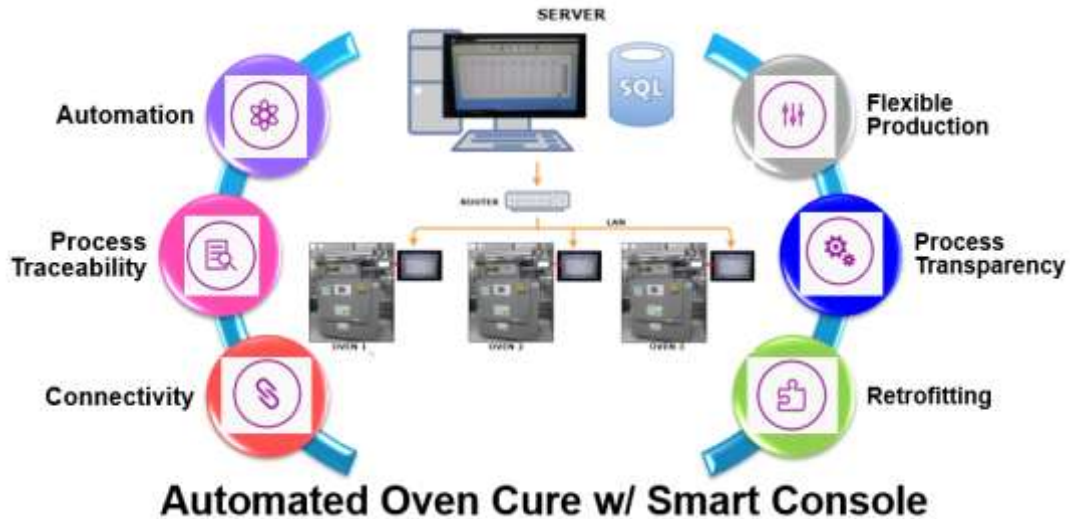


Fig. 5. Automated Oven Cure with Smart Console

How it works? The barcoded lot traveler will be the reference, where all the material information is included. And during transaction in Automated Oven Cure with Smart Console system, it requires to scan the barcode lot traveler to load the material information, the system has a smart compare system to validate if correct material in being loaded, to prevent wrong recipe or program. Below are the other Advantages of Automated Oven Cure with Smart Console as shown in figure 6.

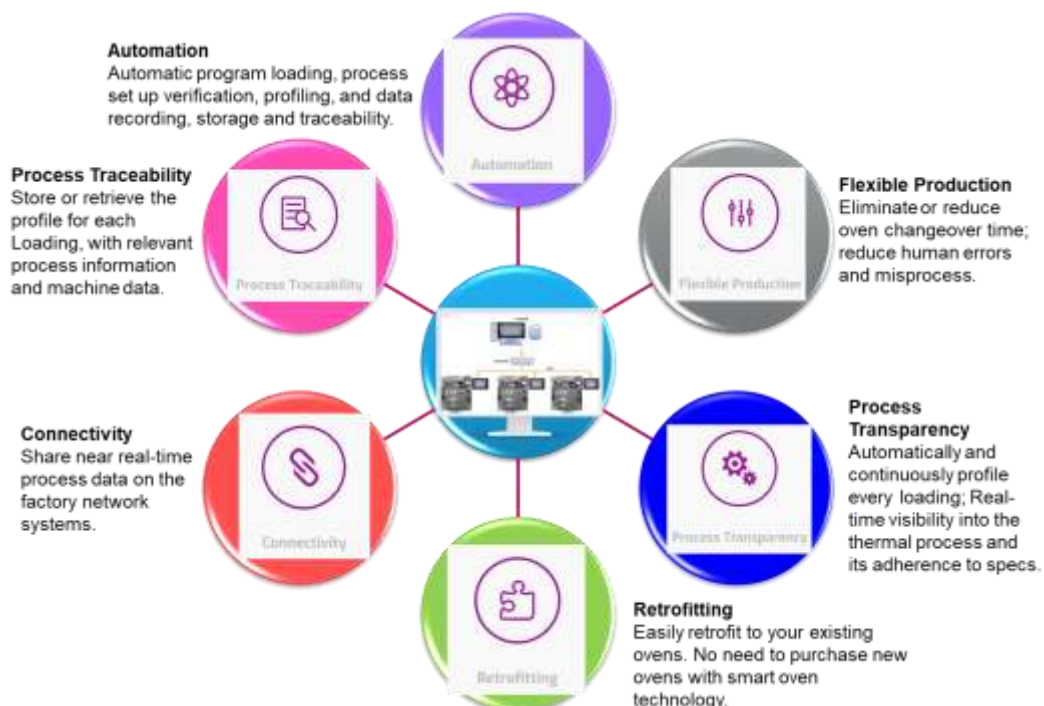


Fig.6. Advantages of Automated Oven Cure with Smart Console



With the development and implementation of Automated Oven Cure w/ Smart Console. provides thermal profiling hardware and profiler software tools that help define, measure, monitor, and improve thermal processes for electronics manufacturing services. This reduces downtime, can decrease electrical expenses, and reduce your labor costs, all while improving your manufacturing quality, overall productivity, employee morale and customer satisfaction... and ultimately, profits.