

Process Improvement of Hard Disk Drive Performance Testing Based on Classification Code

Pakamard Sommate, and Paphakorn Pitayachaval

Abstract—In the competition of industrial market, beside number one of product quality, time to market and production cycle time are also important to consider product to the best product. Shorten production cycle time would be a factor for fasten company growth. This paper presents an improving temperature testing process of hard disk drive production by using classification code in which an attribute of classification code had been changed. The result showed that process has been improve to zero defect.

Keywords—classification code, testing temperature process, hard disk drive.

I. INTRODUCTION

HARD Disk Drive (HDD) is a main component of computer or electronic device such as camera or telephone. This component has many paths to assembly and the accuracy of each step to assembly has been required. To guarantee performance product configuration must be simulated. Temperature is the one of product configuration. There are two temperatures that use to test HDD, hot temperature (>22C) and ambient (at 22C) temperature.

Temperature test process is a significant process before shipping HDD to customer, as shown in Figure 1.

For HDD testing process, starting from HDD is assembled. Then, it has to test PRE-TEST for hot temperature and FINAL-TEST for ambient temperature, in which all HDDs must test these two temperatures. After that, HDD is tested a visual mechanical inspection to check scratch on the product. If customer requires to test Label Outgoing DPPM Test, (LODT) then operator selects that part to test additional temperature process. Otherwise HDD can be shipped to customer. For additional temperature, there are two temperatures to test; ambient temperature and hot temperature. If the last digit of serial number of HDD is XXXXXX0-XXXXXXXF, then

Pakamard Sommate is with the School of Mechatronic Engineering, Institute of Engineering, Suranaree University of Technology, Nakhon Ratchasima, Thailand (corresponding author's phone:086-5659679; (e-mail: sommate.pakamard@gmail.com).

Paphakorn Pitayachaval is with the School of Industrial Engineering, Institute of Engineering, Suranaree University of Technology, Nakhon Ratchasima, Thailand. phone:66(44)22-4563; (e-mail: paphakorn@g.sut.ac.th).

HDD is tested by hot temperature, otherwise, it is tested by ambient temperature. If those HDD pass additional temperature process, they will be shipped to customer, otherwise they will be reworked again. This process is shown as Figure 1.

A Tester is an equipment to simulate HDD functional at any temperature in order to guarantee quality of HDD that can operate at either hot temperature or ambient temperature. The tester consists of 1152 controllers to control temperature as shown in Figure 2.

Each controller composes of two slots to test either hot temperature or ambient temperature, when hot temperature is applied to HDD while ambient temperature cannot be applied. So the pair of slot must be applied on the same temperature. Either hot temperature or ambient temperature testing if those two slots of a controller are assigned by difference temperature. The 1st slot that load HDD is operated while the other slot is

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This situation is called temperature interlock. The idle slot has to wait until the 1st slot is finished. The processing time of temperature testing process will be enhanced if there are many idle slots. In order to reduce processing time, idle slots must be reduced.

This event occurs by human error when operator assigns wrong classification code as shown in Figure 3.

To solve the problem classification code, the code is automatically assigned at FINAL-TEST instead operator control.

This paper presents an improving temperature testing process of HDD production by using classification code. Since there are many effects of human error usually on the night shift as [1]-[5].

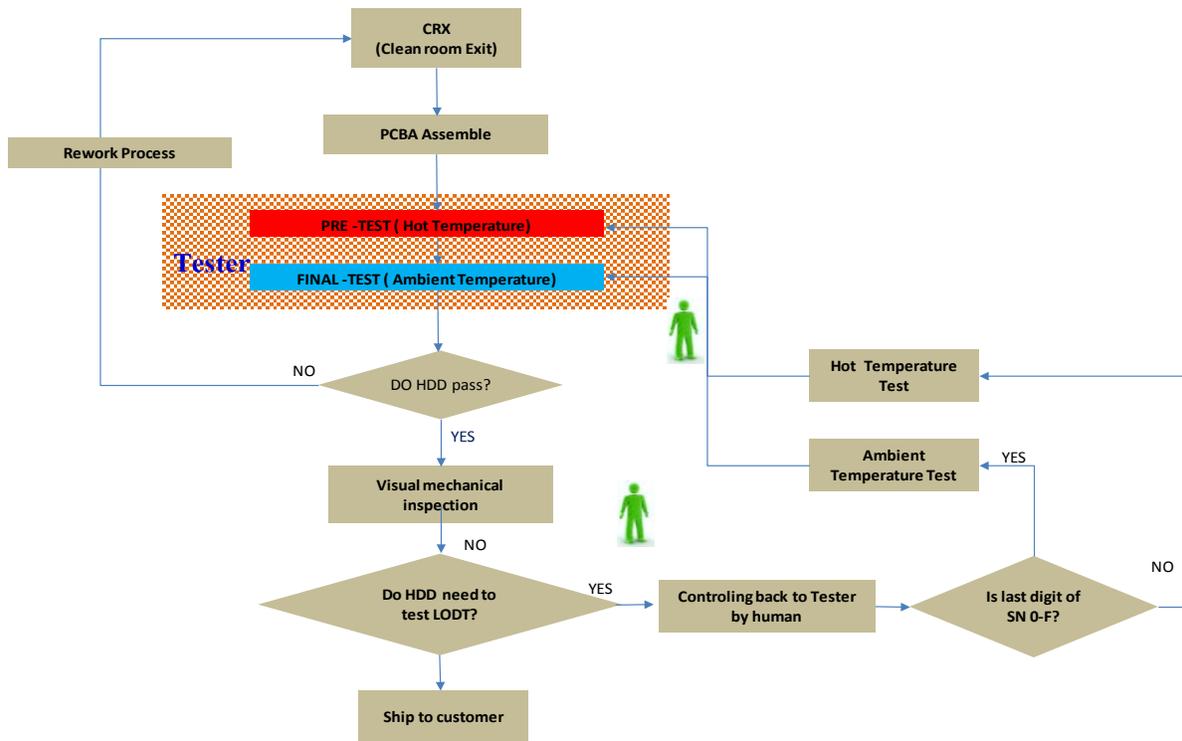


Fig. 1 Temperature Testing Process

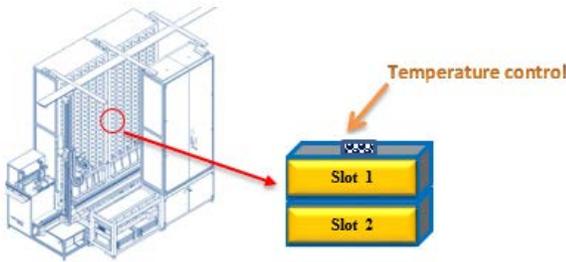


Fig. 2 Tester Structure

II. RESEARCH METHODOLOGY

To improve temperature testing process, human who is assigned classification code was be removed. The classification code is assigned at the FINAL-TEST by adding attribute as shown in Figure 4.

For the improving process, hard disk drive that need to test LODT is checked serial number to test hot temperature or ambient temperature.

The sensor check LODT_FEATURE to assign HDD to the hot temperature or ambient temperature. If it find hot temperature attribute on LODT_FEATURE, then HDD will be sent to hot temperature. Otherwise HDD will be sent to the ambient temperature test. By using sensor to scan LODT attribute, operator who assign LODT attribute can be skipped as shown in Fig 5. So the wrong assigned classification code is eliminate.

The operator have just keep HDD to test in the tester again. This method is very comfortable with operator who is assigned the code for HDD and can reduce mistake form human error.

The new improvement flow that include LODT_FEATURE as shown in Figure 5.

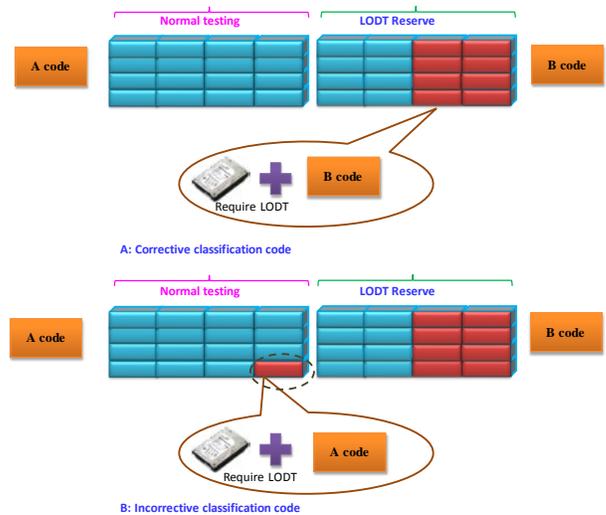


Fig. 3 Effect of corrective and in-corrective in classification code

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81  ForceFW_Config = {"SSB" : [], Adding SSB Example "SSB" : ("PNC.TEST01", "PNC.TEST02", "PNC.TEST03")
82  "TESTER_ID" : [] Adding Tester ID Example "TESTER_ID" : ("SEDCHEM0", "SEDCHEM1"). See Allow setting TESTER
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Fig. 4 Classification code by structure

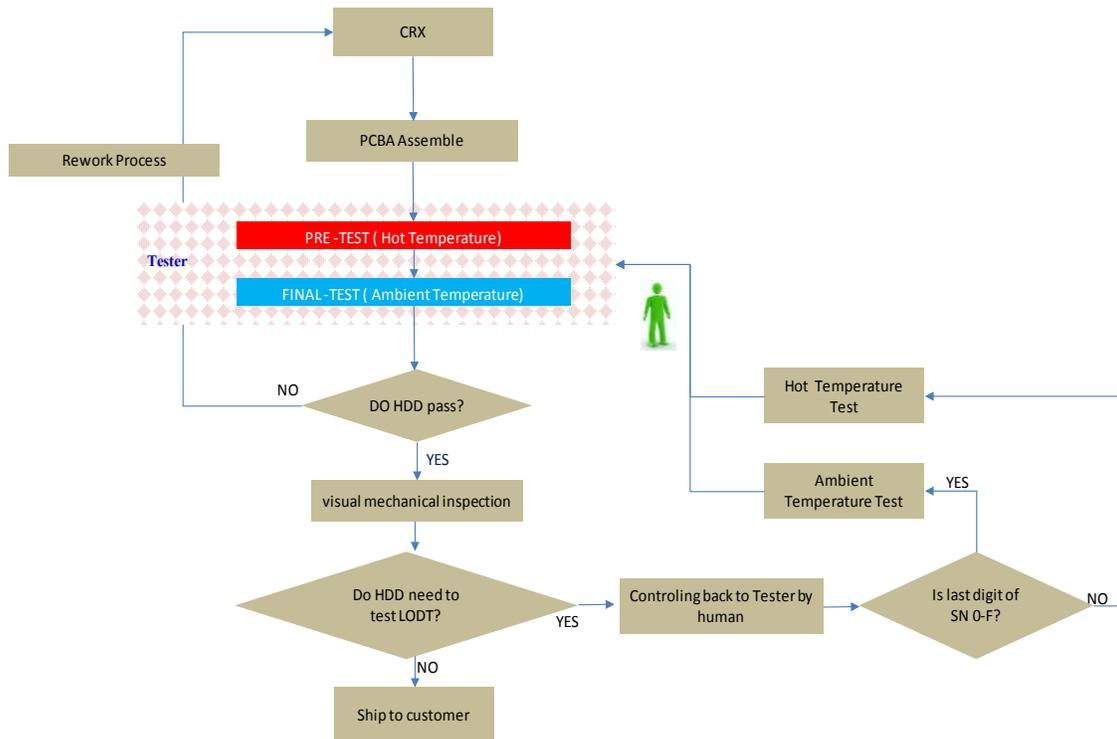


Fig. 5 New improvement process by classification code by adding attribute

III. EXPERIMENTAL RESULTS

When added LODT attribute was apply on the production line, the result shown that the idle slot is reduced and there is zero defect by classification code as shown in Figure 5.

Additionally, the operator is also reduce from two to one operator that transfer HDD to tester. The improving process is automatically temperature testing without human interfere.

From data collection the improving process eliminates the temperature interlock and the test time is reduce 80.9% as shown in table 1. Since the sensor automatically classification HDD by reading feature code, temperature interlock (idle slot) is solve.

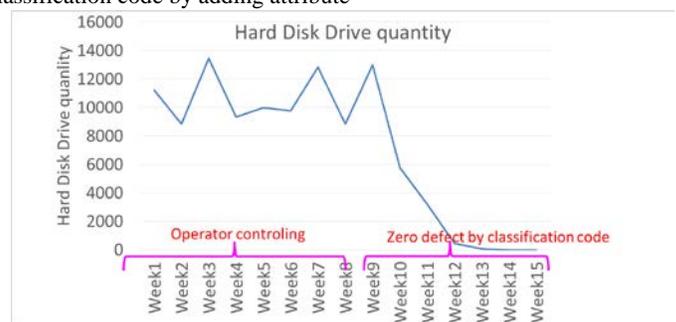


Fig. 6 Data collection before implement and after implement on the production line

TABLE I
TEST TIME COMPARISON BETWEEN CURRENT PROCESS AND
PROPOSAL PROCESS

Processing	Testime by Human controlling (hrs)	Testime by Calsification code (hrs)
Temperature Inter lock	55	0
Testing Time	68	68
Total Testime	123	68
		Reduce Testime 80.9%

IV. SUMMARY

The automatically classification temperature testing is show zero defect of HDD temperature testing. The added LODT_FEATURE reduce production time 80.9% and the temperature tester can be use full capacity without idle slot more over operator can be also reduce.

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