APPLICATION OF STATISTICAL METHODS TO REDUCE THE DEFECT OF ASSEMBLY PROCESS FOR PLASTIC BALL GRID ARRAY (PBGA) COMPONENT

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by

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Report submitted in partial fulfillment
of the requirements for the degree
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APPROVAL AND DECLARATION SHEET

This project report titled **Application of Statistical Methods to Reduce The Defect of Assembly Process for Plastic Ball Grid Array (PBGA) Component** was prepared and submitted by **Tan Chun Huat (Matrix Number: 061050739)** and has been found satisfactory in terms of scope, quality and presentation as partial fulfillment of the requirement for the **Bachelor of Engineering (Manufacturing Engineering)** in **University Malaysia Perlis (UniMAP).**

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ABSTRAK

Pada masa ini, penghasilan pemasangan papan litar bercetak menghadapi banyak masalah terutamanya dalam pemasangan komponen tatasusunan grid bebola plastik. Oleh itu, adalah penting untuk menumpu perhatian dalam proses pembuatan. Penambahbaikan proses adalah merancang di syarikat 'S' pada talian pengeluaran pemasangan papan litar bercetak. Objektif kajian ialah mengumpul dan analisa data proses parameter terpilih dengan tujuan mengurangkan jumlah kecacatan produk bagi proses pemasangan untuk komponen tatasusunan grid bebola plastik. Terdapat empat pembolehubah penting dalam kajian ini, iaitu faktor A-print speed, faktor B-solder paste thickness, faktor C-semi auto connecter jig force, dan faktor D-separation speed. Dengan menggunakan Rekabentuk Eksperimen (Design of Experiment), eksperimen yang direka ialah kaedah rekabentuk one-half fraction of a 2^4 atau kaedah rekabentuk 2^{4-1} untuk tujuan pemeriksa eksperimen. Sebanyak 20 eksperimen dijalankan dalam syarikat 'S'. Eksperimen yang direka ialah central composite design (CCD) untuk menjalankan eksperiment yang tumpu pada factor-factor penting yang diperolehi daripada analisis eksperimen pemeriksaan. Sebanyak 17 eksperimen dijalankan di syarikat 'S'. Jumlah eksperimen yang telah dijalankan di syarikat 'S' ialah sebanyak 37 eksperimen. Perisian. "*Design Expert"* digunakan untuk mensimulasi, menganalisis data dan bacaan daripada eksperimen. ANOVA (analisis of varians) digunakan untuk mengetahui kesan interaktif bagi pembolehubah-pembolehubah dan jawapan yang dikehendaki adalah untuk mengurangkan jumlah kecacatan. Ia disarankan bahawa tetapan optimum parameter yang diperolehi boleh mengurangkan jumlah kecacatan dan menjimatkan perbelanjaan.

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ABSTRACT

The manufacturing of printed circuit board assembly (PCBA) is facing many problems especially in ball grid array (BGA) assembly. Therefore, it is important to focus on manufacturing process. Process improvement in this study is conducted in the company 'S' on the printed circuit board assembly (PCBA) production line. The objectives of the study is to collect and analyze data of selected printed circuit board assembly (PCBA) process parameters in order to reduce the number of defects of assembly process for plastic ball grid array (PBGA) component. There are four important variables in this study which is factor A-print speed, factor B-solder paste thickness, factor C-semi auto connecter jig force, and factor D-separation speed. Using design of experiment (DOE), the experiments are designed with one-half fraction of a 2^4 design or 2^{4-1} design method for screening experiments. Twenty numbers of experiments are run in production line in the factory. Finally, experiments are designed with central composite design (CCD) to optimal concentration significant factors that obtain from screening experiments. Seventeen numbers of experiments are run in production line in company 'S'. Total thirty-seven numbers of experiments had been conducted. Software *Design Expert* is used for simulation and data analysis. ANOVA (analysis of variance) is performed to know interactive effect of the variables on the responses which is to reduce number of defects. It is suggested that the optimal setting of the parameters can reduce number of defects and company can save cost.

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LIST OF ABBREVIATIONS

ANOVA	Analysis of Variance
BGA	Ball Grid Array
CCD	Central Composite Design
DF	Degree of Freedom
DOE	Design of Experiment
ICT	In-Circuit Test
Mils	1 Mil = 0.001 Inches
OEM	Original Equipment Manufacturer.
PBGA	Plastic Ball Grid Array
PCB	Printed Circuit Board
PCBA	Printed Circuit Board Assembly
RTS	Revolutionary Test System
SMT	Surface Mount Technology
SS	Sum of Squares
FVMI	Final Visual Mechanical Inspection

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