CHAPTER 6

Conclusions and recommendations

The first part chapter shows the conclusion of the overall research, all processes that passed and the result. The second part shows the recommendation for further development.

6.1 Conclusions

The current control process assume process mean is shifting in every shift of operation. Therefore, one must re-compute control limits in every shifts of manufacturing. This is not a most efficiency way to overcome the problem in controlling the quality of process.

The above practice contradict a statistical quality control theory. In SPC, control limits should be changed only when one certain that the process mean and variation have shifted to new value. To determine the shift conditions, we have to do a hypothesis testing to prove that the new mean and/or sigma are really different from the one used in calculating control parameters. For p-chart, the change in control limits depends on means and sample size. In this research, the sample size is set to be constant. So, process mean is the only factor that we concern.

The model is constructed to overcome the human factors of when to recalculate control limits by replacing it with the statistical method. The binomial distribution theory, control chart for attributes (p-chart) and the statistical inference on a population proportion are used for the purpose of demonstration.

Firstly, the data has been collected from electrical tester in test department in harddrive manufacturing plant. This data is the yield of the process or fraction conforming. Since this data is yield of process which has only pass and not pass, it is considered as binomial distribution. This set of data is binomial distribution which is approximate to be normal distribution by the calculation of np value. Then, we calculate the process capability by change the data from fraction conforming to fraction nonconforming and approximate Z-level to be P_{pk}. After that, the algorithm was constructed based on statistical hypothesis testing and control chart for fraction nononforming (p-chart). Then, the proposed model were tested using randomly generated data based on binomial distribution with 2 different p. These sets of data were generated by computer. The data are used to visually demonstrate the efficiency of the model. The results show that the model can correctly detect process mean shift at the right point.

Finally, test the model is tested with a data collecting from the actual manufacturing process. The result shows the model can detect the shift in the process mean whereas the human naked eye cannot. Firstly, this is done by making sure that we have sufficient data points for the hypothesis testing by calculates the suitable simple size. Thus, using the propose method we can be certain, by using that process has or has not changed. This leads to an automatic and real time recalculation of control limits in the continuous manufacturing system. By using this proposed algorithm, the decision is systematically made instead of human's, thus reduce one addition manufacturing variation.

6.2 Recommendations

The flowchart of the proposed model is given in this research. This algorithm can be easily transformed into a computer software that can detect the process mean shift in the real continuous manufacturing system.

As described in the previous chapter, this model is developed to use with p chart. With the same logic, it can be applied and improved to use with the other kinds of control chart such as $\bar{x}$ -R chart or $\bar{x}$ -S chart. As we know from the theory of Statistical Process Control that the p-chart is developed from the same base logic with the $\bar{x}$ -R chart. The sample size calculation of this model for p chart is very large. If this is applied to $\bar{x}$ -R chart, it will be smaller, so this model is also suitable for $\bar{x}$ -R chart.