

Foreword

What I Have Learned by My Failures

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There are probably no persons who have engaged themselves in the development of a new technology or a new product and who have not experienced any technical failure. If there is a developer who asserts that he/she has never made any mistake, it is highly questionable. Maybe what he/she calls the development is anything but a development or he/she has blamed his/her mistake upon someone else or he/she simply does not want to admit that he/she has made a mistake.

Normally, technical mistakes are detected by technical evaluations in the process of development and corrected as required. There are, however, technical mistakes which remain unnoticed throughout the development process. At Komatsu, when such a mistake is detected in the process of mass production, the person in charge is required to fill in a document called Important Quality Problem Registration/Control Sheet, report the problem to the related departments, and discuss how to fix it. I am probably the one who has submitted more IQPRC sheets than has any other employee of our company. In fact, I have once written (or should I say “I have been made to write”?) as many as 10 IQPRC sheets in a month. In other words, I label myself the man who has made most technical mistakes at our company. I felt that there were lots of causes of technical failures — bold technical challenges, failure to recognize special uses of our products by customers, failure to accurately reflect variances in materials/production processes in the product design, excessive dependence on bench test results, and other careless mistakes I myself can hardly understand why I made in retrospect. About 13 years ago, when I was looking in the file of IQPRC sheets I had submitted, I noticed something that I have never recognized before because I had been absorbed in solving one problem after another. A review of all my design mistakes from the standpoint of preventing recurrence of the same mistakes told me that the causes of them are boiled down into just three categories. They are: the wrong formula was used to perform calculations; the wrong conditions were input to the formula; and the calculation results were misjudged. The same can be said of engineers who are engaged in testing and evaluation if you replace the word “formula” with “test method”. To my shame, it took more than 20 years for me to become aware of this simple fact. Since then, I have tried to enlighten my subordinate engineers telling them that the above three are the three basic factors in technical failures.

As tools for preventing defects, there are, for example, FMEA and FTA prepared by individual persons. However, these tools are not considered sufficient for the purpose because they depend much on the skill of the person who prepares them. Improving a common FMEA data base on a continual basis might be a means of generalizing FMEA into total knowledge. However, since more than 80% of defects are of recurrent or similar nature, I believe that defects could be reduced dramatically by tackling the prevention of recurrence of the three basic factors in technical failures in earnest.

Recently, the technologies that are incorporated in products have become increasingly sophisticated and complicated. Accordingly, it seems that the causes of technical failures are becoming complicated. However, getting to the bottom of the matter, I feel that any defect is due to one of the three basic factors in technical failures. In his popular book titled “Learning from Failures”, Prof. Yotaro Hatamura stresses the importance of failure-awareness of each individual person. As the one who has experienced technical failures more than anyone else in the company, I agree to this point. As the saying goes, failure is the mother of success. When each individual employee faces failures in earnest, the technical level of the person and of the entire company will be sure to improve. I am not exhorting anyone to make mistakes. What I really want to say is that the engineers should always sharpen their senses to detect their own mistakes and that if they think they have made a mistake, it is important to promptly try to solve the problem considering it as a good opportunity to improve the technical level of the individuals and the company.

As an ‘expert in technical failures’ and a ‘mechanical engineer still on the active list’, I would like to add one word — “A machine is honest and lovable. Continue improving it. It will surely respond to the love and care you provided.”