

“Quality Based Model of Production Line”

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Abstract-

During the past years, the achievement of the any Production System has large research in the area of manufacturing systems engineering. The research fields are productivity and quality, have been extensively studied but there is little research in their intersection of both of these areas. The aim of this paper is to analysis how production, quantity, quality, and productivity are inter-connected in small production systems. In most of research on the relationship between quantity, quality, and productivity are based on unreliable data that focus technical quantitative foundations. This research tries to set up a technical groundwork to examine how production system and process influence productivity and product quality by developing theoretical models and performing research. By doing so, this study will show an important part of the way to produce large quantity with quality based products with lowest cost.

Keywords- Quality, Productivity, Production.

1. Introduction-

Manufacturers strive to satisfy two requirements while minimizing cost. These are quality (every vital characteristic of every manufactured item must satisfy certain specifications) and quantity (a specified number of items must be produced within a specified time interval). Various research papers have tried to explain the relationship between production and productivity, so that they can show ways to design factories to produce more products on time with fewer resources (people, material, space and others). On the other hand, topics in quality research have captured the attention of practitioners and researchers since the early 1980s. The recent popularity of Statistical Quality Control (SQC), Total Quality Management (TQM), and Six Sigma have emphasized the importance of quality. The task of satisfying these requirements is complicated by the presence of uncertainty (changing machine characteristics, unknown machine state, imprecise observations of machine output, etc.) as well as changing conditions (variable demand, lead time, inventory constraints, product mixed.). Production system designers must make quality-motivated decisions such as choosing operation parameters (for example, speeds and feed rates in metal-cutting), the locations of inspection stations, and the actions to take in response to failed inspections. They must also make quantity-motivated decisions such as the sizes of buffers and the structures of production systems. Precise mathematical models have not been available for all relevant performance measures, but even when some have been formulated, quality-motivated design choices have historically been evaluated with quality-focused models, and quantity-motivated design choices with quantity-focused models. Precise models to at the same time predict the interaction of quantity- and quality-related design choices on quantity and quality performance are needed, but do not exist.

Quality models there are two extreme kinds of quality failures based on the characteristics of variations that cause the failures. In the quality literature, these variations are called common (or chance or random) cause variations and assignable (or special or unusual) cause variations [1]. These two fields, productivity and quality, have been extensively studied and reported separately both in the manufacturing systems research literature and the practitioner literature, but there is little research in their intersection. The need for such work was recently described by authors from the GM Corporation based on their experience [3]. Quantitative research is more oriented toward the latter topic. Robust engineering [4] is an area that has gained substantial attention. Improving individual operation yield is another important way to increase the system yield. Many studies in this field try to stabilize the process either by finding root causes of variation and eliminating them or by making the process insensitive to external noise. The former topic has numerous qualitative research papers in the fields of Total Quality Management (TQM) [2] and Six Sigma [5].

3. Quality model

Quality failures are of two extreme types, depending on the characteristics of variations that cause the failures. In the quality literature, these variations are called common (or chance or random) cause variations and assignable (or special or un-usual) cause variations [Montgomery, 1991] [7]. The quality failures due to assignable cause variations are those in which a quality failure happens only after a change occurs in the machine. In that case, it is very likely that once a bad part is produced, all subsequent parts will be bad until the machine is repaired. so check all the above process sincerely to produced better parts.

4. Single machine model

There are many possible ways to characterize a machine for the purpose of simultaneously studying quality and quantity issues. Here, we model a machine as a discrete state, continuous time Markov process. Material is assumed continuous, and μ_i is the speed at which Machine i processes material while it is operating and not constrained by the other machine or the buffer. It is a constant, in that μ_i does not depend on the repair state of the other machine or the buffer level. Figure:1 shows the proposed state transitions of a single machine with persistent-type quality failures. In the model, the machine has three stages:

- Stage 1: The machine is working and producing good parts.
- Stage 2: The machine is working and producing bad parts, but the Operator does not know this yet.
- Stage 3: The machine is not working.

The machine therefore has two different failure modes (i.e. transition to failure states from state1):

- Operational failure: transition from stage 1 to stage- 3. The machine stops producing parts due to failures like motor burnout.
- Quality failure: transition from stage 1 to stage-2. The machine stops producing good parts (and starts producing bad parts) due to a failure like a sudden tool damage.

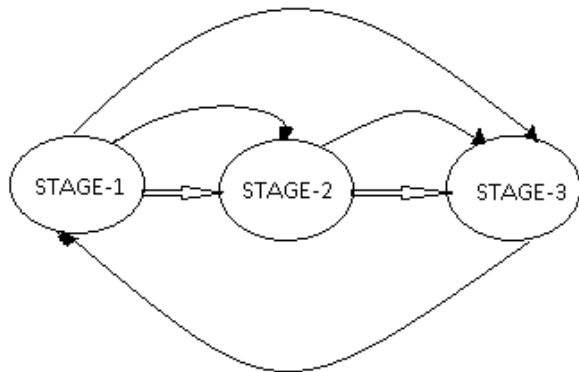


Fig-1 Stages of a Machine

5. Conclusion

This research takes an essential early research step in analyzing how production system, quality, and productivity are interrelated. There was very little quantitative analytical writing that explores this area, even though the effects of the relationships are renowned on the plant floor anecdotally. For better output on the bases of quality sincerely check the entire operations.

6. References

- I. Montgomery D C (2001) *Introduction to statistical quality control 4th edition*. John Wiley & Sons.
- II. Bester_eld D H, Bester_eld-Michna C, Bester_eld G, and Bester_eld-Sacre M,(2003) *Total quality management*. Prentice Hall.
- III. Inman R R, Blumenfeld D E, Huang N, and Li J (2003) *Designing production systems for quality: research opportunities from an automotive industry perspective*. *International journal of production research* 41 (9): 1953{1971.
- IV. Phadke M (1989) *Quality engineering using robust design*. Prentice Hall.
- V. Pande P and Holpp L (2002) *What is six sigma?* McGraw-Hill.

- VI. [6] Montgomery, D. C., \The economic design of control charts: A review and literature survey", *Journal of Quality Technology*, Vol. 12, No. 2, pp. 75 - 87, 1980.
- VII. [7] Montgomery, D. C., *Introduction to statistical quality control*, John Wiley & Sons, Inc, 1991.
- VIII. 3. Black J T (1991) *The design of the factory with a future*. McGraw-Hill.
- IX. 4. Bonvik A M, Couch C E, and Gershwin S B (1997) *A comparison of productionline control mechanisms*. *International journal of production research* 35 (3):789{804.
- X. Burman M, Gershwin S B, and Suyematsu C (1998) *Hewlett-Packard uses operations research to improve the design of a printer production line*. *Interfaces* 28 (1): 24{26.
- XI. Buzacott J A and Shantikumar J G (1993) *Stochastic models of manufacturing systems*. Prentice-Hall.
- XII. Cheng C H, Miltenburg J, and Motwani J (2000) *The e_ect of straight and U shaped lines on quality*. *IEEE Transactions on Engineering Management* 47 (3):321-334. *Integrated Quality and Quantity Modeling of a Production Line* 25.
- XIII. Alles M, Amershi A, Datar S, and Sarkar R (2000) *Information and incentive effects of inventory in JIT production*. *Management science* 46 (12): 1528{1544.
- XIV. Dallery Y. and Gershwin S B (1992) *Manufacturing ow line systems: a review of models and analytical results*. *Queuing Systems Theory and Applications* 12:3{94.
- XV. Fujimoto T (1999) *The evolution of a manufacturing systems at Toyota*. Oxford University Press.
- XVII. Gershwin S B (1994) *Manufacturing systems engineering*. Prentice Hall.
- XVIII. Gershwin S B (2000) *Design and Operation of Manufacturing Systems | The Control-Point Policy*. *IIE Transactions* 32 (2): 891-906.
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