# DEVELOPMENT OF QUALITY CONTROL SOFTWARE FOR CONTROLLING AND EVALUATION PAPER WASTE IN ORDER FOR COST OPTIMATIMATION OF NEWSPAPER INDUSTRY

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**Abstract -** *One of big newspaper industry in Central Java is PT. Masscom Graphy. This company is part of Suara Merdeka Group. Like other newspaper industry, PT. Masscom Graphy also get hard effort for resulting good printing and reducing product defect (misdruk), always appear in printing process. Controlled product defect by Quality Control Department of PT. Masscom Graphy is paper waste. It cannot be avoided but Quality Control Department try to control this in order to reduce waste, that mean reduce production cost. Quality Control of Newspaper Production in PT. Masscom Graphy using statistical assistance tools. This tools include p-chart used for monitoring whether the defective product is still in statistical control or not, Pareto chart for identifying dominant type of defect and for determining the improvement priority, Hystogram for presenting of data and cause-effect table for finding factor that cause paper waste. A system managing the quality control need run in computer based system, in order to get reliable information.*

***Keywords** : newspaper industry, quality control, p-chart, pareto chart, histogram*

## I. INTRODUCTION

Internal quality control within appraisal firms is an increasingly important topic, especially in these times of heightened appraiser accountability. Appraisal firms that Implement quality control review processes have the opportunity to set themselves apart from their competition. [6]

The Industrial Revolution brought heavy reliance on product inspections as a means to prevent defective goods from reaching the customer. As implemented, however, these inspections typically did not improve the production process or provide better training to workers, and companies incurred continuing and unnecessary costs (such as costs related to ongoing defects, high inspection expenses, and so forth) as a result. [6]

Deming and other quality pioneers discouraged reliance on final inspection as a sole means of quality control and argued that production efficiency must be maximized through a robust, continuous feedback loop aimed at process and worker improvement. The quality movement emphasizes the prevention of defects over their detection and is an important means of providing short-term control and long-term enhancements to any production environment. [6]

The introduction of modern tools and sophisticated computer controls over time markedly increased product quality in many manufacturing environments and greatly reduced reliance on inspections. This allowed many producers to replace 100% inspection with a simple sampling process without significantly increasing the rate of defects that reach the consumer. [6]

PT. Masscom Graphy is a company which operate in printing and publishing. The main product is Suara Merdeka newspaper which become the mainstay of the Central Java community. Since 2003, the company has obtained ISO 9001: 2000 as guarantee that the company has implemented a good quality management according to quality standards guidance in order to maintain consumer's confidence. In the production activity, the company always endeavor to produce a good product and reduce high product defects (misdruk) by setting a standards with 6% misdruk tolerance from total production. However, in the reality, misdruk levels fluctuate and sometimes exceeds the specified tolerance standards. [2]

## II. THE QUALITY CONTROL REVIEW PROCESS

The quality control process is founded on defined report and QC review standards and is ideally supported and validated through an audit process designed to guarantee proper adherence to those standards, as illustrated in Figure 1. [6]

Defined report standards are the guideposts by which appraisals must be completed. These standards must be written and clearly understood by the production staff. As previousl[y] discussed, these guidelines may consist of report templates and other standard documents and should be comprehensive enough to cover all issues staff members are likely to encounter. This often requires having multiple templates on hand to address the various property types and appraisal issues that may arise in different assignments. [6]

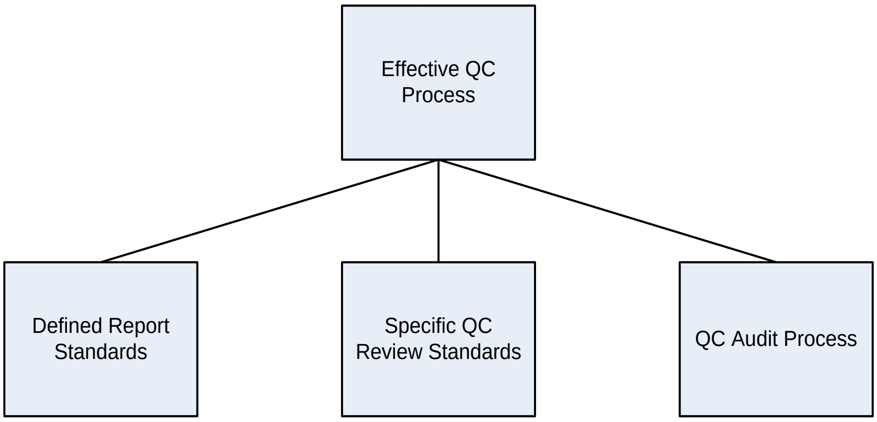


**Fig. 1** QC review process [6]

Quality control standards provide a minimum scope for reviews by identifying common problems and significant sections of the report that must be reviewed in detail to make sure that the defects are spotted and corrected. It is critical that client-defined critical-to-quality (CTQ) are addressed in the review standards, including the following issues previously identified by clients: [6]

- Any factors that significantly impact value
- Standards violations
- Obvious formatting and appearance problems
- Grammar errors

Any writing that is not in line with company standards of readability and branding. The QC standards guide establishes a minimum level of due diligence required of QC reviewers and is used in conjunction with minimum report standards and other guidelines. The minimum standards should be flexible to allow for differences in the experience, sophistication, and ability levels of the appraisers. In addition, the complexity of the property and the appraisal problem should be considered in the application of these guidelines. [6]

## III. STATISTICAL TOOLS IN QUALITY CONTROL

Statistical quality control using SPC (Statistical Process Control) and SQC (Statistical Quality Control), have 7 (seven) main statistical tools that can be used as a tool to control the quality as mentioned by Heizer and Render: check sheet, histogram, control charts, pareto diagrams, cause and effect diagrams, scatter diagrams and process diagam. [3]

### III.1 Flow Charts (Process Diagrams)

A flow chart shows the steps in a process i.e., actions which transform an input to an output for the next step. This is a significant help in analyzing a process but it must reflect the actual process used rather than what the process owner thinks it is or wants it to be. The differences between the actual and the intended process are often surprising and provide many ideas for improvements. Figure 1 shows the flow chart for a hypothetical technical report review process. Measurements could be taken at each step to find the most significant causes of delays, these may then be flagged for improvement. [5]

### III.2 Cause And Effect Diagrams (Ishikawa Diagrams)

Ishikawa diagrams are named after their inventor, Kaoru Ishikawa. They are also called fishbone charts, after their appearance, or cause and effect diagrams after their function. Their function is to identify the factors that are causing an undesired effect (e.g., defects) for improvement action, or to identify the factors needed to bring about a desired result (e.g., a winning proposal). The factors are identified by people familiar with the process involved. As a starting point, major factors could be designated using the "four M's": Method, Manpower, Material, and Machinery; or the "four P's": Policies, Procedures, People, and Plant. Factors can be subdivided, if useful, and the identification of significant factors is often a prelude to the statistical design of experiments. [5]

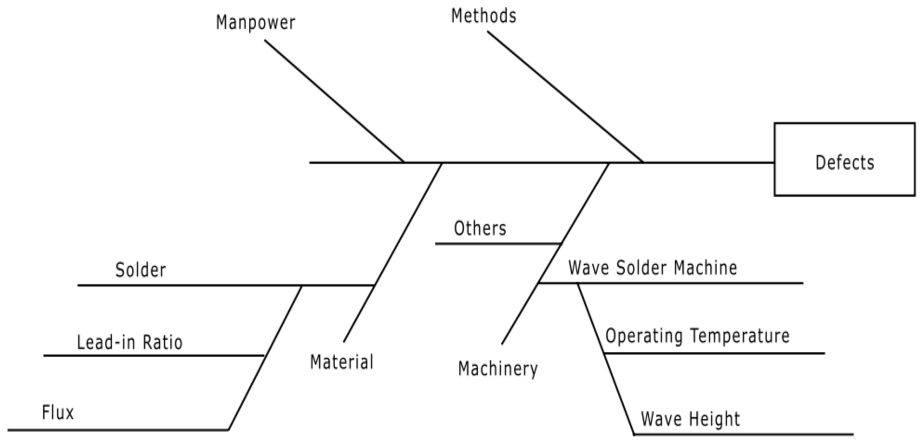


**Fig. 2** Cause and Effect Diagram [5]

### III.3 Checklists

Checklists are a simple way of gathering data so that decisions can be based on facts, rather than anecdotal evidence. Figure 3 shows a checklist used to determine the causes of defects in a hypothetical assembly process. It indicates that "not-to-print" is the biggest cause of defects, and hence, a good subject for improvement. Checklist items should be selected to be mutually exclusive and to cover all reasonable categories. If too many checks are made in the "other" category, a new set of categories is needed. [5]

| Defect | Monday | Tuesday | Wednesday | Thursday | Friday | Total |
|---|---|---|---|---|---|---|
| Solder | I | II | | I | | 4 |
| Part | II | | I | II | I | 6 |
| Not-to-Print | III | II | I | III | II | 11 |
| Timing | | I | I | | I | 3 |
| Other | | I | | | | 1 |

**Fig. 3** Checklists [5]

Figure 3 could also be used to relate the number of defects to the day of the week to see if there is any significant difference in the number of defects between workdays. Other possible column or row entries could be production line, shift, product type, machine used, operator, etc., depending on what factors are considered useful to examine. So long as each factor can be considered mutually exclusive, the chart can provide useful data. An Ishikwa Diagram may be helpful in selecting factors to consider. The data g

athered in a checklist can be used as input to a Pareto chart for ease of analysis. Note that the data does not directly provide solutions. Knowing that "not-to-print" is the biggest cause of defects only starts the search for the root cause of "notto-print" situations. (This is in contrast to the design of experiments which could yield the optimal settings for controllable process settings such as temperature and wave height.) [5]

### III.4 Pareto Charts

Alfredo Pareto was an economist who noted that a few people controlled most of a nation's wealth. "Pareto's Law" has also been applied to many other areas, including defects, where a few causes are responsible for most of the problems. Separating the "vital few" from the "trivial many" can be done using a diagram known as a Pareto chart. Figure 5 shows the data from the checklist shown in Figure 4 organized into a Pareto chart. [5]

### Iii.5 Histograms

Histograms are another form of bar chart in which measurements are grouped into bins; in this case each bin representing a range of values of some parameter. For example, in Figure 4, X could represent the length of a rod in inches. The figure shows that most rods measure between 0.9 and 1.1 inches. If the target value is 1.0 inches, this could be good news. However, the chart also shows a wide variance, with the measured values falling between 0.5 and 1.5 inches. This wide a range is generally a most unsatisfactory situation. [5]

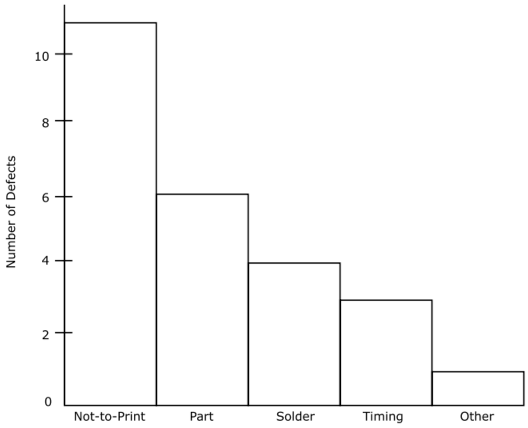


**Fig 4.** Pareto Chart [5]

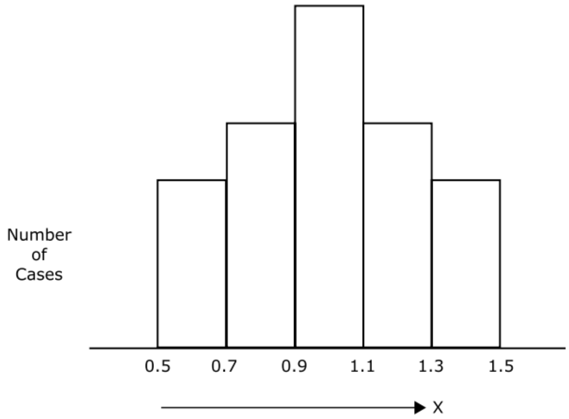


**Fig 5.** Histogram [5]

**III.6 Scattergrams**

Scattergrams are a graphical, rather than statistical, means of examining whether or not two parameters are related to each other. It is simply the plotting of each point of data on a chart with one parameter as the x-axis and the other as the y-axis. If the points form a narrow "cloud" the parameters are closely related and one may be used as a predictor of the other. A wide "cloud" indicates poor correlation. Figure 6 shows a plot of defect rate vs. temperature with a strong positive correlation, while Figure 7 shows a weak negative correlation. [5]

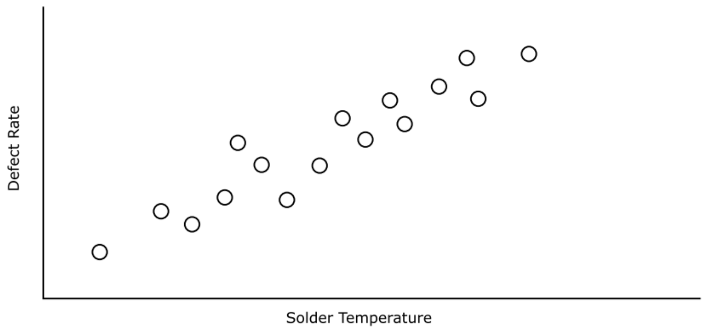


**Fig. 6** Scattergram showing strong correlation [5]

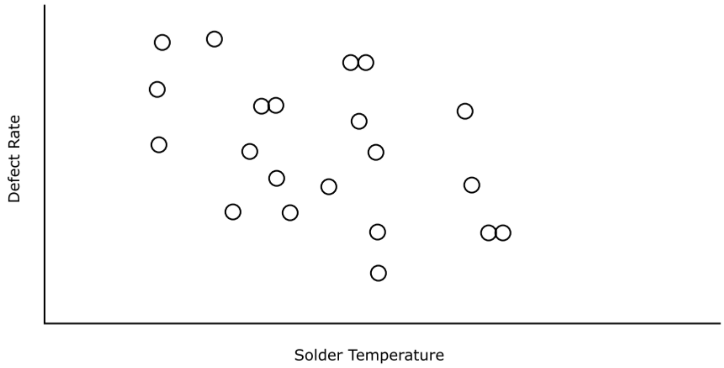


**Fig. 7** Scattergram showing strong correlation [5]

**III.8 Control Charts**

Control charts are the most complicated of the seven basic tools of TQM, but are based on simple principles. The charts are made by plotting in sequence the measured values of samples taken from a process. For example, the mean length of a sample of rods from a production line, the number of defects in a sample of a product, the miles per gallon of automobiles tested sequentially in a model year, etc. These measurements are expected to vary randomly about some mean witha known variance. From the mean and variance, control limits can be established. Control limits a re values that sample measurements are not expected to exceed unless some special cause changes the process. A sample measurement outside the control limits therefore indicates that the process is no longer stable, and is usually reason for corrective action. Other causes for corrective action are non-random behavior of the measurements within the control limits. Control limits are established by statistical methods depending on whether the measurements are of a parameter, attribute or rate. A generic control chart is shown as Figure 8. [5]

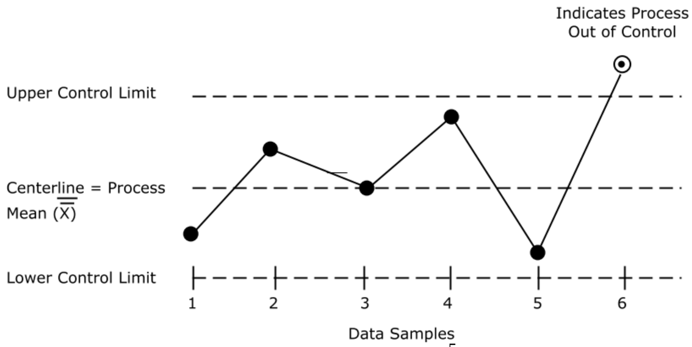


**Fig. 8** Control chart [5]

## IV. THE SOFTWARE PROCESS MODEL

Recently there has been a great deal of discussion and concern about the lack of an appropriate model for the development of large-scale software. Why should we attempt to develop models of the software development process? One reason is that by having a model we can understand for ourselves and explain to others the various steps that we must go through before completing a project. So a model is a means of communication between the developers and the customer and between the developers themselves. Another use of a model is for assisting in the management of the process. A model can provide management with a set of points (milestones), that can be examined to determine the rate of progress of the project. A third advantage of a model is that it gives software engineers a foundation for building tools that will support and enhance the software process. [4]

The traditional model for software development is the so-called waterfall model. A complete picture of this model is seen in Figure 9 and as it has been reprinted so often we will not reproduce it here. The waterfall model views software development as a manufacturing process. Each step is a phase, and the completion of one phase leads to another. Each phase has inputs from a previous phase and outputs (some of which are deliverables), that it produces. These outputs are used by management for tracking the progress of a project. For example, Royce lists six types of documents as outputs: [4]

- software requirement document
- preliminary design specification

- interface design specification
- final design specification
- test plan
- operating instruction manual.

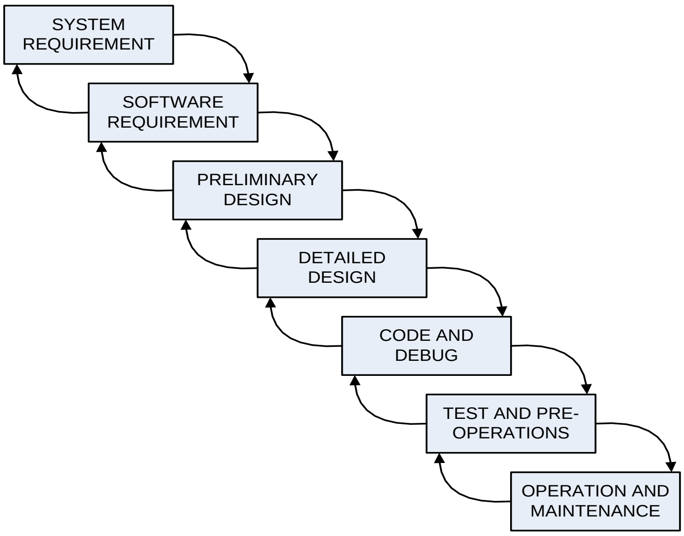


**Fig. 9** The waterfall model of software development [1]

The waterfall model is often shown with back pointing arrows as well as forward pointing arrows, acknowledging that the manufacturing model captured in the waterfall chart is not precise, and that previous phases may be returned to. Royce also emphasizes that the waterfall chart is not intended to preclude prototyping. [4]

The classic waterfall model was defined as early as 1970 by Royce and later refined by Boehm in 1976 to help cope with the growing complexity of the software projects being tackled. The use of such a model:[1]

- encourages one to specify what the system is supposed to do (i.e., to define the requirements) before building the system (i.e., designing);
- encourages one to plan how components are going to interact (i.e., designing) before building the components (i.e., coding);
- enables project managers to track progress more accurately and to uncover possible slippages early;
- demands that the development process generate a series of documents which can later be utilized to test and maintain the system;
- reduces development and maintenance costs due to all of the above reasons; and
- enables the organization that will develop the system to be more structured and manageable.

### IV.1 Software Development

Software development of Quality Control in PT. Mascom Graphy is started by defining entities included in the system and the relation between one entity and another entity. This relation describe in Entity Relationship Diagram (ERD). After that development continued by coding for the program.

### IV.2 Entity Relationship Diagram (Erd)

An entity is an object in the business or system with well-defined characteristics which are represented by columns showing what information can be stored. In relational databases, an entity refers to a record structure, i.e. table. [7]

A data model provides the lower-level detail of a relational database of an application. It shows the physical database models and their relationships in an application. An entity relationship diagram can be used to describe the entities inside a system and their relationships with each other; the entity relationship diagram is also known as a data model. [7]

Entity relationship diagram is a graphical representation of a data model of an application. It acts as the basis for mapping the application to the relational database. [7] Figure 10 shows the ERD of QC in newspaper industry.

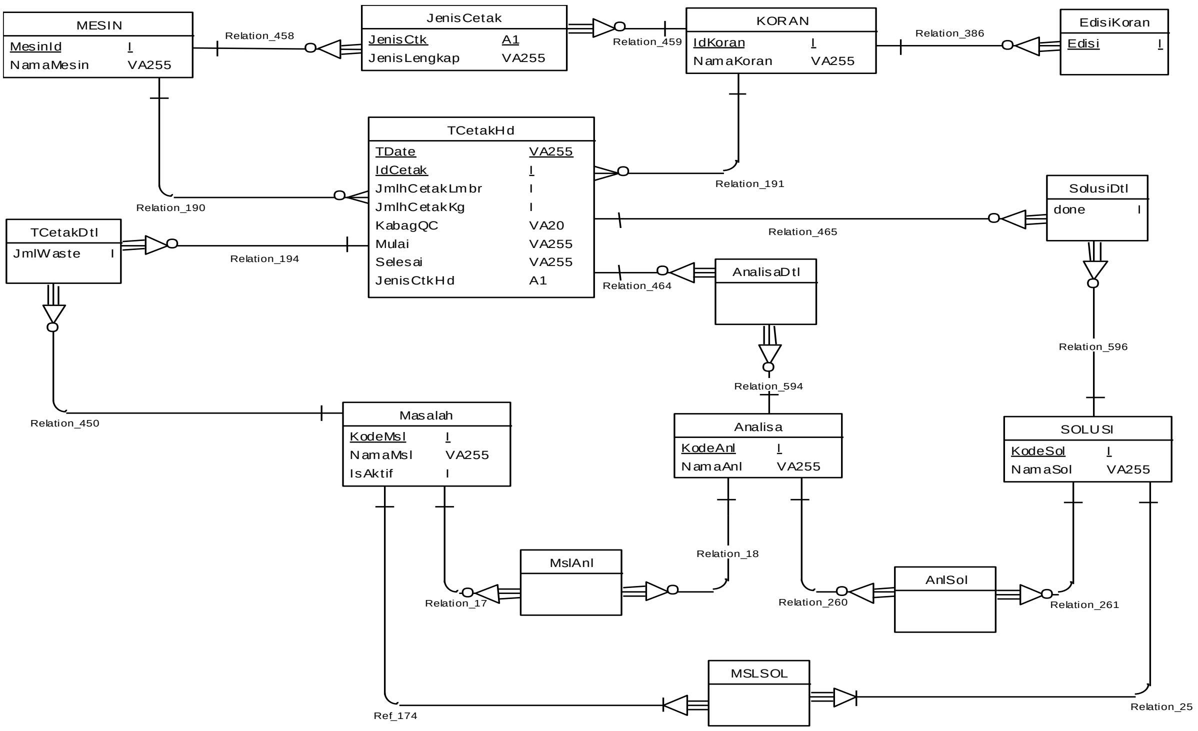


**Fig. 10** ERD

### IV.3 Software Development

Software of application is developed in Visual Basic platform for user interface and the database platform is Microsoft Access. Figure 11 shows dialog for updating newspaper and machine that print the newspaper.


**FIG. 11** KORAN DAN MESIN

Figure 12 shows transaction dialog. This transaction record every printing everyday by Production Department. The data generated for reducing entry that must be done by the user of Production Departement. Every dayly printing has different type of printing that usually the same in the same day.

Every production transaction, records problem of paper waste result prom printing production. The peper waste has different type such as not register, ink wet, paper cutted, etc.

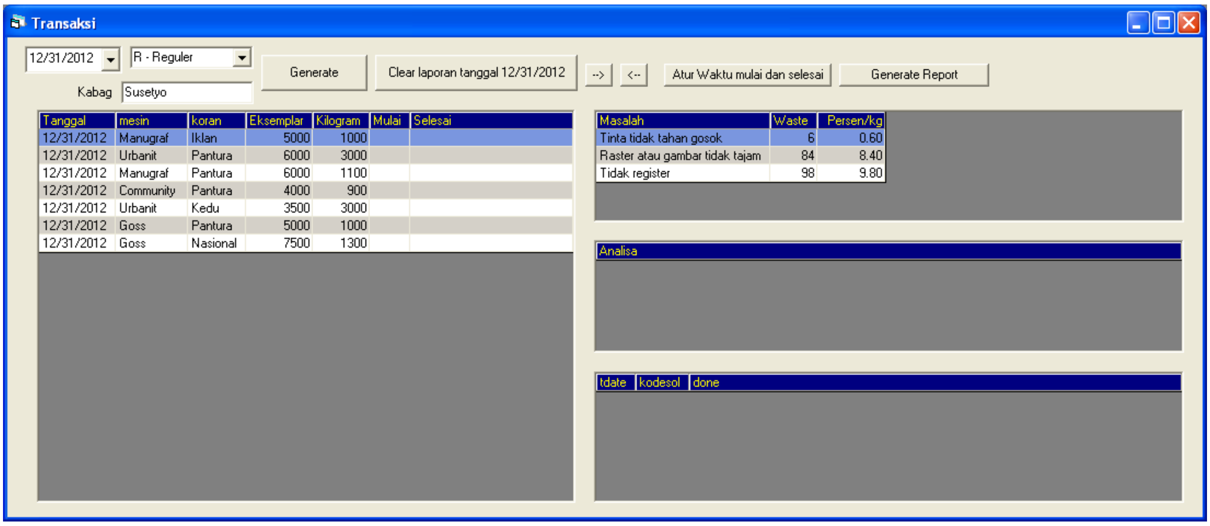


**Fig. 12** Transaction dialog

From the transaction dialog of Quality Control, we can get chart like Pareto Chart as seen in Figure 13 or Histogram as in Figure 14.

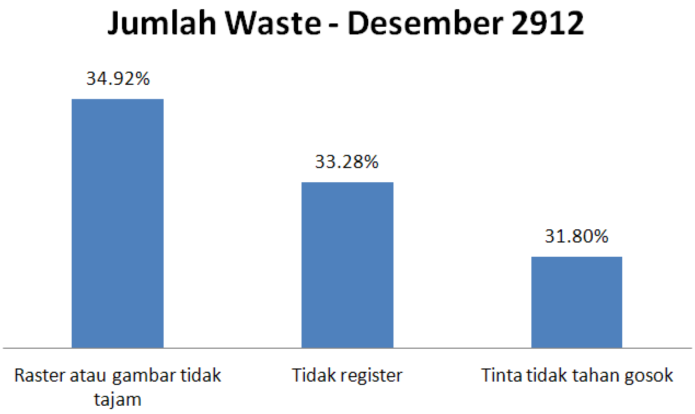


**Fig. 13** Pareto chart

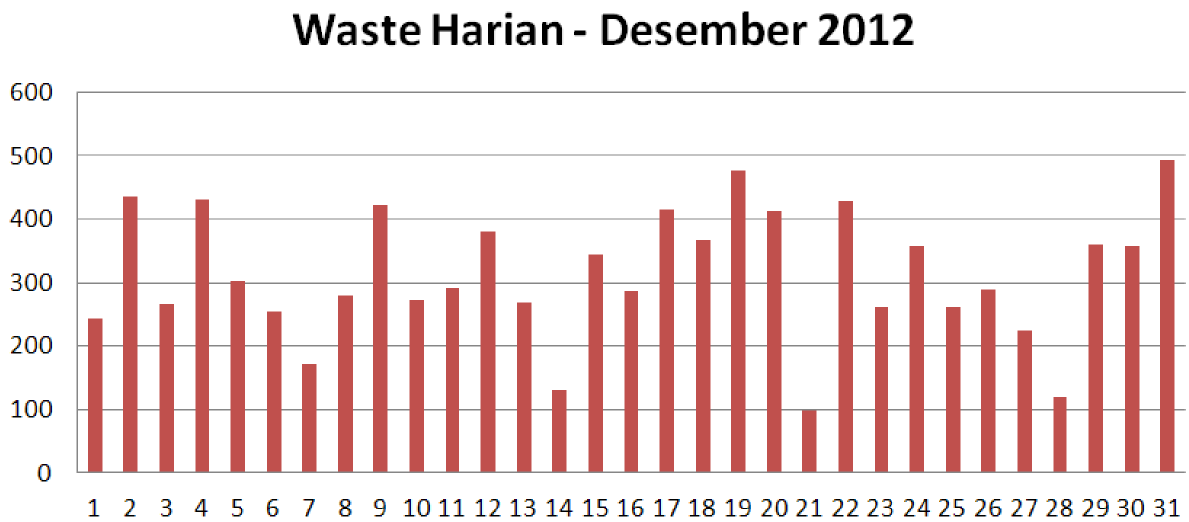


**Fig. 14** Histogram

## V. CONCLUSION

Quality control is very important in production activity of newspaper industry. This activity will control how many kilos paper waste every printing. From this activity we can see which day of controling activity are not really controlled from control chart. We also can determine what kind of waste we can handle according to the budget of the company from Pareto chart. We can observe which day has high waste so we can search what kind of condition that cause that waste.

Activity in the quality control departement is full with data observation. It is very hard to observe and manage the data become information that is usefull for doing the next decision making. System of quality control must be builded in computer base for getting fast and accurate information.

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